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RECENT TRENDS IN WILD LIFE SMUGGLING IN INDIA

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*“Never apologize for being over sensitive and emotional when defending the welfare of **wildlife**. Let this be a sign that you have a big heart and aren't afraid to show your true feelings. These emotions give you the strength to fight for what is right and to be the voice of those who cannot be heard.”*

- Paul Oxtan.

ABSTRACT

Dealing is a type of carrying that has a long history all through the world. Much the same as any exchange, the types of dealing contrast with regards to what is required on the lookout

As untamed life dealing or the unlawful natural life exchange has assumed a more unmistakable position on the worldwide plan, conversations are occurring with regards to how natural life dealing occurs. An expanded agreement has uncovered that debasement is a vital facilitator of this beneficial and unavoidable worldwide underground market, however restricted examination has investigated precisely what that defilement resembles and how debasement empowers untamed life to be dealt. Moreover, research shows that Asia, especially China and Southeast Asia, are central focuses for the gracefully and request of specific types of natural life. Through a writing based examination, this paper unloads the job explicit demonstrations of debasement play in the dealing of ivory, reptile skins and live reptiles from, through or to Asia. It is suggested that in addition to the fact that individual corrupt acts empower untamed life dealing to occur, yet additionally that ruined structures (the criminal equity framework, and monetary and political establishments) in certain social orders empower dealing to occur and furthermore increment the strength of dealing to decrease measures. In gathering nitty gritty information about the types of defilement encouraging natural life dealing gotten apparent the gaps in knowledge, and therefore the important areas for further research, become evident.

INTRODUCTION

In this my article i have mentioned what is wild life and how and why they exploit. As untamed life dealing or the unlawful natural life exchange has assumed a more conspicuous position on the worldwide plan, conversations are occurring regarding how natural life dealing occurs. Unquestionably, there are hypothetical clarifications for the interest driving natural life dealing (TRAFFIC 2008; Wyatt 2013b), however defilement has arisen as an away from of the unlawful exchange untamed life (WWF and TRAFFIC 2015; Wyatt and Cao 2015; UNODC 2016). Debasement is an unpredictable idea that doesn't have a general definition. In drawing on the scope of writing with respect to corruption, Footnote 1 we thought about debasement to comprise of any individual (public official or private person) who manhandles their situation to profit themselves, individuals in their organization, their locale or their association. In directing our writing based investigation, we searched for documentation of degenerate acts fitting this definition all through the flow scholastic, legislative and non-administrative distributions accessible through our University's library information base and on the web. The degenerate demonstrations fall inside the general classifications of pay off, support, conciliatory cover and grant misuse (Wyatt and Cao 2015). Payoff is the contribution of cash or blessings in return for the individual being paid off endeavor one of the demonstrations recorded (deliberately ignoring, giving data, permitting carrying, etc.). Support likewise brings about choosing to disregard and so forth, however the entertainers are associated through a family or companionship organization. For example, rhinoceros farm proprietors and veterinarians plotting with poachers and afterward partaking in the benefit of the horn deal (Duffy 2014). Strategic cover is the utilization of an authority political situation to participate in dealing that is hard to reveal and to stop because of the secured status of these positions. At long last, grant misuse happens in various structures including misrepresentation, phony and robbery (Wyatt and Cao 2015). As expressed above as to the meaning of debasement, the degenerate entertainers are from both the general population and private sectors. They misuse their situation to profit themselves, those near them or their association.

• What is the meaning of wildlife smuggling?¹

Wildlife smuggling or trafficking involves the illegal gathering, transportation, and dispersion of creatures and their subsidiaries. This should be possible either globally or locally. Evaluations of the cash produced by

¹ www.wwfindia.org.

untamed life sneaking fluctuate, to some degree due to its unlawful nature. "Natural life pirating is assessed at \$7.8bn to \$10bn per year, as per the U.S. State Department. The U.S. State Department likewise records untamed life dealing as the third most important unlawful trade on the planet." The illicit idea of such exercises makes deciding the measure of cash included unimaginably troublesome. At the point when considered with unlawful lumber and fisheries, untamed life dealing is a significant illicit exchange alongside opiates, illegal exploitation, and fake items Wildlife pirating or dealing includes the illicit social affair, transportation, and appropriation of creatures and their subsidiaries. This should be possible either universally or locally. Appraisals of the cash created by untamed life pirating differ, partially due to its illicit nature. "Untamed life carrying is assessed at \$7.8bn to \$10bn per year, as indicated by the U.S. State Department.[1] The U.S. State Department likewise records untamed life dealing as the third most important unlawful business on the planet. The unlawful idea of such exercises makes deciding the measure of cash included amazingly troublesome. At the point when considered with unlawful wood and fisheries, untamed life dealing is a significant illicit exchange alongside opiates, illegal exploitation, and fake items¹.

• **Environmental**

Untamed life sneaking straightforwardly influences the biodiversity of various biological systems. Certain creatures are more sought after by bootleggers, prompting an obvious decrease of these species in their local environments.¹

Natural life pirating may likewise cause the presentation of intrusive and hurtful species into a biological system, which can imperil indigenous untamed life by getting a strain on the conditions assets through inter specific rivalry between species. All through the most recent hundred years, around twenty creatures are terminated because of poaching and unlawful pirating. for example, the west African dark Rhinoceros, Pyrenean Ibex, Passenger Pigeon... Lamentably, poaching and unlawful chasing may cause elimination for new 7 species like Plowshare Tortoise, Red-Fronted Macaw.

• **Health**

The spread of creature borne illness influences both human wellbeing just as undermining indigenous untamed life and characteristic biological systems. As indicated by the United States Government Accountability Office, almost 75% of arising infections that arrive at people come from creatures. The connection between untamed life dealing and illness episode is addressed, despite the fact that flare-ups of specific sicknesses have suspected connections to carried creatures.

Infections connected to creature species that are focuses of natural life sneaking

- Herpes B infection is an infection found among macaque monkeys that can be communicated by nibbles or scratches to people in very uncommon cases. If not treated not long after introduction, extreme cerebrum harm or demise can follow disease.
- Salmonella contamination can cause looseness of the bowels, fever, and stomach cramps. Diseases have been connected to contact with turtles unshaven monsters and different reptiles.

CRIMINALIZATION OF WILDLIFE TRAFFICKING

Definitions

Untamed life dealing includes the unlawful exchange, pirating, poaching, catch, or assortment of jeopardized species, secured natural life (counting creatures or plants that are liable to gather shares and managed by grants), subsidiaries, or items thereof. There is, notwithstanding, no generally acknowledged meaning of the term and various wards and associations utilize distinctive wording (Biegus and Bueger, 2017; UNODC, 2016; Wellsmith, 2011).

Global associations, for example, UNODC and INTERPOL utilize the term 'natural life and timberland wrongdoing' to 'allude to the taking, exchanging (providing, selling or dealing), bringing in, sending out, preparing, having, getting and utilization of wild fauna and vegetation, including wood and other woodland items, in repudiation of public or worldwide law. Extensively, natural life and backwoods wrongdoing is the unlawful abuse of the world's wild vegetation' (UNODC, 2019).

The ICCWC further clarifies: 'This may begin with the unlawful misuse of common assets, for example, the poaching of an elephant, removing of an uncommon orchid, unapproved logging of trees, or unlicensed netting of sturgeons. It might likewise incorporate resulting acts, for example, the handling of untamed life into items,

¹ "Wildlife Trafficking". www.state.gov. Retrieved 2018-10-01.

their transportation, offer available to be purchased, deal, ownership, and so on It additionally incorporates the covering and washing of the monetary advantages made out of these wrongdoings. A portion of these wrongdoings will happen exclusively in the nation of cause, while others will likewise happen in the nation of objective, where live fauna or greenery examples, or their parts and subsidiaries, are at long last devoured' (CITES Secretariat, [undated]).¹

CRIMINALIZATION

Laws and guidelines on natural life dealing differ from nation to nation. Contingent upon the ward, infringement of laws identifying with the climate, woodlands, natural life, fisheries, imperiled species, or secured territories may offer ascent to managerial, common or criminal obligation (UNODC, 2012). For additional on this, allude to Module 2 of the E4J University Module Series on Wildlife, Forest and Fisheries Crime.

Criminalization is the harshest type of guideline and includes the most obtrusive types of discipline and procedures. It should consequently be utilized if all else fails when different intercessions and assents don't or would not have the ideal impact. Criminalization, criminal methodology, and discipline must happen in a proportionate and sensible way and should be held for genuine infringement of natural life, timberland, and fisheries laws (see further, Wyatt, 2013; Nurse, 2015; WWF, 2015).

• Illegal wildlife trade in India

Throughout the long term illicit untamed life exchange has arisen as a type of Organized Transnational Crime that has undermined the presence of numerous wild species over the globe. In India, it incorporates assorted items including mongoose hair; snake skins; Rhino horn; Tiger and Leopard hooks, bones, skins, stubbles; Elephant tusks; deer prongs; shahtoosh cloak; turtle shells; musk units; bear bile; restorative plants; lumber and confined winged animals, for example, parakeets, mynas, munias and so forth A huge piece of this exchange is intended for the worldwide market and has no immediate interest in India.

India is likewise an individual from the CITES (Convention on International Trade in Endangered Species of Fauna and Flora) since 1976. Refers to is a peaceful accord between governments that intends to guarantee that worldwide exchange examples of wild creatures and plants doesn't undermine their endurance. Refers to works by oppressing worldwide exchange examples of chose species recorded on Appendices to specific controls.

In India like numerous different nations, the issue isn't of the laws yet that these might be ineffectively imparted and similarly as inadequately executed and upheld. Regularly, positive endeavors to address untamed life exchange concerns are sabotaged by absence of political will and administration disappointments. Without political support, disincentives for over-abuse and unlawful exchange, for example, punishments for legitimate encroachments, are all around very regularly frail.

Latest news on illegal wildlife trade in India²

Elephant poaching in India; Wildlife Bureau seeks Crime Branch probe; 1 Feb, 2014 : Alarmed by the audacity of the trackers, the Wildlife Wing has mentioned the State Government for a Crime Branch test into the elephant poachings in Sambalpur district. In the most recent 10 days, three elephants were killed in Bamra and Sambalpur Forest Divisions. Despite the fact that the Sambalpur FD captured two people and held onto gigantic volumes of ammo, the cheerful readiness of poachers has provoked the Wildlife Wing to look for a test by Crime Branch to break into what it accepts is an undeniable racket.

Madhya Pradesh poachers get three years in jail; 22 Jan 2014: A neighborhood court in Sangli locale has as of late condemned three people from Madhya Pradesh, including two ladies, to three years detainment for executing peafowls inside the Chandoli National Park³.

Three chimpanzees among various creatures seized in Kolkata; 22 January 2014: Three chimpanzees and five marmosets were among a reserve of creatures that were recuperated from a creature broker's living arrangement in Kolkata. This seizure is being considered as one of the greatest untamed life seizures in Kolkata ever embraced. Notwithstanding the Great Apes, five marmosets, a capuchin monkey and a few hundred winged animals have likewise been seized.

¹India has a solid legitimate and strategy system to control and confine natural life exchange. Exchange more than 1800 types of wild creatures, plants and their subordinate is restricted under the Wildlife (Protection) Act, 1972.

² <http://www.newindianexpress.com/states/odisha/Jumbo-Poaching-Wildlife-Wing-for-CB>.

³ <http://articles.timesofindia.indiatimes.com/2014-01>.

Tiger skin dealers to confront tax evasion charges¹; 20 Jan 2014: Tiger skins and body parts merchants Surajpal Jagmohan Koli pseudonym Chat, Sarju Bagdi and Naresh Lala, who are now confronting cases under the Wildlife (Protection) Act 1972, will likewise be reserved under the Money Laundering Act 2002.

Global Tiger skin merchant's bail request dismissed; 17 January 2014 : In a choice which would satisfy the woods office, legal judge dismissed the bail use of Tiger skin broker Suraj Pal false name Chacha. Chacha is professed to be the greatest Tiger skins and body parts runner after Sansar Chand, who is stopped in Tihar Jail for comparative offenses. The contentions on his bail supplication were held for more than two hours.

Poachers held in Chilika; 16 Jan. 2014: Poaching of transitory fowls proceeds with unabated at the Chilika with natural life authorities holding onto 25 dead feathered creatures of five unique species close to the Nalabana winged animal safe-haven on Thursday night. Two poachers were captured at Majhiera. A nation made boat and a sack containing the dead winged animals were seized from the team, said forester (Nalabana natural life range) R K Hota. This is the fourth such occurrence at the Chilika in most recent 20 days. Prior, natural life authorities had held onto 25 dead feathered creatures and captured six poachers from various spots in Tangi untamed life range, sources added. These winged animals are slaughtered for their meat which brings great cash in Balugaon, Khallikote, Berhampur and Bhubaneswar.

Tiger poaching at a 7-year-high; 18 Dec. 2013: Even as the country gets ready for the third Tiger enumeration, which will be held in January-February 2014, poaching of the large feline has broken a seven-year record. As indicated by figures with the Wildlife Protection Society of India (WPSI), a main NGO working for untamed life authorization, in 2013 39 tigers have passed on because of poaching. In 2006, the figure was 37. These are legitimate figures. The number could well be around 51 if admissions of poachers captured by Maharashtra authorities are considered. The poaching figure is considerably higher than a year ago 31 yet lower than 2005 when 46 poaching cases were enrolled.

Like that there are so many case laws.

Wildlife poaching in India more than doubles during lockdown²: Report

Episodes of untamed life poaching in India have dramatically increased during the Covid-19 lockdown with 88 creatures being killed for meat and exchange during this time contrasted with 35 in the pre-lockdown days in February, another investigation has uncovered.³

The examination directed by TRAFFIC, an untamed life exchange observing organization and a NGO working universally on exchange wild creatures, said that between February 10 and 22, the quantity of creature poaching occurrences was 35 while during the lockdown between March 23 and May 3, the number raised to 88.

TRAFFIC, which works as a program division of the WWF India, discovered a critical expansion in detailed poaching of wild creatures in India during the lockdown time frame that isn't confined to any topographical district or state or to a particular untamed life region⁴.

Revealed poaching episodes rose from 35 to 88, including nine panthers being executed during the lockdown contrasted with four murdered in the pre-lockdown period, said the report 'Indian untamed life in the midst of the Covid-19 emergency: An examination of poaching and unlawful natural life exchange patterns.'

Reports of poaching occurrences for utilization and neighborhood exchange have dramatically increased during lockdown in spite of the fact that there was no proof of accumulating of untamed life items for future exchange, it said.

The investigation demonstrates that regardless of steady endeavors by law authorization offices, wild creature populaces in India are under extra danger during the lockdown time frame.

¹ <http://timesofindia.indiatimes.com/city/nagpur/Tiger-skin-traders-to-face-money-laundering-probe/articleshow/29192182.cms>.

² [www. the hindu.com](http://www.thehindu.com).

³ A recent report by TRAFFIC, a leading wildlife trade monitoring network, has recorded a significant increase in poaching in India during the over two month lockdown period.

⁴ www.business-standard.com.

Ravi Singh, CEO, WWF-India stated, If poaching of ungulates and little creatures stays unchecked it will prompt consumption of prey base for huge felines like tigers and panthers and an exhaustion of the environments.

Saket Badola, Head of TRAFFIC's India Office stated, The dramatically increasing of announced poaching cases, mostly of ungulates and little wild creatures for meat is without a doubt putting extra weights on untamed life law requirement offices. Thusly, it is basic that these organizations are upheld enough and in an opportune way so they can control the circumstance¹.

THINGS EVERYONE NEEDS TO KNOW

These crimes threaten tens of thousands of species around the world, causing extinctions, hurting people and spreading diseases.

In August 2020 government specialists charged twelve individuals for illicitly dealing with a large number of dollars of shark blades Florida and two different states over the past seven years.

As indicated by the arraignment, the respondents and their two shell organizations likewise pirated weed the nation over and washed their not well gotten gains into gold, gems and different products.

Despite the fact that the legal disputes could even now take months, the captures speak to an uncommon triumph in the realm of natural life wrongdoing.

Poaching and untamed life dealing influence a huge number of animal types internationally and have caused many elimination. However the issue infrequently gets much media consideration — not to mention prominent captures or feelings.

Here are 10 things you should think about wild life smuggling²: case laws

1. Its enormous business. One examination put the estimation of natural life wrongdoing at up to \$23 billion per year, and since that review was distributed over 10 years prior, the worth today is most likely much higher.
2. It puts a huge number of animal groups in danger — and has caused in excess of a couple of eradications en route, including the western dark rhino. From fowls to pangolins, lions and tigers, and even orchids and hardwood. And so on, somebody's presumably murdering it and transportation it over the world.
3. It likewise hurts people. The COVID-19 pandemic was likely a result of the untamed life exchange, which has been connected to various other sickness episodes as the years progressed. Poachers and dealers have additionally been attached to kill, terrorizing, pay off, coordinated wrongdoing, psychological warfare and a large group of different dangers that destabilize families, networks and public security.
4. It takes numerous structures. Untamed life dealing can include the travel of entire bodies, meat, scales and different parts — or live creatures, sold for the pet exchange or for later utilization. Furthermore, when live creatures are gotten and delivered, few endure the cycle.
5. Its unmistakable from the legitimate natural life exchange and illicit poaching by resource trackers, however integrated with both. Numerous trackers go to the illicit exchange for much-required pay, and dealt items all around regularly get washed through lawful business sectors.
6. It frequently incorporates blow-back. Elephant poachers, for instance, every now and again use toxic substances to take out close by vultures, which would some way or another circle the dead pachyderms and ready specialists to murder destinations. In Southeast Asia wire catches are put to target "important" creatures yet murder unpredictably.
7. Its not simply creatures. Plants, creepy crawlies, corals and different animals are largely intensely dealt. That wood flooring your neighbor just introduced may have come from a secured woodland.
8. Its regularly integrated with different wrongdoings like medication pirating, illegal exploitation and psychological warfare, which utilize similar techniques to move money and products around the globe.

¹ www.state.gov.

² These crimes threaten tens of thousands of species around the world, causing extinctions, hurting people and spreading diseases.

Import/export officers oftentimes discover shipments of natural life items in similar holders as illicit medications, guns and different items.

9. The discipline once in a while fits the wrongdoing. Most poachers and runners get off with a token punishment — if that. Albeit a few nations have begun to pay attention to these violations more, the normal prison terms and fines remain so little that they neglect to go about as a disincentive for future wrongdoings.¹
10. Practically all nations are complicit — either as sources or as purchasers. Furthermore, truly, that incorporates the United States.

REASONS FOR UPSURGE OF ILLEGAL WILDLIFE TRADE IN INDIA

1. Illegal untamed life exchange is driven for the most part by the gigantic benefits acquired by the brokers.
2. Low danger and low punishments make the exchange exceptionally rewarding.
3. Unlike other customary wrongdoings, no disgrace is joined to the guilty parties who perpetrate untamed life violations.
4. Wealthy business sectors in Asia, Europe, USA and the Middle East are the power driving the illicit exchange of untamed life.
5. Craze for adornments made of creature body parts (ivory, tiger teeth/bones), utilization of creature body parts or plants in customary prescriptions, keeping the skins or horns or prongs as superficial points of interest, social convictions or even odd convictions are different variables driving the illicit exchange natural life and their parts and items.

WHY IS ILLEGAL WILDLIFE TRADE A PROBLEM?

Much of the time, illicit untamed life exchange has prompted over-abuse of the focused on species, to where the very endurance of these species is getting troublesome. This perspective has been very much promoted on account of Tigers, rhinos, elephants, Star Tortoises and others. Over reaping for exchange has likewise influenced populaces of numerous freshwater and marine species, for example, otters, freshwater and marine turtles, corals, sharks, fish and other ocean fish. Besides, unlawful natural life exchange in a roundabout way compromises the jobs of a huge piece of our human populace who are reliant on untamed life items from timberland and seaside biomes to continue them. These occupants not just rely upon the assets from the wild for food yet in addition for their business and medical care. It is hence pivotal that these untamed life assets are overseen reasonably and saved by the law.

CONCLUSION AND SUGGESTIONS

Wild life dealing is an impractical practice that prompts eradication and the decimation of environments. Most of respondents communicated an inspirational demeanor toward untamed life protection however said that preservationists and the public authority appeared to think more about natural life than about human prosperity². This recognition should be tested by showcases of altruism from park the board, which could assist work with trusting and improve connections between the recreation center and neighborhood individuals. Past investigations show that schooling can improve capacity to bear carnivores (Woodroffe et al 2005)³. However, it tends to be trying to instruct individuals with a negative demeanor about enormous carnivores because of their absence of energy for finding out about them (Bath and Majic 2001; Kaczensky 2003). Direct sure encounters, for example, securely seeing creatures inside the recreation center, can help diminish fear and support positive view of natural life (de Pinho et al 2014). Projects have been begun in Tanzania to advance secured zone appearance by neighborhood occupants (Wildlife Connection 2013). Comparative projects should be orchestrated in this examination zone, and ladies should be urged to partake.

Government and nongovernmental associations ought to present remuneration and animals protection plans to compensate for misfortunes brought about by natural life; no such plans right now exist. Carter et al (2013) considered perspectives toward tigers (*Panthera tigris*) and inferred that concentrating alleviation and protection endeavors at a particular area where untamed life related effects happen will probably decrease negative mentalities toward natural life inside a bigger encompassing region. Comparable investigations should be

¹ A Journey Inside the Deadly World of Wildlife Trafficking.

² www.wildlife-trade.org.

³ [www.worldwildlife.org > threats > illegal-wildlife-trade](http://www.worldwildlife.org/threats/illegal-wildlife-trade)

embraced around Dachigam National Park to analyze spatial dispersion of mentalities toward untamed life and natural life human clash with the goal that moderation endeavors are centered as needs be.

While significant for the preservation of untamed life in this district of Jammu and Kashmir, the consequences of this examination have wide relevance to traditionalists and strategy producers all through the creating scene and can uphold endeavors to ensure uncommon species and include nearby individuals in protection.

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FACILITATING THE SIGNIFICANT ROLE OF EDUCATORS IN PROMOTING INCLUSIVE EDUCATION IN THE 21ST CENTURY

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ABSTRACT

This study reflected on facilitating the significant role of educators in promoting inclusive education (IE) in the 21st century. IE is a framework that certifies the occurrence, involvement, and accomplishment of all students in learning. IE emphasize occasions for equal involvement, but with choices for special aid and services as required, and for diversity within a common education environment. It distinguished IE from mainstreaming and incorporation and went more a comprehensive significance to the term IE. Educators are estimated to provide accommodations progressively diverse learner inhabitants. IE can be ready potential and flourishing one with the dynamic involvement and positive attitude of the educators. IE needs teachers to take on the challenge of erecting schools where all children can learn and know like they are in the right place. The accomplishment of this full procedure of inclusion be contingent mostly on the common environment they launch contained by the classroom to mark children with disability sense recognized, impression and accomplish their educational and social potentials. An effort has been completed to realize how educators can be encouraged in this endeavor to confirm prosperous of IE. Due to the pivotal role they play in promoting, engaging, and further decreasing achievement, particularly with children who may appear to have learning difficulties, educators are critical in these missions. It's time for educators to grasp their new role in the inclusive classroom as a counselor to children. The present study pursues to travel how inclusive principals can enable the progress of an IE philosophy in which the needs of students undergoing societal, expressive and accommodating strength of personality are best expressed and maintained by educators in the 21st century. The author decided in this study to discover and facilitating the significant role of educators in supportive of IE in the 21st century.

Keywords: Inclusive Education, Educators, Facilitation, Promotion, and 21st Century.

INTRODUCTION

It is the procedure of addressing student's needs contained by the 'mainstream' school, using all accessible means to form prospects to learn in formulating for life. IE is a method that confirms the existence, involvement, and attainment of all students in learning. It has been argued that one of the key barriers to inclusion change is that most educators do not ensure the understanding, skills and attitudes needed to communicate this initiative (Forlin 2001). IE is regarded as lessening and takes away obstacles to access, involvement, and learning for all children, but particularly for those who have been casually discriminated against because of poverty, disability, gender, belief, culture, or any inequities (UNESCO, 2006). A number of the learning needs of students with disabilities can be encountered by usually creating the education structure more flexible, friendly, and receptive ('track' one) – but they will also have needs that need more individual consideration, so this second 'track' has to be portion of an IE framework. The notions of IE as a twin- path method which can enhance the excellence of learning for all yet also deliver particular provision were required for children with disabilities. Each educator is required to acquire about IE, from day one of their teaching. This should be accomplished by implanting IE, privileges, and equivalence in all overall teaching and not merely cover these matters over individual progresses. However educators do have regards about IE and many reviews have established that educators' attitudes towards IE are not mainly encouraging (Ellins & Porter, 2005). IE as a method pursues to discourse the educational needs of all children even if they deviate from each other in their styles and step of knowledge. It is about revealing variety and moving the inflexible school structure in the direction to encounter the necessities of all children. IE does a procedure of growing the partaking of all students in school comprise those with disabilities (Ainscow, 2000). Inclusive schools are required to transform through enduring exploration and amendment of academic performs and procedures of transformation. Virtuous inclusive practices, according to Marchesi, Durán, Giné & Hernández (2009), are activities that educators convey to accomplish occurrence, involvement, and victory for every student, particularly those who are weaker. Growing involvement in classrooms indicates recognition of change as a usual, predictable element, concerning several students learning together with diverse learning styles, prior understanding, and dimensions. Virtuous inclusive practices involve a sequence of issues, which straight impact endorsing inclusive development in the education structure and which can become together into three blocks (Muntaner, Rosselló & de la Iglesia, 2016). IE is a widespread procedure of move across the education structure through which the

various educational needs of all students are discourse and retorted to, irrespective of their societal, financial, ethnic, language, physical, or other environments.

THE ROLE OF EDUCATORS IN FACILITATING INCLUSIVE EDUCATION

Educators are vibrant in provided that quality education for all students. All over and done with the world educators are dedicated to making sure the right to education for all students. Educators need to ponder all students have the right to show up normal education, and explores their school and classroom environments, and reproduce on in what way to make them easy to get to and significant for all of their learners. They will need to do this over an enduring procedure, as societies, values, the benefits; needs, and capabilities of students and educators are continually developing. As an outcome, all children sense consistently esteemed in inclusive programs. Educators can and ensure to make a change to whatever and in what way children study (Hattie 2009). Educators display an important role in creating education more inclusive, over their method to students, the approaches and resources they use their capability to comfortable variety, and get it as strong and their dimensions to adjust and reply to tasks and different educational needs. They involve in inclusive practices occupied at diverse stages containing classrooms, for instance utilizing a diversity of group approaches as replacements to capability group (Black-Hawkins and Florian 2012; Florian 2012), as fit as in cooperative activities for talking matters that need answers away from the classroom (Florian and Spratt 2013; Include-ED Report 2009), or by appealing in specialized and social systems pursuing to subsidize to better social justice (Sachs 2003). IE supports meaningful teaching-learning for all and progresses educators' dimensions to discourse the various needs of diverse students in different ethnic settings. Investigation has recognized practices that can meaningfully subsidize to enhancing learning and accomplishment of susceptible learners, such as practical meeting of families in choices about learning (Flecha and Soler 2013), distributing duty within school for the results of all students, preparing approaches to discourse segregation and underachievement, and functioning with other specialists (Ainscow 2005; Edwards 2007; Include-ED Report 2009). Studies that look at educators' fight to promote inclusive practices and values in their schools display the worth of teamwork, review, and cooperation as a portion of educators' unchanging effort (Deppeler 2006; Kugelmass 2001). Educator capability as mediators of inclusion and social integrity includes at work collaboratively with other managers, and rational scientifically about the customs of changing practices, schools, and structures. Reassuring associations and perceptive learners is measured predominantly significant when teaching learners from various circumstances (den Brok et al. 2010). Educators dedicated to social integrity and inclusion need to be adept at constructing suitable specialized associations with learners and other performers to reply sufficiently to learners' various requirements. It also reassures educators to distinguish and value students' variety as power somewhat than a difficult to be resolved. It maintains and enables educators to get used to the prospectus and teaching approaches to apt the particular settings and needs of their students. Promote, IE works towards raising the values of educator work gratification and competence, in which educators are esteemed by the societies they assist and appreciate their effort. In this sense, IE is a portion of a procedure of enduring learning and progress in the 21st century.

EDUCATORS' COMPETENCE

To effort in inclusive classroom, educator has to identify detailed features about disabilities, approach of teaching and progress individual competencies to make motivating atmosphere for education. The motivation of the IE undertaking has been fixated on improving the competency of educators to deliver suitable education for children both with and without special needs in general classrooms (Mandina, 2012; Mpofo, Kasayira, Mhaka, Chireshe, & Maunganidze, 2007; Mugweni & Dakwa, 2013). Educators progress skills that improve individual gratification and efficiency, but also understanding and skills that boost student self-esteem. Complication of educator work demands competencies for every day allocating with student learning, responsive and interactive features. These processes are reserved to make sure that educators are fortified with the competency to offer real teaching-learning in special and general schools (Majoko, 2016; Mpofo & Shumba, 2012; Mushoriwa & Gasva, 2008). This learning pursued to scrutinize the teaching competencies that special needs education educators distinguish to be needed for IE. The inclusion in different ways able students in general education classrooms needs general school educators to enhancement their skills in-order to reply to the new encounters delivered by their moving roles and duties. These educators are now estimated to discourse difficulties and offer answers to encounters postured by special needs learners who may differ in their ability levels. Inclusion needs a great revelation and definite competencies for educators. The educators are required to distinguish that variety is existing in the classroom and that they should join to various requirements. Therefore, educators are required to offer suitable teaching-learning to these children in general classrooms, within the community of their equivalents without growing intervals (Mandina, 2012; Mpofo & Shumba, 2012; Mutepfa, Mpofo, & Chataika, 2007). A main element in the accomplishment of IE is the future educators' skillful competence to effort with

children with disabilities foundation. In terms of IE, the educator should have new theoretical thinking, the capability to identify the individual and social implications of specialized actions for SEN, and to take duty for the excellence of the outcome designed. Educators also want the competencies to modify teaching-learning to encounter the requirements of all students (Agbenyega & Deku, 2011; Alhassan, 2012; Das, Gichuru, & Singh, 2013). Incomplete competencies of educators, as an outcome of a lack of preparation on effective adaptive teaching approaches, are among the features liable for such disappointment (Mukhopadyay, Molosiwa, & Moswela, 2009; Philpott, Furey, & Penney, 2010; Selvi, 2010). Implication of an extensive study of the willingness of educators to effort in IE is firm by the provisions of social progress and the importance of the educator's role in the inclusion of SEN in the upgrading of academic activities in the 21st century. Through further self-confident and capable educators, the IE program will have a positive influence on the awareness of the society. This would upsurge the admission of disabled children in school in the light of instruction for all and more disabled or differently-abled children would be functioning and subsidizing towards the progress of the society.

EDUCATORS' ATTITUDES

According to Gall, Borg, and Gall (1996), an attitude can be diverse as a person's perspective or personality toward a specific object (an individual, an object or a notion, etc) (p.273). Educators' attitudes seem to be different from their discernments of the precise disability, as fit as the weights that students' educational and executive needs will abode on them. Educator's attitudes towards inclusion diverge crossways the education arena. Several studies have complex educators' attitudes directed for inclusion, in the evaluation under some of the studies denoted to have used the term addition or mainstreaming, although others have used the word inclusion. Despite utilizing dissimilar terms, they all appear to denote to a condition in that a course, a school, or an academic system attempts to encounter the requirements of SEN. However, educators' attitudes directed toward the inclusion of SEN diverge significantly. For example, some educators are keen to contain SEN within the normal classroom when sufficient provision is straight access to them, whereas other educators trust that the inclusion of SEN may be harmful to the education of the repose of the session (Grieve, 2009). Educators' attitudes are entrances to recognize their principles, dream, and their prospective actions in inclusive classrooms. IE includes conveying sustain facilities to the learner in the general classroom environment, relatively than overwhelming the learner obtain support facilities in an inaccessible atmosphere distant from nondisabled peers (Kilanowski-Press, Foote, & Rinaldo, 2010). IE frequently take in a team teaching method in which the general classroom educator works collaboratively with the special education implementer to progress educational strategies and assessment approaches precisely to the educational needs of each learner (IDEA, 2004). Investigation studies concern educators' attitude as extremely related with the operative execution of IE and report that the primary motives for disastrous IE programs are mostly linked with educator allied issues (Boer, Pijl & Minnaert, 2011; Kenny et al., 2003; Khan, 2012; Kibias, 2015). As stated prior, several studies have involved educators' attitudes directed toward inclusion and the results differ. The majority of the educators measured had durable negative outlooks about inclusion and sensed that the choice creators were out of trace with classroom properties (Snyder, 1999). The negative attitudes that educators have toward IE can have an unfavorable influence on student learning and may obstruct the achievement of the IE model (Cassady, 2011). Educator attitudes donate to teaching efficiency and succeeding student learning (Cassady, 2011). Educators' attitudes seem to differ with their discernments of the inclusion bestowing to teaching involvement; the exceeding studies concerning teaching practice showed that younger educators and those with fewer years of experience are more understanding of inclusion. Yet, though the above studies specified that fresher educators and those with fewer years of practice are more helpful in inclusive, other researchers have stated that teaching practice was not knowingly associated with educators' studies (Avramids et al., 2000). The majority of educators showed their positive attitude on the way to inclusion. Yet, some of them had given such replies which specified that they are not entirely dedicated to execute inclusive performs. Few educators described that they would be eager to teach SEN only when they have specific preparation whereas other educators reported inadequate time to accomplish the needs of SEN. Educators are shown that they are worried when SEN be unsuccessful to learn even after many recurrent efforts. An educator described that it was always annoying to grip the interactive difficulties of SEN. The execution of IE raises the workload of educators but educators prompt that the effort load is adequate. Moreover, parents of students of IE displayed support to both schools and educators in the 21st century.

EMPOWERING TEACHER'S TO PROMOTE INCLUSIVE EDUCATION

The education systems that have flourished in enhancing learner results in our quickly growing set point the way forward: educators must be the highest concern. Educators need new responses to today's extraordinary demands and encounters. In modern years IE has exchanged the term integrated education and special

education. The meaning of IE is wide-ranging and it denotes to an instructional and classroom operational system that can provide somewhere to stay all forms of students regardless of their physical, intellectual, mental, societal, expressive, and cultural changes. IE is a method of educating SEN. Further down the inclusion prototypical, SEN proposes most or all of their time with normal students. There are several progressive effects of inclusions all over the place both the SEN and the other students in the classroom benefit. Therefore, the aim of every educator is an inclusive practice is to create learning significant for every student in his/her class. IE is the execution of the 'strategy and procedure' that consents all children to take part in all platforms. 'Policy' means that disabled children should be recognized without any limitations in all the academic programs intended for other children. It signifies equivalence and receives every child with his exclusive abilities. "Educators nowadays more fully recognize the value of inclusion because they get its control as an operative educational practice. We sense that two issues are serious to the efficacy of the neighborhood's inclusion labors: actual teamwork among classroom educators and empowers the promotion of IE and daily activities of educational arrangement period". (Logan, Diaz, Piperno, Rankin, MacFarland, and Bargamian. (December 1994/January 1995). The educators have to display a vital role in the execution of the academic strategies. This means that inclusion of SEN in the normal is potential only if the educators are delivered with skill preparation to discourse to the SEN in general classroom environment settings. The role of the educator is now confirmed as being an acute determining factor in the achievement or otherwise of the practice of IE (Forlin & Lian, 2008). It reasonably surveys then that the role of educators in formulating new advances to work in varied classrooms must also be understood as an acute element for certifying effective inclusion (Romi & Leyser, 2006; Winter, 2006). The adaptability of education systems and their capability to change eventually is contingent on empowering educators to make over what and how learners learn. Educators have a positive effect on their learners' results when they take part in straight lessons and are capable to adapt it to the diverse needs of their various classrooms. To accomplish high quality, education systems need to achieve well in two extents: excellence and equity. Many high performing systems do well on both, representative that excellence and equity are not jointly high-class. Yet, to attain equity, particular actions required to be put in abode to overawed issues known to delay learner presentation. The declaration approves the need for essential strategy changes essential to encourage the methods to IE, specifically empowering educators to help all children, mostly those with special educational needs by executing concrete and approach changes. IE denotes all students, young persons-with or without disabilities being capable to learn together in ordinary pre-school requirements, school, and community-academic environment with suitable nets of support facilities in the 21st century.

CONCLUSION

In the arena of education, educators are regarded as the main promoters in the execution of the way of life of IE, thus, their opinions may result in their performance towards and recognition of SEN. IE is the need of the era. If we want to confirm the right of education for the children and equal occasions for all, then IE is the only substitute before us. Though IE is quite a substance of discussion countrywide and universal but IE is viewed as the only way to yet to come academic system which will lead us to enhanced education, a better society, and a better world. Merely the task which is to be proficient to accomplish an Inclusive system is to adapt the prevailing system to mark it reachable to all kinds of students, and not the modification of the complete system. Subsequently all it is a matter of will and attitude of the stakeholders- educators, managers, academic proposers, and parents. Challenges to IE can be overawed by making awareness on what inclusion is and the welfares to the society, schools having the means and the capability to re-building their program to deliver to all kinds of learners, by securing educators who have the skills and expertise to encounter changing demands within the classroom and by having the support of family. The lowest line of this kind of education for learners with disabilities should be equitable access to occasions that will assurance effective results in IE, employ, and social integration in the 21st century.

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A STUDY OF DATA MINING TECHNIQUES**Harnamo Ram**Research Scholar, Jagannath University, Bahadurgarh

ABSTRACT

Data Mining and Warehousing are one of the most talked about topics in recent times in the world of database, business intelligence and software development. Data Mining is a process which extracts knowledge and finds useful patterns from enormous amount of data. Data mining is also referred as Knowledge Discovery. The paper covers a brief introduction to the Data Mining and its Techniques.

Keywords— Data Mining Techniques; Data Mining Algorithms; Knowledge Discovery.

I. AN OVERVIEW OF DATA MINING

The evolution and development of Information Technology has been generating large amount of databases and huge data in each and every field. Now the question arises:

1. How to deal with this data? and
2. How this data can be useful?

Further researches in databases and Information Technology have given rise to an approach to store and manipulate this precious data for further decision making.

It is also referred as knowledge discovery, knowledge mining from data, knowledge extraction, data analysis or pattern analysis or information harvesting etc.

II. PROCESS OF KNOWLEDGE DISCOVERY

Data mining is a process which is used to large amount of data in order to find useful and relevant data. The goal of data mining technique is to find patterns that were previously unknown. Thus, Data mining is a process of extraction of useful information and patterns from large amount of data. In fact, Data Mining is all about discovering unsuspected or previously unknown relationships amongst the data. These insights derived via Data Mining can be used for marketing, fraud detection, and scientific discovery etc.

Basically, Knowledge Discovery is seven step processes which are:

- Data Integration**
 - Data Selection**
 - Data Cleaning**
 - Data Transformation**
 - Data Mining**
 - Pattern Evaluation and Knowledge Presentation**
 - Decisions or Use of Discovered Knowledge**
- Data Integration** :First of all , we collect data from variety of sources (CRM, OLTP, Excel, MS Access, Oracle, SQL Server, etc) into a single data source called target data or database.
 - Data Selection**: In this step, we focus on only that data set which is required to fulfill our research or assumption, means only meaningful data is selected for further proceedings.
 - Data Cleaning**: The data we have collected are not clean and may contain errors, missing values, noisy or inconsistent data. So we need to apply different techniques to remove such anomalies.
 - Data Transformation**: The data even after cleaning are not ready for mining as we need to transform them into standard format appropriate for mining. The techniques used to fulfill this task are smoothing, aggregation, normalization etc.
 - Data Mining**: After transformation, data is ready for application of data mining techniques to discover the interesting patterns. We try to use the most suitable mining algorithm for current data.
 - Pattern Evaluation and Knowledge Presentation**: The pattern we identified from the data is then interpreted and evaluated to gain knowledge out of it.
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(vii) **Decisions or Use of Discovered Knowledge:** This is the ultimate goal of data mining techniques where knowledge extracted from data mining process is then taken into consideration to make crucial decision for the betterment of any organization.

III. DATA MINING TECHNIQUES

As time changes, requirements and priorities of people also change and to meet our hunger for knowledge and needs, lots of technology are also evolving and developing all around the world. One can do same work in number of ways and it all depends on the requirement, available timeline and last but not the least budget. Lots of data mining techniques and algorithms are available in market from variety of technology vendors in market. Data mining techniques utilize complex mathematical algorithms to break down the information and assess the likelihood of future events.

Following are most common data mining techniques-

1. PREDICTION

- Prediction is amongst the most common techniques for mining the data.
- It is also the most understandable technique.
- As name indicates it is used to forecast the future scenarios based on the current and new data.
- In predictive data mining, existing & historical data is analyzed to identify patterns and relationships between the data.
- After identifying the patterns, new data is then fed to these patterns to forecast the future scenarios.

2. CLASSIFICATION

- Classification is used to retrieve important and relevant information about data. This is a classic data mining technique based on machine learning.
- In fact, classification is used to classify each item in a set of data into a predefined set of classes or groups.
- In classification, different techniques are used to classify the data into predefined groups or classes.
- Classification method makes use of mathematical techniques such as decision trees, linear programming, neural network, and statistics.
- In classification, we develop the software that can learn how to classify the data items into groups.
- One of the most common examples is how Gmail classes the new emails into spam or not spam based on different attributes of the email.

3. ASSOCIATION RULE

- Association is one of the best-known data mining technique.
- This data mining technique helps to find the association between two or more Items in same transaction. That's why this is also known as relation technique.
- It discovers a hidden pattern in the data set.
- It's a fundamental technique but one can be astonished how much knowledge and understanding it can give.
- Association Rule is used in famous Market Basket Analysis to identify a particular set of products a customer purchases frequently together.
- Retailers are using this technique to research customer's buying habits.
- Based on historical sales data retailers might find out that customers always buy candles, decorative items, toffees etc. when they buy cakes therefore they can put these items and other related and also new items relevant to the occasion together to save customer's time and increase their sales.
- Another most important and the most relevant example (in this era of social media and e-commerce) can be the recommended or suggested videos of similar nature when we browse YouTube videos and when we visit any e-commerce website, the website recommend us few more products which people buys together mostly like cell phone cover and external memory card while browsing cell phone etc. And also the sites suggest similar item based on our previous shopping or product searching.

4. CLUSTERING

- Clustering is a data mining technique which creates meaningful clusters of objects which have similar nature or characteristics.
- The clustering technique defines the classes and puts objects in each class.
- In other words, Clustering is the technique used to distinguishing data sets that are likely to each other, to understand the similarities and distinctions in the existing and new data.
- Difference between clustering and classification is that in the classification techniques, objects are assigned into predefined classes.
- A very simple example of clustering is book management in a Library. If we think of Library as a clusters of large number of books on various topics. Now, by using the clustering technique, we can keep books that have some kinds of similarities in one cluster or one shelf and label it with a meaningful name. If readers want to take books in that topic, they would only have to go to the particular shelf instead of looking for the whole library. Thus, readers can take several books on a particular topic without any botheration.

5. REGRESSION

- Regression analysis is the data mining method of identifying and analyzing the relationship between variables.
- It is used to identify the probability of a specific variable, given the presence of other variables.
- In simple words : regression is a technique to predict various possible outcomes in different scenarios.
- For example, regression might be used to predict the cost of a product or service, given other variables.
- Regression is used across multiple industries for business and marketing planning, financial forecasting, environmental modeling and analysis of trends.

6. SEQUENTIAL PATTERNS

- This data mining technique helps to discover or identify similar patterns or trends in transaction data for certain business period.
- In sales, with historical transaction data, various business/organizations can use this technique to identify a set of items that customers buy together at different times in a year. Then business can use this information to recommend customers, buy it with better deals based on their purchasing frequency in the past.

7. DECISION TREE

- The decision tree is one of the most commonly used data mining techniques because its model is easy to understand for users.
- In this technique, a tree like structure is created which Consists of set of questions and answers (or conditions).
- The root of the decision tree is a simple question or condition that has multiple answers and each answer leads to a set of questions or conditions that helps us determine the data so that we can make final decision based on it.

8. NEURAL NETWORKS METHOD

- Neural networks are non-linear statistical data modeling tools that can be used to find patterns in data or to decode complex relationships between inputs and outputs.
- Neural networks are programmed to store, recognize and fetch patterns in database entries, to filter noise and to identify problems.
- The data mining process based on neural networks can give deliver robust results, with high degree of fault tolerance.
- Main reason for the popularity of neural networks is that the users can automate it, so even if they don't have knowledge about databases, data mining becomes an easier task.

9. USING OLAP FOR COMPLEX DATA TYPES

- When there are very large amounts of relational data types and complex data warehouses, the challenge is to develop a system that would handle it properly. This is when we thought of OLAP.
- OLAP or Online Analytical Processing is very useful for all the important steps in data mining functions, such as characterization, association, classification, predictions/analyses, and clustering.
- It is optimized for not just process transactions, but querying and reporting as well.
- OLAP databases can save time too because it aids in quick retrieval of data, enabling companies to work with huge amounts of data in an organized manner.

10. OUTER DETECTION

- This is another important data mining technique in these days.
- Outer detection is also called Outlier Analysis or Outlier mining.
- This type of data mining technique refers to observation of data items in the dataset which do not match an expected pattern or expected behavior.
- This technique can be used in a variety of domains, such as intrusion, detection, fraud or fault detection, etc.

IV. CONCLUSION

- Data Mining is all about explaining the past and predicting the future for analysis.
- Data mining process includes business understanding, Data Understanding, Data Preparation, Modeling, Evolution and Deployment.
- Data mining is the combination of statistics, database management, artificial intelligence, machine learning technologies and data visualization etc.
- Data mining techniques help companies to get knowledge-based information.
- We often combine two or more of these data mining techniques together to build an appropriate process that meets the business requirements.
- Data mining is used in diverse industries such as Communications, Insurance, Banking, Retail, Education, Manufacturing, Service providers, e-Commerce, Supermarkets, Bioinformatics etc.
- Data mining has wide application domain almost in every industry where the data is generated that's why data mining is considered one of the most important frontiers in database and information systems and one of the most promising developments in Information Technology.

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FUZZY CLUSTERING IN SOCIAL NETWORK ANALYSIS USING INFLUENCE PROPAGATION ON CAREER GUIDANCE LINKS

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ABSTRACT

Social Network Analysis technique has potential for influencing the nodes to meet educational learning and guidance needs. we proposed the influence driven approaches to bridge the guidance of who are seeking the guidance of higher education, the proposed framework has been utilizing the social network analytics and clustering algorithms and three phases of persuasive technology. This analysis has discovered the behavioral traits and predicts the individual node then we develop the community by the fuzzy clustering algorithm, it maximizes the influence diffusion across the synthetic networks. The performance values are obtained and validated from driven approaches of persuasive behavioral traits.

Keywords— Influence Diffusion, Machine Learning, Community Detection, Clustering, Influence Propagation, Fuzzy Clustering, Preferential attachment, Social network analysis.

I. INTRODUCTION

Before moving on to the analysis part of the social network graph, the study will discuss the term *Educational Data Mining (EDM)*. The main aim of *choosing Higher Education Institution* is to deliver good career guidance to its aspirant nodes. To achieve the maximum excellence to choose Institution, through data mining techniques by predicting multiple patterns hidden in activities such as student's enrollment links in a career guidance expert which is detection of unfair means used in online survey, prediction about students performance, alienation of the traditional to choose Institutions, detection of abnormal requirements of the students etc. The knowledge is hidden amongst the educational data sets and it can be extracted through data mining techniques. The proposed work focused on Predict the Students to give right guidance to choose Institutions for Higher Education. The dataset of 100 students and information's like Learning Style, Institutional Preference, Interested in Community Institution, Is it Integrated in Sports, Geo Location, Interested in Scholarship, Residence, Like to study Foreign Universities, Job opportunities, Assessment, Summer Programs, Gender and Mode of study are collected from the whoever has looking the guidance to Higher Education Studies in India to predict the performance of the students requirements to choose institution. The purpose of the analysis is to design and explore the potential of Machine Learning in the context of *Career Guidance to Higher Education*. The proposed work was carried out by providing a Machine Learning model approach for the *higher education*. For this research project, we have used open source tool *R-Programming*, For Predicting the links used *Linear Regression Algorithm* and for clustering the predicted links by using *K-Means Clustering Algorithm*. Through this research work, we are able to access to the hidden knowledge, to define the individual students traits and Guidance to the students. It aids in determining the number of dropouts and figures out those students who are less influence with experts and need special attention to the links. It also allows the influential node of career guidance experts to play the role of mentors by providing appropriate advising/counselling.

The study applies SNA to Facebook's higher education pages or groups to check student determination for active participation in social media networks. We had extracted the sample networks for higher education students as well as student communities. The related works of the paper are below described. [1] have applied the social network metrics in facebook dataset of 150 nodes and described the mapping of links and interaction between the ego centric nodes among the community, results were also discussed. [2] have measured the accuracy of links and its categorized into three levels frequency, personalization and regularity of messages between the nodes. [3] proposed the framework for career guidance for target nodes by using the effective communication between the weighed nodes and predict the prospective nodes to pursue the career path of the learning opportunity. [5] proposed the study to evaluate and analyse location-based parameters such as distance, centrality values between the nodes, and residual factors of the parameters the yielded result is 96.78% accuracy to propagate the influence of links to students for the career guidance path. [4] proposed The dependency of discriminate paths was identified and compared to the random walk model

II. LEARNING EDUCATION DATA ANALYTICS**A. Disposition of expert nodes**

It is the joint probability of behavioral traits and the influence of the accomplishment of career. *Figure 1* depicts the dispositions of career links in densely connected edges has analyzed by the individual node traits for developing the strong links in the community.[3] The disposition of careers characteristics are consist of five In-Degree and Out-degree link values :

- (1) Influence Propagation- which the out-degree of the links open to innovative ideas and experiences were shared with the homophily networks.
- (2) Intellectual Links: Which the degree is analyzed by evidence-based decision.
- (3) Resilience: Which an individual In-Degree and Out-Degree of a link is determined and assertive of egocentric oriented links
- (4) Training ties: In which the degree is expressive and centrality of all the nodes in the community.
- (5) Trained ties: In which the degree is influenced by all nodes in the community, it is dependable and organized of all links in the development of the community.

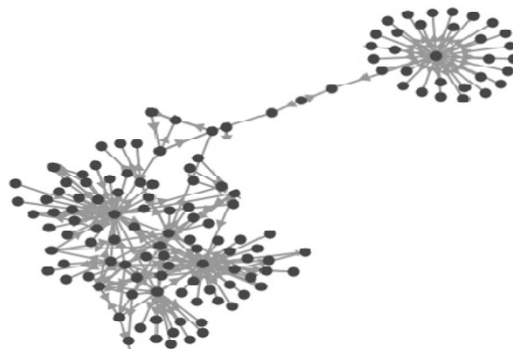


Fig 1: Densely connected edges and nodes

The disposition of carer data values are measured to develop the cohesive bonds in the community, validate the links and make the strong nodes compare to all other nodes in the community structure, this influential node constructs the guidance to the career development of higher education, its self-evaluation is conceptual constructs the career success. Based on the degree of links is routinely captured through the quantitative reflections of nodes.

B. Attributes

The social network graphs has contained the attributes related to node information are Label, Post, Share, Comments, Gender, Demographic Information etc. And Information of Edges Are Weight Direct and Undirected Node, Target node and Source node etc. We have already done in the detailed social network analysis by using tools R programming to fetch the social network

C. The Active and Relevant User Engagement

The nodes are connected with edges. It has carry more weight of the nodes and gives the high level interaction between the dyadic pairs in the type of undirected links or directed links in the community of team work and learning process in good performance between the sub-communities or groups.its shown in the below figure 2.

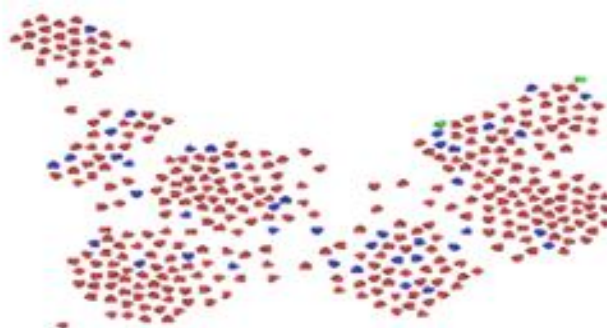


Figure 2: Active links in the groups Red – active , Blue- Less active. Green – No active.

Figure 2 shows the active users functions on the interaction between the groups ,Red shows the most influential node in the group it depends on the relevant participation of the node in the network.Blue depicts the less influential node in the group but it is in active conditional links and less participation of the node.The red and blue nodes were calculated by the social network metrics of centrality coefficient and betweenness centrality attributes.

D. Preferential attachment of the node

Our proposed structure is categorized for predicting and assisting the links to influence the node into the community for the development of strong links in the network. the categorical attributes are Competency, Interest, and aim of the links, It is to specify career interest and career objectives of individual nodes, preferential of nodes are used to detect and predict the links where nodes shared knowledge and practices to build the strong influential community structure.

E. Data Driven Clustering in R

The study demonstrates the feasibility of *SNA* in measuring the student or user's active participation in the groups on the *SNS (Facebook)* related to *HE*. For this purpose, detailing had already done on the above-mentioned networks by using R programming.

SNA tools analyses the structure of connections and interactions which exist between users (most of them students) in these networks. We were able to discover communities which prevailed in these networks generated as a result of the frequency of interactions, Modularity and the number of messages or information exchanged. By using *SNA* tools, the study fetched the graphic representation of the *HE* Social Networks datasets, with proper identification of core members, periphery members and isolated members or outliers and finally we are able to portrait the stratified depiction of the most prominent debatable topics discussed in the network, calculating the metrics for each network like density, centrality coefficient, modularity, number of posts in the network, replies and last but not the least we can also identify the most frequent words used by the users in the network.We are getting two types of networks by *SNA* (i) a network of users where edge represents the communication pattern and (ii) a network of tags used by the users, where edge represents the originator of the tag and the same tag is used again and again as a thread. The first network depicts the communication structure of the active users and core members of the group or the network. Whereas the second network depicts the words or terms exchanged between the users which are frequently exchanged on the network. Finally, the ordered communities depict the frequency of interactions between active users and commonly used phrases in the network.

To improve the choice of higher education is come around in the emerging field of big data. [10] In the establishment of learning analytics, analyzing and processing the data has been encouraged to field the improvement of the process and bridges between the educational community. In analysis of social network nodes are said to be Higher education graduates, career guidance experts have been made in a form of career decisions. It has been developed to start the career influence progressive growth of behavioral traits of the nodes, we proposed the formal career guidance path to higher education graduates by using social network. It makes a community choose the right institution for the right students. In our research work, to introduce career guidance to a higher education framework to improve the career start and enhance to choose the right institution. Higher education graduate nodes are interconnected with online social structures. Career guidance experts act as the influencer of the structural network, it incorporates a persuasive frame to influence the career guidance path to the nodes in the currently demanded in the social network analysis. Our sequential of node action incorporates the three modules. 1. Influential of career guidance (career readiness) 2. Identify the node prediction (career prediction) 3.Influenced Node developed to persuade to identify to choose the institution (career development). The experts and other attributes information are used as a classifier of training data. It is the dense development network structure to connect the nodes with the same similarity of index.experts in such networks is the power of collaboration towards the target nodes of goals and objectives. In social network analytics, this framework

uses to enhance the properties of links followers of links, followed by links, Followers to followee of links to develop and maintain the links for influence to support the career guidance process. The metrics of *SNA* used to evaluate the influence propagation to identify the influence node based on the behavioral traits or structural properties in the network. Those experts are termed as [6] "Influential agent" to drive the behavioral changes and influence node to adopt the propagation demanded by the structure.

At the start phase, the chained of source data has generated and captured the information from skill potential experts. This information about the choosing the current competencies of source node traits of the students to

select the attributes of interest, Career Readiness experts to evaluate and identify the bridges and gaps between the source node and target node.

The results were relevant to the store structure of the data of dispositional career view changing relevant to choose the right institution process.

It is an integral part of the self-learning experience and converts into the analytics of social networks to find the closeness of the cohesive bonds and influence the structural hole of the chained links in social network recommendation.

In the following of the paper, link prediction allocates the influential membership to link the nodes who share the likelihood of links with similar interests. These attributes of interest are mapped and associated with the prediction of choosing higher education institutional links, overlapping links is lead to highly demanded choosing the right institution in the homophily network in the data science. Each potentiality of link nodes is extracted from the attributes of interest in the structural properties of nodes .it evaluate the competency and identify the links for career guidance to the target node. Rohini et al. [1] has analyzed the training data activities in the structural communities of links and created the framework of nodes and operational process of the community.

The Hashtag, share, comments data were extracted and the resources to make the cohesive structure of the community in a collaborative effort. the influence links in the structure have emphasized the similarities of participating in the nodes in the community detection in the social network. node frequency of interaction within a community and outside of the community makes the bridges between the dynamic knowledge of the shared links in the network.

III. An approach for predictive analytics

A. Semi-Supervised clustering Analysis

It is to specify the geodesic connections for pairwise constraints in the seed of data, The label has been used to a large set of clusters to make the clustering for unlabeled data for grouping the nodes, pairwise links are denoted by $C = (i,j)$, non- pairwise links are denoted by $C \neq (i,j)$.

B. Fuzzy clustering

This approach is based to predict the hypothetical links and brings the influenced nodes with similar attributes into a common cluster. the initial process of grouping the nodes is to apply a semi-supervised clustering technique that brings influenced links in the career set of predictions [8]. The node consists of influenced node frequency of interaction and is above a given threshold value parameter. any one of the nodes has matches with the suggested parameters, it yields the career ontology prediction. instances of nodes to be associated with overlapping of links, it will reconstruct the functions of the K-Means algorithm has been allowing the fuzzy and estimate the constraints of overlapping links.

Sudalaimuthu et al., [1][4] experimented and results were discussed about fuzzy clustering K-means algorithm in our previous article.

C. Influence Diffusion

Algorithm 1: Influence Analysis of Node Selection method

Input

$G: (N, L, A \rightarrow d)$, t : Number of target nodes in the structure

Output

Node (N) and influence node (I_n)

Method

$N \leftarrow null$;

$I_n \leftarrow null$;

While $|N| < t$

$N \leftarrow N \cup (n/A - d) = \max(A-d)$

End while

While ($N \neq null$) do

```

A ← Null;
N ← N-A
For all v ∈ V do
End for
N ← N ∪ I
In = In+ / |A|
End while
Return N
Return In
    
```

Table 1: Absolute similarity threshold value metrics

Thresh-old	Nodes	Edges	Cluster-ing	Modul-arity	Deg-ree
0.85	100	350	6	0.567	7
0.45	100	420	6	0.777	10
0.68	100	250	4	0.865	9
0.71	100	1243	3	0.777	9
0.75	100	1486	2	0.777	8
0.89	100	850	7	0.865	5
0.64	100	761	6	0.456	7
0.56	100	596	4	0.487	7
0.87	100	725	3	0.534	7
0.89	100	429	5	0.625	7

Table 2: Fuzzy Clustering Values

Threshold	Nodes	Edges	Clustering	Modularity	Degree
4	100	350	4	0.687	4
5	100	420	4	0.567	4
6	100	250	5	0.966	4
7	100	1243	5	0.477	4
8	100	1486	5	0.845	4
9	100	850	4	0.657	4
10	100	761	4	0.542	4
11	100	596	5	0.578	4
12	100	725	4	0.624	4
13	100	429	4	0.865	4

In the performance evaluation the fuzzy clustering algorithm threshold value increases the clustering community remains stable of 4 and 5 of the two baselines, it shows the effect of nodes of the overlapped region for recovering accurately in the structure. At the threshold value 8, the edges are 1486 the modularity value is 0.845 it generates the dense connection between the edges within a structure but the sparse connection between different communities. To the optimization of the modularity 0.865 at the threshold value 13 it detects the community structures between the cohesive bonds without any structural hole. the expected number of edges would find in the community, the edges are randomly attached and the parameters are in respective ranges. on the contrary, the egocentric nodes, the performance of the fuzzy clustering algorithm the overlapped nodes increases do not cut the edges in the size of the network. This the positive links advantage of our proposed method over other algorithms, which could not able to the specific nodes weighted values or constraints.

D. Simulated data

We described the algorithm the number of edges increases, the overlapped links from the nodes also increased, performance also too large in the sparse nodes, It attains the false positive in the overlapped edges. similar group of learner nodes L, N is the size of the node each node described by a vector of n attributes and denotes the attributes of interest in the community. Each node n₁ with a range of values of minimum and maximum from

the normal distribution. each node has assigned the weight value in the range of maximum and minimum level. The modularity and clustering values show the degree of the nodes in coherent communities.

The Facebook [4] dataset has analyzed by the 100 nodes with different values of edges and threshold values, these node consisting of the interest about the educational institution and demographic values are used to generate the network size the similarity matrix SM 1 up to n are similar and linked into the network, the similarity matrix values are greater than the similarity threshold values it indicates the weight between the dyadic nodes. In the enhancement of the adjacency matrix of (n*n) by joined together the trained node links in the network through the set of attributes of interest, these edges are made as a strong cohesiveness to produce the enhanced network size.

IV. RESULT AND DISCUSSION

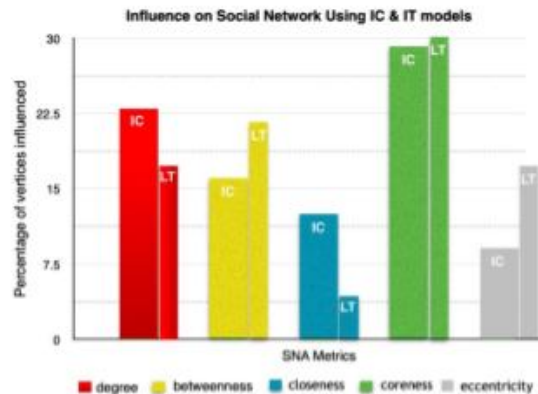


Fig 4: Social Metrics Comparative

The graph depicts the two fundamental values IC-Independent Cascade and LT-Linear Threshold, we analyzed five attributes betweenness, Degree, Closeness, Coerness, and eccentricity. In the Linear threshold model, the node tendency has increased and influenced the community. In the comparative analysis of five attributes the degree attains 22.5% in the independent cascade, the centrality metrics of betweenness has yielded the 15.5%, the closeness of egocentric nodes yielded 8% of diffusion in the community, due to bridges and gaps in the structure the iteration process takes to influence of node in the network. to highly raised value in the coerness yielded 30% of edges has influenced in the network. by compare coerness and degree have attained to more closeness of the vertices in the structural network, the links are also strongly connected in the betweenness and closeness of the nodes. on the contrary, the eccentricity has yielded the threshold values of 15.8% below the degree and betweenness values.

On the other hand Independent cascade of social network analysis metrics, The degree has yielded 15.5% and betweenness slight decreasing the values of 15.3%. The closeness and eccentricity values are yielded 8% and 7%, the coerness value has raised in the maximum level of social network metrics.

The Degree and centrality metrics of betweenness have well in the two models with degree yielded values perform better than the cascade model compares to the linear threshold model. IC model Influence propagation links are random. Finally, the graph tells the strategy of eccentricity to select the nodes that have performed well in the linear threshold model which has higher than the Independent cascade model of 43%.

VII CONCLUSION AND FUTURE WORK

We measured the guidance capacity has referred to as dispositions of career for each node, the results were analyze by the knowledge-based level of two fundamentals, Linear Threshold and Independent Cascade model to visualize the values. Linear threshold values yielded good results compare to the cascade model it compares the social network analysis metrics of degree, eccentricity, coerness, closeness, and betweenness.

Future work involves the Learning analytic methods to analyze the academic performance of individual nodes and predict the links for suggesting the improved capabilities of models.

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A STUDY ON EFFECTIVENESS OF VESTIBULAR REHABILITATION EXERCISES TO IMPROVE BALANCE IN CHILDRENS WITH CEREBRAL PALSY.

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ABSTRACT

Back ground: Cerebral palsy described group of disorders of the development of movement and posture causing activity limitation that are attributed non-progressive disturbances that occurred in the developing fetal or infant brain. Vestibular stimulation can be effective for reducing or eliminating and improving visual-motor control, improving balance and coordination and promoting normal development in children with delayed motor development of children's with cerebral palsy.

Objective: To find out the effectiveness vestibular Rehabilitation Exercises to balance in cerebral palsy.

Research design: Experimental design

Study setting: Trichirappalli Multipurpose social service society, Physiotherapy Unit.

Procedure: A convenience sampling of 20 children with cerebral palsy were selected from this study. Their demographic profile and detailed medical history was collected through interviewing their parents and special educator and from the physiotherapy treatment records. Samples were divided into two groups as one is Experimental group and other is Control group. Group A was received only Basic Balance Exercises and Group B was received Vestibular Stimulation Exercises with Basic Balance Exercises for 3 weeks, 6 days a week. Subjects were reassessed after 3 weeks to measure the Balance for the difference between pre and post test values

Outcome measures: Pediatric Balance Scale (PBS)

Results: The data obtained was tabulated and statistically analyzed. Pre and post intervention, parametric statistical tests, dependent t sample test and un paired t test were used. The two-tailed P value is less than 0.0001 by conventional criteria; this difference is considered to be extremely statistically significant of Experimental group.

Conclusion: The vestibular Rehabilitation therapy was facilitate compensation, adaptation and habituation and involves stimulating the sensory systems, the central nervous system to reinterpret abnormal vestibular inputs as normal and regenerate or initiate new activity in the brain stem nuclei. Thus the study proves that effectiveness of vestibular rehabilitation therapy to improve the balance in children's with cerebral palsy.

Keywords: Cerebral palsy, Balance, Vestibular Rehabilitation therapy.

INTRODUCTION:

Cerebral palsy is a disorder that mainly affects a person's ability to move. The brain sends abnormal messages to the muscles, significantly impacting function. Altered muscle function causes balance problems, making it difficult for the person to stand and walk. The prevalence of congenital CP is approximately 2per 1,000 births. Cerebral palsy develops in the womb, during birth or in the first few months of life. There are 4 types of cerebral palsy: spastic, ataxic, athetoid and mixed. Spastic cerebral palsy is characterized by excessive muscle tightness in certain areas of the body. Ataxic cerebral palsy is characterized by decreased muscle coordination and balance, while athetoid cerebral palsy causes involuntary body movements. Mixed cerebral palsy is a condition that includes features of more than 1 type of cerebral palsy. Each type of cerebral palsy is associated with balance problems. Severe balance problems may prevent a person with cerebral palsy from standing or walking, requiring a wheelchair for mobility. Cerebral palsy is not a single condition. It is a term used to describe a group of conditions causing movement problems. Although the main problem is with the muscles in one or more parts of the body, the condition is caused by damage or faulty development in a part of the brain. The part of the brain affected is that which sends messages to muscles. It controls movement and the way different parts of the body work together (co-ordination). The damage or faulty development usually occurs as a baby is growing in the womb. Sometimes it occurs during, or shortly after, birth. Depending on the type of cerebral palsy and the area of brain affected, a child may not be able to walk, move, talk, eat, or play in the same ways as other children.

OBJECTIVE OF THE STUDY:

The main aim of the study is to evaluate the effectiveness of vestibular Rehabilitation therapy to improve balance in children's with cerebral palsy.

METHODOLOGY:

A convenience sample of twenty subjects was taken for this study. Infants who attended an physiotherapy intervention program (N=20) were chosen. This study was a randomized clinical trial, Twenty children with cerebral palsy received vestibular stimulation, two sessions per week with a course of twelve sessions, based on vestibular stimulation protocol including head, sitting, standing, walking, lying and eye stabilization exercises. Standardized balance assessments are administered for several different purposes, including screening, diagnosis and determination of eligibility for public-funded early intervention programs, treatment planning, and measurement of change for evaluating the effectiveness of intervention.

INCLUSION CRITERIA:

Age range 7 to 11 years

Degree of spasticity 1 +1

Tightness in both hamstring and limitation in knee extension

They were able to understand any command given to them with an IQ level with in 4

They have ability to stand with support

Walk with assistance in flexion hip and knee and valgus of the foot

EXCLUSION CRITERIA:

Shortening

Severe contracture

Cardio vascular diseases

Surgery with previous 2 months

Sensory defensiveness

PROCEDURE:

Brief and scripted introductory information about the study was provided to the child's parent or guardian by one of two persons: the staff person at the facility who received the child's initial referral or the child's physical therapist who provided the child's ongoing therapy services. If the parent or Guardian agreed to have his or her child participate in the study a screening and child demographic questionnaire was administered via phone. Application of Vestibular rehabilitation therapy used to each balance affected children. The children were selected from the intellectually challenged home at Trichirappalli multipurpose social service society in the year of 2011-2012, Department of physiotherapy. The age group of children were (n =20, age 7 months to 9 years old.) pre intervention assessed by Peadiatric balance scale and the Vestibular Rehabilitation therapy was applied for continuously three months, after the post intervention should be assessed.

Group A: Passive range of motion (PROM) and maintain the positioning of child

Group B: Vestibular Rehabilitation Exercises applied for cerebral palsy and nine stimulus zones.

Cerebral palsy also known as general motor delay and it has motor as well as balance deficits with unknown or postural control mechanisms. Balance at developmental stages from 4-6 years known to be critical period. There sensory cues plays a predominant role. In cerebral palsy loss or peripheral vestibular and central lesions results in peripheral vestibular deficits. Impairments occur in balance, motor abilities, vision abilities and gait. It administered to the infants at the start of the study and at 3-month and 6-month intervals following the standardized procedures outlined in the test manual. All of the Testing was performed by physical therapist.

INTERVENTION:

1. Head exercises:

- Bending
- Turning (side to side)

2. Sitting

- Shrug shoulders

- Turn shoulders to right and then to left – 20 times.
 - Rotate head, shoulders and trunk – 20 times each a. Rotate upper body right to left with eyes open, then repeat with eyes closed.
 - Rotate upper body left to right with eyes open, then repeat with eyes closed.
 - Bend forward and touch ground then sit up. Keep eyes focused on wall – 20 times
 - Bend forward and touch ground then sit up. Move eyes to floor and back – 20 times
 - Eye movements (head is still) a. Up and down (focusing on finger) b. Side to side (focusing on finger) c. Finger to tip of nose and out (focusing on finger)
3. Standing
- Change from sitting to standing and back again
 - Standing with one foot in front of the other
 - Standing on a cushion
 - Standing and throwing
 - Stand with heels together
 - Stand on one foot
4. Walking:
- Walking on a straight line
 - Walking combined with head turning
 - Walk across the room

5. Eye Exercises:

MATERIALS:

Pediatric Balance scale.

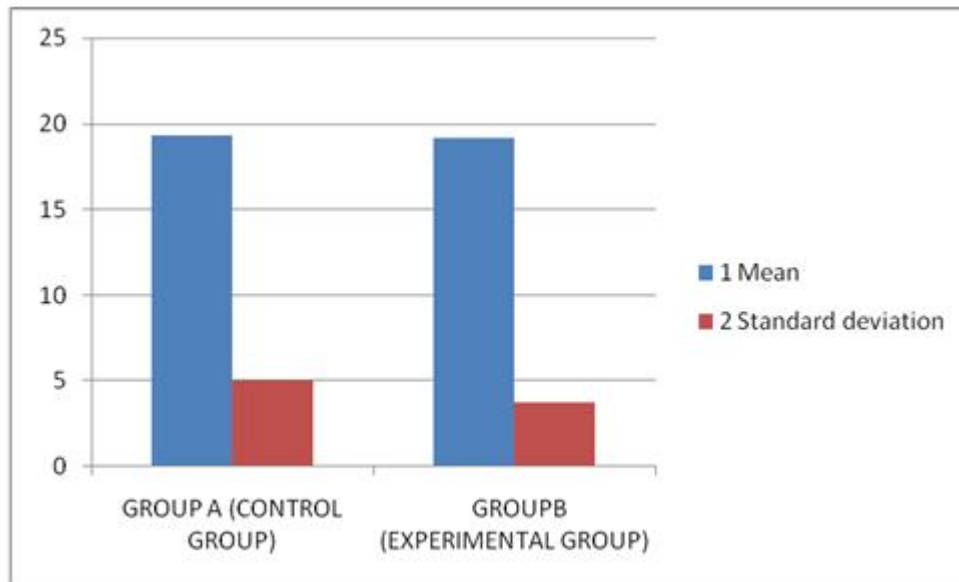
RESULTS AND DISCUSSION:

Data analyzed using unpaired t- test to measure the difference between the Pre and the Post test values within the group. The significance (Probability-P) was selected as 0.05. The calculated t value was compared with tabulated t-value to find out whether there was any significant difference between pre test and post test values. Table 1 and fig: A reveals comparison between Group A and Group B of Pre test values and reveals the Mean difference, Standard deviation and t-value and p-values. The Mean difference for Group A is 19.333 and for Group B is 19.133 .The Standard deviation for Group A is 5.0237 and for Group B is 3.777. Standard deviation for Group A is 25.238 and for Group B is 14.266.The Population Standard deviation for Group A is 4.853 and for Group B is 3.649. The Population Standard deviation for Group A is 23.555 and for Group B is 13.315. Table 2 and fig: B reveals comparison between Group A and Group B of Pre test values and reveals the Mean difference, Standard deviation and t-value and p-values. The Mean difference for Group A is 35.333 and for Group B is 78.733.The Standard deviation for Group A is 7.825 and for Group B is 12.836. Standard deviation for Group A is 61.238 and for Group B is 164.780.The Population Standard deviation for Group A is 7.560 and for Group B is 12.401. The Population Standard deviation for Group A is 57.155 and for Group B is 153.795. In the present study total 20 patients participated in this study with mean age of 5.6 yrs. Paired t test was performed between pre test and post test values to analyze the effect of PMS with tilt table and Passive exercise. The analysis of data shows that calculated t –value was greater than tabulated t value. The two-tailed P value is less than 0.0001 By conventional criteria, this difference is considered to be extremely statistically significant

Table.2 Pre intervention of Balance for Group A and B

S.No	Statistical measurement	CONTROL GROUP A	EXPERIMENTAL GROUP B
1.	Mean	19.333	19.133
2.	Standard deviation	5.0237	3.777
3.	Variance(Standard deviation):	25.238	14.266

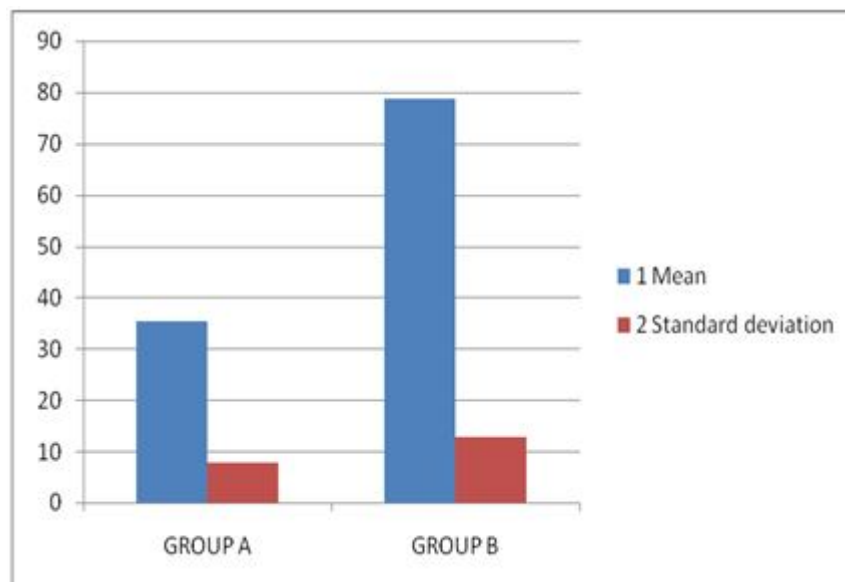
FIGURE:1 pre intervention



Post intervention of Balance for Group A and B

S.No	Statistical measurement	CONTROL GROUP A	EXPERIMENTAL GROUP B
1.	Mean	35.333	78.733
2.	Standard deviation	7.825	12.836
3.	Variance(Standard deviation):	61.238	164.780

FIGURE: 2 post intervention



Balance retraining and coordination exercises include training in use of ankle, hip and step movement strategies, sensory organization activities to promote balanced use of visual, vestibular and Proprioceptive systems together, functional reach, bend, squat, kneel and equilibrium tasks. The vestibular stimulation is more effective treatment in the children with cerebral palsy and to improve the balance, posture and movement, reduce abnormal muscle tone, visual alertness, motor and reflex development also cognitive development and mother-infant attachment

SUGGESTIONS AND RECOMMENDATIONS:

This study was done in a short-time period with a small number of subjects. Therefore to make the results more valid, long-term study with a larger sample size is recommended. This study does not include EMG analysis or Biofeedback training. So further studies utilizing EMG analysis of muscle activity, EMG Biofeedback training can be carried out. Inclusion of a control group would be helpful in validating the results. Further studies are

recommended to analyse the effect some other modified exercise regimen. The described model for a vestibular Rehabilitation therapy program is not restricted to the treatment of children with cerebral palsy. It is a systematic way of trying to solve a child's functional problems. Most of the participating therapists who received the training reported that they had started to apply the program to other children (children with more severe cerebral palsy or with other diagnoses such as spina bifida, developmental delay, or attention-deficit/hyperactivity disorder). Future studies should be performed to determine for which children and for which parents this approach is useful. In addition, the children in our study generally received only physical therapy. Children who attend schools for special education or who attend rehabilitation centers often receives a combination of therapies that involve many professionals. In such situations, collaborative problem definition and collaborative goal setting become more difficult, but are even more important. It would be interesting to study the application of the Vojta therapy model for children involved with many professionals.

CONCLUSION:

Cerebral palsy is a non-progressive syndrome of posture and motor impairment and common cause of disability in childhood. The disorder results from various insults to different areas within the developing nervous system, which partly explains the variability of clinical findings. The vestibular Rehabilitation therapy facilitated compensation, adaptation and habituation and involved stimulating the sensory systems, the central nervous system to reinterpret abnormal vestibular inputs as normal and regenerate or initiate new activity in the brain stem nuclei. Thus the study proves the effectiveness of vestibular rehabilitation Exercises to improve the balance in children's with cerebral palsy.

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TESTING READING FOR SPECIFIC PURPOSES IN AN ART EDUCATION COURSE FOR GRADUATE STUDENTS IN SAUDI ARABIA

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ABSTRACT

Since most Saudi graduate students are not proficient in English, they are required to take an ESP course to enable them to read and comprehend reference material in English and translate the required information for their assignments and theses. Based on a needs assessment questionnaire and an English Proficiency Test results, an ESP course was especially designed to meet art education students' academic and professional needs. At the end of the semester, the students were posttested. The posttest required the students to locate main ideas and supporting details and to figure out meanings of key art terms from context. It also required them to identify the part of speech of art terms and detach suffixes. They also gave the overall meaning of short paragraphs and single sentences in Arabic. A detailed description of the content sampled, skills tested, sample items, and statistical analyses of the ESP reading test scores are reported.

Keywords: art education, ESP, graduate students, reading for specific purposes, reading in art education, reading instruction, reading skills, reading tests.

1. INTRODUCTION

Course and test design for students learning English for Special Purposes (ESP) such as nursing, business administration, science and technology and electronics has been a controversial issue in many countries for many decades. For example, in Algeria, Scholz & Scholz (1979) investigated the level of language proficiency in ESP that can be effectively taught to nonnative speakers. They administered 8 tests to 50 students at an electronics institute in Algeria after a 16-week intensive English course. The first four tests were in ESL skills such as grammar, listening comprehension, a cloze test of brief ESL passages and dictations. The other four tests were in technical language, including a technical grammar test, reading passages, cloze tests of brief passages, and dictations. It was found that the results of the ESL tests significantly correlated with those of the technical language tests. The following semester, structure and listening tests were administered. It was found that the ESL tests scores predicted ESL performance slightly better than the ESP tests scores, whereas the integrative cloze and dictation tests were better indicators of a student's ability to succeed in technical subjects.

In Germany, Brunt (1981) discussed problems related to testing English for Science and Technology. Brunt found that both teachers and students had little knowledge of the content and conventions of scientific writing, because they were mainly trained in literary English. Difficulties arose when needs, aims, and methods were not sufficiently clarified. Students at comprehensive universities had to take make-up courses in English, German, and mathematics, with the course content and conditions for final exams established by the Ministry of Science and Education. Instruction aimed at helping students pass the final exam set by the Ministry. Teachers had to decide what the students needed to know. At one university, word lists were compiled with emphasis on sub-technical vocabulary, and attention was given to teaching the reasons for using rhetorical devices. The cloze test used proved to be valuable in testing students' awareness of logical cohesion between sentences.

In the U.S.A., Regan & McCoy (1982) indicated that most U.S. institutions required international students to meet a minimum English proficiency test requirement for admission to an institution. The language requirements for admission appeared to be the same for technical and academic students. Standardized English proficiency tests purported to be non-specific and the majority of the items referred to materials of an academic nature. This involved a problem for ESP training programs which provided training in a register of English that was not necessarily academic. The researchers recommended that ESP programs prepare students to take the required non-specific tests, that proficiency test be the sole criteria for evaluating students' readiness to enter technical training, and that English programs prepare students for admission to the university and enrolment in the technical program.

In Kuwait, Mason (1984) looked at the appropriateness of multiple-choice placement tests of grammar, vocabulary, and reading comprehension for placement and diagnostic purposes in large programs at Kuwait University Language Center and concluded that carefully designed and written multiple-choice tests were invaluable in helping to form homogeneous classes.

In Ukraine, Tarnopolsky (1996) described an intensive course in English for business communication offered to graduate-level teacher training. The course consisted of a 14-week intensive general English class to develop

basic communication skills and characteristic behavioral patterns of English-speakers and a 14-week immersion class in English business communication that covered a wide range of business-related contexts. The latter class was divided into nine steps based on a single theme about a Ukrainian businessman visiting London. After the first part, students' progress was evaluated using an oral and a listening test. At the end of the second part, two oral and one listening test were administered. The course proved to be successful, with high achievement rates for most students.

In Japan, Adamson (1998) designed a two-semester content-based ESP course for nursing students. The course aimed at meeting licensure requirements for English language training. It emphasized listening and speaking skills, and incorporated principles of accelerated learning. The materials consisted of a ten-chapter text per semester and a serial melodrama based on a story line about a nurse working at a large hospital and characters flexible enough for the students to help develop their personalities. Increasingly serious medical story lines evolved, with cliff-hangers at the end of each chapter and a plot of high interest to students. Classroom teaching techniques included playing of classical music during passive readings and a series of review and expansion activities. Testing consisted of a series of true-false questions. The test results showed that the curriculum was positive.

In Iran, Salmani-Nodoushan (2003) studied the effects of text familiarity, task type, and language proficiency on university students' language for specific purposes test and task performances. Students majoring in electronics took the Task Based Reading Test. Analyses indicated that text familiarity, task type, and language proficiency resulted in significant differences in overall and differential test and task performances.

To conclude, different English program design, content and different test formats and test content were used by the above studies for assessing the students' acquisition of English. The difference arose from the aims for which the students are studying English, and from institution and degree requirements. For learning, teaching, and testing to be in harmony, test specification and test items should be derived from the same needs analysis and program consensus used for developing ESP instructional materials (Scholz, 1993). Scholz (1993) pointed out that little research has been conducted on this issue, or in ESP testing in general. He recommended that the structure of the original needs analysis be reviewed and consensus-building be undertaken to increase the program's pedagogic and operational cohesion. Thus, program evaluation and improvement would be beneficial, and both instructional materials and tests would be more appropriate.

Based on a needs assessment questionnaire and an English proficiency test, an ESP course was specially designed for female graduate students majoring in art education at the College of Home Economics (CHE) in Riyadh. The aims of the ESP course were to develop the students' ability to read and comprehend specialized materials in art education and be able to translate the material that they need for their assignments, terms papers, and thesis. At the end of the semester, a posttest was designed to assess the effect of the ESP course in developing the students' reading comprehension and translation skills. The aims of the present study are to describe the ESP program components and the content and skills measured by the posttest. This description will enable instructors teaching English for art education purposes to replicate the procedures in teaching ESP to other groups of graduate students and help them construct Reading for art education purposes tests that they can use to assess graduate students' achievement. This study has both theoretical and practical implications for ESP instructors. It identifies the reading skills and course content to be taught and tested.

2. PARTICIPANTS

Ten female graduate students participated in the study. They were all art education major and were in their first semester of the doctoral program in art education. They were enrolled in an English-for-Art-Education course which the author taught for two hours a week, in partial fulfillment of the Ph.D. requirements. The students were concurrently enrolled in three art courses. All the subjects were working as lecturers at the Art Education Department, where they taught art courses to undergraduate students. They were all Saudi and were Arabic native speakers. Their median age was 28-36 years. They all had 6 years of EFL instruction in grades 6-12, and two semesters of English at the B.A. and M.A. levels.

3. IDENTIFYING GRADUATE STUDENTS' NEEDS

According to Dudley-Evans (1998: 1), Jureckov (1998: 2), Flowerdew (1995: 19-35), Cruickshank (1983: 1), needs analysis is the basis of ESP course design. Thus, the first day of classes, the students' English language needs were assessed by a needs assessment questionnaire which consisted of the following questions: (A) *For what purposes do you need English while studying?* (B) *For what purposes do you need English after you graduate?* Students' responses were tallied, and their language needs were identified. It was found that all the students needed to learn English to be able to read specialized materials in art education in English during the

doctoral program and after graduation and to be able to translate the information that they need for their homework-assignments, terms papers and theses from English into Arabic.

4. ASSESSING STUDENTS' PROFICIENCY LEVEL

Before instruction, the students' proficiency level in English was assessed by a teacher-made test consisting of four subtests: reading comprehension, vocabulary, paragraph-writing and translation. The pretest consisted of the following questions: (i) *Read the passage and answer the questions that follow;* (ii) *Write the Arabic meaning of the following art terms;* (iii) *Write the English meaning of the following art terms;* (iv) *Break the following art terms into prefixes, suffixes and roots using dashes (-);* (v) *Read the following paragraph and fill in the table;* (vi) *Write a paragraph in which you introduce yourself and talk about your job and field of study;* (vii) *Give a summary of the following English text in Arabic.* Results of the English Proficiency Test revealed that 90% of the subjects exhibited poor reading comprehension skills, vocabulary knowledge, writing, spelling and translation skills (See Table 3).

5. THE ESP PROGRAM

On the basis of the students' language needs, and their proficiency level in English, an ESP course was designed. The course had the following components:

- (i) **Reading Texts:** Authentic art texts about general art themes were selected from art encyclopedias, art books, internet art websites, encyclopedic art dictionaries and art book reviews. The texts increased in length and difficulty level. They had different organizational structures and formats. Most texts had familiar art themes. Examples of art themes selected for the reading material were: Art schools (cubism, surrealism, realism, neoclassicism, romanticism...etc.), famous artists, visual elements and principles of art (line, shape, color, space, texture, balance, emphasis, movement/rhythm), art materials and tools, The Artist's Toolkit Encyclopedia from Minneapolis Institute of Arts, ARTyclopedia, Art book reviews from Amazon, The British Museum and others.
- (ii) **Reading Skills:** The students received training in the following reading comprehension skills: identifying main ideas and supporting details such as names of artists, artworks, place names, characteristics, classification, time sequences, enumeration, comparison and contrast; following directions; skimming for certain information; understanding and identifying the organizational structure of a text; and identifying transitional word and devices that signal comparison and contrast, classification, enumeration, sequences of events, cause-effect and illustrative examples.
- (iii) **Vocabulary Enrichment:** Art terms and new general lexical items were taught in context. The students were trained to infer the meaning of art terms by breaking words into prefixes, suffixes and roots, by identifying the part of speech of the word as used in context, from definitions, punctuation marks, synonyms, antonyms, and examples available in the surrounding context. The students also looked up terms for art tools, art materials, and art schools from monolingual encyclopedic dictionaries.
- (iv) **Grammatical structures in context:** Students were trained to locate the head noun and verb in a sentence, connect pronouns with their antecedents, understand compound, complex and embedded sentences by breaking them down into smaller units and identifying parts enclosed between commas, parentheses or dashes.
- (v) **Translation:** As a comprehension check, single words, certain phrases and sentences and the overall meaning of a paragraph were translated into Arabic.

6. POSTTESTING

At the end of the semester, the students took a posttest (final exam). As recommended by Scholz (1993), for learning, teaching, and testing to be in harmony, test specification and test items should be derived from the same need analysis and program consensus used for developing ESP instructional materials. Therefore, the aim of the posttest was to measure students' ability to read and comprehend written English art texts, knowledge of art vocabulary, and ability to render the overall meaning of an art text in Arabic. The following is a description of the posttest.

6.1 Content Covered

The texts selected for the posttest were similar to those covered and practiced in class in terms of theme, sources, difficulty level and length. The test contained a long text about an artist, short texts, an art website, and web shots of book citations from amazon.

6.2 Skills Tested

- (i) **Reading comprehension skills:** The reading test required the students to recognize the art text macro- and micro-structures, to locate main ideas and supporting details such as names of artists, artworks and place names, characteristics, classification, time sequences, enumeration, comparison and contrast, skimming through web shots from some art websites and book citations from Amazon, and locating specific information, identifying key concepts and key terms in the text and rendering the meaning of paragraphs, selected book citations and art terms in Arabic.
- (ii) **Vocabulary skills:** The test required the students to figure out meanings of key art terms from context. It also required them to identify the part of speech of some art terms in context and to identify prefixes and suffixes in art terms.
- (iii) **Translation skills:** The translation subtest required the students to translate single words, the overall meaning of the text about an art museum, art works, and book titles.

Table 1. Test Specification Table

Content tested	Comprehension Skills tested				Vocabulary Skills tested			Translation skills
	Identify macro structure	Identify micro-structure	Identify main idea	Locate details	Identify suffixes	Identify part of speech	Give Arabic meaning	
Long text (Picasso)	7		1	63				
Short text 1				2				
Short text 2		2	2	3				
Short text 3 (art gallery)								1
4 short texts	4	4		24				4
4 Book citations	4	4		40				4
Words					21	15	3	
Total	7		3	152	21	15	3	9

6.3 The Reading Test Items

Table (2): Reading Test Questions and Marks Allocated to Each question

Task	Test Questions	Marks
<i>Skimming; locating main ideas; recognizing text divisions; locating specific details</i>	Q1: The students were given a long text about “Picasso”. The test required the students to skim through the text and answer the following questions:	
	1) Write the main idea of the whole text.	3
	1) Write why Picasso is an important artist.	3
	2) locate the information below and write it in a summary table:	
	o Stages in Picasso’s Career	7
	o Dates of each stage	7
	o Cities he visited in each stage	7
	o Museums in each stage	7
	o Artists he met in each stage	7
	o Name of Paintings mentioned in each stage	7
	o Subject Matter of each painting mentioned in each stage	7
	o Painting style of each painting mentioned in each stage	7
o Characteristics of each painting mentioned in each stage	7	

Vocabulary skills	4) Vocabulary questions:	
	o Write the meaning of 3 word in English	3
	o Detach the suffixes of 6 words	6
	o Give 15 (nouns, verbs and adjectives) derived from 6 words taken from the text	15
	o Find 21 words in the text ending with suffixes that refer to persons, art works, art styles, actions, and characteristics.	21
Identifying details	Q II: The students were given a short text and asked 2 questions about details.	4
Identifying details & recognizing organizational clues	Q III: The students were given a short text and asked 3 questions about details	6
Translation	Q IV: The students were given a short text and asked to render the overall meaning in Arabic.	6
Skimming Recognizing punctuation marks and text format identifying details giving a summary translation	Q V: The students were given 4 short texts with an artwork from an online art website. They were asked to skim through the texts and fill in a summary table with the following:	
	o Name of work	4
	o Name of artist	4
	o Where it is kept	4
	o Name of donator	4
	o When it was finished	4
	o Art elements	4
o Summary of elements and characteristics in Arabic	10	
Skimming; identifying detail; recognizing parts of an online book entry or citation; comparing information; translating book titles.	Q VI: The students were given 4 book entries (citations) from www.amazon.com. They were asked to skim through the entries and fill in a summary table with information below:	
	o Title	4
	o Author	4
	o Editor	4
	o Publication year	4
	o Topic	4
	o Most expensive book	2
	o Best book	2
	o Book with several editions	2
	o Fastest to get	2
o Translate book title in Arabic	8	

6.4 Scoring the Test

The pre- and posttests were blindly graded by the author. An answer key was used. Word level questions were given one point each; sentence level questions were given 2 or 3 points each and paragraph level questions were given 5 points each (see distribution of marks in Table 2). Points were deducted for spelling and grammatical mistakes. Each student was given 3 scores: a reading score, a vocabulary score, and a translation score. Scores were converted into percentages.

6.5 Test Validity and Reliability

The posttest is believed to have content validity, as it aimed at assessing the students' comprehension of art texts, knowledge of basic art terminology and ability to translate the overall meaning of an art text at the paragraph level. The content covered by the test was comparable to course materials, class discussion and assignments. The test instructions were phrased clearly, and the examinees' task was defined. All of the students comprehended the questions and responded to them as instructed.

Concurrent validity of the posttest was determined by correlating the students' total score on the posttest and their total score on the midterm test that measured reading comprehension, vocabulary and translation skills as well. The validity coefficient was .62 and it was significant at the .01 level.

Since the author was the instructor and the scorer of the pretest and posttests for both groups, estimates of inter-rater reliability were necessary. A 30% random sample of the pretest and posttest answer sheets was selected and double-scored. A colleague who holds a Ph.D. degree scored the pre and posttest answer sheets. In scoring the sample answer sheets, she used the same answer key and followed the same scoring procedures utilized by the author. The marks given by both raters for each subtest in the sample were correlated. Inter-rater correlation was 98%.

Furthermore, examinee reliability was computed as it indicates how consistently examinees perform on the same set of tasks. Examinee reliability was also calculated by using the Kuder-Richardson 21' formula as it estimates the internal-consistency of the test items. The reliability coefficient of the posttest was .63.

7. STATISTICAL ANALYSIS

The mean, median, range, standard deviation, and standard error were computed. To find out whether the students made any progress (gain) as a result of instruction, a within group paired T-test was computed using the pre and posttest scores.

8. RESULTS

Table (3) shows that the median score on the pretest was 22.5% (range = 15% -48%) and the median score on the posttest was 62.5% (range = 40% - 88 %) with larger variations among the students' posttest scores than the pretest score as revealed by the standard deviation values. Results of the paired T-test in Table (4) show a significant difference between the pre and posttest mean scores at the .01 level, suggesting that the students' achievement significantly improved as a result of exposure to ESP course (T = 14.6, Df = 9). Results of the Pearson correlation matrix in Table (5) show that there is a significant positive correlation between the students' vocabulary and translation scores (r = .77; P<.001) and a significant correlation between students' reading and translation scores (r =.51; P<.05). However, the correlation between the reading and vocabulary scores was non-significant.

Table 3: Distribution of Pre- and Posttest Scores

	Mean	Median	SD	SE	Mode	Range
Pretest	27	22.5	9.49	3	20	15-48
Posttest	62.5	66.5	13.54	4.28	48	40-88

Table 4. Paired T-test Results

	N	Mean	SD	SE Mean	t	df	P
Pretest	10	27.0	9.49	3.00	9.0	9	.000
Posttest	10	62.5	13.54	4.28	14.6	9	.000

Table 5: Pearson Correlations among Vocabulary, Reading and Translation Posttest Scores

	Vocabulary	Reading
Vocabulary	-	-
Reading	.31	-
Translation	.77**	.51*

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

The test also had a good discrimination power. It could discriminate between students who mastered and those who did not master the reading skills practiced in class as shown by the mean, SD and range of student scores in Table (3).

9. DISCUSSION AND CONCLUSION

To improve graduate students' reading, vocabulary and translation skills, an ESP course was developed and taught to graduate students majoring in art education in Saudi Arabia. At the end of the semester, a test was designed and administered to find out whether the students' ability to read, comprehend and translate paper and online art reading material has significantly improved. The test also aimed at assessing the effectiveness of the ESP course in developing the required reading vocabulary and translation skills. Test results showed that the course was successful in developing the reading, vocabulary, and translation skills that the students needed to pursue their graduate courses in art education and to continue to read specialized English material in art

education after graduation. Findings of the present study are consistent with findings of other studies conducted by Tarnopolsky (1996) in English for business communication offered to graduate-level teacher training in Ukraine and by Adamson (1998) in English for nursing offered to Japanese students. Since the study was conducted with a small sample of graduate students, it is recommended that the ESP course and ESP test be replicated with larger groups of male and female graduate students majoring in art education to get better estimates of validity and reliability. The effectiveness of the ESP course can be also measured by self-reports at the end of the course and while taking graduate courses in art education as a follow-up measure of the effectiveness of the course taught. Since the subjects have a master's degree in art education and they are lecturers at their department, the effect of their background knowledge in art education on reading comprehension in English and translation skill acquisition may be subject to further investigation in the future.

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APPENDIX

The Art Education English Reading Test

[I] Read the following text, then answer the questions that follow:

Pablo Picasso (1881–1973)

Pablo Picasso is one of the most innovative artists of the 20th century. Throughout his long career, Picasso experimented in many different painting styles. His artwork had a major influence on the development of modern art. Along with Georges Braque, Picasso created a style of abstract art called cubism. Picasso was also a printmaker, sculptor, ceramicist, stage designer and poet.

Early life

Pablo Picasso was born on October 25, 1881, in Málaga, Spain. His father was a drawing teacher. Around the age of 10, Picasso became his father's apprentice. Picasso held his first exhibition at the age of 13. In 1895, the family moved to Barcelona, and Picasso joined Llotja, an art academy. In 1897, his painting "Science and

Charity” was awarded an honorable mention at the Fine Arts Exhibition in Madrid. Picasso then lived in Madrid for few years. He painted life scenes he saw around him, in the cafés and on the streets. In the Prado Museum, Picasso had a chance to come in contact with masterpieces of Spanish painting. The work of artists such as Diego Velázquez, El Greco, and Francisco de Goya were to be lifelong influences. In early 1899, Picasso returned to Barcelona and decided to break with his formal training. He became part of a group of experimental artists and writers. Later that year, Picasso first visited Paris. There he began painting in brilliant colors.

Blue period

In 1901, the painter Carles Casagemas, a close friend of Picasso's, shot himself. The death had a profound effect on Picasso. He began painting images of poverty, despair, and death portraits of his friend. This part of Picasso’s career is called the blue period (1901–04) because Picasso mostly used blue tones.

Rose period

Picasso moved to Paris in 1904. By 1905 the blue tones had given way to earth colors—shades of rose, or deep pinkish red. His subject matter also included lively characters such as dancers and acrobats. This rose period lasted until about 1907.

Cubism

Picasso touched new ground when he painted *Les Femmes d'Alger* in 1907. Picasso was fascinated by tribal art and carvings. Two of the women's faces that he painted were like African masks. At that time, many people found this painting shocking. Picasso began working with his friend and fellow painter Georges Braque in Paris. Picasso and Braque developed a new art style called cubism which began in 1907. Picasso's painting “The Three Musicians” (1921) is a well-known example of the cubism style. Picasso and Braque rejected traditions such as perspective and the realistic imitation of nature.

Neoclassic period

In 1917 Picasso went to Rome to design the costumes and scenery for Sergei Diaghilev's ballet company. Between 1918–1925, Picasso's paintings showed the use of classical forms and drawing techniques. He also continued working on his cubist style, making it less severe. He began to create sculpture in 1928.

Effects of war

In 1937, Picasso painted *Guernica*, which many consider as his best. *Guernica* was Picasso painted *Guernica* in response to the 1937 bombing of *Guernica*, a small Basque town, during the Spanish Civil War. In this and many of his later pictures, he used distorted forms instead of painting realistic figures. The imagery is more dreamlike. In the mid-1930s, Picasso began writing dreamlike poetry. Throughout World War II (1939–1945), Picasso remained in France. However, he was now allowed to exhibit his artwork after the Germans occupied France. He joined the French Communist party in 1944.

Last years

Picasso continued to work into his 90s. On April 8, 1973, he died in the town of Mougins, France. He played an important role in each of the major art movements of the 20th century, continually experimenting with styles and media. He said that to repeat yourself is to go against “the constant flight forward of the spirit.”

a) **What is the main idea of the whole text?**

b) **Why is Picasso an important artist?**

c) **Fill in the chart below with the required information from the text entitled “Pablo Picasso (1881–1973). Write one example only in each cell.**

Stages in Picasso’s Career	Dates	Cities He Visited	Mus-eums	Artists He Met	Name of Paintings	Subject Matter	Painting Style	Charac-teristics

d) Write the meaning of each word in English:

- Cubism:
- Prado:
- Llotia:

e) Write the suffix in each word on the line:

Sculptor ----- cubism ---- classical --- Realistic --- ceramicist --- designer ---

f) Fill in the chart with the missing parts of speech where applicable.

Verb	Noun	Adjective
-		communist
Influence		
	Experimenting	
		innovative
-		Spanish
-	Ceramicist	

g) Find words in the text that match each category in each column.

	person	Artwork	style	action	Chs.
	sculptor	Carvings	cubism	carving	realistic
1					
2					
3					

[2] Read the following paragraph and fill in the answers:

Indian Basketry

Almost all Indian groups made baskets that they used to store and carry food. The Indians also wove fibers into mats and wall coverings, articles of clothing such as hats and sandals and fish traps. The Pomo Indians of California, who were probably the finest basket makers, sometimes combined the woven fibers with shells and feathers.

- What baskets were used for
- What baskets were made of

[3] Read the text then fill in the sentences:

In India a distinct style, preserved mainly in architecture, developed after the Delhi Sultanate was established (1192). This kind of art made extensive use of stone and reflected Indian adaptation to Islam rule, until Mughal art replaced it in the 17th century. Typical of the Mughal art is Char Minar of Hyderabad (1591) with large arches, arcades, and minarets. In Turkey the mosque style was also derived from Persia, like most Turkish art.

- Characteristics of Indian art are:
- An example of Indian art is:
- Examples of Islamic art are:





[4] Translate the following paragraph into Arabic:

The National Gallery

It is the biggest picture and portrait gallery in Greece. The nucleus of the National Gallery collection, consisting of 117 paintings, was cataloged in 1878. It was later enriched by the donation of the private collections of Alexandros Souzos, Euripides Koutides and many other Greek painters and collectors. A number of important works of art, as in the “Crifixion” by Lorenzo Veneziano and a collection of engravings of the 16th to 20th centuries, were purchased by the Gallery itself.


[5] From the paintings below, Fill in the chart with the missing information:


	Picture A	Picture B	Picture C	Picture D
Name of work				
Name of artist				
Where it is kept				
Name of donator				
When it was finished				
Art elements				
Summary of elements and characteristics in Arabic				


<p>(A) Many artists use shapes that may appear similar to both geometric and organic shapes. In this sculpture the artist used found shapes with straight and curved edges. The relationship of the shapes to one another is emphasized by the neutral color of the sculpture and the play of shadows and light.</p>		<p>Louise Nevelson Case with Five Balusters 1959 wood, paint Walker Art Center Gift of Mr. and Mrs. Peter M. Butler</p>
<p>(B) Thick and thin lines have been used on this jar to create a decorative pattern. The thin lines that form the light-colored part of the pattern also suggest texture.</p>		<p>Kayenta Jar about 1260 - 1300 ceramic, polychrome The Minneapolis Institute of Arts The Putnam Dana McMillan Fund</p>
<p>(C) The shapes in this painting are irregular, fantasy shapes. They resemble organic shapes which might exist in the sea, but they come from the artist's imagination.</p>		<p>William Baziotis Opalescent 1962 oil on canvas Walker Art Center Gift of the T. B. Walker Foundation</p>
<p>(D) Many shapes in our environment appear to be machine-made because of their perfect, regular, straight or curved edges. The containers on this table are made up of geometric shapes, but the artist has treated the curved, organic shapes of the bread and fruit as if they were machine-made too!</p>		<p>Jean Metzinger Still Life 1921 Oil on canvas The Minneapolis Institute of Arts Gift of Mr. and Mrs. Theodore W. Bennett</p>

[VI] Skim through the books below from Amazon, then fill in the chart with the missing information.

	Book A	Book B	Book C
Title			
Author			
Editor			
Publication year			
Topic			
Price			
Most recent book			
Best book			
Book with several editions			
Used book			
Fastest to get			
Translate book title into Arabic			

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Sums Formulas of Generalized Fibonacci Polynomial Sequence

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A STUDY OF CLOUD DATA SECURITY CHALLENGES AND COMPARATIVE ANALYSIS OF ITS DIFFERENT DATA SECURITY ALGORITHMS

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ABSTRACT

Network and Internet applications are growing very fast, since the need to secure these applications are very fast. For this purpose cryptography algorithms (symmetric & Asymmetric) are proposed. The use of relevant algorithm deals with the level of data safety in cloud because data security in cloud computing is a serious issue as the data centers are located worldwide. Authentication is the most essential procedure to ensure the cloud data in a secured manner. However, strong user authentication is the main requirement for cloud computing that reduces the unauthorized user access of data on cloud. Data security is a more important issue of cloud computing. Thus, the need to ensure the safety of information that being exchanged between the users and the cloud became more significant. Many security and authentication techniques have been proposed to secure the exchanged data. These techniques aim to keep the authentication, privacy and reliability levels of data. Here in this survey paper, I have presented security algorithms in cloud computing.

Keywords: Cloud computing, Cryptography, Encryption, Decryption, Cipher Text, DES, TDES, AES, RSA, Homomorphism, IDEA, Blowfish

INTRODUCTION

Since, in cloud computing, every data(image, audio, video, etc.) is stored on the cloud, and we access these data though the cloud using the internet. Because of the remote usability using the internet, there's an issue of security. Private data of the client organization is vulnerable. The Public Cloud with the least security can be breached by hackers which may have catastrophic impact on the client organization as well as the provider. Some examples are: Amazon Elastic Compute Cloud (EC2), Microsoft Azure, IBM's Blue Cloud, Sun Cloud, Google Cloud, etc., Even for different computing layers, most of the service providers are not able to provide 100% security. Generally, the early start-ups and businesses will go for Public Cloud, such that the probability of breaching is very high because of the low security issue in Public Cloud.

TYPES OF CLOUDS

There are basically four types of clouds, which are described below-

- **Public cloud:** This is the one of the cloud in which cloud services are being available to users via a service provider over the Internet. It provides a control mechanism for them. The services may be free or offered on a pay-perusage model.
- **Private Cloud:** This provides many of the benefits of public, but the main difference among two is that the data is managed properly within the organization only, without the limits of network bandwidth.
- **Community Cloud:** This type of cloud is basically managed by group of originations that have a common objective to achieve. The members share access to the data in the cloud.
- **Hybrid Cloud:** This is the combination of public as well as private cloud. It can also be defined as multiple cloud systems that are connected in a way that allows programs and data to be moved easily from one

CHARACTERISTICS OF CLOUD COMPUTING

Here are several characteristics of cloud computing, which are described below-

- **Virtualization:** Through Cloud computing, user is able to get service anywhere through any kind of terminal. User can attain or share it safely anytime.
- **High Reliability:** Cloud uses data fault tolerant to ensure the high reliability of the service.
- **Versatility:** Cloud computing can produce various applications supported by cloud, and one cloud can support different applications running it at the same time.
- **On Demand Service:** Cloud is a large resource pool that a user can buy according to his/her need; cloud is just like running water, and gas that can be charged by the amount that user used.

- Extremely Inexpensive: The centered management of cloud make the enterprise needn't undertake the management cost of data center that increase very fast. The versatility can increase the utilization rate of the available resources compared with traditional system, so users can fully take advantage of low cost. Some advantages are listed below-
- Cloud computing do not need high quality equipment for user and it is easy to use.
- Cloud computing can realize data sharing between different equipments.
- Cloud computing provides dependable and secure data storage center. You don't worry the problems such as data loss or virus.

CLOUD SECURITY CHALLENGES:

Organizations seeking cloud security solutions should consider the following criteria to solve the primary cloud security challenges of visibility and control over cloud data.

- **Visibility into cloud data** — A complete view of cloud data requires direct access to the cloud service. Cloud security solutions accomplish this through an application programming interface (API) connection to the cloud service. With an API connection it is possible to view:
 - What data is stored in the cloud.
 - Who is using cloud data?
 - The roles of users with access to cloud data.
 - Who cloud users are sharing data with.
 - Where cloud data is located.
- **Control over cloud data** — once you have visibility into cloud data, apply the controls that best suit your organization. These controls include:
 - **Data classification** — Classify data on multiple levels, such as sensitive, regulated, or public, as it is created in the cloud. Once classified, data can be stopped from entering or leaving the cloud service.
 - **Data Loss Prevention (DLP)** — Implement a cloud DLP solution to protect data from unauthorized access and automatically disable access and transport of data when suspicious activity is detected.
 - **Collaboration controls** — Manage controls within the cloud service, such as downgrading file and folder permissions for specified users to editor or viewer, removing permissions, and revoking shared links.
 - **Encryption** — Cloud data encryption can be used to prevent unauthorized access to data, even if that data is exfiltrated or stolen.
 - **Access to cloud data and applications** — As with in-house security, access control is a vital component of cloud security. Typical controls include:
 - **User access control** — Implement system and application access controls that ensure only authorized users access cloud data and applications. A Cloud Access Security Broker (CASB) can be used to enforce access controls
 - **Device access control** — Block access when a personal, unauthorized device tries to access cloud data.
 - **Malicious behavior identification** — Detect compromised accounts and insider threats with user behavior analytics (UBA) so that malicious data exfiltration does not occur.
 - **Malware prevention** — Prevent malware from entering cloud services using techniques such as file-scanning, application whitelisting, machine learning-based malware detection, and network traffic analysis.
 - **Privileged access** — Identify all possible forms of access that privileged accounts may have to your data and applications, and put in place controls to mitigate exposure.
 - **Compliance** — Existing compliance requirements and practices should be augmented to include data and applications residing in the cloud.

- **Risk assessment** — Review and update risk assessments to include cloud services. Identify and address risk factors introduced by cloud environments and providers. Risk databases for cloud providers are available to expedite the assessment process.
- **Compliance Assessments** — Review and update compliance assessments for PCI, HIPAA, Sarbanes-Oxley and other application regulatory requirements.

In cloud computing, encryption algorithms play an essential role in providing secure communication through connected and distributed resources. They primarily convert the data into a scrambled type to protect by using “the key,” and transmitter users only have the key to decrypt the data. There are mainly two types of key encryption techniques used in security algorithms today: symmetric key encryption and asymmetric key encryption. Symmetric key encryption uses a single key to encrypt and decrypt the data. In contrast, asymmetric key encryption uses two keys — a public key for encryption and a private key for decryption. There are several techniques used to create better data security in cloud storage and ensure secure communication. Encryption techniques convert message or plaintext into ciphertext, and decryption techniques extract the original message or plaintext into the same ciphertext. In this post, we will look at the top 10 cloud security algorithms designed to provide better and secure data security in the cloud

In cloud computing, encryption algorithms play an essential role in providing secure communication through connected and distributed resources. They primarily convert the data into a scrambled type to protect by using “the key,” and transmitter users only have the key to decrypt the data. Cloud is nothing but the group of servers and data centres that are placed at different places and these servers and data centres are responsible for providing on demand service to its users with help of internet. The service provided by cloud is not present on user’s computer. User has to access these services with help of internet connection through subscribing them. The main advantage of Cloud computing is that it eliminates the need for user to be in same location where hardware software and storage space is physically present. Cloud makes it possible to store and access your data from anywhere anytime without worrying about maintenance of hardware software and storage space. All these services are provided to user at low cost. User has to pay according to storage space he is using. Due to this flexibility everyone is transferring his data on cloud. Security becomes big issue when any one stores its important information to a platform which is not directly controlled by the user and which is far away. While sending of data and during storage data is under threat because any unauthorised user can access it, modify it, so there is need to secure data. A data is secure, if it fulfils three conditions (i) Confidentiality (ii) Integrity (iii) Availability. Confidentiality means the data is understandable to the receiver only for all others it would be waste; it helps in preventing the unauthorised disclosure of sensitive information. Integrity means data received by receiver should be in the same form, the sender sends it; integrity helps in preventing modification from unauthorised user. Availability refers to assurance that user has access to information anytime and to any network. In the cloud confidentiality is obtained by cryptography. There are mainly two types of key encryption techniques used in security algorithms today: symmetric key encryption and asymmetric key encryption. Symmetric key encryption uses a single key to encrypt and decrypt the data. In contrast, asymmetric key encryption uses two keys — a public key for encryption and a private key for decryption. There are several techniques used to create better data security in cloud storage and ensure secure communication. Encryption techniques convert message or plaintext into ciphertext, and decryption techniques extract the original message or plaintext into the same ciphertext. In this post, we will look at the top 10 cloud security algorithms designed to provide better and secure data security in the cloud.

1. RSA ALGORITHM

RSA is a Public Key algorithm that provides security by encrypting and decrypting the data so that only authorized users can access it. RSA stands for Ron Rivest, Adi Shamir, and Len Adleman, who first described it in 1977. The data is encrypted, and the ciphertext is then stored onto the cloud. When a user needs the data, the user places a request to the cloud provider, then authorizes the user and provides him the data. Third-Party can detect Cloud service provider misbehaviour with a certain probability by asking for proof for a constant number of blocks independent of the total number of file blocks [4]. Every message block is mapped to an integer value. RSA algorithm consists of Public Key and Private Key. The public key is known to all cloud users, whereas Private-Key is known only to the user who initially owns the data. The Cloud service provider performs encryption, and the Cloud user/cloud customer performs decryption. Once the data is encrypted with the Public Key, it can be decrypted with the corresponding Private Key.

2. BLOWFISH ALGORITHM

One of the most common public algorithms provided by Bruce Schneier, Blowfish algorithm, is a symmetric key algorithm, which functions almost like DES Algorithm, in which the key is small and can be decrypted

easily. However, in the Blowfish algorithm, the size of the key is massive, and it can differ from 32 to 448 bits. Blowfish also consists of 16 rounds and can encrypt data having multiple sizes of eight, and if the size of the message is not multiple of eight, then bits are protected. In the Blowfish algorithm also, 64 bits of plain text is separated into two parts of the message as size 32 bits' length. One part acquires as the left part of the message, and another one is the right part of the message. The left part of the message is XOR with the elements of the P – array which creates some value, after that value is transmitted through transformation function F. The value initiated from the transformation function is again processed XOR with the other half of the message i.e., with right bits, after that F| function is called which replace the left half of the message and P| replace the right side of the message.

3. DIFFIE HELLMAN KEY EXCHANGE (D-H)

Whitfield Diffie and Martin Hellman discovered Diffie Hellman key algorithm substitute. It is a technique for exchanging securely by using cryptographic keys over a public network and was the primary specific sample of public-key cryptography. It enables only two users to exchange a secret key over an untrusted network. These two users do not need any prior knowledge about secrets sharing information between them. It is predicated on the complexity of computing discrete logarithms of massive prime numbers. It needs two large numbers, one prime (P) and another is (G), a primitive root of P.

4. ELLIPTIC CURVE CRYPTOGRAPHY ALGORITHM

Elliptic Curve Cryptography Algorithm was discovered by Neil Koblitz (University of Washington) and Victor Miller (IBM) in 1985. It is a public key encryption technique that depends upon discrete algorithms, which is utilized to create efficient, quicker, and smaller cryptographic keys. Elliptic curve public-key cryptography (ECC) is an innovative approach based on the algebraic structure of elliptic curves over finite fields with low key size. The ECC deals with two points (x, y), which satisfies the equation $y^2 = x^3 + ax + b$ with some condition ($4a^3 + 27b^2 \neq 0$) by sharing the secret key. The points that lie on the curve operate as a public key, and random numbers are used as private key encryption. ECC is used in some integer factorization algorithms that have applications in cryptography.

5. DATA ENCRYPTION STANDARD (DES) ALGORITHM

The Data cryptography standard (DES) is a symmetric- key block cipher discovered as FIPS46 within the Federal Register in January 1977 by the National Institute of Standards and Technology (NIST). In encryption site, DES takes a 64- bit plaintext and creates a 64-bit ciphertext, after that the decryption site, it takes a 64-bit ciphertext and creates a 64-bit plaintext. Each encryption and decryption technique is used for the same 56-bit cipher key. The encryption process is made of two permutations (P-boxes), that we tend to call initial and final permutation, and sixteen Feistel rounds [17]. Each round transmits a different 48-bit round key generated from the cipher key encryption.

6. EL GAMAL ENCRYPTION

The El Gamal encryption system is an asymmetric key encryption algorithm for performing public-key cryptography, which is based on the Diffie–Hellman key exchange process by using cryptography. Taher Elgamal illustrated it in 1984. ElGamal encryption is protected in the free GNU Privacy Guard software, latest versions of PGP, and other cryptosystems. The Digital Signature Algorithm is detailed about a variant of the ElGamal signature scheme, which should not be confused with ElGamal encryption. ElGamal encryption can be described over any cyclic group G. Its security is based on the difficulty of a certain issue in G related to computing discrete logarithms.

7. ADVANCED ENCRYPTION STANDARD (AES)

Advanced Encryption Standard is the new encryption suggested by NIST to replace DES. AES comprises three cipher blocks: AES-128, AES-192, and AES-256. AES-128 uses a 128-bit key length to encrypt and decrypt a message block, while AES-192 uses a 192-bit key length, and AES-256 a 256-bit key length for encrypting and decrypting messages. Each cipher encrypts and decrypts data in 128-bit blocks, using 128, 192, and 256-bit cryptographic keys.

Symmetric, also known as a secret key, ciphers use the same key for encryption and decryption, so both sender and receiver have to know the same secret key — and use it —. Top Secret information requires either key lengths of 192 or 256 bits. Ten rounds are available for 128-bit keys, 12 rounds for 192-bit keys, and 14 rounds for a 256-bit key. A round consists of several processing steps involving the substitution, transposition, and mixing of the plaintext input to transform it into the final ciphertext output.

8. DIGITAL SIGNATURE ALGORITHM (DSA)

The digital signature algorithm (DSA) refers to a digital signature standard. The National Institute of Standards and Technology (NIST) introduced it in 1991 as a better method for creating digital signatures. Along with RSA, DSA is considered one of today's most preferred algorithms for digital signatures. DSA does not encrypt message digests using a private key or decrypt message digests using the public key. Rather, it uses unique mathematical functions to create a digital signature consisting of two 160-bit numbers originating from digests of the message and the private key. DSAs use the public key to authenticate the signature, but when compared with RSA, the authentication process is more complicated.

9. TRIPLE DATA ENCRYPTION STANDARD (3DES)

3DES is based on the DES algorithm. Making use of Triple-DES is very easy to modify existing software. It also has the advantage of proven reliability and a longer key length that eliminates many of the attacks that can be used to reduce the time it takes to break DES. It takes three 64-bit keys, for a total 192-bit key length. In Stealth, you type in the entire 192-bit (24 characters) key rather than entering each of the three keys individually. The Triple-DES DLL then breaks the user-provided key into three subkeys, padding the keys if necessary, so they are each 64 bits long. The procedure for encryption is the same as regular DES, but it is repeated three times, hence the name Triple DES.

10. MD5 (MESSAGE-DIGEST ALGORITHM 5)

Message-Digest Algorithm 5 (MD5) is a cryptographic hash algorithm that can be used from an arbitrary length string to create a 128-bit string value. Though insecurities with MD5 have been identified, it is still widely used. MD5 is most commonly used for checking file integrity. It's also used in other security protocols and applications like SSH, SSL, and IPsec, however. Some applications reinforce the MD5 algorithm by adding a salt value to the plaintext, or by applying multiple hash functions.

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DEVELOPMENT OF A SEPIC CONVERTER POWERED HETEROGENEOUS POWER BRIDGE FOR SOLAR PHOTOVOLTAIC APPLICATION

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ABSTRACT

Normally converters are designed by using either MOSFET or IGBT as switching device. In this work a Heterogeneous Bridge which is the combination of both MOSFET and IGBT is proposed. The power input to the Heterogeneous H-Bridge is from a solar PV arrangement regulated by a SEPIC converter. It is a DC-DC one-side Ended Primary Inductor Converter which is operated to maximize the output power. An advanced Microcontroller based control is used to achieve the controlling of firing the switches to produce an AC output to feed a low power AC load. The performance of the combined SEPIC and Heterogeneous converter delivered a power at increased efficiency and decreased distortion and these are evidenced through simulation and hardware circuits.

Keywords— IGBT converter, MOSFET converter, photovoltaic panel, SEPIC converter, simulation model.

1. INTRODUCTION

Energy from the Sun is beginning for all types of energy. This energy can be utilized in two different ways for example utilizing heat for drying, warming, cooking or electrical power by using the Photovoltaic, which changes over solar energy in to electrical power that can be utilized for varied purposes, such as, lighting, water pump and electrical energy. The Solar source, due to its contamination free nature, for all intents and purposes and boundless limit and global availability, it is an existing energy that is extremely appealing and is an asset to the life on the Earth. This solar energy can be used for various applications as the most copious energy on the planet. It is not just a solution to the present energy yet additionally a natural and inviting type. Photovoltaic (PV) power generation is an effective generation for utilizing the energy from the Sun. Sunlight based panels (a variety of photovoltaic cells) are currently widely utilized for running road lights, for controlling water heaters and to meet local loads [1].

In this work, a novel converter called heterogeneous converter is used to convert the DC power obtained from the solar energy harvest system to the required AC power to the load. For the conversion of solar energy to suitable DC power a SEPIC converter is used. The circuit configuration of both SEPIC converter and the Heterogeneous converter are discussed in the following sections. The hardware model and the test results with waveforms are also discussed.

2. SCHEMATIC DIAGRAM OF THE HETEROGENOUS CONVERTER

The schematic block diagram of the Heterogeneous converter arrangement is depicted in Fig.1. The solar insolation brings about electrical power which is harvested through the Solar PV Panel. The yield from the PV panel is connected with the SEPIC converter to operate in a buck-boost mode to obtain a required output voltage. The output electrical power from the SEPIC converter is stored in a battery. When the load has to be supplied with an AC power, the energy stored in the battery is connected to the Heterogeneous Bridge (H-Bridge) inverter consisting of combined IGBT and MOSFET Switches. A microcontroller based control scheme is used for operating both the SEPIC and the Heterogeneous Bridge converter and drive the system to provide necessary output[2].

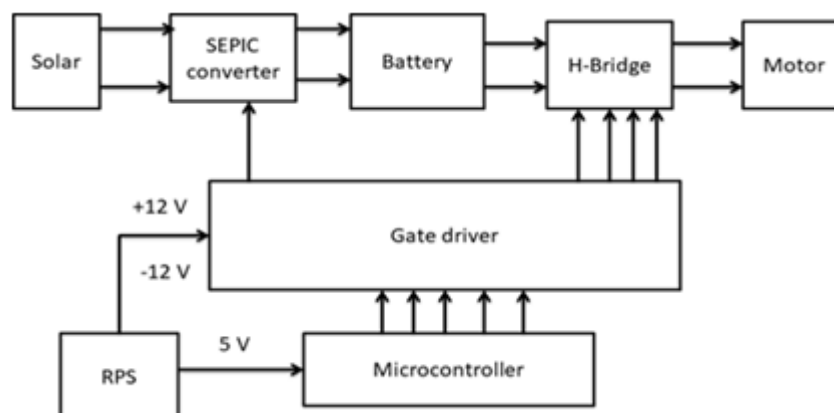


Fig. 1 Block Diagram of the Heterogeneous System

3. SEPIC CONVERTER

Fig. 2 shows the SEPIC converter actualized with loss free switches. Alike the Cuk converter in which the polarity of the output is inverted, the SEPIC converter, keeps up the output polarity similar to the input polarity. The demerit of this converter is the extra pole due to extra LC arrangement in the circuitry. This results in a control loop with more complications than in a normal setp-up, step-down arrangement[3].

A SEPIC converter is required to connect the output of the PV module to the load with required voltage levels. Thus the SEPIC converter is comprised of capacitors, inductors, power switch (IGBT), a fly-back diode (fast switching type) and is connected as shown in the Fig. 2. The transistor, here works as a switch, it is turned on and off as per the applied pulse width regulated (PWM) control signal.

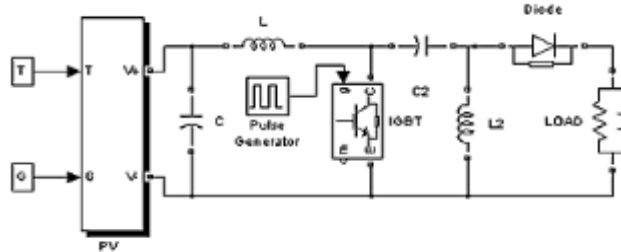


Fig. 2.SEPIC Converter

This converter, which is associated between a PV module and a load, is a pulse width modulation based SEPIC converter working in continuous current mode (CCM). In the solar PV applications, it is preferred that ripple has to be minimum whereas the Power Curve have to be at its maximum. The condition for the determination of the input ripple current is the equivalent for all converters [4]. The input current wave (Δi_L) during the switch on of the power switch is characterized by the condition given in the expression (1).

$$\Delta i_L = \frac{V_i D}{f L_1} = i_2 - i_1 \tag{1}$$

Where: f , switching frequency, i_1 is the Inductor current at time t_1 from i_1 (initial value) to i_2 (secondary value) increases linearly and at time t_2 from i_2 to i_1 decreases linearly

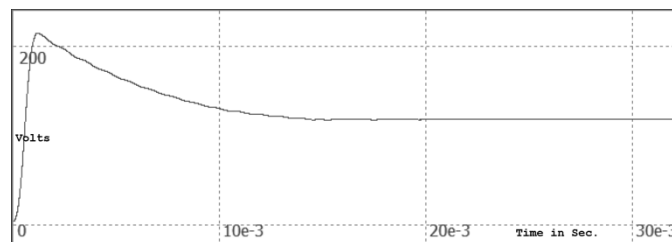


Fig. 3 Voltage Output of a SEPIC Converter

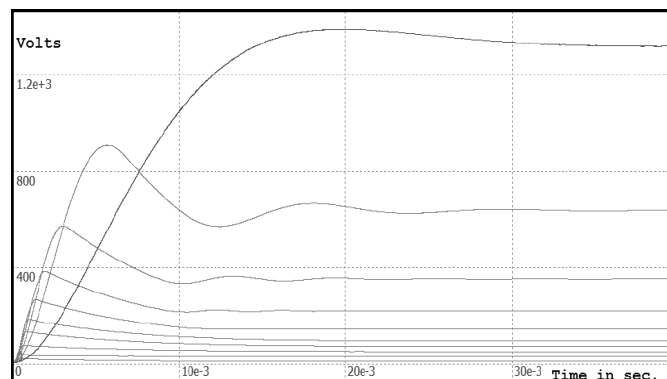


Fig. 4 Output Voltage with Varying Duty ON Periods [0.5,1.5.. 9.5]

4. SIMULATION OF THE SEPIC CONVERTER POWERED HETEROGENEOUS CONVERTER

In this segment, the simulation of the heterogeneous converter is analysed when worked from the voltage provided by a renewable source of power specifically a solar energy through the SEPIC converter.

A SEPIC converter will be in continuous conduction mode if the current flowing through the wound inductor L_1 is not zero. During a SEPIC's consistent steady state working, the normal voltage over the capacitor C_s (VCs) is equivalent to the input applied voltage (V_{IN}). Since capacitor C_s does not allow direct current, the normal current over it (I_C) is zero, making the inductor L_2 the main source of current through the load. Subsequently the average value of current flowing through the inductor L_2 is equivalent to the avg. Value of the load current and henceforth not dependent of the input voltage. Taking this at normal voltages, the following results can be composed:

In the Fig. 5 shown, the heterogeneous converter is just an arrangement of current controlled device namely the IGBT and voltage controlled device namely the MOSFET arranged in H-Bridge configuration and powered by the output of the SEPIC converter [5]. The output of the heterogeneous converter is AC suitable enough to feed the load.

$$V_{IN} = V_{L1} + V_{Cs} + V_{L2} \tag{2}$$

Since the avg. voltage of VCs is same as V_{IN}

$$V_{L1} = -V_{L2} \tag{3}$$

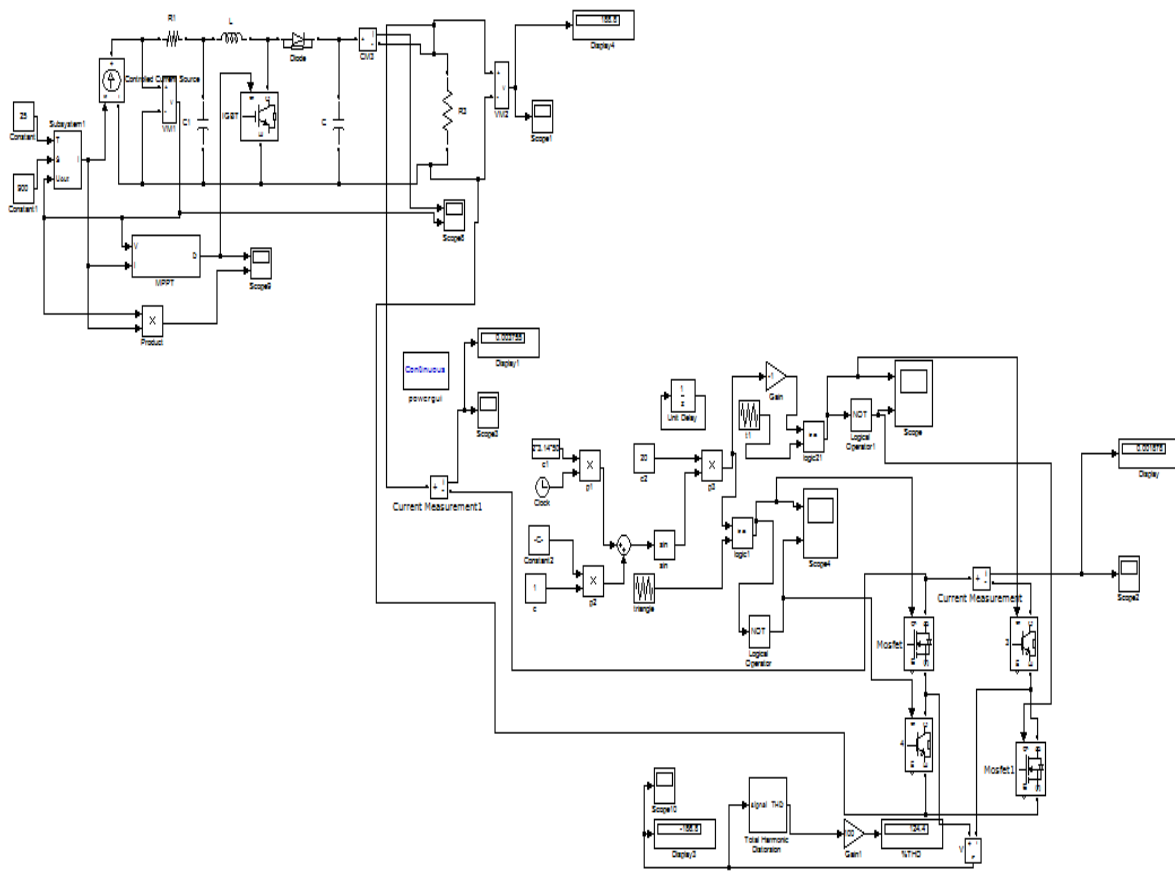


Fig. 5. Simulation circuit of the SEPIC powered Heterogeneous Converter

As the above shown voltages are the equivalent in amplitude, the ripple current flows in the two inductors will be also equivalent. The normal flows can be added as:

$$I_{D1} = I_{L1} - I_{L2} \tag{3}$$

The voltage output V_O of the converter is obtained by equalling input as well as the output powers. Thus the output power which is obtained is given as follows:

$$P_o = \frac{V_o^2}{R} \tag{4}$$

by comparing (2) and (3), the voltage output is obtained as

$$V_o = \frac{aV_E}{2\sqrt{D}} \tag{5}$$

Here D is non-dimensional value represented by

$$D = \frac{f_s L_i}{R} \tag{6}$$

The output stage of the converter corresponds with a buck–boost converter which is operating in Continuous Current Mode, bus voltage mentioned as V_B as given in (7)

$$V_B = \frac{1-\alpha}{\alpha} V_O = \frac{(1-\alpha)V_s}{2\sqrt{D}} \tag{7}$$

from above, the operating of the converter (input stage) in Discontinuous mode, output stage in continuous conduction mode, the bus voltage as well as the output voltages are inversely dependent on ‘ α ’, the duty cycle.

$$V_B + V_O = \frac{V_s}{2\sqrt{D}} \tag{8}$$

The input stage should be operated in DCM for any load for which the limit duty cycle ‘ α limit’ is possible to obtain from the voltage transformation ratio within the DCM–CCM limits.

$$\alpha_{limit} = \frac{1}{1+V_O/V_B} \tag{9}$$

Until actual value of duty cycle is lesser than the value of limit shown by (9), the first stage of the converter operates only in DCM mode.

4.1 Energy transferring components

The energy transferring components value at the input side, which is L_i , is obtained based on the power output as well as assuming fully efficiency converter. Hence the value of the inductance in input side is given as:

$$L_i = \frac{\alpha^2 V_B^2}{4P_O f_s} \tag{10}$$

Thus the estimation of the capacitor which is another energy moving component also called as the bus capacitor CB is determined in order to confine the low-recurrence ripple of the above said bus voltage, this voltage is the thing that applied to the second phase of the DBB converter. The flow of current through this capacitor is likewise the ones flows through diodes D1 and D2. In those diodes, just the current through D1 is balanced by an line frequency which is rectified. So as to figure the bus voltage ripple, the low freq. segment of the current passing through D1 must be acquired. The normal current through D1 can be determined as:

$$\langle i_{D1} \rangle = \frac{1}{T_s} \frac{i_{D1_peak} t_1}{2} \tag{11}$$

Here i_{D1_peak} is the peak value of the current through diode D1 for each switching period with t_1 , the time needed by the current to reach zero value. The above said values change after a dualling of the line frequency for the values given:

$$i_{D1_peak} = \frac{V_B}{L_i} \alpha T_s \tag{12}$$

5. SIMULATION PARAMETERS

The simulation parameters used in this work is shown in Table 1. It can be seen that all parameters of the IGBT based converter and the Heterogeneous converter are same except the output voltage, where the heterogeneous H- bridge output is more compared to conventional IGBT H-bridge converter.

Table 1 Consolidated Simulation Results

Parameter	IGBT H-Bridge	Heterogeneous H. Bridge
Temperature ⁰ C	25	25
Insolation W/m ²	900	900
SEPIC O/P (V)	188.8	188.8
H-Bridge O/P (V)	169.58	172.5
Conversion Efficiency %	89.82	91.25

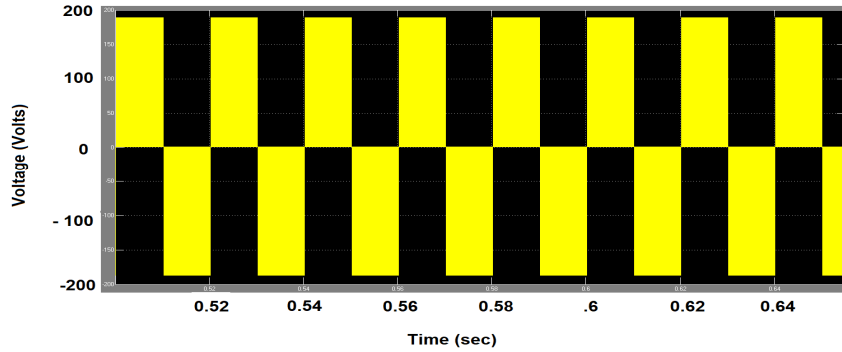


Fig. 6 Output Voltage of the Hetrogeneous Converter

6. HARDWARE

The prototype model of the work is shown in Fig. 7. The SEPIC converter as well as the Hetrogeneous bridge converter along with the controllers and battery pack is shown.

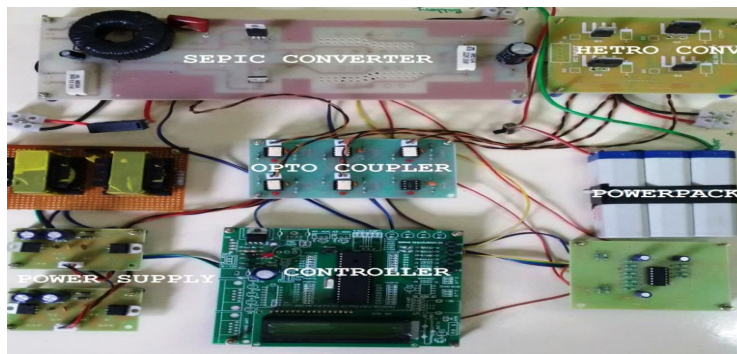


Fig 7. Prototype of Work



Fig 8. The Prototype with Solar PV Panel

In Fig. 8 the prototype model with solar PV panel is shown. This setup will be connected to the specified load.

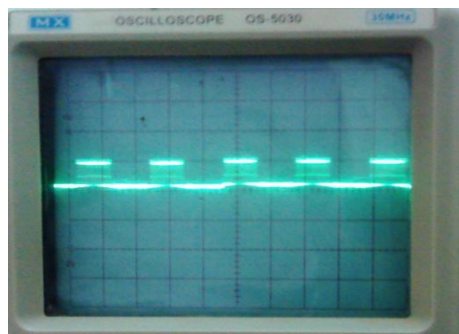


Fig.9 Control Pulses applied to the heterogeneous converter as seen in the scope

Fig. 9 shows the output of the opto-coupler which gives the firing pulses to the hetro converter. Fig. 10 shows the voltage applied to the load

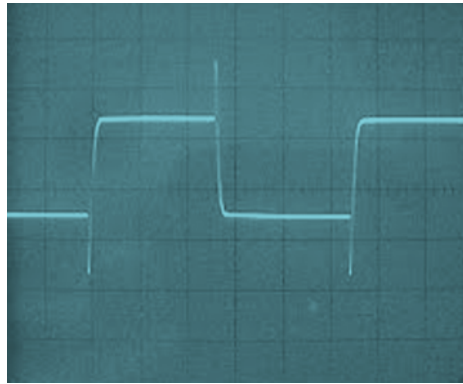


Fig. 10 Output Voltage Waveform of the H-Bridge converter as seen in scope

Table 2. gives the consolidation of the hardware results of this work. A hardware prototype model which is assembled in the laboratory using a solar panel of lower wattage and voltage ratings is connected to the SEPIC converter for a regulated DC and then the output DC obtained is fed as the input to the Heterogeneous converter. It is evident from the hardware results that a conventional IGBT-H bridge gives lesser output voltage when compared with the combination of SEPIC and Heterogeneous converter .

Table 2. Consolidated Hardware results

Parameter	IGBT H-Bridge	Heterogeneous H. Bridge
Insolation W/m ²	450	450
SEPIC O/P (V)	19.6	19.6
H-Bridge O/P (V)	16.4	17.7
Conversion Efficiency %	83.67	90.30

7. CONCLUSION

From the discussions in the preceding sections it can be concluded that, when a SEPIC converter is combined with the conventional H- Bridge converter gives lesser output when compared to the combination pair of SEPIC and the heterogeneous converter. This is inherently due to the decrease in loses in the conversion. Though the simulation was done for higher power ratings, the prototype made was only for a low power load just to demonstrate the efficiency of the converter combination. This Heterogeneous converter if combined with the other converters used for harvesting the solar power, may provide improved performance and hence compensate to the reduced efficiency of the solar PV arrangement.

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IMPORTANCE OF RESEARCH AND DEVELOPMENT IN THE CURRENT ERA

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**ABSTRACT**

Research and Development is the study of new knowledge. It is an activity which companies undertake to launch new products, processes and services. R & D is very important in many business processes. Launching new processes or improving business activities helps the company reputation. It helps you to improve your technological and computer skills and motivates you to do critical things in which you can study more about other subjects. Research and Development is crucial in business as the level of competition, processes & production are rapidly increasing. In the field of marketing where companies keep a bull eye on challengers and buyers in order to keep pace with new and modern trends and scrutinizes the need of demand and desires of their customers. If a company has a department of Research and Development, the result for it is very good but also the company has to spend a lot to signify more creativity, profit, etc. Engineers also use research and development in creating new innovations in software technology. The technology and pharmaceuticals sectors has the highest percentage of spending on research and development. Research and Development plays very important in any organization whether it is big or small. Many organizations in industries like pharmaceuticals has a full fledged to control in the quality of product and inventions of new technologies and products. Research and Development has become more important in day to day life in business activities and has evident more in the factors that resulted in a good way in the economic performance of 21st century. Well-known companies use research and development has commercial functions and has enhanced the company's main objective by creating innovative and better products. It also improves operational processes and provides expert advices to the customers of the company. It enhances the company's growth. The paper consists of research and development in the current era.

Keywords: Economic Growth, Education, Innovations, Organizations, Research and development.

OBJECTIVE OF THE STUDY

- To study the importance of Research and Development in this era.
- To analyse new technology and innovations.
- To focus in R & D in different sectors.

INTRODUCTION

Research and Development (R&D) is a very important aspect in the ongoing development / enhancement in any field. It has proved to be a crucial stage in shifting global technological frontiers. And this has led to a rise in new technologies and scientific innovations.

Using Rail transport as an example, though the train was invented in 1804, it wasn't until 20 years later the first steam locomotive was invented to transport people. 75 years later the Electric train was invented. Even though three quarters of a century passed, these two initial trains ran at speeds around 10kmph. Now fast forward to today, we have the fastest train in the world on wheels running at speeds of ~400 kmph, and a Maglev (trains on magnets) can run to a speed around 500 kmph. How did this transpire? What are the contributing factors that resulted in this technological explosion? It's convergence. Yes a convergence of departments using the knowledge set in history by minds who have focused on a single area of expertise. Though electricity was around for a millennia, Benjamin Franklin penned his findings on discovering electric currents around the mid 1700s and paved the way for many to revisit his findings. Those who understood his findings, spent more time and continued to explore his ideas and discovered electromagnetic induction. They viewed his discoveries in

detail and attempted to modify and add more detail to it, this process is called Research and Development. People from different fields like Blacksmiths, those who understood the idiosyncrasies of Iron and metal bindings, then from the field of the Steamer Locomotives, even business men who saw a means for profit. It was an inert process, but history has scientists and great minds who have sought to develop and increase the efficiency of this new found technology.

Though there was a hundred year gap from when Electricity was first discovered to when it was actually implemented in 1879 as a use in the first electric passenger train. There was then another approximate 100 year gap to the creation of the magnetic trains. There was something else that made this converge to something that we use on a daily basis. In the end if we look at electricity and a locomotive as two separate pieces, power and technology and of course two hundred yeas. It was only through research of knowledge of the past and testing, experimenting and developing on it, have we reached to a point where today we can travel in luxury at speeds of 500 Kmph, on a train without wheels.

REVIEW OF LITERATURE

Precious Sibiyi (August2011), in their paper titled the role of Research and Development in Industry and Commerce have conducted the research with the aim of to know the importance of R&D in today's world and what actually is research and development. They also explained the role of many sectors. They included letter to editor, articles, expert opinions, etc. They also concluded the research paper as government must prioritise effective policies that promotes and protect research and development.

DISCUSSION

We have collected our data primarily by conducting a survey. We have discussed in this paper about the working of research and development, why it is important in many organizations as well as in this era. We have also discussed the importance of research and development in the economic, pharmaceutical and other sectors. Research and development aims at high point at many levels in any organization so objectives are also analysed and types are discussed. The main is that why it is important in current era is also consisted. We have discussed the promotions of research and development by the government. The discussions are discussed below

WHY IS R&D IMPORTANT ?

- Crucial to survival.
- Fast changing environment.
- Continuous technology change.
- Increases competition.
- Changing customer preferences.
- Fundamental to “marketing”

WHY DOES R&D MATTER ?

Research and development plays a crucial role to some companies than to others. For e.g. a software company would spend more on R&D than a retail sales company. Many technological companies survive by developing more effective technology than their competitors. A company like Samsung has more employees that work in R&D because Samsung company competes in the market by first developing and then releasing their devices that are more better and appealing which creates by the competitor.



HOW DOES RESEARCH AND DEVELOPMENT WORKS ?

For e.g.: let's say company ABC is a pharmaceutical company which produces pain relieving medication. ABC has many competitors, so the accuracy production of medications is essential to maintain or improving its share in the market. Company ABC needs to allocate more in resources in order to continue to produce effective medication both financially and human to the development of more effective pain relieving meditation. So, use of these resources is called research and development.

PROMOTION OF R&D BY GOVERNMENT

The government policies already promotes research and development in many ways. Around 32% of gross national expenditure on R&D in the year 1996 was funded by the government. They also promotes innovative activities in firms through spending directly on education, training, medical, patent, competition, etc. Government follows more policies which affects some companies/firms incentives to invest in R&D. Policies which directly target the research and development that includes government R&D labs, funding, universities or business, investing in human capital formation, etc.

WHY R&D IS NECESSARY ?

- a) It builds our knowledge and facilitates learning.
- b) It increases public awareness and it is a means to understand issues.
- c) It is also a means to find opportunities.
- d) It promotes to analyse love of reading, writing and sharing valuable information.
- e) It helps us to succeed in the business.

CURRENT ERA IN R&D

This era has a breakthrough in technology which has transformed from an organization to all large scale business and budget sizes. Today, in this 21st century both large and small organizations are committed to time and resources to support technology R&D in efforts to improve and innovate. Development continued in emerging technologies, such as cloud computing, artificial intelligence (AI), data science is paving the way for this continuing R&D investment is recognized as the advantage in this era.

Let us take a look at a few current trends in R&D

CLOUD COMPUTING

Many modern businesses demand for the latest technology from their cloud provider because updating new technology is essential to meet business specific customer and needs. New features, security and technologies updates are continuously being developed in modern cloud solutions to create more secure and streamlined processes. Cloud computing focuses R&D investment and creates opportunities for modern cloud providers to adapt to these new features in technology and grows at the speed businesses need. Whereas older technologies like Lawson Software and Alibaba Cloud, may not have more necessary means to update as frequently and are therefore not suitable to adapt in the companies.

Investment in Cloud computing includes

- Improves service : The cloud has a significant effect on product and services are delivered to customers.
- Simplified management : Providers can take on maintenance responsibilities with ease when there is less upkeep.
- Adaptable to growth : Modern cloud technology provides necessary resources for businesses to scale.

ARTIFICIAL INTELLIGENCE

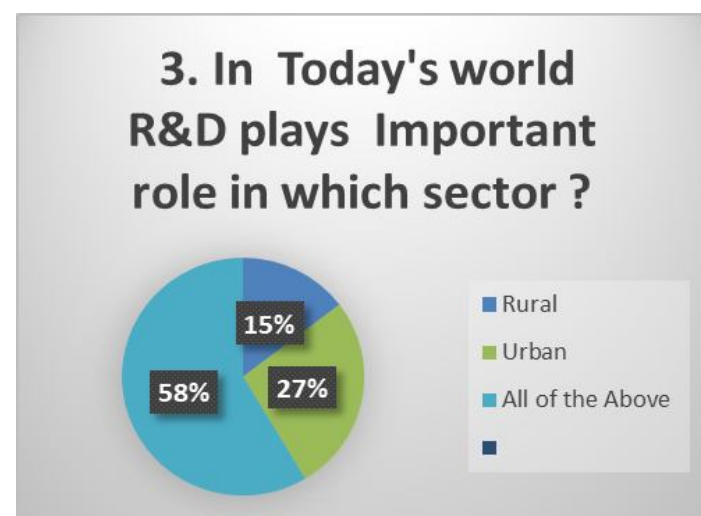
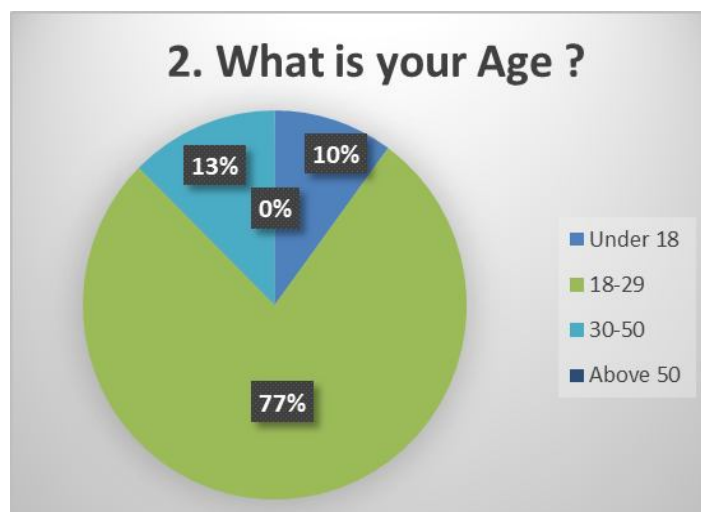
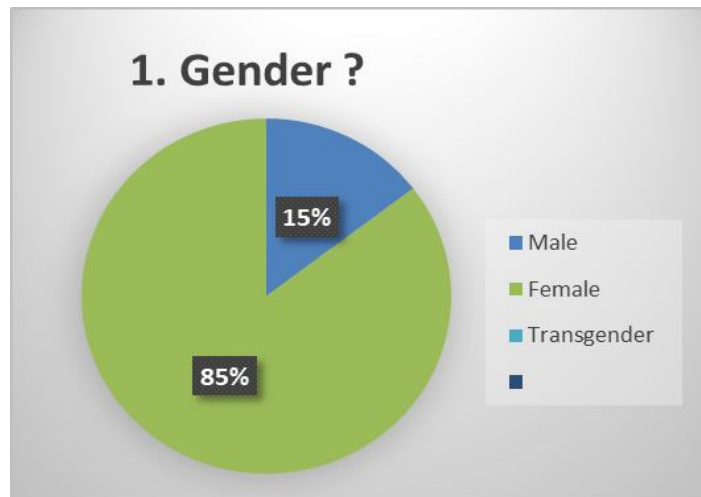
AI's are enabling advanced capabilities in R&D department to work on improving much sophisticated and innovative business offerings. Many business leaders recognize the importance of this technology as it relates to the future innovative ideas and their ability to provide the highest quality offerings in today's competitive market. Similarly, early adopters' interests in AI and is facilitated by their experience with artificial intelligence.

Investment in Artificial Intelligence includes

- It makes a long term investment.
- Develops effective methods.
- Ensures safety and security.

DATA ANALYSIS

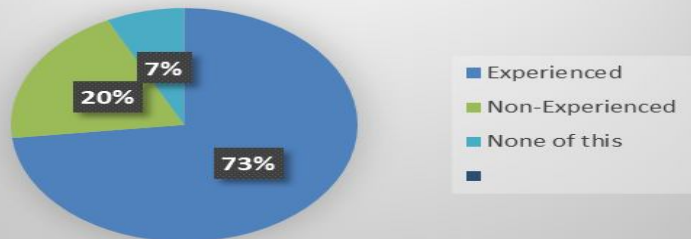
The objective of the paper is to study the importance of research and development in this current era. We have got 41 responses and there were mainly research students. Students at the age of 18-29 were more followed by 30-50 age. There were 9.8% responses from the age group of under 18 and there were less responses from the age above 50. We knew from our analysis that R&D plays important role in today’s world and there were less percentage of people given a chance to participate in R&D centre. We knew from our data that experienced candidates are selected and R&D plays a crucial role in development in the society from our survey. It is proved that R&D is done in research centre. We have known that every age group benefits in most while carrying out R&D programmes. The aim to study this research paper is to improve the current technology. R&D is also important in moulding one’s career. The data which we collected indicates that R&D is important in this current era.



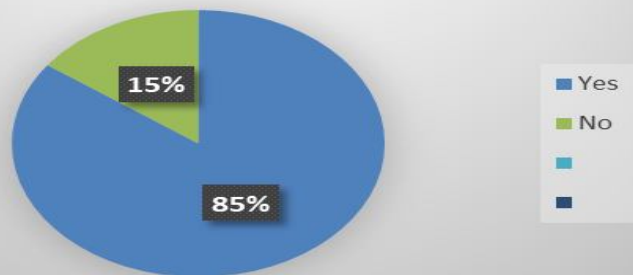
4. Given a chance would you like to participate in R&D center ?



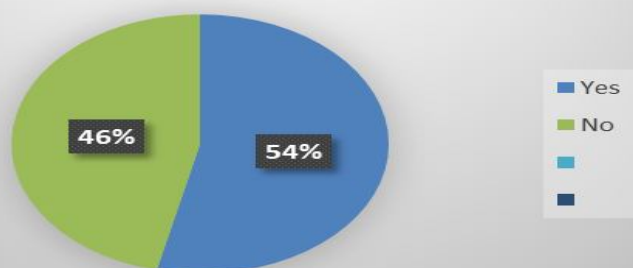
5. What type of candidates are selected to initiate R&D programs ?



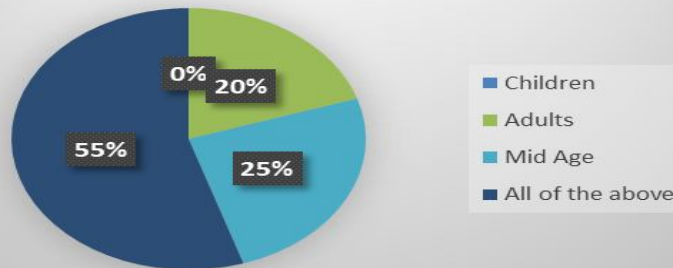
6. R&D plays a crucial role in the Development of the society ?



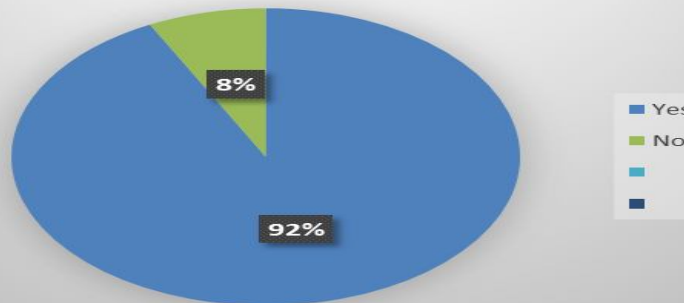
7. Is it True that programs are held only in Research Center ?



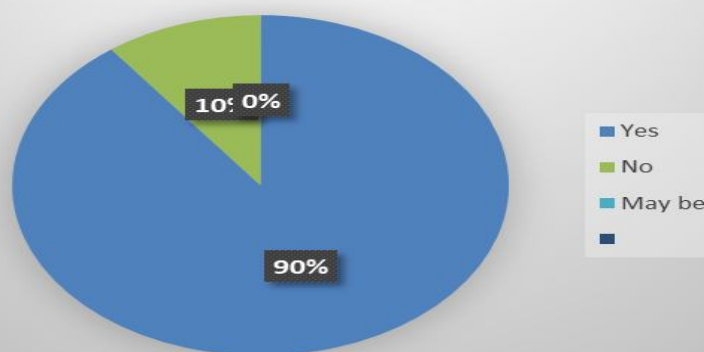
8. Which age group benefits most while carrying out R&D programs ?



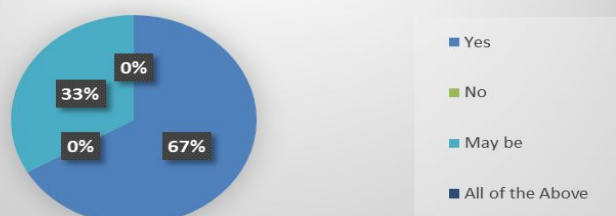
9. The aim of R&D is to Improve the Current Technology?



10. R&D is very Important asset for moulding one's career ?



11. Did you think R&D is Important in the Current era ?



CONCLUSION

So basis this example, it can be observed that, what was first discovered as an event in the sky, this was further tested and experimented on to bring about a controlled phenomenon of the same event. Or in today's world it's called re-creating the same event in a lab. In order to do so, one has to have a fundamental grasp on the previous experiment in order to further experiment on and develop an innovative idea. These ideas have a major impact on the Country's economy. R&D is factored in state funded and private institutions. This is undertaken in a systematic manner to ensure documented awareness of the research being conducted, this increases knowledge and advances education in science and technology. This is proved in the amount of scientific development that has risen over the last few decades. The flow of success and information that has contributed to an increase in the global economic growth in both developed and developing nations. It is only with the constant application of researched innovations that there has been progress in a city's infrastructure, transportation, communication and even entertainment.

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HUMAN RESOURCE MANAGEMENT- CONFLICT MANAGEMENT

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ABSTRACT

A conflict may be a clash of interest. Human resources personnel settle work disputes through decoding company policies and employment and labour laws. The fundamentals of conflict could vary however it's forever a district of society. Management includes the activities of setting the strategy of a company and coordinate the efforts of its workers to accomplish its objectives through the appliance of accessible resources, like money, technological and human resource. Every organization encounters conflicts on a routine. The conflicts can't be avoided, however it's potential to manage them in an exceedingly method that we tend to acknowledge them on time. It's necessary to unendingly track the structure signals that purpose to their existence. The human resources department, HR, often acts as a negotiator between staff and managers, quickly responding to conflict and making certain employers don't violate the rights of staff.

Conflict resolution involves the reduction, elimination, or termination of all forms and kinds of conflict. 5 styles for conflict management, as known by Kenneth Thomas and Ralph Kilmann, are: competitor, compromising, collaborating, avoiding, and accommodating. Businesses will take pleasure in applicable varieties and levels of conflict that's the aim of conflict management. Conflict management minimizes the negative outcomes of conflict and promotes the positive outcomes of conflict with the goal of up learning in a company. Properly managed conflict will increase structure learning by increasing the quantity of queries asked and encourages individuals to challenge the established order.

Keywords: Conflict Management, Conflict Resolution Skills, Human Resource Personnel, Positive outcomes, Organization, Styles for Conflict Management.

OBJECTIVE OF THE RESEARCH

- To understand the importance of conflict resolution and management.
- To study the style and strategies of conflict management.
- To specify ways to overcome conflict management.

RESEARCH METHODOLOGY

- Quantitative method of Primary data of Survey (questionnaire) was used for further studies.
- Available secondary data was used for the study wherein various books, articles and websites were referred.

INTRODUCTION:

Conflict management is a technique through which disputes are been resolved wherein positives results are prioritized and negative results are minimized. Depending on the situation, negotiation, and creative thinking different tactics are involved as a key for management skills. Enhancing learning skills and group outcomes also including effectiveness in an organizational setting is an aim of conflict management. If organizational conflicts are properly managed one can improve group outcomes. Human Resource Management is important for the right functioning of any business that employs giant numbers of individuals. Even though it is exhausting to overestimate the importance of Human Resource inside the organization, the majority don't even perceive what the role of the Human Resource is and the way necessary these specialists once it involves conflict resolution within the work. Of course, there's more to the duties of the Human Resource than simply resolve the conflicts, therefore allow us to look nearer at a number of the essential tasks of the Human Resource that facilitate them touch upon all the inter-personal and intra-personal problems at the work. Conflict management includes three orientations which are: lose-lose, win-lose and win-win. The lose-lose orientation could be a sort of conflict that tends to finish negatively for all parties concerned. A win-lose orientation leads to one victorious party, typically at the expense of the opposite. The win-win orientation is one among the foremost essential ideas to conflict resolution. A win-win answer acquired by integrative dialogue is also getting ready to best for each party. Lose-lose, win-lose and win-win are orientations engaged in a cooperative approach rather than a competitive one. "The win-lose orientation is made in our society in contest, admission to educational programs, industrial promotion systems, and so on. People tend to generalize from their objective win-lose things and apply these experiences to things that don't seem to be objectively fixed-pies- which means the pie does not change its size, the party who gets the biggest piece wins and the other loses - there is no chance of a win-win outcome. This

kind of mentality may be harmful once human action with completely different cultural teams by making barriers in negotiation, resolution and compromise; it may lead the "loser" to feel not very good. Once the win-win orientation is absent in negotiation, completely different responses to conflict could also be ascertained.

REVIEW OF LITERATURE

A detail review of literature has been made on to find out the research and to identify the relevant issues for the study. It is essential for research review to relate literature study as it also helps to understand the research gap and draws light onto the scope of the study.

o **Conflict Management Models**

Blake and Mouton (1964) were among the first to present a conceptual scheme for classifying the modes (styles) for handling interpersonal conflicts further classified into five types which are forcing, withdrawing, smoothing, compromising, and problem solving.

o **Khun and Poole's model**

Khun and Poole (2000) established a similar system of group conflict management in which they split Kozan's confrontational model into two sub-models which was distributive and integrative.

o **DeChurch and Marks's meta-taxonomy**

DeChurch and Marks (2001) examined the literature out there on conflict management at the time and established what they claimed was a "meta-taxonomy" that encompasses all alternative models. Thus, they argued that all other styles have characterised them into two dimensions which are activeness and agreeableness.

o **Rahim's meta-model**

Rahim (2002) noted that there's agreement among management students that there's nobody best approach to a way to create choices, lead or manage conflict. In a similar vein, instead of making a really specific model of conflict management, Rahim created a meta-model (in a lot of identical method that DeChurch and Marks, 2001, created a meta-taxonomy) for conflict designs supported 2 dimensions, concern for self and concern for others.

DATA COLLECTION METHOD: -

The students/ working professionals view, opinions and thoughts are provided which is considered to be appropriate for the research. The primary data was collected from students and working employees through a procedure which first include the selection of the research topic and then the planning and preparation phase which include drafting of a questionnaire for an effective survey. After which it was distributed and then analysed and clarified, and finally conclusions, recommendations and references for the research made. Systematic sampling technique as it is more convenient than simple random sampling as it is easy to administer and simple to adopt as it does not require complicated procedures it also enables the sample to be proper and true representative and it prevents unnecessary and irrelevant item into the sample.

SAMPLING: -

The method used for sampling the data is systematic sampling. Systematic sampling is equivalent to simple random sampling where there is no bias but is simpler and more straight forward than simple random sampling. Probability sampling technique is used in which the researcher sets a selection of a few criteria and chooses members from a random selection. This technique was taken into effect as random number of individuals such as students studying in university and employees working in an organization to obtain information for collecting data in a systematic manner. Questionnaire survey method was used in which a google form was circulated to the students and employees on a random basis.

DATA ANALYSIS AND RESEARCH ANALYSIS: -

The analytical format of the research is through the study of the respond of the questionnaire circulated. The overall respond to the survey was of about 50 responses which includes university students and working employees and was done in an accurate manner. Below is the result of the survey in an analytical format.

SURVEY RESPONSES			
What is your current occupation?	Student 56%	Working 44%	
During an argument do you often say things and then regret?	Agree 66%	Disagree 34%	
Do you try to win every argument even if you lose your friends?	Agree 16%	Disagree 84%	

If two friends/employees are arguing do you try to understand both sides in the argument?	Agree 100%	Disagree 0%	
Do you find win-win solution to disagreement?	Yes 54%	No 46%	
Have you ever been the resource to deal with conflicts?	Yes 32%	No 14%	Maybe 54%
Do you know about procedures of conflict management?	Yes 50%	No 50%	
What is your perception towards conflict?	Conflicts are good 16%	Healthy conflicts 68%	Conflicts are bad 16%
Do you try to adjust your priorities to accommodate other people’s need?	Yes 38%	No 18%	Sometimes 44%
When a conflict occurs do you tend to back out of the situation and do something else?	Yes 44%	No 56%	
Do you stand by your principles even in any conflict which occurs?	Yes 88%	No 12%	

The above table is the reference of the survey conducted along with the questions asked and its responds in percentage format for better understanding.

DISCUSSION: -

The above responses suggests that the respondents often say things that they regret later. Majority of them prioritized their friends rather than winning the argument. The overall response suggests that they try to understand both the sides of the friends/employees in the argument. Only half of the responses were been resource to deal with the conflicts and are aware of the procedures for conflict management. Majority of them have perception that conflicts are healthy where the rest think it’s either good or bad. Sometimes people try to adjust the priorities to accommodate other people’s need depending on the situation. Half of the respondents tend to back out of the situation and do something else when a conflict occurs but majority of them stand by their principles in any conflict.

IMPORTANCE OF CONFLICT RESOLUTION

Whenever employees with different backgrounds, attitudes and opinions work together on any project, conflicts are inevitable. Following are some benefits of conflict resolution that will highlight its importance:

- **Garner strong relationships:** Having good conflict resolution skills help the employees reduce the friction that damages their work relationships. By resolving conflicts in more professional way and respectful manner, they are able to collaborate better with co-workers, building stronger work relationships.
- **Reduced disruptions:** Employees with poor conflict resolution skills cause a tension to build in the face of any disagreement, which then spreads to other employees who may not have been involved originally. This ends up in a dropped employee morale as well as stalling of the work flow. By training the employees for conflict resolution, such disruptions can be decreased and a better working environment can be created.

STRATEGIES FOR CONFLICT MANAGEMENT

Strategy 1: Competing

Competing is highly assertive and completely uncooperative stance to resolving conflicts. The goal is to win or beat the other person. Often known as the “win-lose” approach, it’s power-oriented and solely seeks to defend its own position, typically at the expense of others.

What to keep in mind about competing?

- **Use this option during emergency situations:** This approach works best once time is of utmost importance, like throughout calamity when everybody has got to be escorted out of the premises.
- **Refrain from using your power or rank to bully the other party to submission:** Outside emergency or life and death situations, this system is probably going to cause even additional conflict down the road.

Strategy 2: Collaborating

This is the holy grail of conflict management. It is both assertive and cooperative.

What to keep in mind about collaborating?

- **It's best employed when looking to uncover new solutions:** Whether you're searching for solutions to existing or anticipated issues, collaboration makes area for everybody's opinions, ideas, and suggestions to seek out the "win-win."
- **Reaching a consensus is not easy:** Often, it needs time, patience, a high degree of trust, and a lot of attention to come up with the simplest outcome. But the nice news is it that can be done. Strategy 3: Compromising

Compromising is smack within the middle as a result of it's each assertive and cooperative, however solely to a particular degree.

What to keep in mind about compromising?

- **The aim is to find a middle ground:** The parties on the both sides of the conflict get something but also have to give something up to arrive at a solution acceptable to everyone, which is why it is also referred to as a "lose-lose" scenario.
- **Focus on what could be achieved instead of what would be lost:** Highlight the benefits of the compromise, not what each party would have to sacrifice. This way, individuals are more likely to accept the result.

Compromising may trigger more conflicts: Although less likely to cause issues than other conflict resolution styles, such as avoiding or competing, lingering dissatisfaction may cause future disagreements, particularly among groups who can need to keep operating along.

Strategy 4: Avoiding

Avoiding is both unassertive and uncooperative. People who avoid conflict pretend that it does not exist and hope for it to go away with time.

What to keep in mind about avoiding?

- **Some things you just have to let go:** Avoiding conflict is acceptable when the issue is trivial and you have more pressing issues to attend to.
- **Confronting the issue will do more harm than good, albeit temporarily:** When a situation is emotionally charged, avoiding it may give everybody time to cool down and think more rationally.

Some conflicts don't resolve themselves: Ignoring a conflict might end in a much bigger conflict. For instance, employers ignoring employees' recurrent requests to review their advantages packages could realize themselves being indicted during an expensive labor suit. Strategy 5: Accommodating

Accommodating is most cooperative but also the least assertive. Also known as harmonizing or peacekeeping, it is when you give in to the demands of the other party, without any regard for your own concerns. Like all the other styles we have discussed so far, accommodating has its uses.

What to know about accommodation?

- **Give in if it means better options or solutions:** Acquiescing doesn't sound so bad if it ends up in higher structure outcomes.
- **Accommodate only when you can do so cheerfully:** Accommodating works best when winning is more important to the opposite party and losing is of little consequence to you.
- **Acquiesce to preserve personal relationships:** People who give rather than take are usually sensitive to the needs of others and find satisfaction in helping.
- **Don't be a victim:** People at risk of giving in will simply be exploited by the combative, competing types. Also, after you admit defeat merely to avoid conflict, people may even see you as weak or lazy.

The Role of HR in Resolving Conflicts at Work

– Manage the Differences

Most of the fashionable companies, particularly international ones, use individuals of various cultural backgrounds, which may lead to the emergence of conflicts. Whenever a tension between individuals happens, the unit of time management must apply conflict resolution skills to assist individuals perceive that the variations between them don't hinder the work method however enrich the team and provides it a lot

of strength. Totally different individuals with different mindsets will come back up with crazy concepts which will ultimately profit everybody within the company and turn out some positive changes.

– **Locate the Tension Points**

A smart Human Resource manager always keeps an eye on the team to prevent conflicts before they even happen. The Human Resource manager must always read between the lines of this specific conflict essay and see where the points of tension emerge between the employees. For instance, you may see two employees generating tension over some work-related issues or even over a place in the parking lot by the office so that you need to react instantly to prevent the conflict from getting out of hands. The employees must feel free to communicate their concerns and problems with the Human Resource, that is how they can eliminate the conflicts before they even happen.

– **Create a Healthy Environment**

There are tons of conflict essays that talk about a healthy environment within the team but you've got to perceive that each team is exclusive and that you cannot apply the same approach to two different teams. However, the basic recommendation is that HR has to create an atmosphere of trust in which people feel safe to discuss their problems and free to communicate with each other the way they feel most comfortable. A healthy environment can also be achieved by adding some value to the time people spend at the office. Give them some entertainment, a comfortable kitchen, some opportunities for fun and relaxation, and the people would feel so much more comfortable doing their job. When people are comfortable, they are less likely to engage in conflicts, so it is always a smart move to increase their general job satisfaction.

– **Deal with Conflicts**

Dealing with conflicts is the hardest part, but every Human Resource has to be aware of the relevant conflict resolution techniques to deal with any situation that might arise. Of course, each situation has its own unique nuances that can make it difficult to apply a particular technique for the office conflict resolution, but a smart HR manager can apply the combination of techniques and experience to address the situation in the most efficient manner. Each HR has to develop a set of skills and knowledge to effectively deal with the conflicts, and all of that comes with experience and practice.

– **Wrap Up**

The role of Human Resource is so much more than just facing the conflicts; it also is about helping people overcome their personal issues, managing diverse teams, providing people a comfortable operating atmosphere, and simply ensuring everyone seems to be happy in the organization. All of those tasks are essential for sustaining the economical functioning of the business. That is exactly why Human Resource managers are some of the most important people in the office.

CONCLUSION:

Conflict is inevitable because people will always have different viewpoints, ideas, and opinion. Conflict management is the practice of having the ability to identify and handle conflicts sensibly, fairly, and efficiently. Since conflicts in an organization are a natural part of the workplace, it is important that there are people who understand conflicts and know how to resolve them. There are various strategies to handle conflicts; however, not all of them are wise strategies. According to Floyd, "Our choices almost always have an effect on professional relationships." Therefore, it is important to learn, and practice effective, conflict management strategies. The conflict management strategy you chose to apply will have an effect on your professional relationships with others. Conflict does not damage the relationships; poor management of conflict does.

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PROPTECH FOR PROACTIVE PRICING OF HOUSES IN CLASSIFIED ADVERTISEMENTS IN THE INDIAN REAL ESTATE MARKET

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ABSTRACT

Property Technology (PropTech) is the next big thing that is going to disrupt the real estate market. Nowadays, we see applications of Machine Learning (ML) and Artificial Intelligence (AI) in almost all the domains but for a long time the real estate industry was quite slow in adopting data science and machine learning for problem solving and improving their processes. However, things are changing quite fast as we see a lot of adoption of AI and ML in the US and European real estate markets. But the Indian real estate market has to catch-up a lot. This paper proposes a machine learning approach for solving the house price prediction problem in the classified advertisements. This study focuses on the Indian real estate market. We apply advanced machine learning algorithms such as Random forest, Gradient boosting and Artificial neural networks on a real world dataset and compare the performance of these methods. We find that the Random forest method is the best performer in terms of prediction accuracy.

Keywords: AI, Data science, Housing Price, Machine learning, PropTech, Real Estate.

INTRODUCTION

Property Technology (PropTech) is the next big thing to disrupt the real estate market. PropTech espouses the use of technology to facilitate the management and operations of real estate assets [1]. The assets here mean either buildings or cities. PropTech can be seen as a part of digital transformation in the real estate industry and it focuses on both the technology and mentality changes of the people involved (including the *This study is a proof-of-concept (PoC) and can be treated as a Technical Report. The purpose is to raise awareness about PropTech by solving one use-case. customers) in this industry [2]. PropTech can also lead to new functionalities such as more transparency, which were not possible earlier [3]. Big data, data analytics, machine learning, blockchain and sensors form a part of PropTech as well [3].

Most of the applications of PropTech documented in the literature are mainly in construction and real estate. One interesting use case is the Rental platforms and “space as a service” that matched supply and demand and work towards the demand for flexibility [3]. Other applications include Sales Platforms and webshops, digitization of administrative management and smart buildings [3]. Please refer to [3] for a detailed overview of various applications of PropTech.

We already see a lot of investments flowing in the PropTech startups in US and European real estate markets [3]. Some of the most innovative PropTech firms across the globe are Atlant, Bowery, Buildium, Flip, Foyr, hOM, Huthunt, No Agent, Opendoor, Open Listings, PeerStreet, Purplebricks, Ravti, Reposit, RealtyShares, Riley, Squarefoot and VR Listing [4]. As far as India is concerned, there is still lot of catch up to be done. One interesting startup that is using PropTech in the Indian context is “Gharvalue”. According to their website [5], they have built India’s first user driven Automated Valuation Model (UAVM), which can help in performing realistic valuation of a property that can help the customers. As mentioned in their website, “GharValue’s UAVM will deliver an online housing value estimate based on proprietary models built on housing data, economic data, neighborhood data, amenities, parking, distances from transportation hubs, malls, schools and myriad other variables.” [5]. There are some companies such as unissu.com that are connecting property with PropTech industries [6]. *This study is a proof-of-concept (PoC) and can be treated as a Technical Report. The purpose is to raise awareness about PropTech by solving one use-case.

In this paper, we will work on the problem of proactive pricing of houses listed in classified website advertisements in the Indian real estate market as explained in details in Section The rest of this paper is structured as follows. In the next section we will discuss the problem statement and a brief overview of the literature. Then in Section 3 we will discuss the dataset, which is followed by the Experimental results in the next section. Finally, Section 5 concludes the paper.

PROBLEM STATEMENT & RELATED WORK

In India, there are multiple real estate classified websites where properties are listed for sell/buy/rent purposes such as 99acres [7], housing [8], commonfloor [9], magicbricks [10] and more. However, in each of these websites we can see lot of inconsistencies in terms of pricing of an apartment and there are some cases when

similar apartments are priced differently and thus there is lot of in-transparency. Sometimes the consumers may feel the pricing is not justified for a particular listed apartment but there no way to confirm that either. Proper and justified prices of properties can bring in a lot of transparency and trust back to the real estate industry, which is very important as for most consumers especially in India the transaction prices are quite high and addressing this issue will help both the customers and the real estate industry in the long run. We propose to use machine learning and artificial intelligence techniques to develop an algorithm that can predict housing prices based on certain input features.

The business application of this algorithm is that classified websites can directly use this algorithm to predict prices of new properties that are going to be listed by taking some input variables and predicting the correct and justified price i.e. avoid taking *This study is a proof-of-concept (PoC) and can be treated as a Technical Report. The purpose is to raise awareness about PropTech by solving one use-case. price inputs from customers and thus not letting any error creeping in the system. This study on proactive pricing of houses in the Indian context has never been reported earlier in the literature to the best of our knowledge.

However, the problem of house price prediction is quite old and there have been many studies and competitions addressing the same including the classic Boston housing price challenge on Kaggle [11]. As far as housing price prediction in Indian context is concerned, [12] used machine learning techniques such as XGBoost for predicting housing prices in Bengaluru, India. MachineHack [13] conducted an hackathon on predicting housing prices in Bengaluru in 2018. The problem statement was to predict the price of houses in Bengaluru given 9 features such as area type, availability, location, price, size, society, total square foot, number of bathrooms and bedrooms. In fact, the experimental design of this study is motivated by [12] and [13]. Moreover, there have been other studies for house price prediction in other cities of India such as Mumbai [14].

DATA

When someone visits a classified website such as commonfloor [9] to check apartments listed for sell, some of the information that are displayed are the Project name, region, type of apartment (2BHK, 3BHK and more), super built up area of the apartment, carpet area, number of bedrooms & bathrooms, Price of the apartment, parking availability (yes/no), direction facing, listed by (broker/individual), furnishing status (fully furnished/semi furnished/not furnished), facilities (gym, swimming pool, wifi, 24 hr electricity backup, etc.) and more information. In this paper, we have taken publicly available data manually from the website [9] (accessed on 25th March, 2019), which in turn collates the listings data from various publicly available sources. The *This study is a proof-of-concept (PoC) and can be treated as a Technical Report. The purpose is to raise awareness about PropTech by solving one use-case. total number of observations in the dataset is 66.

EXPERIMENTAL RESULTS

Our goal is to solve the regression problem where the target variable is the price and the independent variables are number of bedrooms, number of bathrooms, super built up area, carpet area, furnishing status, floor type, direction facing, type of apartment, region and facilities. We perform one-hot encoding on facilities i.e. create categorical variables for each facilities. For example the feature vector for Apartment 1 with gym, swimming pool, wifi but no cafeteria would be [1 1 1 0] whereas the feature vector for Apartment 2 with gym, no swimming pool, no wifi and no cafeteria would be [1 0 0 0]. The number of independent variables is 56. We divide the data into training and test in the ration of 4:1. While building the model on the training dataset, we use 5 fold cross validation for all the methods. All the experiments were run using the opensource software R and on a system with configurations 4 GB RAM Mac iOS 1.6 GHz Intel Core i5.

We then apply advanced machine learning algorithms such as Random forests and Gradient boosting [15]. In Random forest we use ntrees=5000 and refer to it as RF for the rest of this paper. For Gradient boosting ntrees=10000 and learning rate= 0.01 and we will refer to this method as GBM for the rest of this paper. We have also used Artificial neural networks [16] with different hyper-parameters. We use one design of neural network with 2 hidden layers and 100 hidden nodes in each, which we will refer as ANN1 for the rest of this paper. In ANN2, we use 3 hidden layers with 100 hidden nodes in each and finally in ANN3, we use 3 hidden layers with 200 hidden nodes in each. The activation function used is "Rectifier". The evaluation metrics used for comparing the different methods are mean percentage error and median *This study is a proof-of-concept (PoC) and can be treated as a Technical Report. The purpose is to raise awareness about PropTech by solving one use-case. percentage error on the test dataset. The reason for taking median as it is considered as a robust measure that is not affected by outliers. Table 1 shows the model results. We can clearly see that the RF i.e. Random forest method is the best performer in terms of prediction accuracy.

Table 1: Model Results on the Test dataset

Method	Mean Percentage Error	Median Percentage Error
RF	27.48%	16.25%
GBM	41.62%	32.77%
ANN1	76.15%	65.43%
ANN2	70.51%	52.56%
ANN3	58.03%	44.36%

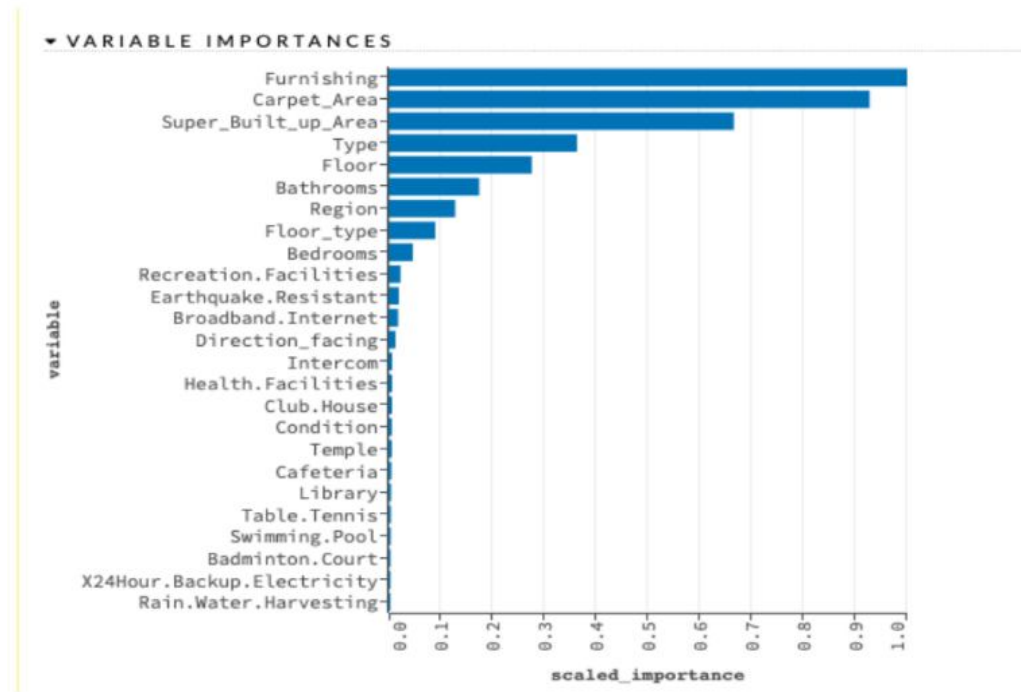


Figure 1: Variable Importance Chart

Figure 1 shows the variable importance plot for the RF method.

We can see that the *This study is a proof-of-concept (PoC) and can be treated as a Technical Report. The purpose is to raise awareness about PropTech by solving one use-case. furnishing status, carpet area, super built up area, type of apartment, region, floor type, number of bathrooms and bedrooms are the most important variables

.CONCLUSION

In this paper, we have discussed the concept of PropTech and its applications. We worked on the use-case of proactive pricing of houses in classified advertisements in the Indian Real Estate market. We used advanced machine learning and artificial intelligence techniques to develop an algorithm that can predict housing prices based on certain input features. The business application of this algorithm is that classified websites can directly use this algorithm to predict prices of new properties that are going to be listed by taking some input variables and predicting the correct and justified price i.e. avoid taking price inputs from customers and thus keeping transparency in the system. The proposed methods can be used for other applications of PropTech as well as mentioned in Section 1. Since this was a proof of concept (POC), so the models were implemented on a smaller dataset. However, the error margins can be reduced further if we use much larger datasets, which we aim to work on in the future.

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MOLECULAR CHARACTERIZATION AND ANTIBIOTIC RESISTANCE PATTERNS OF VIBRIO CHOLERAE ISOLATED FROM ORNAMENTAL GOLD FISH (CARASSIUS AURATUS)

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ABSTRACT

The main objective of this study was to determine the presence and density as well as the antibiotic profile of *Vibrio cholerae* bacterium isolated from ornamental gold fish (*Carassius auratus*). A total of 175 ornamental gold fish (*Carassius auratus*) were analyzed for the presence of *V.cholera*. Infected and moribund gold fishes were collected during the period between January 2020 and October 2020 at a local breeding farm in Chennai, Tamilnadu. The obtained samples were confirmed by polymerase chain reaction-plate on TCBS agar methods, *V.cholerae* was detected in 55 samples and *V. cholerae* O139 was detected in 14 samples, with a density ranging between < 3.5 to 85.0 MPN/g and < 3.5 to 11.3 MPN/g respectively. The isolated *V.cholerae* was further subjected to antibiotic susceptibility test in Mueller-Hinton agar using disc diffusion method of 10 different antibiotics and the results interpreted as per the Clinical and Laboratory Standards Institute guidelines. All the *V. cholerae* isolates evinces highly resistant to Penicillin, Amoxycylav, Kanamycin and Cefotaxime when compared with other antibiotics used in this study, The MAR index values of 0.2 to 1.0 indicates that the isolates were exposed to high risk sources in the environment. This study recommends aquarium fish may disseminate the bacteria in the aquatic environment and may transfer it to water birds that consume them. Therefore, aquarium fishes are the reservoirs of *V. cholerae* and may play a role in its global dissemination.

Keywords: *Vibrio cholerae*, ornamental gold fish, molecular characterization, antibiotic resistance, public health.

INTRODUCTION:

Vibrio cholerae, the causative agent of cholera, is a natural inhabitant of aquatic environments. Only two serogroups of *V.cholerae* O1 and O139 are known to cause epidemics and pandemics (Sac *et al.*, 2004). *Vibrio* infection is the most prevalent bacterial disease in ornamental fishes that leads to extensive economic loss. The main clinical signs of infected fishes evinces dropsy, exophthalmia, scale detachment and haemorrhages on the body surfaces (Shankar Ganesh, 2012). Besides several reports of pathogenic *Vibrio* spp. in seafoods, to date few studies have characterize the occurrence, molecular assay and antibiotic resistance patterns in ornamental fishes (Sugita, Nakamura, Shimada 2005; Katherine Smith *et al.*, 2015).

In India, the demand for ornamental fish has increased manifold because of the increasing popularity of aquariums. Ornamental fish sector generates huge potential for female employment in the ancillary industry of aquarium decoration, and providing other accessories, as well as medicines. Ornamental goldfishes (*Carassius auratus*) are the most cheerful among other fishes and also the highest preference among hobbyists, hence its breeding dominates among the Indian Ornamental Fish Sector (Manju Das *et al.*, 2019).

Zago *et al.*, (2017) reported, the potentially pathogenic and zoonotic risks caused by *V. cholera* of both non O1/non O139 isolated from ornamental fishes mainly originated from Southeastern region of Italy, Asia between 2000 and 2015. *V.cholera* bacteria was recovered from 104 septicemic goldfish in Australia (Austin and Austin, 2007). Other countries such as Japan and Iran, (Samira Kiani *et al.*, 2016; Malka halpen, 2017) isolated *V. cholerae* of non-O1/O139 from diseased ornamental fishes internal organs of ayu (*Plecoglossus altivelis*) and guppy fish (*Poecilia reticulata*). Similarly *Vibrio cholera* O1 was detected by using conventional molecular approaches of aquarium water containing ornamental goldfish aquarium shops in Rhode Island (Smith *et al.*, 2012). Ashok Kumar *et al.*, (2019) demonstrated, the *V. cholerae* non-O1 and non-O139 in fresh water sediments by using the most probable number (MPN) method. Epidemiological studies evinces, fish carry the cholerae bacteria from one place to another, eventually, water birds feed on the fish, *V. cholera* may transfer in some water bird species digestive tracts and that leads to global spread (Central Veterinary Institute, Animal science group, 2010).

Worldwide, *V.cholera* considered as virulent pathogen and possibly transmitted among aquarists in countries which are outside cholerae endemic areas (Plesník and Procházková, 2006). Antibiotics plays crucial role in decreasing illness and death associated with bacterial infections in humans and animals. Recently, usage of

antibiotics in aquaculture and companion animals is restricted in many countries (Carnevia, Letamendia and Perretta, 2013). In India, ornamental fishes are frequently subjected to various treatments without a veterinary prescription, treatments includes the use of number of antibiotics applied inappropriately (Carnevia, Letamendia and Perretta, 2013a; Yanong *et al.*, 2010). Bacterial infection in fishes are occasionally chronic, it may need months of antibiotic treatment, if effective at all, and this would easily induce resistant genes. According to (Central Veterinary Institute, Animal science group, 2010a) research reports, antibiotics are easily available via the five gram regulation, that would be recommended, provided all antibiotics be solely on prescription via a veterinarian, to avoid selection of resistance. Moreover, the presence of antibiotic resistance of enteric bacteria in ornamental fish needs careful interpretation. Nevertheless, Aquarium water, with or without antimicrobials in it are drained into surface water or sewage plants, which are ideal sites for exchange of antimicrobial resistance genes, because there is a constant influx of enteric bacteria of large numbers are present and in close contact with each other. Therefore, considering these factors, the present study is designed to continuous monitor the characteristics of frequently occur pathogenic *V.cholerae* strains in ornamental fishes with multiple antibiotic resistance patterns that become significant to protect and promote the global public health.

MATERIALS AND METHODS:

Sample collection

A total of 175 infected and moribund ornamental gold fish (*Carassius auratus*) were collected in sterile polythene bag brought to the laboratory in an ice box within 2 hours. Aseptic procedures were strictly followed during collection, transportation and analysis of the samples.

Most probable number (MPN) procedure

Most probable number (MPN) procedure was followed the US FDA Bacteriological Analytical Manual (BAM) was employed with some modifications (Kaysner and DePaola, 2004). Briefly, 10 gms portion of flesh along with the gut sample were homogenized with 225 ml of Alkaline Peptone Water (APW) with 3% NaCl in a sterile polythene bag (Hi-Media, Mumbai) for one minute, then pre-enriched mixture was diluted tenfold for three successive times and maintained at room temperature for 18 to 24 hours prior to MPN analysis. For the MPN analysis, about one ml of each dilution tube was transferred into three tubes set containing 9ml of APW and further incubated at 37°C for 18 to 24 hours. After the incubation period, the turbid portion was streaked onto Thiosulphate Citrate Bile salt Sucrose (TCBS) agar (Hi-Media, Mumbai). After the incubation in APW broth, a loopful of enrichment broth was aseptically streaked onto sterile surface of dried Thiosulphate Citrate Bile salt Sucrose (TCBS) agar. The presumptive flat yellow colonies (Fig 1) appeared on TCBS agar plates were picked and further confirmed by Polymerase Chain Reaction (PCR).

Genomic DNA extraction and PCR assay

The isolated single colony was transferred to 2 ml of Tryptic Soy Broth (TSB) with 1% sodium chloride (NaCl) and incubated overnight in an incubator shaker. A one ml portion of the cultures was centrifuged at 15,000 x g for 1 min. Further the pellet was re-suspended in 500 µl sterile distilled water and vortexed vigorously. The obtained cell suspension was boiled for 10 min and chilled immediately on ice for 10 min and centrifuged again at 15,000 x g for 1 min. Subsequently, the obtained supernatant crude DNA was transferred into a new 1.5 ml tube and 5 µl was used as DNA template in PCR, using the specific primer pairs and the PCR conditions as described by (Hoshino *et al.* 1998; Norshafawati *et al.* 2011). The PCR product was checked for purity by electrophoresis on 2% agarose gel, stained with 0.3 µg/ml ethidium bromide for visualization of the amplicons under UV light gel documentation system.

Antibiotic susceptibility test (AST)

The susceptibilities of 50 *V. cholerae* isolates to antibiotics were determined via disc diffusion method (Bauer *et al.*, 1966) as per the CLSI guidelines. Briefly, the colony was directly suspended into 1 ml of normal saline inoculum of 0.85% NaCl, and adjusted to 0.5 McFarland turbidity standard. The inoculum was swabbed evenly on Mueller– Hinton (MH) agar plate (Hi-Media, Mumbai) using a sterile cotton swab and allowed to dry for 3–5 min at 37°C. Antibiotic discs were arranged accordingly onto the plate, and incubated at 37°C overnight. The inhibition zone was measured, and the results were interpreted based on the CLSI recommendation M45- 2A. Ten selective antibiotic discs from (Hi-Media, Mumbai) were used for the susceptibility test viz., Amoxyclav (Amc) 30µg, Penicillin (P) 10µg, Cefotaxime (Cef) 30µg, Chloramphenicol (C) 30µg, Erythromycin (E) 15µg, Gentamicin (G) 10µg, Kanamycin (K) 30µg, Norfloxacin (N) 10µg, Streptomycin (S) 10µg and Doxycycline (Do) 30µg.

Determination of MAR index

The multiple antibiotic resistance (MAR) index for single isolates followed the procedure as described by (Osundiya, Oladele, Oduyebo, 2013) in which a total number of antibiotics to which isolates are resistant to (a) is divided by the total number of the antibiotics used in the study (b). The calculating formula is MAR Index = a/b.

Results:

In this study, a total of 175 goldfish (infected and moribund) were investigated for the presence of *V.cholera*, fifty five samples was positive for *V. cholerae* and 14 samples were positive for *V. cholerae* O139 strains. The obtained positive samples of *V. cholerae* and *V. cholera* O139 strains evinces the density ranged between <3.5 to 85.0 MPN/g and <3.5 to 11.3 MPN/g, respectively. Fifty five *V. Cholerae* strains were randomly picked from 37 positive samples were tested for their susceptibility to all 10 selected antibiotics. However, the 14 positive samples was detected using PCR assay of the MPN turbid tubes, but unable to pick any of the *V. cholerae* O139 isolates on the TCBS agar. Fifty five isolates of *V. cholerae* were found to be resistant to Penicillin, Amoxycylav, Kanamycin and Cefotaxime, with 13 isolates from different samples showing resistance to Penicillin and Cefotaxime antibiotics tested and 38 antibiotic resistance patterns (Table 1). Otherwise the isolates were sensitive to Doxycycline.

Discussion:

Next to the viral infection, bacterial infections are the most important causes of disease problems in Indian aquaculture (Sahoo *et al.*, 2011). The Gram negative bacteria such as *Vibrio* infections are very common in ornamental fish settings. *Vibrio* spp. inhabitants in healthy ornamental fish systems which in turn opportunistic or secondary pathogenic invaders that induce mortalities ranging from trivial to 100% (Lightner 1988; smith *et al.*, 2001). However, the etiologic agent of cholerae is *V. cholerae*, an autochthonous to various aquatic environments, in India, studies on the investigation of *V.cholerae* in ornamental fishes are extremely scanty (Yigal Senderovich, Ido Izhaki, Malka Halpern, 2020). Similarly, various research conducted by Canigral *et al.*, (2010); Scharer *et al.*, (2011) transmission pathway of this vibrio pathogen in marine fish and shellfish, investigation on aquarium fishes contamination was unclear. In our study, the data indicates that the presence of *V. cholera* and *V. cholera* O139 isolates in goldfish maintains similarity with the seasonal regularity of cholera epidemics in developing countries. Norshafawati *et al.*, (2017b) reported aquatic environments are more supportive to disease causing bacteria independently of their host than the terrestrial environment, which leads to the pathogen reach high densities among fish population, eventually ingest them or contaminating the fishes through harvesting. Smith *et al.*, (2001) reported strains which produce the cholera toxin belonging to the O1 serogroups, but non-O1/ O139 serogroups also produce toxins and disease. In this study the selected fish species evinces the presence of targeted bacteria and also the aquarium water contamination, the prevalence of *V. cholerae* bacterium is high. It is beyond this scope of this paper to discuss about the aquatic environment through sewage and other sources of water contamination. Thirty-three different countries had exported seafood/fish on which an alert was reported, the highest alerts were received on fish sent from India. Contamination through sewage is a very common practice around the world and especially in India. Overboard sewage discharge into seafood harvest areas, illegal harvesting from sewage-contaminated waters and sewage runoff from land after heavy rains or flooding are the many ways, (unpublished data) of India First report, Dec-2019. Our study evinces *V.cholerae* isolates with MAR value more than 0.2 indicated samples originating from a high risk source of contamination with potentially hazardous to human health, this is in agreement with recent studies of Chia Wanq Tan *et al.*, (2020) prevalence, multidrug resistance patterns MAR of *Vibrio parahaemolyticus* isolated from different types of seafood in Selangor, Malaysia. PCR-based detection targets the specific region of DNA, for identification of bacterial strains and also less labor intensive and much faster than conventional methods. This study in agreement with Angelo and Ramesh (2017) molecular identification and of *V.cholerae* from marine fishes from local fish market Thanjavur, Tamil Nadu, The antibiogram profile revealed that isolates, all isolates showed multi-drug resistant to Penicillin, Amoxycylav, Kanamycin and Cefotaxime, and they are susceptible to the doxycycline used in this study which is commonly used to treat many different bacterial infections, such as acne, urinary tract infections, intestinal infections, respiratory infections, eye infections, gonorrhoea, chlamydia, syphilis, periodontitis (gum disease). Sandrine Baron *et al.*, (2016) reported, antimicrobial susceptibility of 50 environmental isolates of *Vibrio cholerae* non-O1/non-O139 collected in surface waters in Haiti in July 2012, nearly all isolates were sensitive to amoxicillin-clavulanic acid, cefotaxime, ciprofloxacin, and gentamicin, only doxycycline antibiotic evinces smaller inhibition zone (15mm). Roychowdhury *et al.*, (2008) also reported tetracycline resistant in *V. cholerae* strains in Kolkata during the year 2005. There is an agreement between the results that evinces high individual and multiple antibiotics resistance MAR among all examined *Vibrio* strains (Angelo and Ramesh 2017a). Despite, antibiotics provide

the main basis for the therapy of bacterial infections, high genetic variability of microorganisms enables them to rapidly evade the action of antibiotics by developing antibiotic resistance. On the other hand, compared with toxigenic *V. cholerae* O1 and O139 strains isolated over the same period from 1993 to 2009 evinces few toxigenic O1 strains were resistance to ampicillin, chloramphenicol and azithromycin, whereas resistance to these antibiotics was common for toxigenic O139 strains (Li Yu *et al.*, 2012). Julian Davies and Dorothy Davies, (2010) reported, man's overuse of antibiotics to exploit every source of resistance genes and every means of horizontal gene transmission to develop multiple mechanisms of resistance. In this study we found the unabsorbed antimicrobials and secreted antimicrobial metabolites in aquatic water and sediments around fish farms. This study supported by Joy Watts *et al.*, (2017) stated that even low concentrations of antibiotic from fish excreta leads to major alterations in the biodiversity of the sediments. Monteiro SH *et al.*, (2018) have also reported there is a sparse knowledge about the great amount of fish excreta in aquaculture, that containing non digested antibiotics, is able to stimulate the genetic variability and horizontal gene transfer in the sediment around aquaculture. However, there is an urgent need for the discovery of new and novel antimicrobial drugs to effectively eradicate the diseases producing microorganisms, the emergence of AMR requires awareness raising, improving farm management (practices and monitoring), stricter regulation and controls.

CONCLUSION:

Our work demonstrates the occurrence, molecular characterization and antibiotic susceptibility pattern of *V. cholerae* isolated from ornamental gold fish species. Molecular assay of the MPN method could be rapid and concise methods for the detection of foodborne bacteria. This study also revealed the development of multidrug resistance except doxycycline (tetracycline-class antibiotics). However, we are unable to pick the *Vibrio cholerae* O139 strain on TCBS agar, their presence indicates a need for quality microbiological surveillance in the ornamental fish industry. Finally, the results of this study indicates over-use of antibiotics and emergence of AMR requires awareness raising, improving farm management (practices and monitoring), stricter regulation and controls. The findings of this study can also serve as baseline information for the antibiotic resistance of *Vibrio cholerae* isolated from ornamental goldfish samples to monitor trends in the future.

Conflicts of interest

All authors declare to have no conflict of interest.

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Table 1. Antibiotic susceptibility patterns and multiple antibiotic resistance index of *V.cholerae* isolated from goldfish

Antibiotic resistant patterns	Multiple antibiotic resistance index (MAR)	No. Isolates
PAmc	0.2	2
KCef	0.2	1
PAmcK	0.2	2
PAmcK	0.2	1
PAmcK	0.2	1
PAmcK	0.2	2
PAmc	0.2	1
PAmc	0.2	1
PAmc	0.2	1
PAmc	0.2	2
KCef	0.2	1
KCef	0.2	1
KCef	0.3	1
KCef	0.3	2
KCef	0.3	1
PAmc	0.3	2
PAmc	0.3	1
PAmc	0.4	1
PAmc	0.4	2
PAmc	0.4	1
PAmc	0.4	1
PAmc	0.4	1
PAmcK	0.5	1
PAmcK	0.5	1
PAmcK	0.5	1
PAmcK	0.5	1
PAmcK	0.5	1
PAmcK	0.6	1
PAmcK	0.6	1
PKCefAmc	0.6	1
PKCefAmc	0.6	1
PKCefAmc	0.6	2
PKCefAmc	0.6	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1

PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.7	1
PKCefAmc	0.2	1

Gentamicin (Gn) 10µg; Norfloxacin (Nor) 10 µg; Erythromycin (E) 15 µg; Chloramphenicol (C) 30 µg; Streptomycin (S) 10 µg; Amoxycylav (Amc) 30 µg; Penicillin (P) 10 µg; Cefotaxime (Cef) 30 µg; Kanamycin (K) 30µg .



Figure 1: *Vibrio cholerae* in TCBS

GLOBAL PUBLICATIONS RESEARCH TRENDS IN HISTOPATHOLOGY: A SCIENTOMETRIC ANALYSIS

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ABSTRACT

The output of the research using through scientometric methods will enable the academics and decision makers for the fruitful enrichment of funds on emerging thrust areas. Academics from different domains have witnessed the growth of scientometric studies through various media. A huge amount of funds is being invested to measure the research trends and growth in science. Data were downloaded from the web of science database. A keyword "Histopathology" has been chosen for the present study with a span of five years i.e 2014 to 2018. A total of 21340 records was analyzed bibexcel software and tabulated in excel sheet to find out the result. The average exponential growth rate was 3.67 % for the total productivity of 21340. USA, one of the G7 countries holds the first rank rather than other countries. SAARC and BRIC countries India got the first rank during the period 2014–2018. Mayo Clinic topped the list with 159 records and its total citations are 2318 of the total publications, h-Index of 24 highest in histopathology research. The highest number of citation 39770 (12.99) was average citation per article in the year 2014 followed in 2015 with 34517 (10.69) average citation. The fifteen top publishing authors with taken for the study and highest number of records was contributed by Kumar R with 30 (1.86%) total numbers of citation i.e.268 and h- index was 10.The scientometric study is concern as the most dominant method for conducting quantitative aspects of the research. The present study concluded that the consistently trend towards the developed research organization and funding agencies increased productivity in the field of histopathology.

Keywords: Scientometric, Citation, H-index, Histopathology, Organization, Web of Science

INTRODUCTION

The current environment in library and information centres faces significant challenges due to technology. The use of bibliometric techniques has become in LIS research globally. These methods have been used for evaluation of global trends in different subject areas. Bibliometrics has crossed a long channel in terms of new metric methods such as Scientometrics, webometrics, Librametrics Cybernetics and so on. The bibliometrics has been divided into two types i.e. descriptive and evaluative studies. The "descriptive studies" are the output count by including the records, books, documents and other formats of communication. The "evaluative studies" are the literature usage count made by counting the references/citations in research articles, books, and other formats of communication. The main derivatives of bibliometrics are publication counts, authorship patterns, co-citation analysis, author collaboration, document type, country-wise records and so on. A huge amount of funds is being invested to measure the research trends and growth in science. Histopathology is one of the studies related to diseases of tissues and involved to examine the cells under a microscope. Histopathologists deal with clinical specialties and they diagnosis even a small piece of tissue from the skin, liver, kidney or other organs. The process of such an examination is widely known as biopsy. Their role is instrumental in exploring the changes that take place in cells. In UK, nearly 20 million Histopathology slides are being examined every year. Histopathologists provide a wide range of consultancies in cancer detection. Histopathology gains a significant position among the other subjects under the science stream. The output of the research through scientometrics methods will enable the academics and decision makers for raising funds on emerging thrust areas. Academics from different domains have witnessed the growth of scientometric studies through various media. LIS professionals will rarely join for collaborative research with different disciplines for results in science-related journals.

REVIEW OF LITERATURE

Zhou, H., Tan, W., Qiu, Z., Song, Y., & Gao, S. (2018) evaluated the global scientific output of gene research of myocardial infarction and explored their hotspots and frontiers during 2001 -2015, using bibliometric methods. The data were retrieved from the Web of Science Core Collection database. Bibliometric method and Citespace V were used to analyze the publication years, journals, countries, institutions, research areas, authors, research hotspots, and trends. The results identified 1,853 publications on gene research of myocardial research. United States was ranked high among the countries with most publications, and the leading institute was Harvard University. Similarly, global productivity in the field of breast cancer, breast malignancy and breast tumor were analyzed by Zarei, M., Bagheri-Saweh, M. I., Rasolabadi, M., Vakili, R., Seidi, J., Kalhor, M. M., & Gharib, A.

(2017) demonstrated a common type of malignancy, i.e. breast cancer which is one of the major causes of death in women globally. The aim of the current study was to analyze Iran research performance on Breast Cancer in the context of national and international studies, based on the publications indexed in Scopus database during 1991- 2015. This scientometric study employed the following four strings of keywords: “breast cancer” or “breast malignancy” or “breast tumor” or “mammary ductal carcinoma”. Time span was during 1991 - 2015 inclusive, and revealed that Iran’s increasing publication during 1991–2015 in breast cancer research. Papers were indexed in Scopus (2,399) with an average of 95.96 papers per year, and achieved an h-index of 48. Iranian cancer research articles have received 15,574 citations during 1991–2015, and average citations per paper were 6.49. Iran was ranked 27th among the top 30 nations with a worldwide stake of 0.67 %, the 20 top publishing journals published 744 (31%) Iranian research articles. Among them, there were 15 Iranian journals. The study concluded that the number of Iranian research papers on breast cancer and the number of citations to them got increased.

In the article, entitled “Global research output of nanobiotechnology research: a scientometrics study” by Karpagam, R. (2014) based on SCOPUS database which was conducted to evaluate nanobiotechnology research from a different perspectives during the period 2003–2012. It was discussed that nanobiotechnology has been intensively investigated by bibliometric methods such as technological importance and impact on economical activity. The study analyzed nanobiotechnology research output on different parameters, including the growth, global publications share and citation impact, the share of international collaborative papers and contributions of major partner countries. The result showed that the total number of records i.e.114, 684 were published during 10 years and received 2,503,795 citations with an average of 21.83 citations per paper. It was observed that during 2003–2012, USA ranked first position with the number of publications i.e.34, 736, h-index (349), g-index (541), hg-index (434.52) and p-index (326.47). Bibliometrics were constantly used in other disciplines similar to Gotting, M., Schwarzer, M., Gerber, A., Klingelhöfer, D., & Groneberg, D. A. (2017) who described pulmonary hypertension (PH) which is characterized by the increase of the mean pulmonary arterial pressure in the lung circulation. There is no wide work which analyzed the global research activity on PH so far. A bibliometric data of the publications on pulmonary hypertension for two periods were collected from the Web of Science database. The second evaluation period covers the time interval from 2008 onwards including the year 2015. The data were analyzed and processed to density maps using the NewQIS platform. A total number of 18,986 publications was identified in t1 which came from 85 countries. The study showed that the US published the highest number of publications (n = 7,290), followed by the UK, Germany, Japan, and France. In t2, 19,676 items were contributed by 130 countries. The USA was the most publishing country with 7,127 publications on PH, followed by the UK and Germany. Japan fell back on 6th place, whereas China occupied the 5th position. Further, the study revealed that the average number of international collaboration was found in 1978 (530) and in 2015 with the USA being the country with the high collaboration. The present study is known as the first large-scale density-equalizing mapping and scientometric analysis of global PH research activity.

The empirical study on “Celiac Disease: A Scientometric Analysis of World Publication Output 2005-2014” by Bansal, M., Gupta, R., & Bansal, J. (2016) who analyzed 14317 records in celiac disease, downloaded from Scopus database during the period 2005-2014. The study revealed that 15 most productive countries contributed with 83.89% share in world output, (largest share 21.40%). However, 15 most productive organizations, authors and journals accounted for 15.06%, 10.71% and 16.57% share of the world publications. It was concluded that individual countries must foster global research and development, by way of providing investment in R and D which enhance their specialized manpower. It was suggested to provide adequate training and infrastructural facilities to scientists and researchers so as to control the spread of the disease.

METHODOLOGY

The data were collected from the web of science database with a keyword on histopathology during the period 2014 -2018 (5 years). The web of science database was maintained by Clarivate Analytics. A total of 21340 records was analyzed and using the software Bibexcel. The data were formulated using Microsoft Excel application software and VOS viewer network further visualization.

OBJECTIVES

- To find out the Pattern of Collaborative Index
- To identify the year wise distribution of AGR and Exponential Growth Rate
- To explored the year wise distribution of publication and citation
- To explore the Year Wise Output of the G7, SAARC and BRICS countries

➤ To determine the publication and citations trends of top fifteen organizations

RESULTS AND DISCUSSION

Table -1 Year Wise Output of the G7, SAARC and BRICS countries

	Countries	YEAR					Total
		2014	2015	2016	2017	2018	
G7 Countries	USA	845	862	821	717	697	3942
	UK	189	179	174	157	130	829
	France	111	94	95	86	56	442
	Germany	223	241	214	169	172	1019
	Italy	125	115	110	91	84	525
	Canada	111	102	93	109	88	503
	Japan	172	188	162	148	140	810
SAARC Countries	India	285	286	267	246	199	1283
	Pakistan	48	40	40	42	30	200
	Bangladesh	3	5	6	4	2	20
	Sri Lanka	4	1	2	3	4	14
	Nepal	4	5	3	6	9	27
BRICK Countries	Brazil	172	156	136	125	116	705
	Russia	4	9	10	3	2	28
	China	258	234	166	134	630	1422
	India	272	646	700	725	594	2937
	South Arica	25	19	15	10	3	72
Total		4865	5197	5030	4792	4974	24858

The research output and growth rate of the G7, SAARC and the BRIC countries were identified. It was also revealed that 8070 records were published by the G7 countries from 2014 to 2018. Among the G7 countries, US topped with 3942 articles, followed by UK with 829. Remaining G7 countries such as France (442) Germany (1019) Italy (525) Canada (503) and Japan (810) have shown similar growth rate. Among the SAARC countries, India topped with (1283) papers, followed by Pakistan with (200) papers. India had gained the highest growth rate and followed by Bangladesh (20), Sri Lanka (14) and followed by Nepal (27). Among the BRIC countries, India topped with 2937 papers, followed by China with 1422 Brazil with 705 followed with South Africa with 72 and Russia with 28. When the G7, SAARC and the BRIC countries, were compared with the one of the G7 Countries i.e. USA had the highest growth rate (3942). USA, one of the G7 countries holds the first rank during the period 2014 – 2018. Among the SAARC and BRIC countries India got the first rank during the period 2014–2018.

Table – 2 Pattern of Collaborative Index

S.No	Year	Total Articles	Total Authors	CI
1.	2014	3275	28770	8.78
2.	2015	4220	26404	6.25
3.	2016	4501	23832	5.29
4.	2017	4690	18351	3.91
5.	2018	4654	63353	13.61
	Total	21340	160710	7.53

Collaborative index has been evaluated among the total research papers and total number of authors on histopathology during the chosen period. Range of collaborative index is from 8.78 to 13.61 between 2014 and 2018. The peak range of collaborative index is 13.61 in 2018. The lowest range of collaborative index is 3.91 in 2017. The average range of CI is 7.53.

Figure: 1 Pattern of Collaborative Index

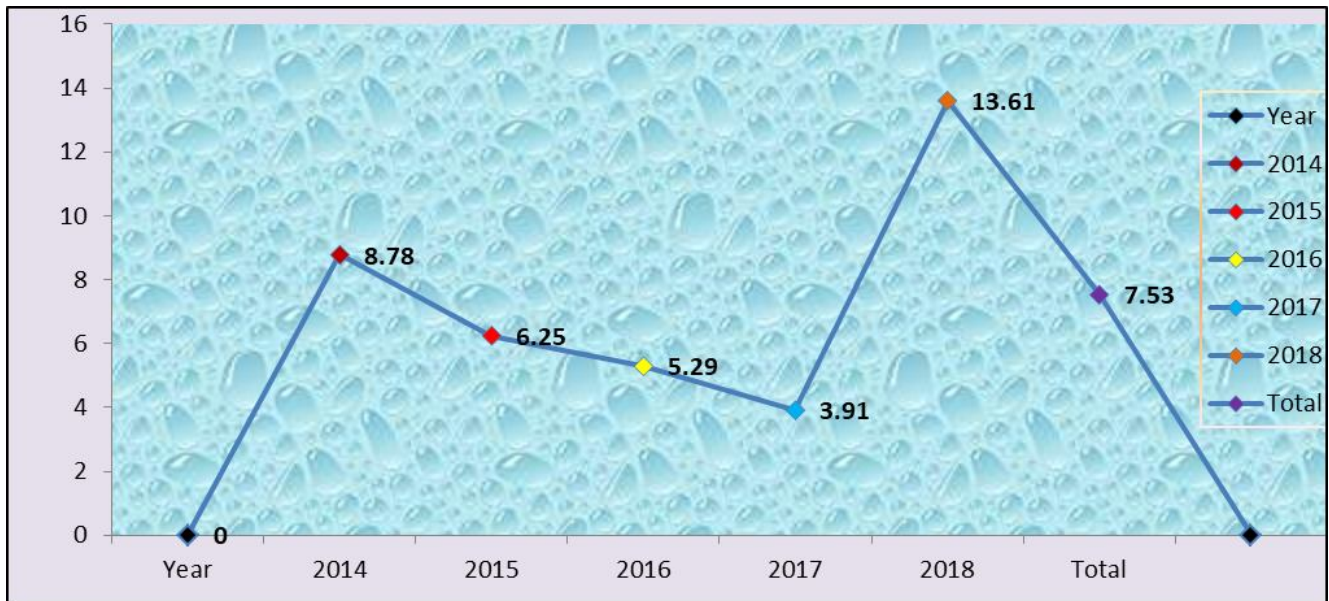


Table -3 Year wise distribution of AGR and Exponential Growth Rate

S.No	Year	Publication	Percentage	AGR	Exponential Growth Rate
1	2014	3275	15.35	-	-
2	2015	4220	19.77	28.85	0.77
3	2016	4501	21.09	6.66	0.94
4	2017	4690	21.98	4.20	0.96
5	2018	4654	21.81	-0.77	1.00
Total		21340	100		3.67

The exponential growth rate on publications output in Histopathology research during 2014-2018 has been explored. The highest growth rate (1.00) was found in the year 2018 (4654 papers). The lowest exponential growth rate was 0.77 in the year 2015 (4220) followed by 0.94 in the year 2016 (4501 publication). The average exponential growth rate was 3.67 % for the total output of 21340. The annual growth rate of the total output calculated year wise. The AGR for increased level of publications was 28.85 in 2015. The AGR has decreased 0.77 in 2018.

Table – 4 Year wise distributions of publication and citation

S.No	Year	Publication	Citation	Average Citations per article
1	2014	3275	39770	12.99
2	2015	4220	34517	10.69
3	2016	4501	29582	8.83
4	2017	4690	21257	5.99
5	2018	4654	11739	3.31
Total		21340	136865	6.41

Year wise distribution of citation in histopathology research productivity during the period 2014 – 2018 has been identified. The highest number of citation i.e.39770 (12.99) were average citation per article in year 2014 followed in 2015 with 34517 (10.69) average citation and 2016 with 29582 (8.83) average citation, 2017 with 21257 (5.99). The minimum number of citation was 11739 (3.31) average citation per article in 2018. The average citation per article was 6.41 for the total citation of 136865.

Table -5 Publication and Citations trends of top 15 organizations

S.No	Organizations	Records	Percentage	Citations	H-index
1	University of São Paulo	166	0.92	1018	15
2	Mayo Clinic	159	0.88	2318	24
3	University of California	301	0.85	1017	15
4	Harvard University	154	0.76	3093	31
5	Shanghai Jiao Tong University	138	0.71	1088	16
6	University of Toronto	129	0.67	1785	23
7	University of Pennsylvania	121	0.66	1490	20
8	University of Sydney	119	0.65	1164	18
9	University of San Francisco	118	0.65	1415	18
10	All India Institute Of Medical Sciences	117	0.61	636	13
11	Fudan University	111	0.61	849	15
12	Memorial Sloan Kettering Cancer Center	110	0.60	1843	23
13	Cairo University	109	0.58	829	15
14	King Saud University	106	0.55	719	15
15	Ohio State University	100	0.55	1594	20

Among the top 15 institutions, Mayo Clinic topped the list with 159 records and its total citations are 2318 of the total publications, h-Index of 24 in histopathology. All India Institute of Medical Sciences has the lowest citations with 636 and h-Index with 13 compared to other institutions.

Figure: 2 Publication and Citations trends of top 15 organizations

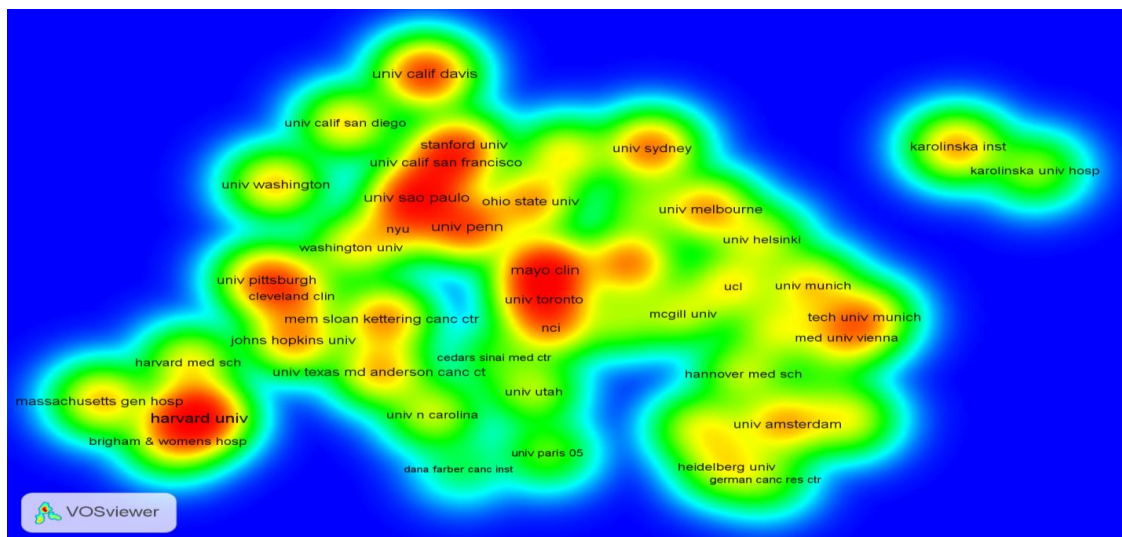


Table -6 Publications and Citations trends of top 25 Authors (India)

S.No	Authors	Publication	Percentage	Citation	H-index
1.	Kumar R	30	1.86	268	10
2.	Sharma S	28	1.74	96	6
3.	Singh R	27	1.67	93	5
4.	Kumar P	25	1.55	124	7
5.	Kumar S	25	1.55	125	7
6.	Singh S	22	1.36	152	8
7.	Kumar A	20	1.24	158	8
8.	Sharma P	20	1.24	217	9
9.	Kumar V	19	1.18	146	6
10.	Sharma A	17	1.05	92	6

11.	Gupta S	16	0.99	53	4
12.	Kumar N	16	0.99	135	7
13.	Agarwal S	15	0.93	59	4
14.	Bal C	15	0.93	181	9
15.	Das A	15	0.93	91	3

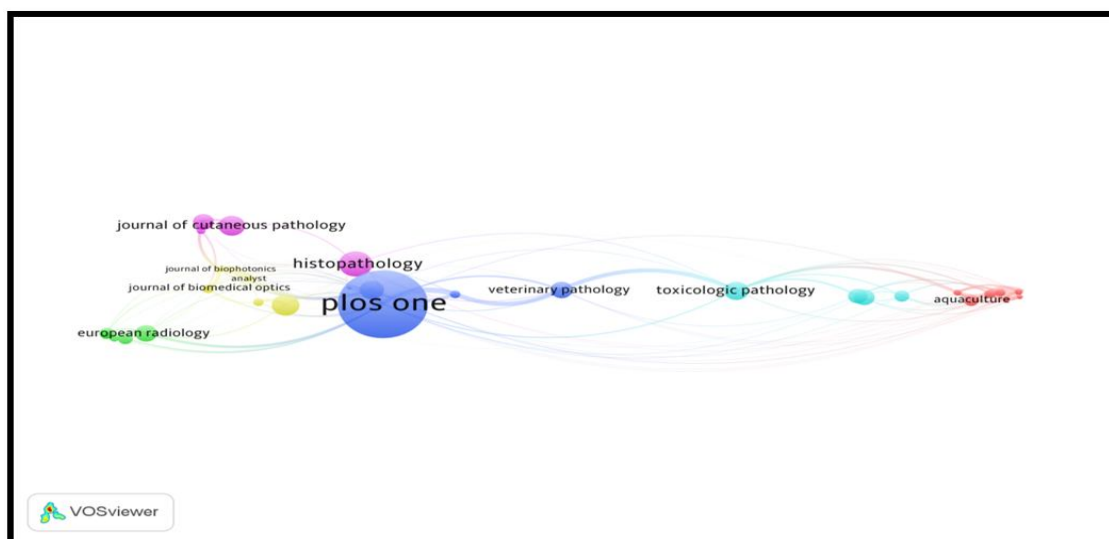
It indicates that the h-index analysis based on publication and citation of the Indian authors on Histopathology research during the study period. The highest productivity is concerned Kumar, R, occupies first rank with 30 papers (1.86) with 268 citations and his h-index is 10, followed by Sharma, S. Who published 28 records (1.74) and received 96 citations and his h-index are 6. The lowest number of h-index is 3 by Das A.

Table -7 Top fifteen Source titles wise distributions

S. No	Source Titles	Records	Percentage
1.	PLOS ONE	368	2.04
2.	Scientific Reports	148	0.82
3.	Medicine	110	0.61
4.	World Journal of Gastroenterology	94	0.52
5.	Biomedicine Pharmacotherapy	93	0.51
6.	European Radiology	90	0.50
7.	International Journal of Clinical and Experimental Pathology	88	0.48
8.	Journal of Cutaneous Pathology	88	0.48
9.	American Journal of Dermatopathology	87	0.48
10.	Veterinary Pathology	82	0.45
11.	International Journal of Clinical and Experimental Medicine	79	0.43
12.	JCPSP Journal of the College of Physicians and Surgeons Pakistan	79	0.43
13.	Regulatory Toxicology and Pharmacology	74	0.41
14.	Journal of Ethno pharmacology	73	0.40
15.	Journal of the American Academy of Dermatology	71	0.40

The above table shows the distribution of papers in top fifteen journals during the period 2014-2018. It depicts that out of total 710 journals, the top fifteen journals chosen were PLOS ONE with 368 (2.04%) Scientific Reports followed by with 148 (0.82%). The minimum numbers of papers were published by Journal of the American Academy of Dermatology 71 (0.40%).

Figure: 3 Source titles wise distributions of articles



CONCLUSION

The world research productivity on histopathology (keyword) taken for the study (five years). The findings showed that there is an increasing trend in publishing the citation 39770 i.e. 12.99 and average citation per an article in 2014. Kumar R topped the list with 30 productivity and its total citations are 268 of the total publications, h-Index of 10, which is highest among the authors in histopathology research and followed by all others. As far as organization wise contribution is concerned, top 15 organizations and the highest level of distribution articles is Mayo Clinic got the first place with 159 records and its total citations are 2318 of the total publications, h-Index of 24. The exponential growth rate on publications output in Histopathology research growth rate was 1.00 found in the year 2018 with 4654 papers and the annual growth rate increased level of output was 28.85 during the period 2015. PLOS ONE 368 records (2.04%) were the top most journals of publishing articles in the histopathology research. Among the G7 countries, US topped with 3942 articles, followed by the UK with 829 and SAARC countries, India topped with (1283) papers and followed by BRIC countries, India topped with 2937 papers, followed by China. The scientometric technique is used for different purposes such as the classification of different scientific indicators, source title, authors, and predicting the probability of a field. This work presents an analysis of histopathology (keywords) during the period 2014-2018.

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BOOK RECOMMENDATION**R. A. P. Muralitharan**M.Sc. Data Science, Computer Science & Information Technology Department, Kalasalingam Academy of Research and Education, Krishnankoil, Tamilnadu, India

ABSTRACT

Recommendation systems are widely used to recommend products to the end users that are most appropriate. Recommendation systems were evolved as intelligent algorithms, which can generate results in the form of recommendations to users. They reduce the overhead associated with making best choices among the plenty.

Now, Recommender systems can be implemented in any domain from Ecommerce to network security in the form of personalized services. They provide benefit to both the consumer and the manufacturer, by suggesting items to consumers, which motivates and increases the demand for the recommended items. Every recommender system comprises of two entities, one is user and other is item. A user can be any customer or consumer of any product or items, who get the suggestions. Input to recommendation algorithm can be a database of user and items and output obviously will be the recommendations. As in our case, inputs consist of database of customers and database of books and output denotes the book recommendations.

This book recommendation helps to buy the books online or offline as a stronger tool which recommend books that are of buyer's interest. This system uses features of collaborative filtering to produce efficient and effective recommendations. Collaborative recommendation is probably the most familiar, most widely implemented and most mature of the technologies. Collaborative recommender systems aggregate ratings of objects recognize commonalities between users based on their ratings and generate new recommendations.

Keywords—Collaborative filtering, Content based filtering, Recommendation system

INTRODUCTION

Recommendation systems were evolved as intelligent algorithms, which can generate results in the form of recommendations to users. They reduce the overhead associated with making best choices among the plenty. Now, Recommender systems can be implemented in any domain from E-commerce to network security in the form of personalized services. They provide benefit to both the consumer and the manufacturer, by suggesting items to consumers, which can't be demanded until the recommendations[1].

Every recommender system comprises of two entities, one is user and other is item. A user can be any customer or consumer of any product or items, who get the suggestions. Input to recommendation algorithm can be a database of user and items and output obviously will be the recommendations.

As in our case, inputs consist of database of customers and database of books and output denotes the book recommendations. This paper presents a new approach for recommending books to the buyers. This system combines the features of content filtering, collaborative filtering and association rule mining to produce efficient and effective recommendations.

OVERVIEW

Recommendation systems are widely used to recommend products to the end users that are most suitable. Recommendation systems are enhanced as intelligent algorithms, that can generate results in the form of recommendations to users.

They reduce the overhead associated with making best choices among the plenty.

We can implement the recommendation system in any domain from Ecommerce to network security in the form of personalized services. Recommendation systems provide benefit to both the consumer and the manufacturer, by suggesting items to consumers, that motivates and increases the demand for the recommended items.

A Recommender system comprises of two entities, one is user and other is item. A user can be any customer or consumer of any product or items, who get the suggestions. Input to recommendation algorithm can be a database of user and items and output obviously will be the recommendations.

In our case, inputs consist of database of customers and database of books and output denotes the book recommendations.

In this project , we use features of collaborative filtering to produce efficient and effective recommendations.

Collaborative recommender systems aggregate ratings of objects recognize commonalities between users based on their ratings and generate new recommendations.

CONTENT RECOMMENDATION SYSTEM

Conventional techniques dealing with information overload use content-based filtering techniques. They analyse the similarity between items based on their 2.2 Recommender Systems 23 contents and recommend similar items based on users' previous preferences. (Jian et al. 2005; Pazzani and Billsus 2007; Malone et al. 1987).

Typically, content-based filtering techniques match items to users through classifier-based approaches or nearest-neighbor methods.

In classifier-based approaches each user is associated with a classifier as a profile. The classifier takes an item as its input and then concludes whether the item is preferred by associated users based on the item contents. Conventional techniques dealing with information overload use content-based filtering techniques.

They analyze the similarity between items based on their Recommender Systems contents and recommend similar items based on users' previous preferences .

Typically, content-based filtering techniques match items to users through classifier-based approaches or nearestneighbor methods. In classifier-based approaches each user is associated with a classifier as a profile[2]-[3]. The classifier takes an item as its input and then concludes whether the item is preferred by associated users based on the item contents.

Content recommendation system filter books based on the content of the book, in which buyer is interested[4].

Content recommendation system uses Content based filtering for doing the separation.

Like other system Content based filtering is also having some limitations like finding the quality of the content.

For example Content based filtering cannot differentiate between good article and bad article if both of them are using same terminology[2].

COLLABORATIVE FILTERING RECOMMENDATION SYSTEM

Collaborative filtering, one of the most popular technique for recommender systems, collects opinions from customers in the form of ratings on items, services or service providers[5].

It is most known for its use on popular e-commerce sites such as Amazon.com.

Content based filtering cannot find out the quality of the item.

To overcome this problem collaborative filtering system are used.

Item based collaborative recommendation algorithm looks in to the set of items the target user has rated and computes how much similar they are to the target item i and then selects k - most similar items $\{i_1, i_2, \dots, i_k\}$ to the set of items the target user has rated, the recommendation is then computed by taking the weighted average of the target user's rating on these similar items[6].

BOOK RECOMMENDATION SYSTEM

Purpose of this book recommendation system is to recommend books to the buyer that suits their interest.

This recommendation system works offline and stores recommendations in the buyer's web profile.

This system has following seven steps:

- 1) In this step we record the books which users has bought earlier.
- 2) In next step we find out category of book from users buying history.

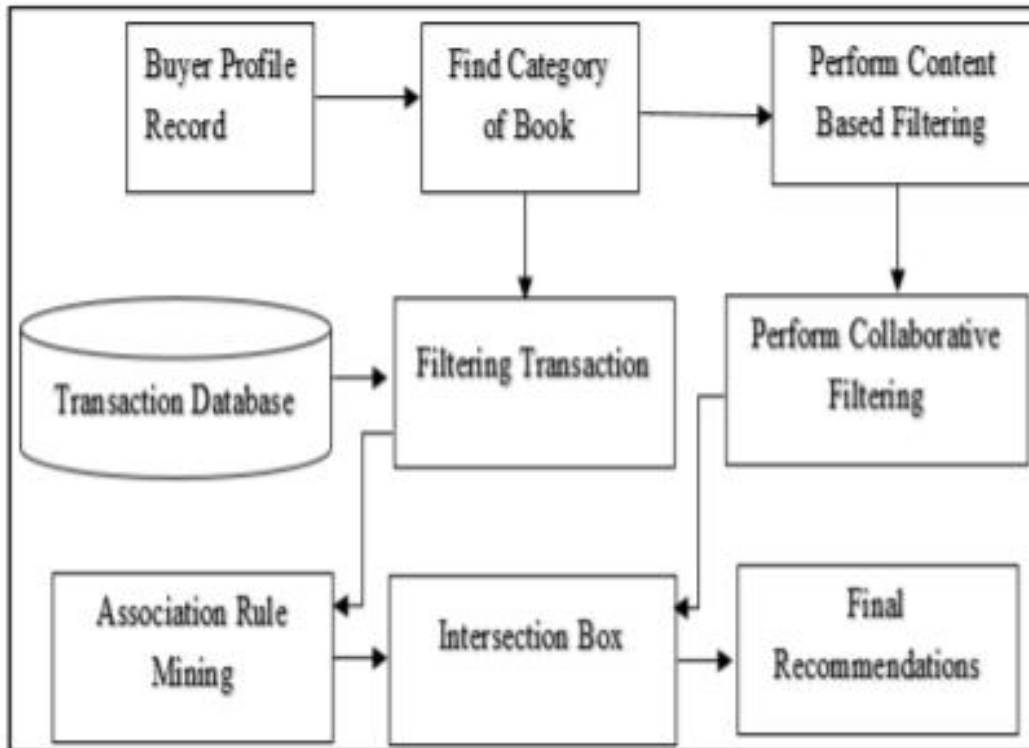


Fig.1: Block Diagram of Recommendation System

- 3) In this step we perform content based filtering i.e. we find all the books according to the category found in step 2.
- 4) On the result of step 3 we perform item based collaborative filtering and find out the list of books in the descending order of ratings. In this step system actually evaluate the quality of the recommending books based on the rating given to those books by the other buyers.
- 5) From the book transaction database we find all those transactions whose category is same as found in step2. Apply association rule on those transactions and find out the books which are frequently buy.
- 6) Find out the intersection of the result of step 4 and 5.
Arrange the intersection result in the descending order of ratings as given by the step 4.
- 7) Outcome of the step 6 is the final recommendations for the buyer.

All these steps are performed when the buyer is offline and the results are stored in the buyers web profile.

When the buyer comes online next time the recommendations will be generated automatically This book recommendation system is represented by block diagram in the fig.1

Task

Book recommendation system is needed to suggest books to customers which are more relevant for them.

This results in increased sales thereby leading to more profit.

In this project it is decided to build a book recommendation system.

OBJECTIVE

The objective of the project is to recommend books to the end users that are most appropriate.

TOOLS

Python

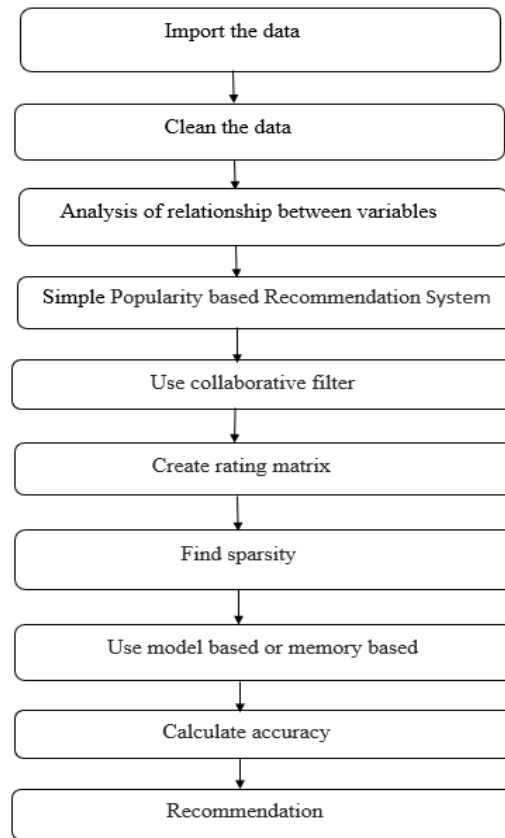
Pandas

Numpy

Matplotlib

Pandas-profiling

PROPOSED WORK FLOW MODEL FOR SOLUTION



BRIEF ANALYSIS

Recommendation systems are also known as recommender systems or recommender engine

“Recommendation systems are systems that help users discover items they may like ”

There are three type of recommendation system namely, Popularity-based and content based and Collaborative Filtering.

Popularity based:

These simply recommend the most popular items to users. Popularity-based systems are simplest of all and have minimal computational requirements.

Content based:

The recommendation system recommend product, which are rated highly by the similar users.

Collaborative Filtering:

The recommendation system recommend product, which are similar to that user selected.

FINAL RECOMMENDATION



Fig. 2: Final result of book recommendation

CONCLUSION

The goal of the most recommendation system is to predict the buyer's interest and recommends the books accordingly.

This book recommendation has considered many parameters like content of the book and quality of the book by doing collaborative filtering of ratings by the other buyers.

This recommender system also uses associative model to give stronger recommendations. This system does not have performance problem since it built the recommendations offline.

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A MESH NETWORKING BASED SOLUTION ON POWER MANAGEMENT

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ABSTRACT

The development of automatic metering system and power management is presented in this paper. The system consists of Zigbee Digital Power meters installed at every consumer's unit and an automatic e-Billing system at the energy provider's side. The Zigbee Digital Power meter (ZPM) is a single phase digital kWh power meter with embedded Zigbee modem which utilizes the Wireless sensor network to send its power usage reading and the electricity bill back and forth wirelessly. At the power provider side an e-billing system is used to manage the received zigbee meter reading, compute the billing cost, and to publish billing notification to its respective consumer through wireless modem. Also the circuit is designed to manage power, when the generation of power is less available at the electricity board. The controller prioritizes the electrical appliances in each node (i.e. houses) similar to that of a mesh network. Then it gives the highest priority to the most necessary appliance needed by the user then in the same way it gives priority to all other appliances connected to the node. When the power value reaches below a threshold, the PC at the power provider section gives a command to the controller, to supply the power only to the higher priority appliances and stop providing power to the lower ones. Likewise depending on the availability, power is equally distributed to all the nodes connected to the energy provider so that each node can at least make use of the most used appliance without total power shutdown.

Keywords — AMI, GSM, MDMS, Zigbee.

I. INTRODUCTION

Automated metering is expected to be an integral part of the modern energy grid. Automated metering entails transport of metering data from the consumer's premises to the data management systems of the energy provider and potential information in the other direction. The power management system consists of Zigbee Digital Power meters installed in every consumer unit and an e-Billing system at the energy provider side. The Zigbee Digital Power meter (ZPM) with embedded Zigbee modem which utilize the Wireless sensor network to send its power usage reading to the energy provider wirelessly. At the power provider side an e-billing system is used to manage a received zigbee meter reading, compute the billing cost, update the database, and to publish billing notification to its respective consumer through wireless network. The concept of dynamic assignment of power transfer to the prioritized appliances is discussed which reduces the entire power shut down for hours together and cuts off only for the lower priority tasks, which under some circumstances becomes a higher priority task. Slicing of reading timings is also discussed which can be used

to improve the performance of the proposed system. The highest priority task is serviced more than the lower priority task. Hence it need not wait for the slack time of other previously higher priority interrupts. If power will be less in power grid, automatically power will be manage using RTOS.

II. RELATED WORK

There are alternative approaches which may be used to implement smart metering solutions using different Communication technologies such as GPRS, 3G and PLC. In the case of cellular, the utility provider will have to sort out agreements with the cellular operator which may cost implications. Cellular penetration may be another factor that needs to be considered to ensure coverage is adequate. Broadband technology is another alternative wherein the data can be securely tunneled over the broadband network. However, broadband penetration issues need to be considered. PLC appears like an attractive choice given the seamless penetration of power lines in the consumer premises. This method also involves complications since power and the billing information has to travel on same line. Thus zigbee seems to be an attractive mode of data transfer, since the amount of data transferred (meter reading) is less and the time slice used for the meter reading (once in a month) is high.

III. OVERVIEW OF PROPOSED SYSTEM

A. Introduction

Motivated by the need to improve energy efficiency and reduce the impact on the environment, we see efforts being directed towards enabling a 'Smart Grid'. One of the fundamental elements of the Smart Grid is the Automated Metering Infrastructure (AMI), envisaged to be a network of meter and concentrator nodes wherein meter readings are automatically sent by smart meters located at the customer premises to the Meter Data Management System (MDMS) through concentrators provisioned by the utility provider. This is done by providing a controller based circuit at every node. The controller makes sure that after each predetermined slot the power consumption is noted. The time slicing is done based on the energy provider's convenience. For example in Chennai the meter reading is taken once in a month. Likewise the controller is responsible to collect the power reading in a set of nodes adjacent to it and transfer it to the nearest electricity office, usually called a concentrator by the network.

Also the circuit is designed to manage power when the available power is less present to the electricity board. The controller at the consumer side first priorities the electrical appliances connected to it. Then it gives the highest priority to the most necessary appliance needed for the user (e.g. fan) then in the same way it gives priority to all other nodes connected to the controller at each house. When the power value reaches below a threshold value the pc at the admin section gives a command to the controller to supply power to the higher priority appliances and stop providing power to the lower one. At this time as soon as the controller receives an interrupt the power line of the lower priority appliances is shut down. The system consist of a set of threshold values based on which the appliances and power given to them is managed.

The highest priority is based on the most necessary appliance that is used.

For example if a house (i.e. node) consist of the three categories of appliances such as highest priority is given to fans at the house, next intermediate priority to television (not much used) and lowest priority to air conditioner(used mostly at nights). If the power is below the first threshold power given to air conditioner is cut down, and other appliances work well, when the power goes beyond second threshold then power to television is also removed. Like the same way according the availability the power is equally distributed to all the nodes connected to the energy provider so that each node can at least have the most used appliance without total power shutdown.

B. Disadvantages of Existing System:

Till today Meter reading is taken manually by humans that can cause fatal errors, these errors occur due to less concentration which cannot be avoided. Lesser accuracy may lead to confusions for both consumers and energy providing authorities. Huge Manpower is needed as population rate and new power line connections to each houses increase. Work can be delayed due to external conditions such as weather, natural calamities etc. inefficiency in reaching rural areas of observation. Power cut is done manually due to lack of payment. Total power shutdown in case of less available power generation. Uneven distribution of power having higher power shut down time for rural areas and less timings at the cities.

C. Advantages of Proposed System:

Meter reading is taken automatically. Power cut achieved from EB office through wireless. Work cycle is not stopped due to time and external conditions. Less manpower is involved in case of collecting energy consumption at each consumer premises. High Accuracy meter reading. Customer service is achieved at its best. Power management is achieved at the time of less power generation.

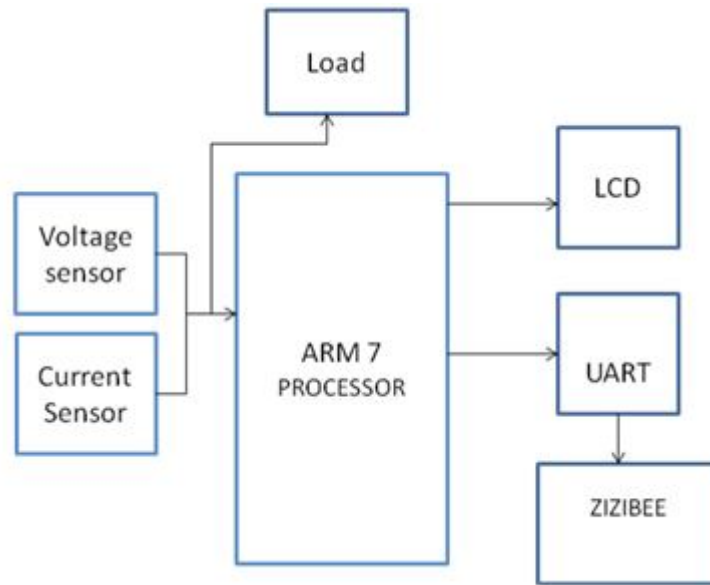


Fig 1. Block Diagram of Proposed System.(Admin Section)

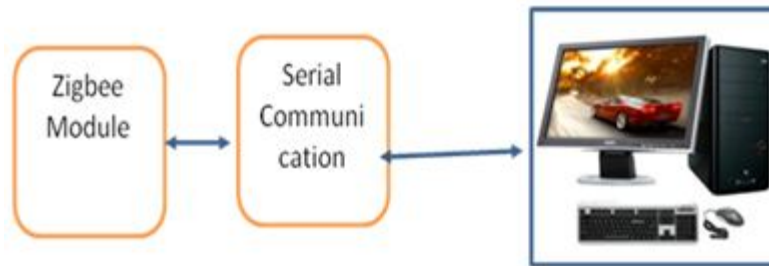


Fig 1. Block Diagram of Proposed System.(User's Section)

IV. EXPLANATION OF BLOCK DIAGRAM

A. Potential Transformers:

In electrical engineering, a current transformer (CT) is used for measurement of electric currents. Current transformers, together with voltage transformers (VT), are known as instrument transformers. When current in a circuit is too high to directly apply to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments. The current transformer also isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are used here for metering purpose, which calculates the amount of current consumed by the user.

Voltage transformer is also known as potential transformers. These are a type of instrument transformers that gauge and protect the safety levels in high-voltage circuits. Their designs allow presenting a negligible load to a supply that's being measured and for creating a precise voltage ratio for stepping down high voltages accurately. It allows operations at lower potentials. The voltage transformer is used for the same purpose as that of the current transformer. It measures the amount of voltage consumed and gives it to the controller. The controller calculates the power from the readings of the voltage and current transformers and manipulates the e-bill.

B. ZIGBEE

Zigbee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. Zigbee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows Zigbee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices. Any Zigbee device can be tasked with running the network. Zigbee is targeted at applications that require a low data rate, long battery life, and secure networking. Zigbee has a defined rate of 250 Kbit/s. The technology defined by the Zigbee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. Here it is used to transfer the meter reading calculated by the controller to be transmitted to the admin (nearby electricity office) for calculating the electricity bill and also the admin to transfer the control signals to the user side to enable and disable the corresponding loads according to the power that is present at the electricity board.

C. Microprocessor

A Microprocessor is a small computer on a single integrated circuit containing a processor core, memory, programmable input/output peripherals, program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microprocessors are designed for embedded applications, in contrast to the microcontrollers used in personal computers or other general purpose applications. Microprocessors are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

V. SCENARIOS AND PERFORMANCE ANALYSIS

The following chapter presents the analyzed scenarios together with the conducted performance analysis.

A. Scenario Description

Scenario 1: Small-scale scenario with 350 meters.

Scenario 2: Full-scale scenario with 17,181 meters.

Scenario 1 is used for validation purposes to confirm proper functionality of geographical routing algorithm, whereas the second scenario is used to derive statistics for complete scenarios. Both scenarios are evaluated for a simulation time of 24h. Each node sends a data packet towards the data Collector every four hours with a uniformly randomized starting time

B. Performance Analysis

The results of the simulation runs for different reference scenarios are presented in the following section. The results focus on the success rate of received packets per node in order to measure the performance of the deployed system. Communication gaps and bottlenecks are measured by the success rate of received packets per node.

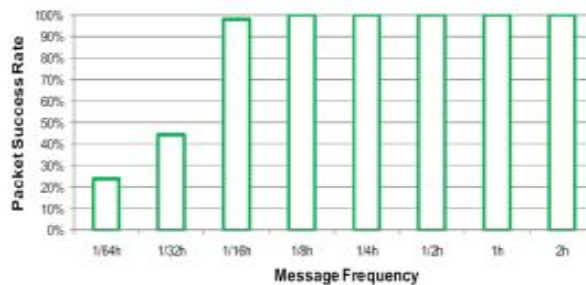


Fig .2 Packet Success Rate Vs Message Frequency

The system performs with 100% success rate (i.e. received packet ratio) for the small-scale area, given a message frequency of 1 message per 4hrs. In order to identify bottlenecks in the network topology, the message frequency was increased to 1h, 15min, 7.5min and 4min which led to more than 98% success rate for a message frequency below 7.5min (see Figure 2). Above this frequency a drastically reduced success rate was noticed due to collisions in some central nodes.

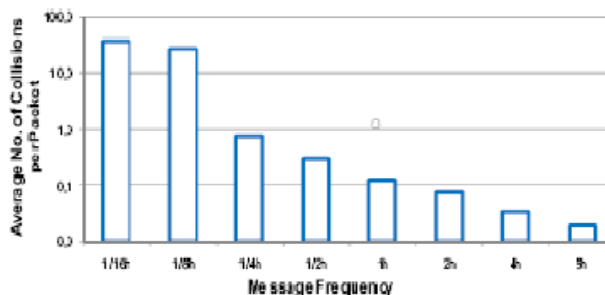


Fig.3 No Of Collisions Vs Message Frequencies

The number of average collisions per packet is shown in Figure 3. Within the large-scale scenario, an overall success rate of the system was observed with 99.99% for a message frequency of 1 message per 4h.

VI . Simulation Results

Network simulator 2 is used to visualize the network and the data packets. When the code is executed the nodes get appeared. The power provider first prioritizes the electrical appliances at each node. Initially all the nodes are given equal priority when the power level is high and all nodes receives power. (See fig .4)

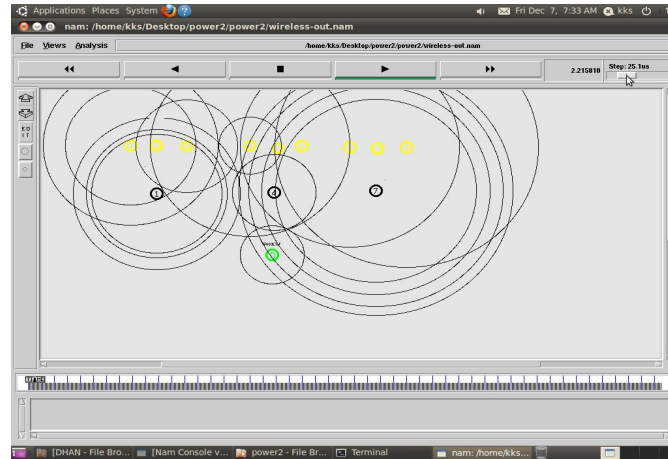


Fig .4 Snapshot of power provided to all nodes

As power at the provider decreases below the first threshold, the lowest priority appliances will get automatically disconnected. (See fig .5)

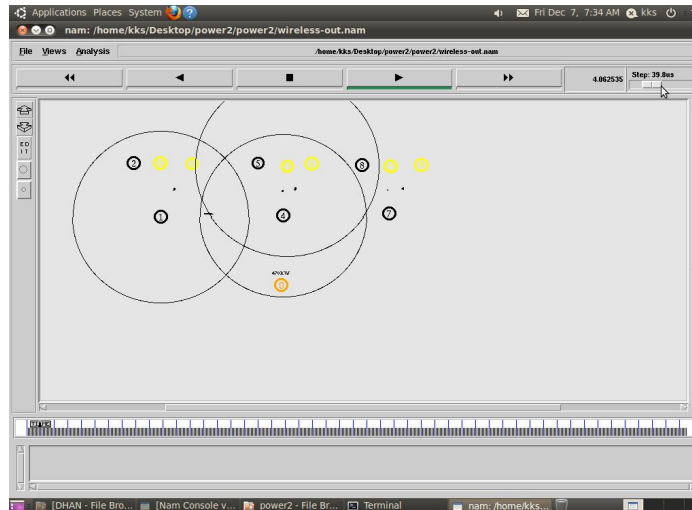


Fig .5 Snapshot Of Power given to most prioritized nodes

When the power at the provider decreases below the second threshold, the intermediate priority appliances will get disconnected automatically. (See fig .6). And only the lower priority appliances will be provided with power.

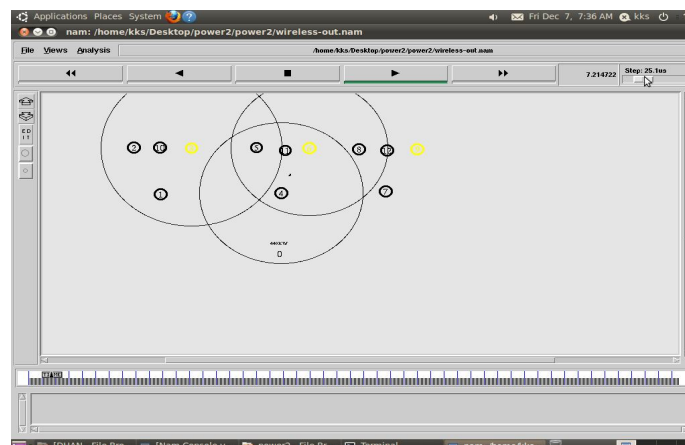


Fig. 6 Snapshot of Power given Only to Higher Priority Nodes

VII Conclusion

In order to overcome the manual errors made during meter reading and to effectively manage long duration of power cuts this method has been proposed. This method makes sure that power is equally distributed to all providers irrespective of the amount of power needed. The execution involves both by the consumer side controller in collecting the meter reading and by the administration controller in issuing interrupts to the user's section controller in need of power managements.



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PERFORMANCE EVALUATION OF NINE AND EIGHT SWITCH BASED UNIFIED POWER QUALITY CONDITIONER FOR ENHANCING THE QUALITY OF POWER USING INTELLIGENT CONTROLLER

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ABSTRACT: *Research is focusing on the improving power quality in distribution system based on unified power quality conditioner device. Each converter has six switches and these switches are controlled in order to mitigate power quality issues. A nine switch UPQC topology is proposed to reduce the harmonics and some precincts such as more switching stress, high value of DC link voltage etc. Hence in this work, intelligent control methods are fuzzy, ANN, PSO based ANN implemented in this nine switch UPQC to overcome the aforementioned issues. The outcome of UPQC mainly be identified by analysing the speed and the way the compensation signals are rated accurately. The predominantly focus on improve the power quality in distribution system using flexible ac transmission system connected with grid. In order to reducing the total cost of the system, minimization of number of switches is essential. But it is a challenging task for every researcher. The topology of UPQC can be modified into nine switch topology and the results are validated for nonlinear loads, sag and swell conditions. From the results, it is concluded that PSO-ANN algorithm gives encouraging results compared to FLC and ANN controller.*

Keywords: - Intelligent Control, UPQC, Non Linear

Load, Nine Switch

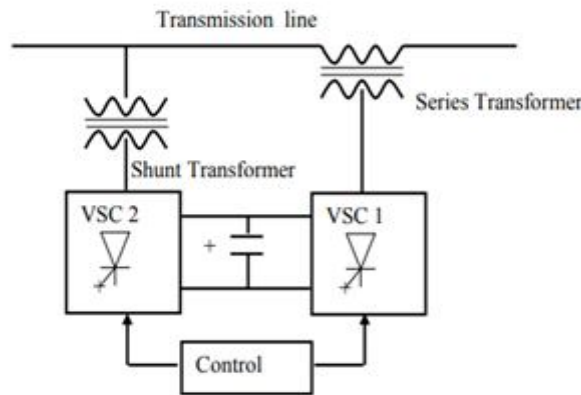
I. INTRODUCTION

Nowadays, the emergent intricacy of the electric power transmission and distribution system has made the usage of modern Flexible AC Transmission System (FACTS) as inevitable. A FACTS device naturally consists of a power semiconductor device, hence affect the power quality of the system by injecting harmonics into the delivered power. In addition the usage of power electronic converters has **also** affected the power quality. the electricity provided to the consumer should not be compromised in its quantity and quality should be maintained. The consumers inject harmonics in the form of ac to dc converters and ac and dc drives, the utility inject harmonics in the form of facts devices. the familiar facts devices are static synchronous compensator (statcom), the static synchronous series compensator (sssc), the unified power flow controller (upfc) and the dynamic voltage restorer (dvr) .

The UPFC is a significant FACTS candidate in electric power transmission system. With common DC link UPFC comprises STATCOM and SSSC. The main function of UPFC is real and reactive power compensation, voltage sag/swell compensation, fault tolerant etc. The UPFC maintain the voltage profile of the system during the aforementioned issues. It guarantees the delivery of electric power at the desired voltage and frequency levels with improved powerfactor.

Shunt and series converter are embodied in the UPQC. There are 6 switches in each of the converters. Therefore it requires minimum 12 switches to achieve the desired power quality. In order to reducing the total cost of the system, minimization of number of switches is essential. But it is a challenging task for every researcher. The topology of UPQC can be modified into ten switch topology, nine switch topology, matrix converter based four legs VSI based UPQC etc.

Matrix converter based topology suffers from increasing the number of switches and unidirectional power flow (Kumar et al.). The four leg inverter has the limitations, that at AC interface both converters have operated at same frequency. Ten switch and nine switch topology mitigate the power quality issues satisfactorily, but it increases the switch current rating to a onsiderable limit topology.



Therefore the size of the switches must be oversized and all the switches are remain operated irrespective of UPQC compensation. Hence its reliability is affected. It also suffers from high switching stress and phase shift.

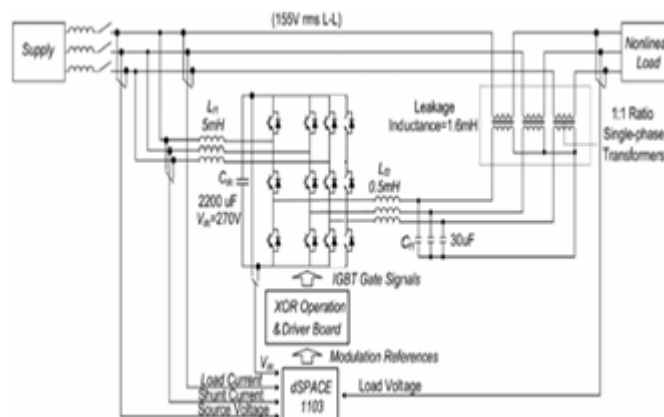
TOPOLOGY OF NINE SWITCHES UNIFIED POWER QUALITY CONDITIONER.

UPQC involves both shunt and series converter. The dc link capacitor connects the converters back to back. shunt converter is a current source and series converter is a voltage source. Shunt converter injects current harmonics and series converter injects voltage harmonics for compensation. UPQC topology performs satisfactorily; it has a limitation that at lower modulation in the series converter leads to computational issues. The block diagram of nine switches UPQC is shown in Fig. It consists of three legs, and each leg consists of three switches. The combination X acts as a series converter and combination Y serves as a shunt converter. The load voltage error is used to generate the upper switches reference wave. And the lower switches the reference wave is generated by source current error. By using gate pulses of both upper and lower switches, the middle switches gate pulse are generated as shown in equ (3.1)

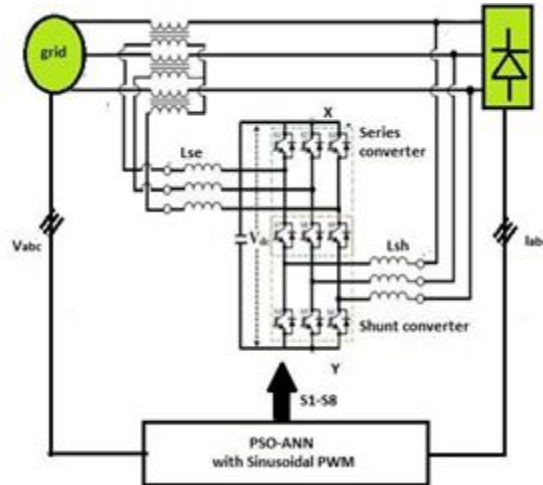
$$S_7 = \overline{S_1} \cdot \overline{S_4} \quad S_8 = \overline{S_2} \cdot \overline{S_5} \quad S_9 = \overline{S_3} \cdot \overline{S_6} \quad (3.1)$$

The reference load and voltage and source currents are generated using instantaneous reactive power theory.

12 switches were utilized in this Existing method where the switching losses are at high level. In this figure shown, the total harmonic changes are at high elevation, when enforced to the nine-switch converter. It carries to those output voltage transitional for signifying V per phase. These voltage conversions show that the impermissible state and is effectively closed off. This blockade is due to the encumbrance of added restraint circumscribing the reference amplitudes and phase shift and reference amplitude. These restrictions are particularly important for references undergoing substantial amplitudes and/or different frequencies, as exemplified by the explanatory cases. A maximum modulation ratio of 0.5 each of two references of various frequencies are extensible by 1.15 times if triplen offset is added, in order to circumvent crossover. The limited phase-shift constraint, aligned with references of the similar frequency and combined modulation ratio of greater than 1.15 with triplen offset added, is a well-ordered and intuitive application of the nine-switch converter.

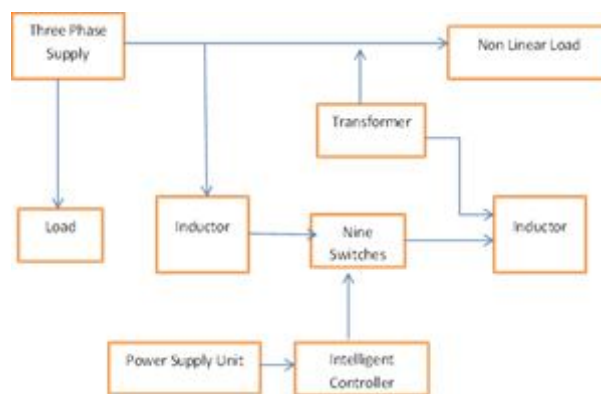


The figure of Existing system circuit



Switching losses are less in this method as there is only 9 switches used. The sum harmonic distortion is less as shown in below Fig 5.2. The same method can be executed again with no series compensation added. The nine-switch UPQC means the CF mode discussed in section set to zero and the transformer by passed. The former leads to a smaller dc link voltage, while the latter causes losses to be smaller, since large load current now does not flow through the nine-switch UPQC. For comparison, values calculated for the back-to-back UPQC operating without series compensation are also included, with clearly show it having slightly lower losses under normal operating condition. The back-to-back UPQC using only six modulated switches for shunt compensation are assigned by the lower losses. While the nine-switch UPQC uses six up per modulated switches and three lower conducting switches. The reversal of action happens when sag occurs, during which the back-to-back UPQC uses 12 modulated switches. On the other side the nine-switch UPQC uses only nine, and therefore producing lower losses.

In the present situation non-linear loads have gotten critical and individuals are turning out to be subject to it. Not many of these non-linear loads are TVs, printing and fax machines, rectifiers, inverters, speed drives, AC, and so on. Harmonics are acquainted in the lines due with the broad utilization of these loads in our regular reason. The dependability of any electrical gadgets relies upon its voltage and current waveforms. In the event that the fundamental waveform is sinusoidal, and its harmonics are sinusoidal too then these harmonics happens in essential products of the fundamental waveform. Because of these symphonious distortion made by nonlinear loads a few issues are caused in the machines utilized in our motivation like: engine getting overheated, increment in a few kinds of losses, perpetual harm of hardware in the most pessimistic scenario, high error in meter perusing, and so forth. Thus evacuation of these harmonics or harmonics alleviation from voltage and current waveforms are of great concern for electrical specialists. Because of the harmonics presentation in the lines by the nonlinear loads different issues of distress are voltage swell, voltage sag, flicker happening in voltage, and so forth and thereby disturbing overall power supply.

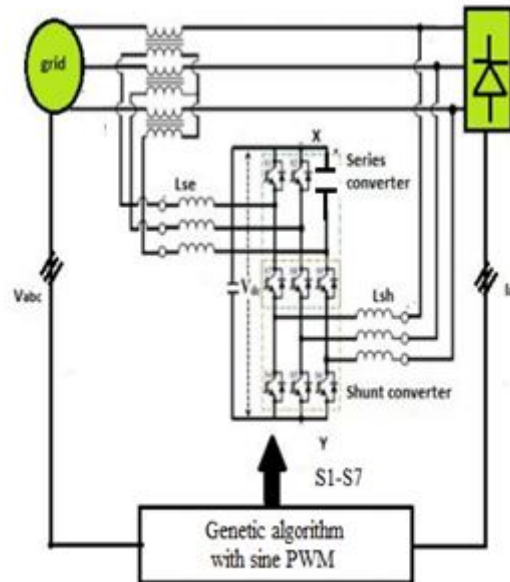


Block Diagram of switched power conditioner

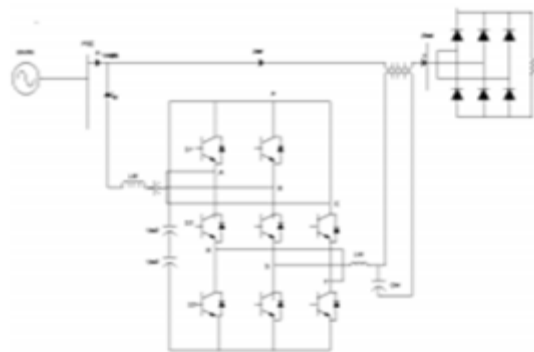
EIGHT SWITCH BASED UPQC

The unified power quality conditioner has reduced the switches and thereby decreasing the switching losses. A similar computation can again be performed with no series compensation included. For the nine-switch UPQC has less dc link voltage with fast settled the desired value while the later has fewer losses, eight switch UPQC there is no current flow in substantial load. Fig. shows the overall configuration of proposed circuit.

For upper switches reference wave is generated by using load voltage error and for lower switches the reference wave is generated by source current error. For middle switches the gate pulse are generated by using gate pulses of both upper and lower switches.



The block diagram of switched power conditioner is shown in Fig 4.9. The unified power quality conditioner has reduced the switches and thereby decreasing the switching losses. A similar computation can again be performed with no series compensation included. For the nine-switch UPQC, the CF mode is dealt in area, set to zero and the transformer by past. Since the substantial load power presently does not flow through the eight-switch UPQC, the previous prompts a littler dc link voltage, while the latter generates losses be smaller.



Values set on for the consecutive UPQC working without series compensation are additionally included, comparatively; which authenticate it comprising, a less capacity of lower losses under normal operating condition. The lower losses here are credited to the consecutive UPQC utilizing six modulated switches for shunt compensation, while the eight switches UPQC utilizes six upper modulated switches and two lower conducting switches. This action would invert when slump happens, amid which the consecutive UPQC utilizes 9 adjusted switches. On the other hand the eight-switch UPQC hence producing lower losses. Fig shows the circuit diagram of eight switch unified power conditioner.

CONTROL TECHNIQUE

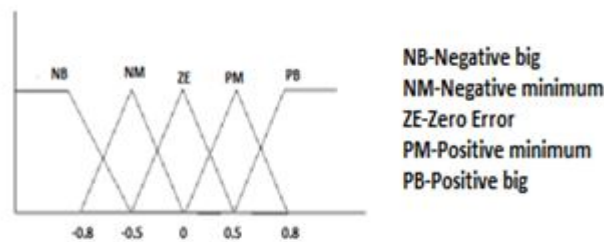
FLC is a knowledge based system. This technique is based on human experience and deals with linguistic variables. The conventional controller like PID controller needs an exact mathematical model of the system. But the FLC does not need a precise model. Hence it is used when there is non-availability of mathematical model or the model has high complexity.

The four FLC used in this work are of mamdani type with two inputs such as error and error rate and the output is a controllable parameter. The controllable parameter may be modulation index (MI), phase angle. From the

MI and phase angle, a reference sine wave is created and compared with carrier to give the gate pulses. The control in FLC is done by linguistic rules. These rules are framed based on knowledge about the system. The three basic functions of FLC are fuzzification, interference and defuzzification. The membership function used is triangular and it is shown in Fig 3.2. The FLC for shunt and series is shown in Fig 3.3 and 3.4. The error and change in error is defined by the Equation (3.4 & 3.5).The rule base is shown in Table 3.1.

$$E(k) = \frac{X_{ph(k)} - X_{ph(k-1)}}{Y_{ph(k)} - V_{ph(k-1)}}$$

$$CE(k) = E(k) - E(k - 1)$$



Fuzzy Membership Function

Error	NB	NM	ZE	PM	PB
Error rate	NB	NM	ZE	PM	PB
NB	NB	NB	NB	N M	ZE
NM	NB	NB	NM	ZE	PM
ZE	NB	NM	ZE	PM	PB
PM	N M	ZE	PM	PB	PB
PB	ZE	PM	PB	PB	PB

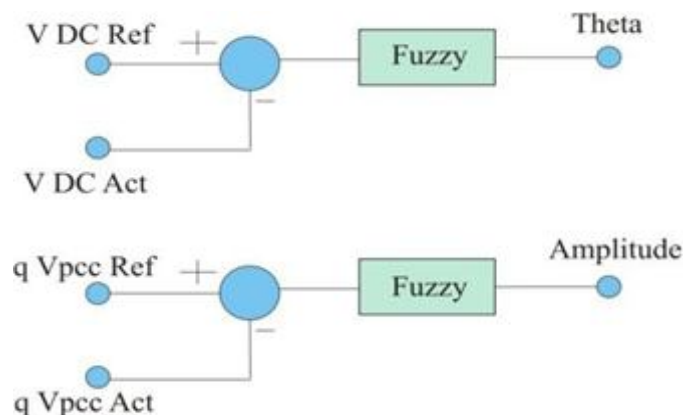
The FLC rules are derived from Equation

$$u = -[\alpha E + (1 - \alpha)C]$$

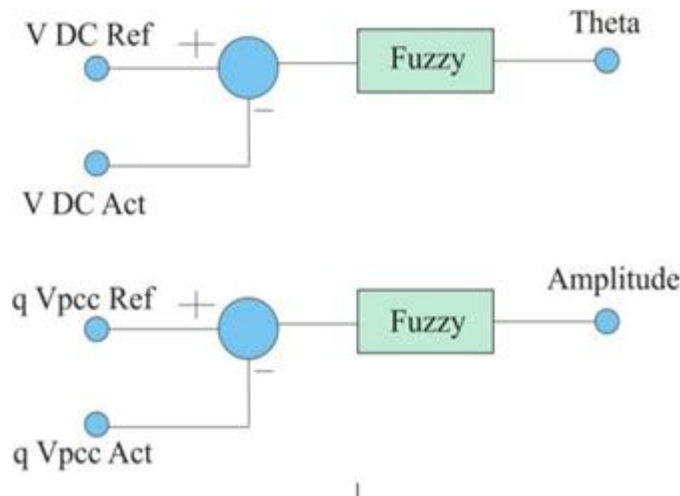
Where α means self adjustable factor,

E is error of the system

C is varying ratio error



FLC for ShuntConverter



FLC for SeriesConverter

The FLC does not need a precise model. Hence it is used when there is non-availability of mathematical model or the model has high complexity. The control in FLC is done by linguistic rules. These rules are framed based on knowledge about the system. The three basic functions of FLC are fuzzification, interference and defuzzification.

ANNCONTROLLER

ANN mimics the human brain. In this work feed forward neural network structure is used. The typical feed forward ANN has three layers, input, output and hidden layer. The neurons are the functional element in ANN and it performs the functions called activation function. The neurons in one layer are connected to other layer through synapse and the weight is called synaptic weight.

At learning phase, the synaptic weights vary with each iteration. The typical neuron structure is shown in Fig 3.5. It consists of two inputs and two outputs. The data set of 1000 samples for ANN system is taken from PI controller. Of which 75% is used for training and 25% is used for testing. The inputs are error of dc link voltage and error in load voltage and the outputs are modulation index and phaseangle.

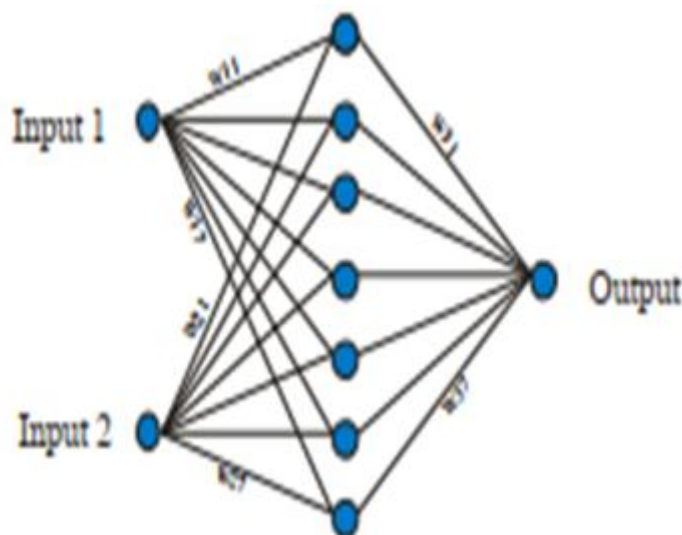


Fig. Typical ANN Network

PSO-ANN

The flow chart for the proposed technique is shown in Fig The PSO is a Meta heuristic search technique famed for its efficient computation and easy implementation. The PSO is used along with ANN in this work. In ANN, the weight updating is a crucial part to get the feasible and accurate results. The weight updating in learning phase needs high computation.

Hence PSO is used for updating synaptic weights in the learning phase. In back propagation algorithm, the systematic weight updating results in local optima. PSO avoids the local optima by include the randomness in particle initialization.

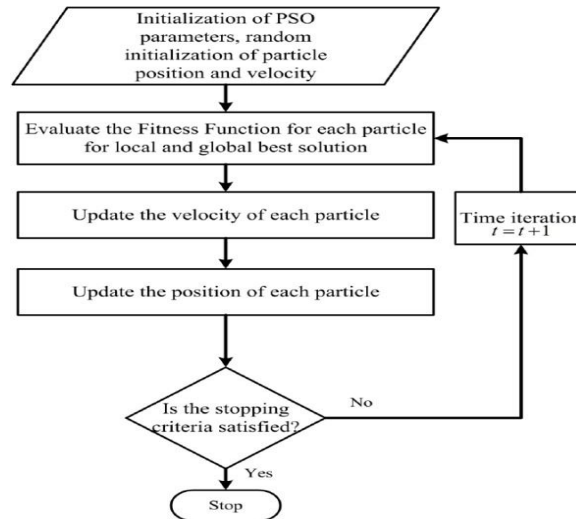


Fig. Flow Chart for PSO-ANN

The PSO is a Meta heuristic search technique famed for its efficient computation and easy implementation.

GENETIC ALGORITHM CONTROLLER

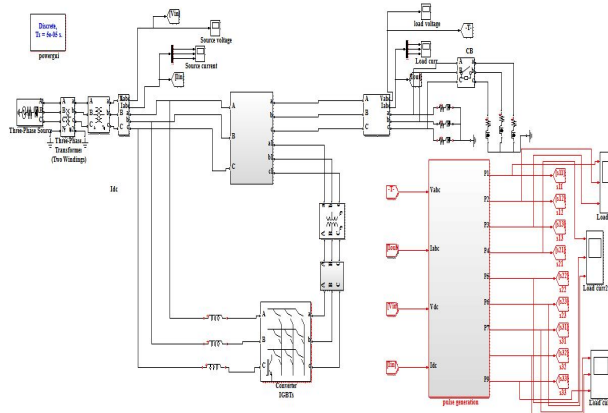
The genetic algorithm is energized by The mechanism of regular selection prompts the genetic algorithm where strong individuals would probably be the winners in a demanding surroundings. The diagram shows the flowchart of genetic algorithm. The value of k_p and k_i has tuned by using genetic algorithm. This algorithm be subject to environment and evolution operators (i.e. reproduction, crossover and mutation) to appear at the preminent solution. Genetic algorithm has high performance and generates local minima and converging to sub optimal solution. In this way, GA has been revealed to be capable of locating high performance areas in complex domains without practicing the difficulties associated with high dimensionality, as may occur with rise descend methods that rely on derivative information.

Fig. Flowchart of Genetic Algorithm

SIMULATION MODEL

NINE SWITCHES UNIFIED POWER QUALITY CONDITIONER.

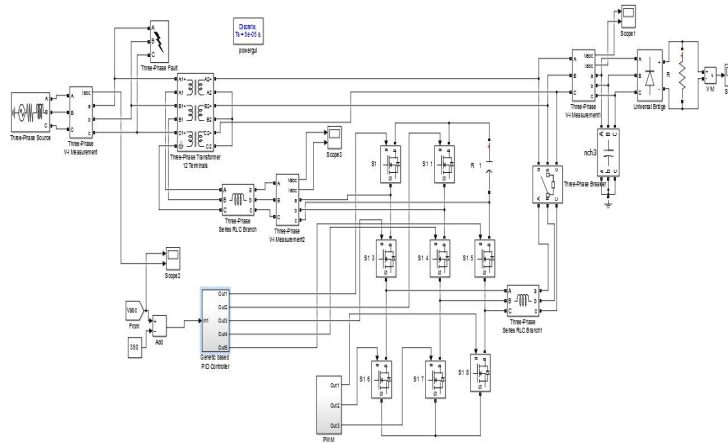
The elevation of complication in the power system results in, voltage sags and swells in power conditioner. The voltage sag is a short reduction voltage from nominal voltage, occurs in a short time. Voltage swell is a rise in the r.m.s voltage from its nominal voltage; which produce great effect on the industrial customers. Nine switch power conditioner (UPQC) appears to be an especially good solution in the current situation. The distribution static compensator and the dynamic voltage restorer are most productive devices, in which both of them are based on the VSC principle. The nine switch power conditioner shown in Fig



Simulation Diagram For Nine Switch Power Conditioner

**SIMULATION MODEL
EIGHT SWITCH BASED UPQC**

The power conditioner (UPQC) has used for compensating the voltage and current can be recompensed by using the power conditioner (UPQC) It's design is implemented in MATLAB Simulink. Fig. Shows the overall simulation diagram of eight switch UPQC.



Simulation Diagram For Eight Switch Power Conditioner

RESULT AND DISCUSSION

NINE SWITCHES:

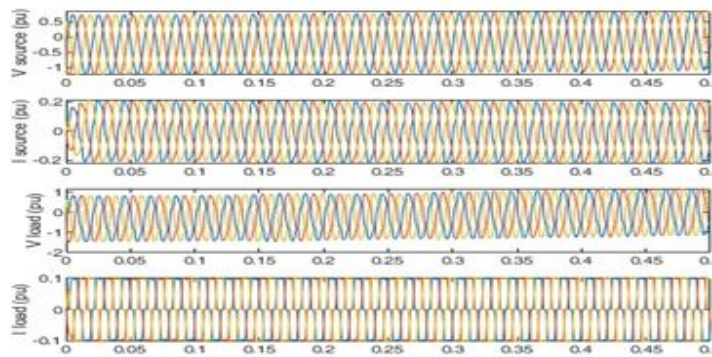


Fig. Source voltage, Source current, Load voltage and Load current for nonlinear load without nine switches UPQC

The FLC, ANN and PSO-ANN for the nine switch UPQC was designed and implemented in MATLABSIMULINK. Fig shows the source voltage, source current, load voltage and current in nine switch UPQC for non linear load. The non linear load makes the source current distorted and the THD is increased without the nine switch UPQC. The THD pertaining to the non linear load is 10.73% and it is shown in Fig

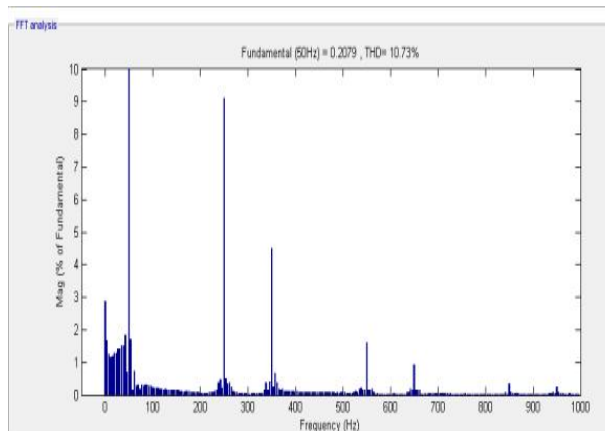


Fig. THD for non linear load without nine switch UPQC

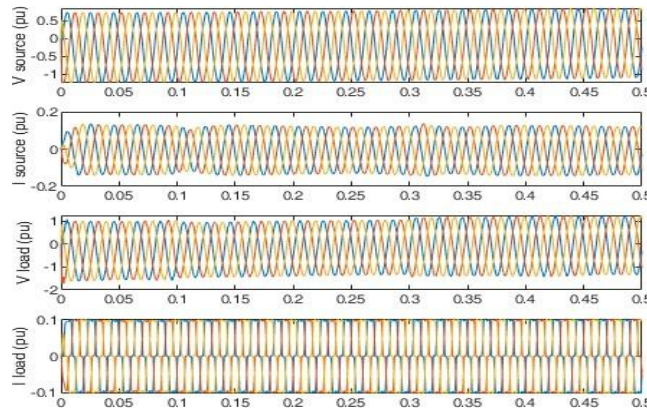


Fig. Source voltage, Source current, Load voltage and Load current for nonlinear load with nine switch UPQC using PSO-ANN

Fig shows the source voltage, source current, load voltage and load current for the non linear load with nine switch UPQC using PSO- ANN. The UPQC is controlled by FLC, ANN and PSO-ANN. The THD corresponding to FLC, ANN and PSO-ANN is shown in Figs. From the Fig. it is reveal that PSO-ANN improves the power quality of the system by reducing THD to 0.53%. Hence the PSO-ANN outperforms compared to FLC and ANN.

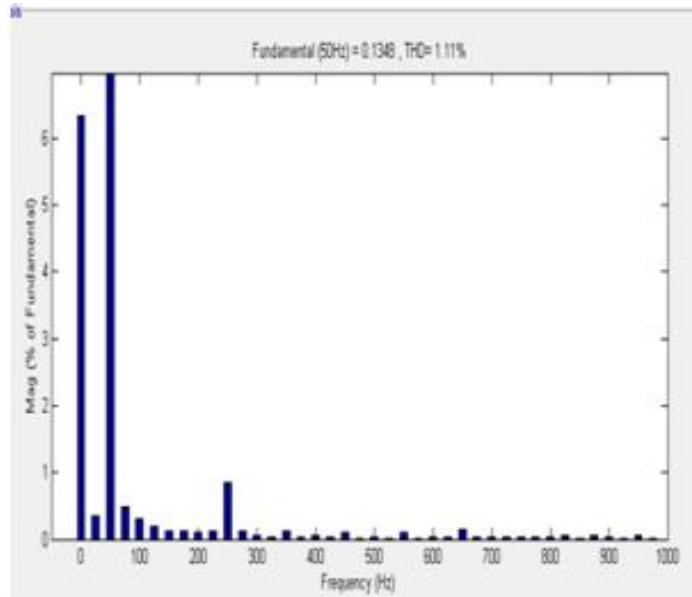


Fig. THD for non linear load with nine switch UPQC using FLC

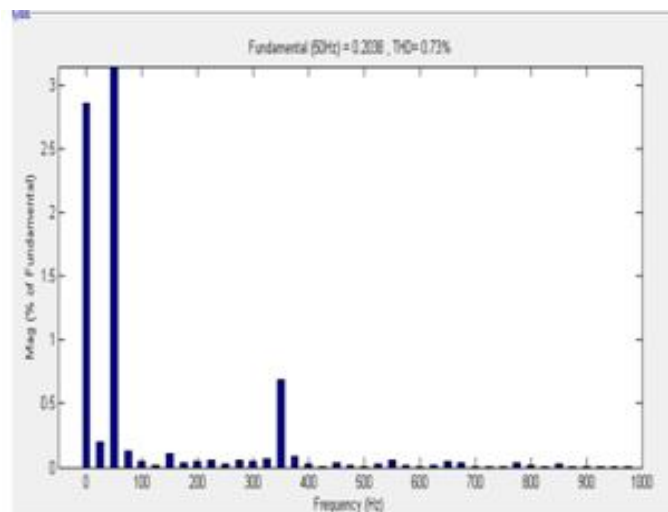


Fig. THD for non linear load with nine switch UPQC using ANN

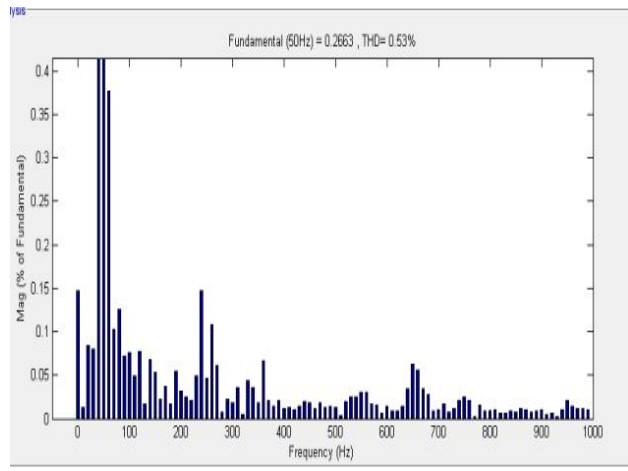


Fig. THD for non linear load with nine switch UPQC with PSO-ANN

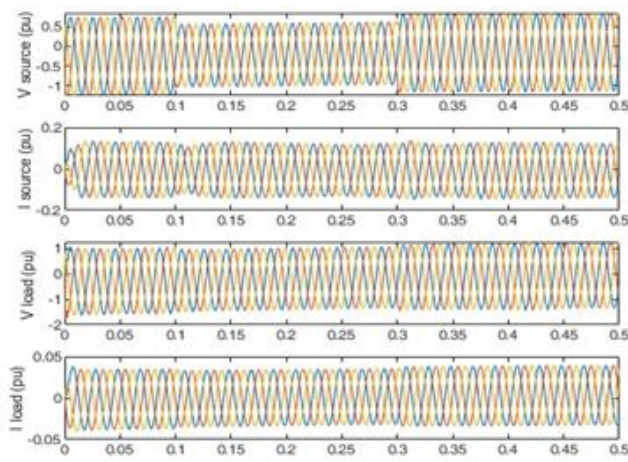


Fig. 3.13 Source voltage, Source current, Load voltage and Load current for sag condition with nine switch UPQC using PSO-ANN

A 10% sag condition is introduced during the period between 0.1 and 0.3 second. The source voltage reduced abruptly which will affect the load side voltage if UPQC is not present. The PSO-ANN based nine switch UPQC maintains the load voltage at the rated level. Fig shows the source voltage, source current, load voltage and load current for the sag condition with nine switch UPQC using PSO-ANN. The real and reactive power compensation for both source and load side is shown in Fig. The power factor on the source side is maintained within 0.95-0.99 for reactive load with the help of nine switch UPQC as shown in Fig.

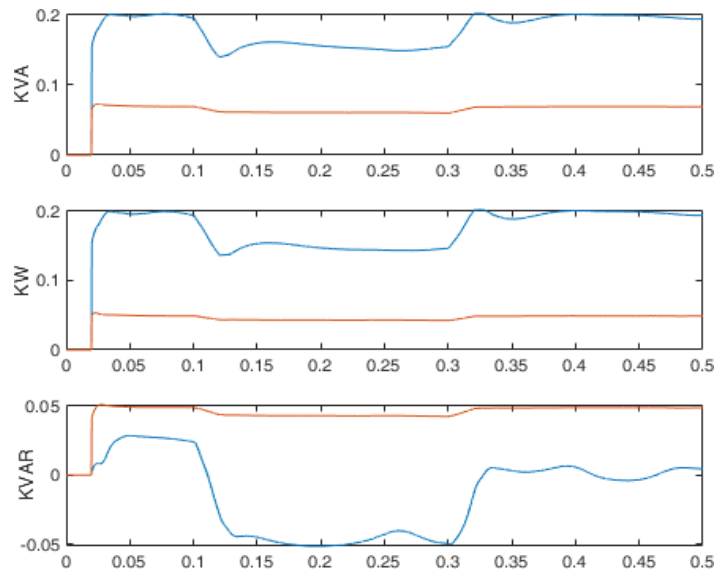


Fig. Reactive power, Real power and apparent power for sag condition

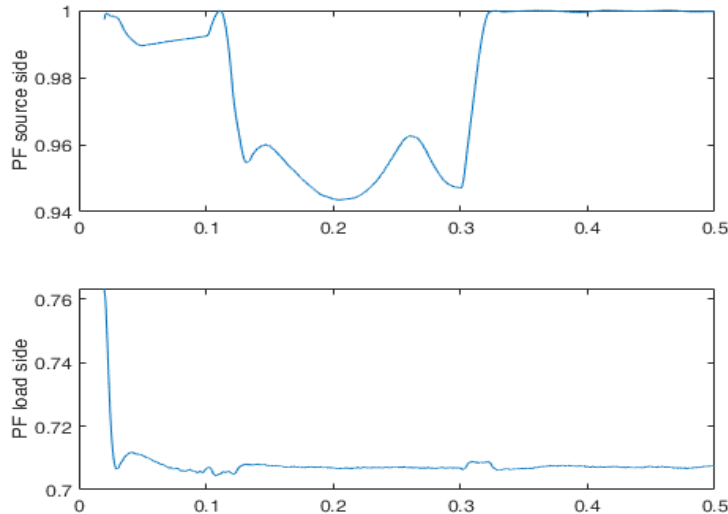


Fig. Power factor for source and load side

A 10% swell condition is introduced during the period between 0.1 and 0.3 second. The source voltage increased abruptly which will affect the load side voltage if UPQC is not present. The PSO-ANN based nine switch UPQC maintain the load voltage at the rated level. Fig shows the source voltage, source current, load voltage and load current for the swell condition with nine switch UPQC using PSO-ANN.

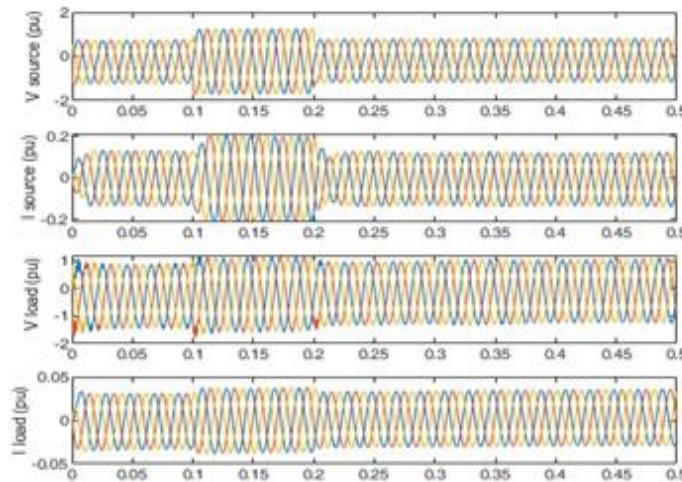


Fig. Source voltage, Source current, Load voltage and Load current for swell condition with nine switch UPQC using PSO-ANN

The real and reactive power compensation for both source and load side is shown in Fig. The power factor on the source side is maintained within 0.95-0.99 for reactive load with the help of nine switch UPQC as shown in Fig Table represents the comparison of controller.

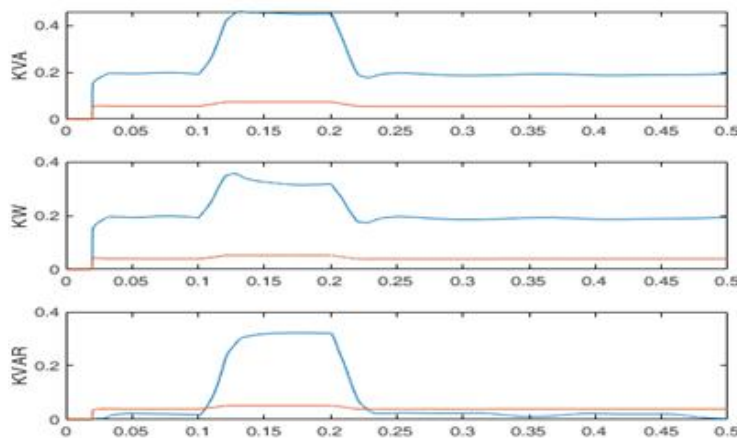


Fig. Reactive power, Real power and apparent power for swell condition

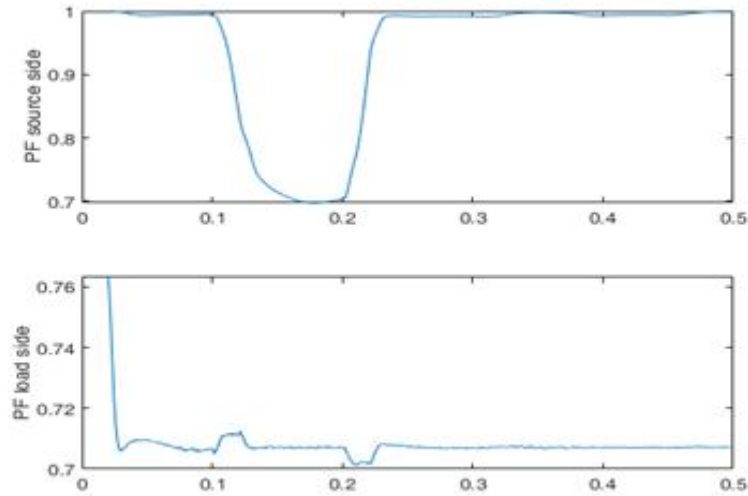


Fig. Power factor for source and load side for swell condition

Parameters	FLC	ANN	PSO-ANN
THD of source current	1.11%	0.73%	0.53%
Reactive power compensation	91%	92%	95%

Table Comparison of Controllers

EIGHT SWITCH BASED UPQC

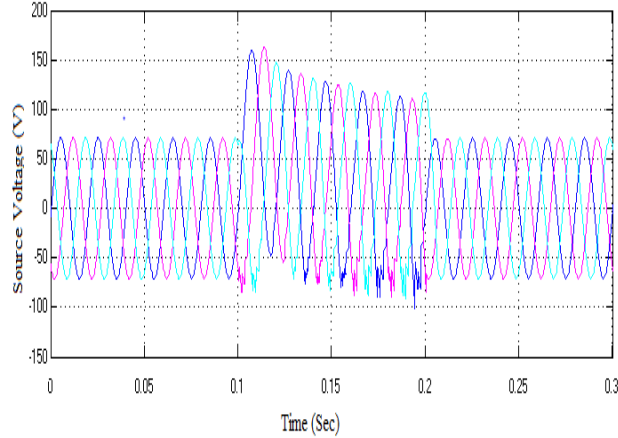


Fig. Source Voltage in eight switch UPQC using Genetic algorithm

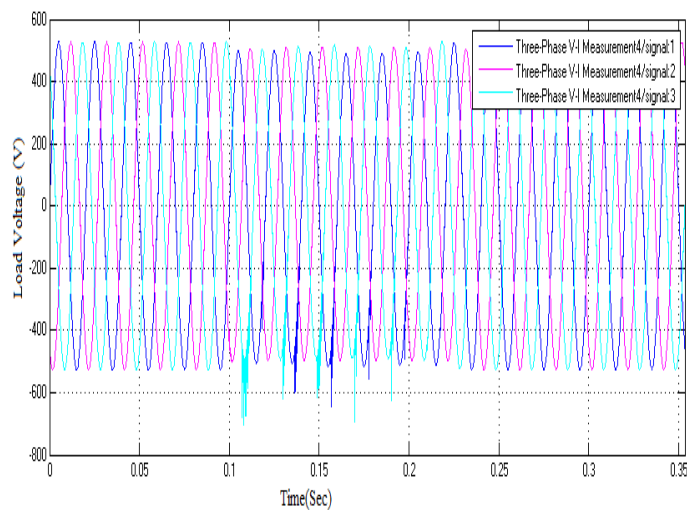


Fig. Load Voltage in eight switch UPQC using fuzzy Controller

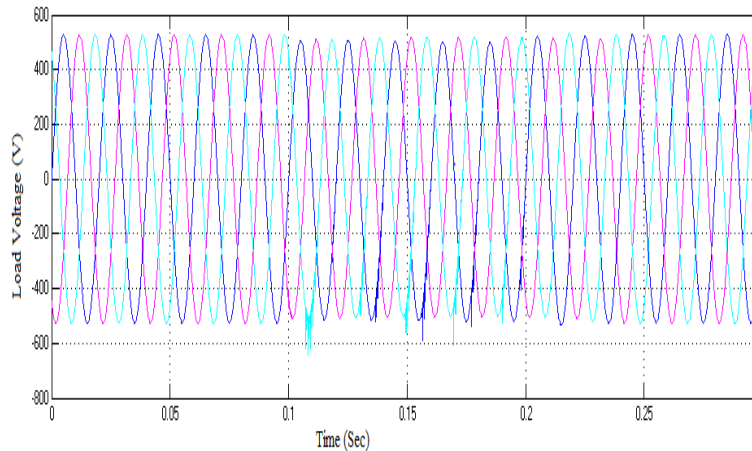


Fig. Load Voltage in eight switch UPQC using ANN Controller

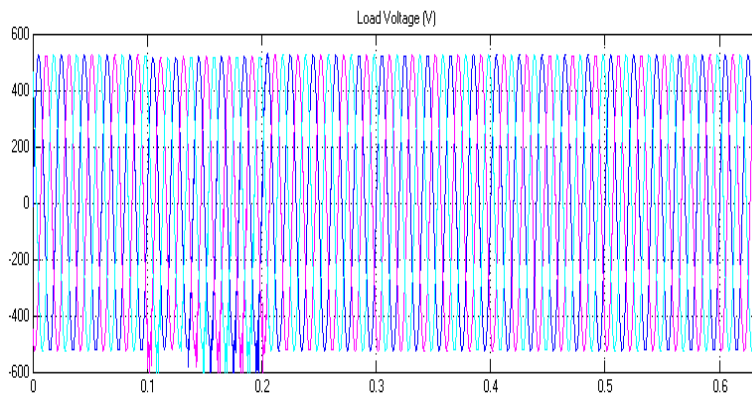


Fig. Load Voltage in eight switch UPQC using Genetic algorithm

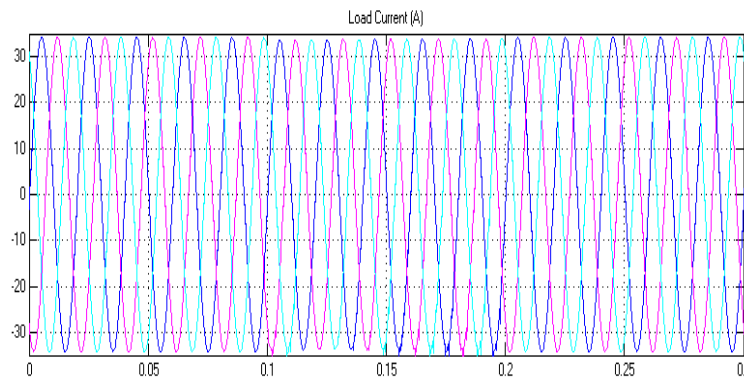


Fig Load Current in eight switch UPQC using Genetic algorithm

Fig shows the input voltage under sag condition in grid. The gate pluse has been made and given for changes to turn on the switch those entryway beat are created and offered by the gate plus looking at the switch is turned ON and OFF. Fig shows the output voltage of non-direct load utilizing fuzzy and ANN regulator. Fig shows the output voltage and yield current of non-direct burden utilizing genetic regulator.

source current distorted and the THD is increased without the nine switch UPQC. The THD pertaining to the non-linear load is 10.73%. the nonlinear load with nine switch UPQC using PSO-ANN. The UPQC is controlled by FLC, ANN and PSO-ANN. The THD corresponding to FLC, ANN and PSO-ANN is 1.11, 0.73 and 0.53%.

The value of THD is reveal that PSO-ANN improves the power quality of the system by reducing THD to 0.53%. Hence the PSO-ANN outperforms compared to The unified power quality conditioner is a flexible ac transmission system for both voltage and current compensation device.

Compensation of both sag and swell operation are designed and validated with MATLAB/Simulink software. The non-linear load makes the FLC and ANN.

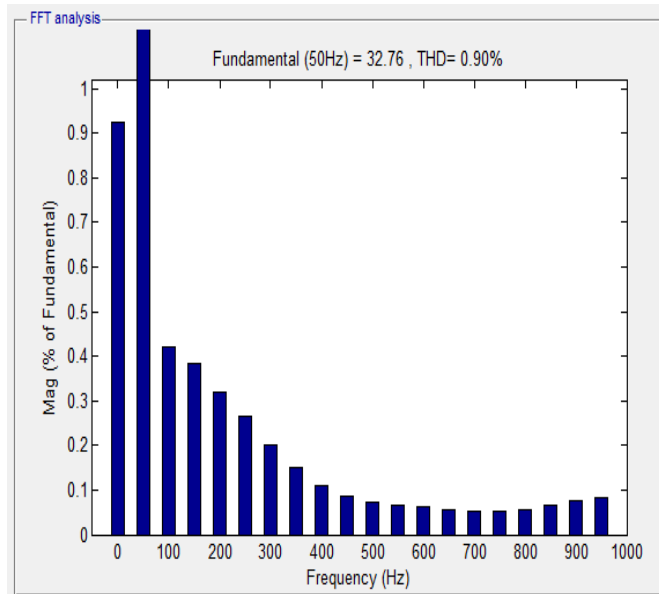


Fig. Total harmonic distortion of non- linear load using fuzzy controller

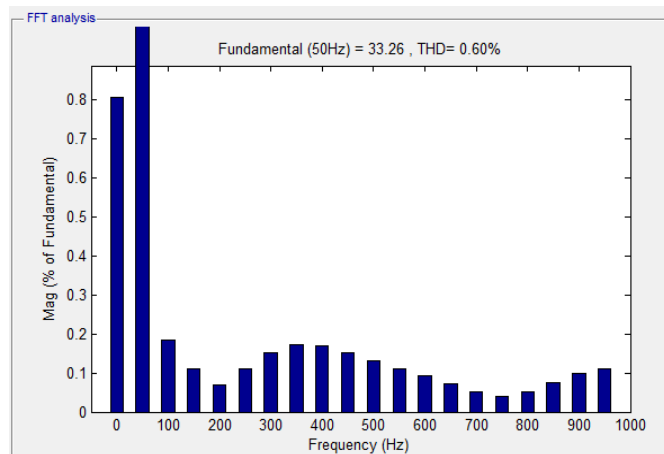


Fig. Total harmonic distortion of non- linear load using ANN controller

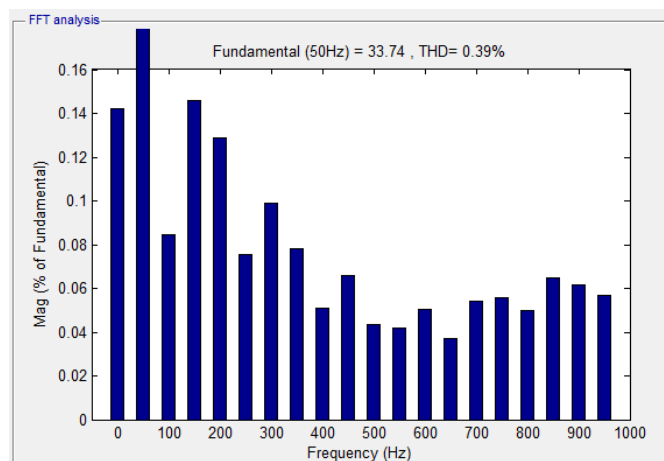


Fig. Total harmonic distortion of non- linear load using Genetic controller

Table Comparison of Various Control Methods in UPQC Based Eight Switch Inverter

THD	FLC	ANN	Genetic Algorithm
Nine Switch UPQC	1.11%	0.73%	-
Eight Switch UPQC	0.9%	0.6%	0.39%

Fig. shows the total harmonic distortion of non-linear load using fuzzy, ANN and genetic controller. The powerless region is first decided before in performance out the proper switching action in system reconfiguration. The system reconfiguration arrangement is accomplished by setting the weak area or the voltage sag sources concerning as conceivable far from the fundamental power supply.

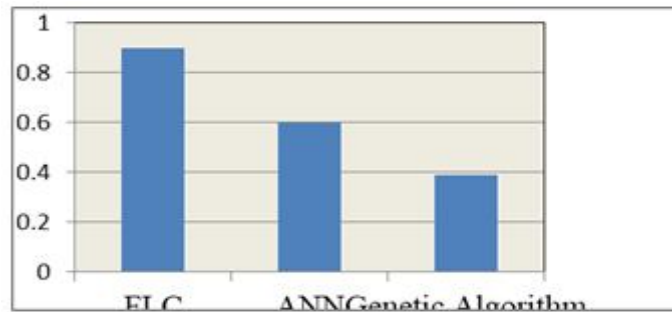


Fig. Chart for THD analysis for Different Control techniques in Eight Switch UPQC

Fig shows the THD analysis of different control techniques. The simulation output waveform for voltage droop at the time of voltage sag the transmission voltage is dropped down the voltage list will be 220 v from phase to phase at the time voltage sag condition this makes the fault and it is overwhelmed by 8 switch power conditioner.

A unified power quality conditioner has planned and a blend of shunt and series active power filter is associated across a dc interface capacitor. The gadget used to diminish the force quality issue, for example, voltage harmonics, gleam, sag and swell condition, receptive power control. The legitimacy is to keep up the load voltage is sinusoidal and the progression of dynamic and responsive power is the significant concern terms.

The degree of waveform phase to phase RMS voltage (v) is 240 and the recurrence is 50 Hz. The base voltage is 240 V and the voltage assessment is a phase to ground. The most outrageous recurrence is 1000 Hz and the input frequency is 60 Hz. Exactly when the 8 switch power conditioner is related the voltage drop has been repaid after that normal phase to stage voltage 240 v has been stayed aware of no drop this cutoff the issue at the transmission side. The genetic algorithm has used to reduce the total harmonic distortion compared to conventional method.

CONCLUSION

A nine switch UPQC topology is proposed to reduce the switches in UPQC. Intelligent control techniques such as FLC is implemented in this nine switch UPQC. The proposed control techniques for UPQC are implemented in MATLAB/Simulink and the results are validated for nonlinear loads, sag and swell conditions.

Results obtained from the THD of source current in unified power quality conditioner fed eight switch inverter using different control techniques are discussed. Three phase fault applied to source side the voltage and current varied at load side. The voltage and current compensated by using the various control method such as fuzzy, ANN, PSO and Genetic algorithm. This control method has to compensate the sag and swell. The compensated voltage has some harmonics it will reduce by control methods.

The research work is focused on detailed analysis of different control techniques that are used for reducing the total harmonic distortion in unified power quality conditioner fed from eight switch inverter. The unified power quality conditioner has utilized for enhance the performance of voltage sag, swell, harmonic distortion. Intelligent control techniques such as FLC, ANN and PSO-ANN are implemented in this nine switch UPQC. The proposed control techniques for UPQC are implemented in MATLAB/Simulink and the results are validated for nonlinear loads, sag and swell conditions. From the results, it is concluded that PSO-ANN algorithm gives encouraging results compared to FLC and ANN controller. Be that as it may, the voltage sag issue at the incompletely relieved buses can be illuminated by locating other voltage sag alleviation device. In spite of the fact that the reconfiguration technique remembers a changed for exchanging status, it enlightens bigger part of the voltage droop concern. The eight switch unified power conditioner has used as the series and shunt converter and which change the back to back converter. The reactive power, harmonics at the load, voltage and current compensation is attained using the pulse width performance. The simulation results demonstrate that the proposed system reconfiguration technique dependent on the space vector regulation is proficient and sensible. The Genetic algorithm control method is utilized in eight switch UPQC to repays the exhibition of voltage droop, expand and decrease the harmonic contortion at the load side. In the proposed framework, the reproduction results with hereditary calculation end up being more powerful than ordinary

techniques. The reconfiguration strategy remembers a changed for exchanging status, it enlightens a bigger part of the voltage droop concern. The receptive force, harmonic at the load, voltage, and current remuneration is achieved the beat width execution utilizing advancing control technique. The genetic algorithm based UPQC using eight switch inverter for improving the power quality are simulated in MATLAB/Simulink software to validate the performance of system.

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**QUATERNARY TECTONIC REJUVENATION INDICATED BY MORPHOMETRIC STUDIES
ALONG THE SIANG RIVER, EASTERN HIMALAYAS, INDIA**

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ABSTRACT

The Siang River flows through the tectonically active Eastern Himalayan Syntaxis. This region is known for high rate of uplift and erosion that may have induced the formation of tectonic aneurysm beneath the syntaxial one. Recent studies have indicated rapid uplift of ~1 km/Ma since the 4 Ma. The uplift is centred within the Siang river valley that is bounded by ~3500 m high valley sides. Regions to the north and south of this rapidly uplifting zone do not show the same rates of tectonic movement. This has led to questions about the extent, nature and cause of the uplift. Keeping in view the relatively short response time of streams to tectonic unrest, and their ability to restructure their path to suit the dynamic landscape, streams are the best proxy to remodel the quaternary tectonics in a region. Using morphometric parameters from the Siang trunk stream and its tributaries, the following study aims to place spatial constraints on the regions undergoing dramatic changes. Results from longitudinal profiles of the Siang River and its tributaries along with their hypsometric profiles demarcate the region to the northwest of the Siang River that is witnessing an extreme change in its equilibrium at least since the Quaternary. Datasets for specific stream power, concavity index and steepness index also corroborate with this result while also indicating recent change in steady-state conditions along the trace of the Main Boundary Fault further to the south. The study presents evidence to argue for tectonic rejuvenation in the Late Quaternary along these regions brought about by the ongoing compressive plate tectonics.

INTRODUCTION

The Siang antiform forms the eastern terminus of the Himalayan orogen and is marked by the conspicuous folding of mountains into a half-dome structure (Acharyya 1998) (Fig 1a). The antiform is separated from the Namche Barwa massif directly to its north by the Indus-Tsangpo suture zone (ITSZ). The antecedent Yarlung-Tsangpo River that cross-cuts the Namche Barwa massif is known as the Siang River once it enters Arunachal Himalaya. Unravelling the deformation history of the Siang antiform forms an integral part in understanding the dynamics between tectonically driven aggradation and erosion spearheaded by fluvial and mass wasting processes.

In mountainous terrain, since bedrock rivers represent a local base level for transected hillslopes, therefore channel incision rates exert a fundamental control on topographic evolution (Kirby et al., 2001). Analysis of channel evolution thus becomes a promising way to estimate the spatial distribution of tectonic activity in an active orogenic setting (Duvall et al, 2004). Geomorphic indices have been developed to identify areas of rapid tectonic deformation. These indices are characteristics observed in a landscape that indirectly reveal quantitative information regarding the influence of tectonism and climate on landscape evolution. Geomorphic indices include the concavity index (θ), the steepness index (k_s) and hypsometric integrals and are calculated from longitudinal bedrock river profile analysis. They can potentially be utilized to constrain actual uplift rates in a steady-state environment.

This study presents a view of the Siang drainage basin using a suite of geomorphic parameters to constrain the pockets undergoing a change in their steady-state. River longitudinal profiles have been used as a first principal result to determine the change the river dynamics with respect to uplift and consequent fluvial down-cutting. Further, to constrain the extent of previously indicated pockets of rapid uplift along the Siang trunk stream and its tributaries, quantitative parameters such as the stream concavity index and normalised steepness index have been computed. Evidence from these techniques was then further consolidated using hypsometric integrals for the entire watershed. This entire dataset brings to the light previously unknown pockets of uplift that are controlled by major and minor faults. Finally, using published values of thermochronological data, argument has been made that indicates Late Quaternary tectonic rejuvenation along two zones of the Siang River in the Eastern Himalayas.

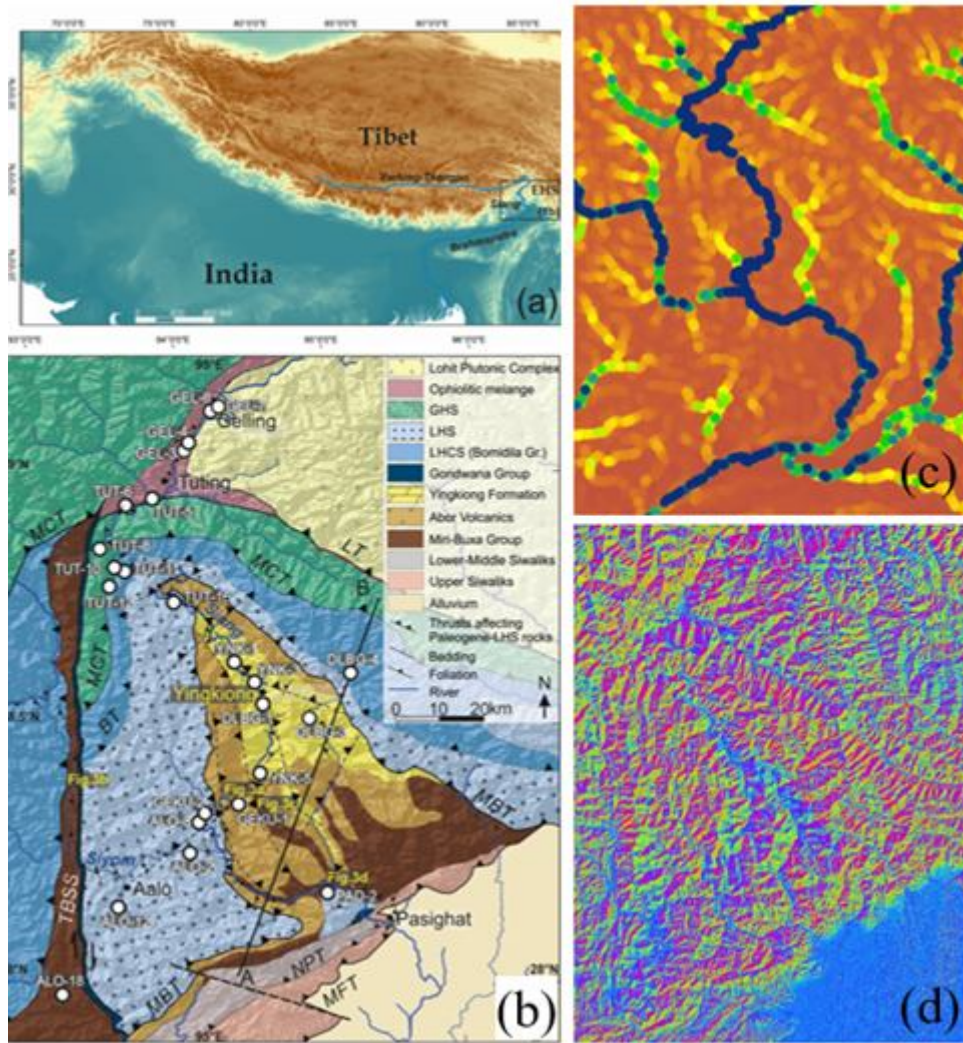
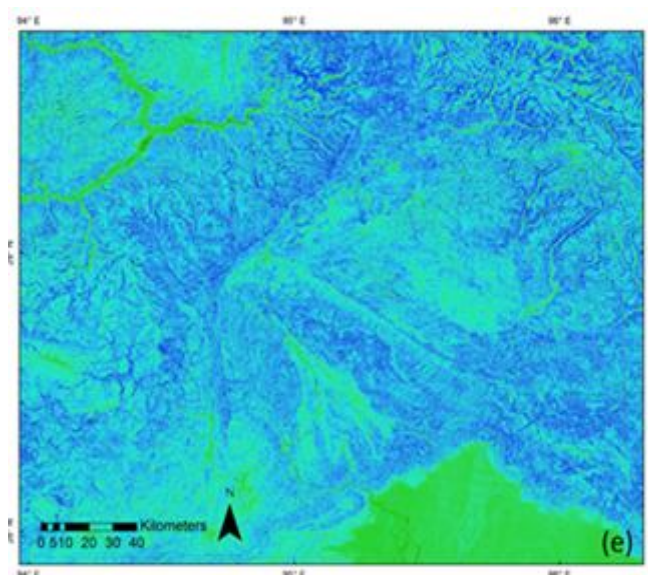


Fig. 1. (a) Digital elevation model of Eastern Himalayan Syntaxis (EHS), India and Tibet. Faults after Acharyya et al., 2007; Booth et al., 2009; Gururajan and Choudhuri, 2007. Blue line shows the path of the Yarlung-Tsangpo-Siang River as it flows through Tibet and the Himalaya. The black rectangle shows location of the Siang antiform; (b) Geological map of Siang antiform modified after Acharyya (2007) with Siang River trunk stream and its tributaries marked in blue. MFT, Main Frontal Thrust; MBT, Main Boundary Thrust; MCT, Main Central Thrust; TBSS, Tuting Basar Strike Slip; LT, Lohit Thrust; (c) Erosion index (normalised over 0.9 km radius) for the study area; (d) Hill shade with aspect 135°; (e) Slope map for the Siang River and its surrounding regions. The green values designate minimum slope while the dark blue values denote maximum slope.



BACKGROUND

Along the Siang River in eastern Arunachal Himalaya, the MCT and MBT thrust sheets are broadly folded into a half dome structure that is truncated to the south (Acharyya 1998; Acharyya and Sengupta 1998). The crystalline thrust sheets overlie a duplex structure that is comprised of Paleogene meta-sedimentary and meta-volcanic sequence. The growth of antiformal duplex has passively folded and breached the overlying thrust sheets to form a tectonic window (Acharyya et al, 2007).

The Paleogene meta-sediments comprise rocks belonging to the Yingkiong Formation and the Miri Formation and are interspersed with those of the Abor volcanic sequence (Fig. 1b). The LHS is comprised of low to medium grade quartzite, schists, and gneiss while rocks forming the GHS are mainly high-grade gneisses and migmatites. A stark difference in metamorphic grade separates the low-grade Paleogene rocks and the medium to high grade rocks forming the MBT and MCT thrust sheets.

Results from previous thermochronological studies in the Siang valley show very young apatite fission track and zircon (U-Th)/He ages (Salvi et al., 2017). All the apatite fission track ages in the Siang valley are younger than 2.5 Ma and three ages close to Tuting in the north of the valley are as young as 1.0 and 0.6 Ma. These translate to a rapid cooling of the upper crust at rates $>75^{\circ}\text{C}/\text{Ma}$ (Salvi et al., 2017). The same trend is observed for the cooling ages derived from zircon by (U-Th)/He dating. The youngest age of 3.8 Ma is from the northernmost part of the valley, near Tuting, giving a cooling rate of $>10^{\circ}\text{C}/\text{Ma}$ (Salvi et al., 2017). Together, this dataset indicates removal of at least 3-4 km of rock mass from the surface since 4 Ma.

METHODOLOGY

3-arc second digital elevation models sourced from SRTM imagery hosted at the USGS EarthExplorer website were used in following geomorphic analysis. The dataset was acquired and stitched together into a mosaic and then duly corrected using a smoothing filter of 3×3 pixels. Values for slope and relief were computed from this corrected dataset. To calculate the erosion index, the stream power law model proposed by Finlayson and Montgomery (2003) was employed. Based on this model, the upstream drainage area and slope is computed for each pixel. By modifying the relation for the stream power law of erosion (E) given by Synder et al. (2000), the erosion index for each point can be calculated using the relation: $EI = A_m S_n$, where m and n are constants that modified to derive the variations of the stream power law. Values of 0.5 and 1 were used for the exponents m and n, respectively, to compute the unit stream power.

This was followed by extraction of streams from eastern Arunachal Pradesh using the D8 algorithm. Longitudinal river profiles were generated for each tributary and for the trunk stream in the study area. River longitudinal profiles reflect the changes in channel drainage area and slope and are useful to determine steep reaches along streams that may correspond to a change in the channel equilibrium. In order to reduce the variations induced by variable basin relief and size, and to facilitate comparison between the channels, the river long profiles were normalised for basin relief and total distance (Lee and Tsai, 2009). A graph of log-drainage area vs. log-slope was plot (Appendix) to determine the power-law scaling for each stream. The critical drainage area was obtained based on the first 'knickpoint' in the regression line for each stream. An average value of 104.6 was determined for all the streams in the study area. Points before this value typically form a part of colluvial scaling or divergent topography.

Concavity and steepness indices were calculated for each individual channel following the workflow shown in the figure 3. Regressions performed for individual streams provided the values for concavity (Θ) and steepness (K_s) for each stream. The mean concavity was then computed from the weighted average concavity of all the streams in the study area. Normalised values of K_s for the Siang valley and surrounding regions are shown in figure 4.

Hypsometric analysis represents the relationship between elevation and basin area, watershed, or catchment (Langbein, 1947; Strahler, 1952). It can provide insight into the erosional maturity and flood response of a basin. Hypsometric curves were calculated for the study area based on the tributary basin area and elevation while hypsometric integrals were calculated using the variation in channel relief. These indices can be effective in delineating local effects of denudation and tectonic uplift.

In this study, the drainage basin for each of the major tributaries of the Siang River in Arunachal Pradesh was segregated and then the values of a, h, atot and htot were computed for each tributary basin. Hypsometric curves were plotted as relative height h/h_{tot} against relative area a/a_{tot} on the graph which shows the amount of land area at each elevation step. All the graphs were normalised along the abscissa and the ordinate to enable comparison between the individual streams.

RESULTS

Topographical metrics and channel longitudinal profiles

Elevations within the Siang valley vary from about 120 m in the foreland of the Himalayan ranges to greater than 4000 m as we move northwards (Fig. 1d), towards the hinterland. Valley floor height for the Siang River decreases steadily from 550 m in the north, near the town of Gelling, to 150 m near Pasighat in the south. At Pasighat, the Siang River creates extensive alluvial fans as it exits the its narrow Himalayan valley. Topographic relief (Fig. 1d) increases with an increase in the rock uplift rates (Ahnert, 1970; Synder et al., 2000). The eastern and western flanks of the Siang main stream show a dramatic difference in topography and relief. In general, the eastern mountain ranges of the Siang River have greater elevations reaching up to 4100 m and higher relief of about 2400 m. In contrast, the western flank of the Siang River shows highest elevations of 3000 m and relatively lower relief of 900 m.

In its northernmost reaches, the Siang river has eroded its course through gorges that are 4000 m deep from the adjacent valley peaks. Further south, this relief reduces to about 2000 m. The longitudinal profile constructed for tributary 3 shows the maximum concavity as compared with all other graphs. Long profiles for the northernmost tributaries 1 -7 show convex-down profiles that suggest that these streams are in a state of flux while profiles for the more southerly tributaries 8-13 indicate a more steady-state profile tending towards an appropriately graded stream profile for a mountainous river.

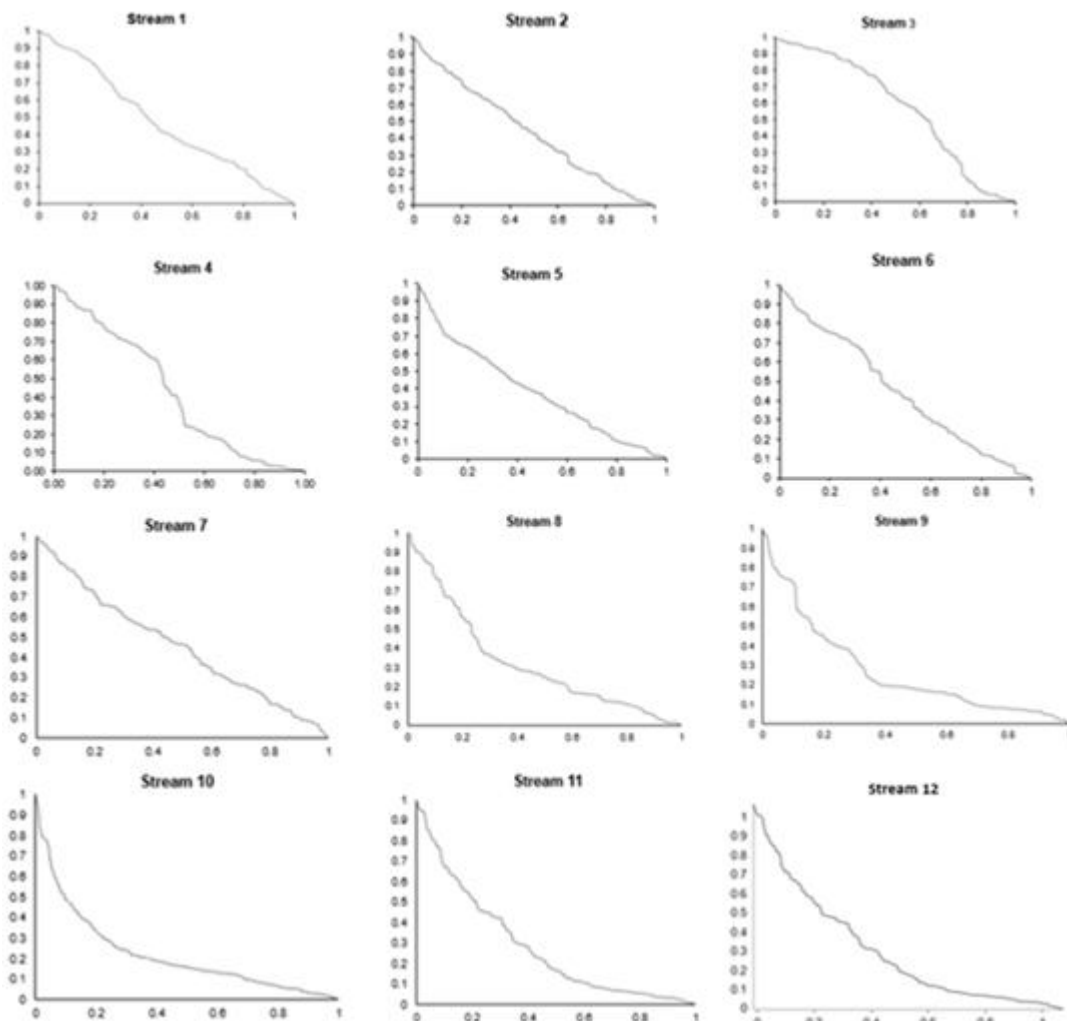


Fig. 2. Longitudinal profiles for the tributaries of Siang River valley. The profile for tributary 3 shows the maximum concavity as compared with all other graphs. Long profiles for the northernmost tributaries 1 -7 show convex-down profiles while profiles for the more southerly tributaries 8-13 indicate a more steady-state profile.

NORMALISED CHANNEL STEEPNESS INDEX

The concavity and steepness values for the entire drainage network of the Siang were processed following the workflow shown in figure 3. Distinct increases in the steepness values of multiple tributaries along a lineament may indicate fault activity (Fig. 3b). Higher steepness values are noted along the major faults such as MCT (Fig.

3c) and MBT (Fig. 3d and e) in different parts of the study area. Local changes in the steepness values along a stream may result from tectonically controlled differential uplift such as those observed along the Siang River (Fig. 3b-d). Peak values were noted along two distinct regions in the north, just to the south of Tuting and in the southern portion of the Siang valley, close to Padu (Fig. 3d).

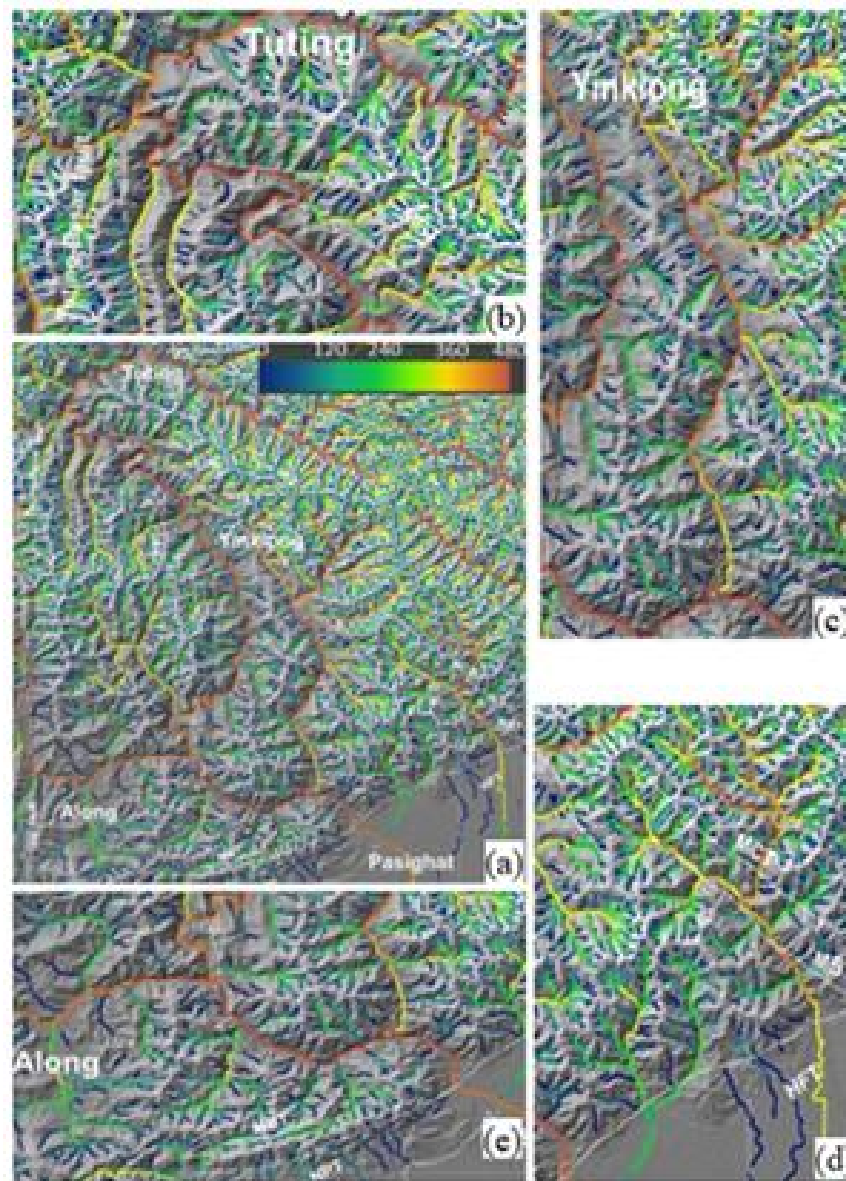


Fig. 3. Digital elevation image of the study area with the steepness values for the Siang River and its tributaries. Parts of the stream in red denote high values while those in blue indicate lower values. Magnified portions (b-e) emphasise the local variation of channel steepness values along streams.

HYPSONETRIC CURVES AND HYPSONETRIC INTEGRALS

A total of 13 tributary watersheds were extracted and the value of the hypsonetric integral (HI) was computed for each separately. The HI values ranged between 0.26 and 0.57 for the entire Siang valley. The drainage basins in the south showed the lowest values (<0.40), with values consistently increasing for drainage basins in the central and northern parts of the study area. The highest value of 0.57 is shown by the drainage basin 3 to the north-west of Tuting.

Table 1: Hypsonetric integrals for the tributaries within the Siang River valley

Basin number	Area (km ²)	Minimum elevation	Maximum elevation	Relief	Mean Elevation	HI
1	0.03	869.00	5644.00	4775.00	3371.85	0.52
2	0.12	425.00	4325.00	3900.00	2480.33	0.53
3	0.07	420.00	5404.00	4984.00	3281.84	0.57

4	0.00	3287.00	4417.00	1130.00	3575.72	0.26
5	0.01	419.00	4605.00	4186.00	2419.94	0.48
6	0.01	404.00	2973.00	2569.00	1564.85	0.45
7	0.01	390.00	2909.00	2519.00	1453.47	0.42
8	0.01	405.00	2912.00	2507.00	1512.04	0.44
9	0.01	417.00	4123.00	3706.00	2167.80	0.47
10	0.05	263.00	3043.00	2780.00	1364.28	0.40
11	0.53	210.00	5002.00	4792.00	2182.40	0.41
12	0.10	408.00	5217.00	4809.00	2786.19	0.49

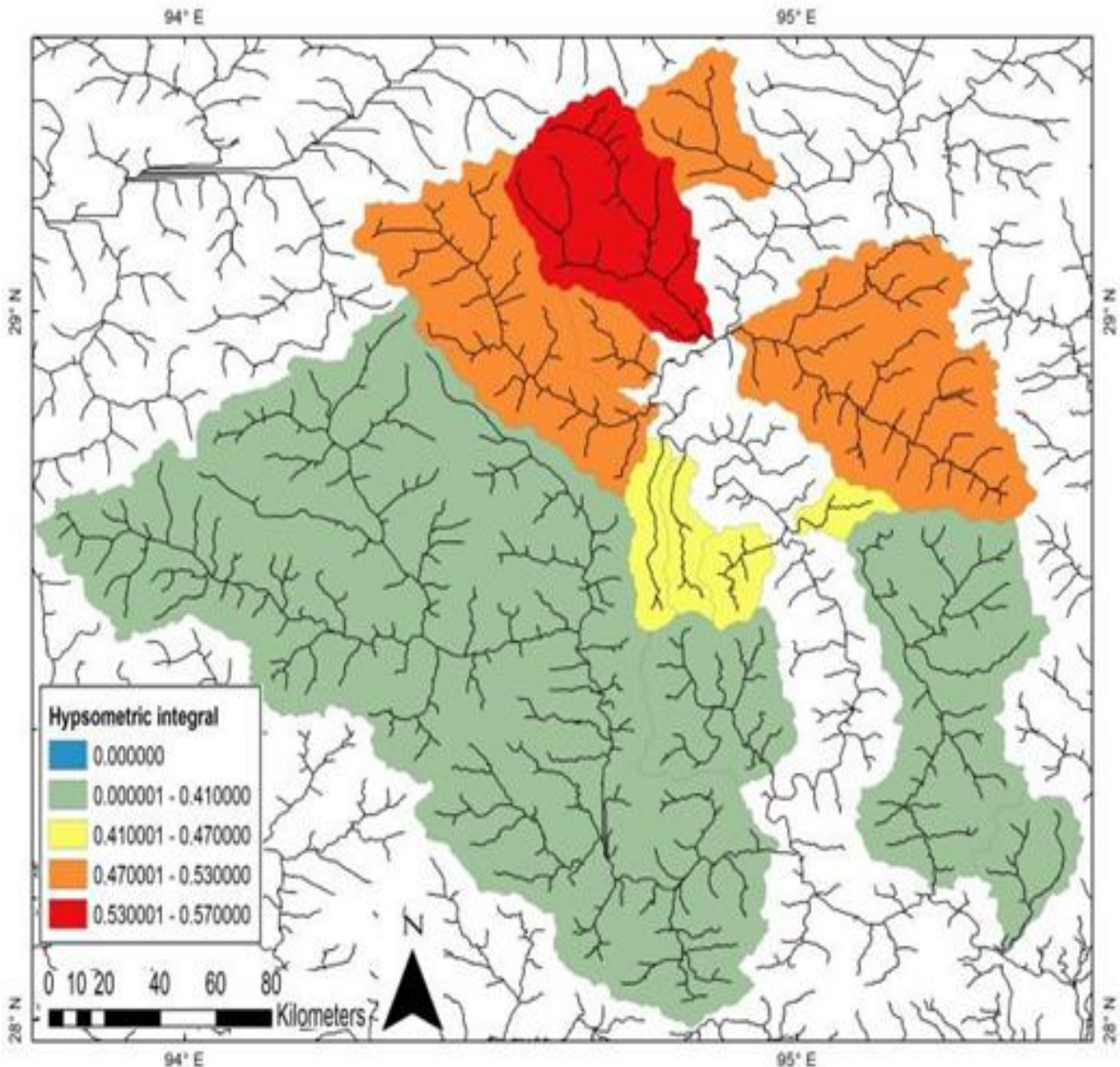


Fig. 4. Hypsometric integrals for the Siang River tributaries. The values range between 0.26 (green) and 0.57 (red) for the entire Siang valley with a consistent increase towards the central and northern parts of the study area.

Hypsometric curves were plotted separately for each sub-basin of the Siang River within the study area (Fig. 5). The curves for drainage basins 1, 3 and 5 show the steepest convex-down curves denoting high elevations, young landscape that is pervaded by diffusive processes. All these three basins drain the high topography to the north-west of the Siang River. Basins 2, 4, 7, 9, 10, 12 and 14 show protracted S-shaped curves (concave at high elevation and convex at low elevations) indicative of older basins which are relatively more mature. The drainage basins 6, 8, 11 and 13 are smaller basins and show a linear hypsometric curve indicating that these drainage basins are presently in dynamic equilibrium.

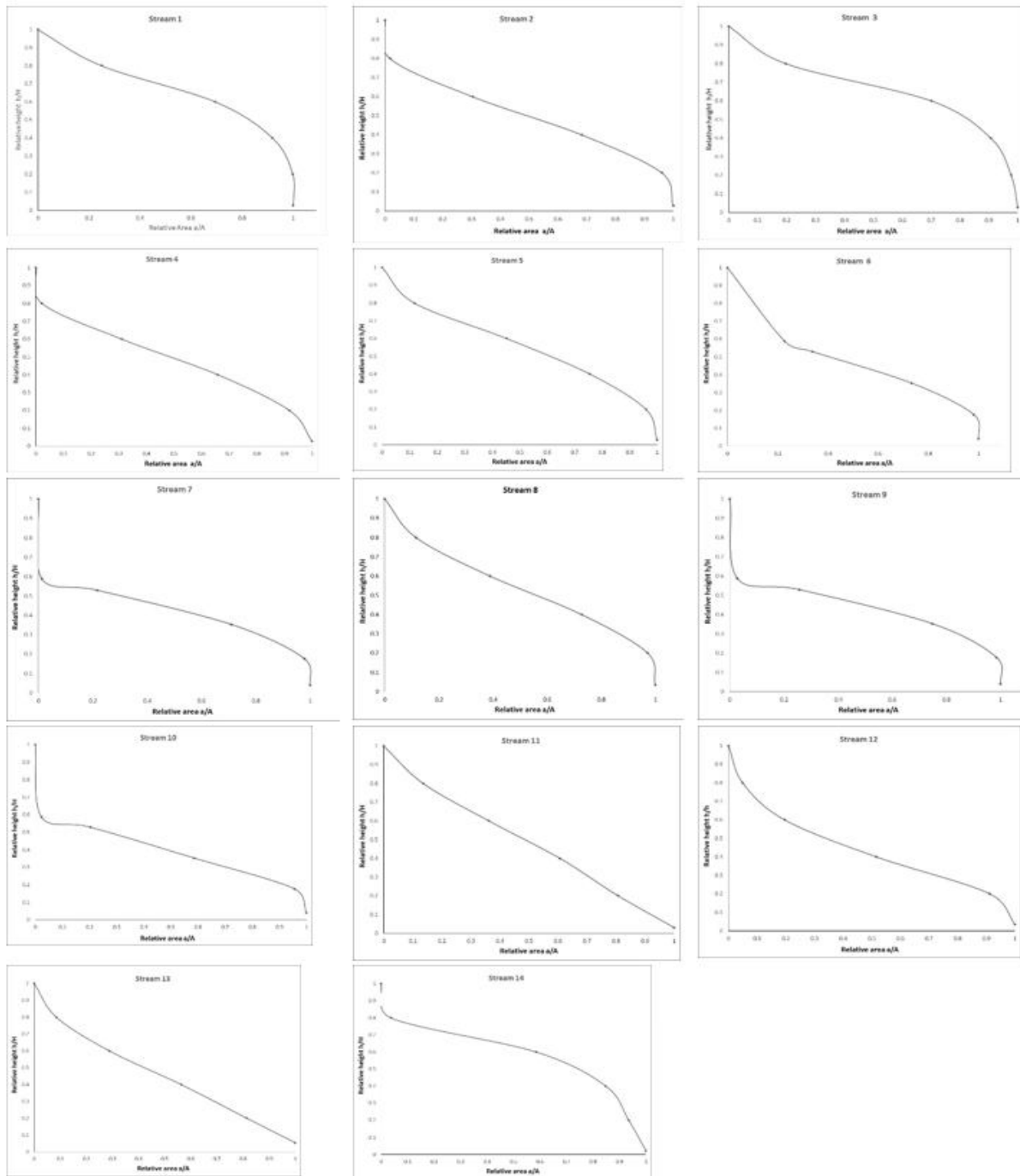


Fig. 5. Hypsometric curves for the Siang River tributaries. The curves for drainage basins 1, 3 and 5 show the steepest convex-down curves while basins 2, 4, 7, 9, 10, 12 and 14 show protracted S-shaped curves (concave at high elevation and convex at low elevations). The smaller drainage basins 6, 8, 11 and 13 show a linear hypsometric curve.

Discussion

Results from topographic analysis of the Siang River valley which include that slope, relief and data results from the erosion index show that the region to the northwest of Tuting has very steep gradients, consequent high relief and high erosion potential. Tributary 3 that drains this region shows the highest values of concavity and an abrupt increase in the readings of normalised steepness index. In addition, the hypsometric curve for this drainage basin indicates that it is unstable, quickly eroding terrain that has very young topography. Surrounding left bank drainage basins of the Siang River tributaries 1, 4 and 5 also show similar results for long profiles, channel concavity and hypsometric curves although their results are less extreme than that for tributary 3. The right bank tributary 2 on the other hand, shows much lesser values for all the parameters as compared to all the other basins. This indicates that it is only the left-bank of the Siang River, the north western portion of the Siang River valley that is showing such young and unstable topography.

Moving southwards, the value of the hypsometric integral tends to reduce gradually for the tributary drainage basins. This indicates higher stability and maturity of these basins as compared to the drainage basins in the north. This trend clearly points towards a northward increase in the uplift witnessed within the Siang River valley. This trend is reflected and supported by the northward younging of the AFT ages (Salvi et al., 2017) in the Siang valley, however, no such trend is observed in the zircon (U-Th)/He ages. The younging AFT ages thus help constrict the beginning of this northward younging to the Early Pleistocene, Quaternary period.

Apatite fission track ages <1.0 Ma and zircon (U-Th)/He ages <4 Ma (Salvi et al., 2017) from the upper Siang valley imply removal of ~3-4 km of rock mass from the surface in the last 4 Ma and removal of at least 1.5-2 km of rock mass from the surface in the last 1 Ma. The removal of such a large amount of material is effective in regions that have strong diffusive processes such as mass-wasting and fluvial agents at work. Hillslope processes such as landslides and rill erosion remove the material from high peaks via collapse and sliding and transport them to the base of the valleys where active fluvial agents work tirelessly to remove this material. Rapid rates of uplift are thus countered by weathering and erosion to balance each other out and maintain a prolonged dynamic equilibrium.

The concomitance of young thermochronological ages and unsteady long profiles for tributary 3 indicate that this region is witnessing high levels of uplift induced by tectonic activity. There are no major reported thrust faults or no observed vertical displacements in the region drained by this stream. However, the general inaccessibility to this region because of the steep and unstable topography coupled with the dense tropical vegetation makes it difficult to completely eliminate the possibility of a local fault that may be driving this vertical uplift.

Data presented by Salvi et al. (2017) for the stream power along the Siang River valley focussed on only the main trunk of the Siang River and proposed a mechanism for climatically controlled deformation along the trunk stream. While this is true, results from this study indicate that the tributaries of the Siang River are also witnessing a gradual change in their equilibrium that is changing similarly with the Siang River from the south to the north. This indicates that it is not only the main trunk stream of the Siang River that is undergoing rapid evolution since the Early Pleistocene but also the entire Siang drainage network within Eastern Arunachal Himalaya.

CONCLUSIONS

- The region to the north-west of Tuting is undergoing rapid uplift and erosion. This is indicated clearly by the shape of the river long profile, erosion index, and hypsometric integral for the basin.
- The specific stream power, concavity index and steepness index also corroborate with this result while also indicating recent change in steady-state conditions along the trace of the Main Boundary Fault further to the south.
- Datasets from the previous studies along in conjunction with the present study highlight the extreme change in the equilibrium of the northern reaches of the Siang River at least since the Early Quaternary. This can be used to argue for tectonic rejuvenation in the Quaternary along these regions brought about by the ongoing compressive plate tectonics.

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TOURISM MANAGEMENT**Johns Vincent¹ and Aayushi Desai²**¹Student, Finance, Chetana Hazarimal Somani College of Commerce & Eco., SMT. Kusumati Chaudhari College of Arts, Self Financing Courses, Bandra (E), Mumbai²Student, Marketing, Chetana Hazarimal Somani College of Commerce & Eco., SMT. Kusumati Chaudhari College of Arts, Self Financing Courses, Bandra (E), Mumbai

ABSTRACT

This paper reviews the significance of tourism management in tourism sector to emphasize the fact that effective management is inevitable for acquiring productive and outstanding results in any business. To understand it fully it is necessary to analyse not only the the main elements involved in the management of tourism such as planning, marketing and operating but also, the influence of tourism management over the ethnic, societal and financial dimensions of a country. A close study about the various types of tourism and different options available for management of tourism along with deep knowledge in the new upgrading trends of this sector can make it more easy to understand the functioning of tourism management. Eventhough, the sudden occurrence of COVID-19 pandemic have badly affected the tourism sector, it is expected that things will get back to its normal pace in coming years, because of the efforts made by both government and public. The paper concludes after a close evaluation on tourism management and it's impact on a nation along with a noting of how tourism management will make use of latest technologies in future.

Keywords: COVID-19, Technology, Tourism, Management, Marketing.

INTRODUCTION

Tourism is one of the strongest benefactor that contributes to growth of the economy of nation over the last few decades. Tourism is a cultural, economic and social domain which is based on the movement of a person to any place, either for business or for pleasure. Recently, people consider holidays as essential, and not as a waste of money. Tourism involves the teamwork of travel agents, tour operators, and tourists and has many key elements – destinations, attractions, sites, accommodation, and all ancillary services. Thus, Tourism management is a multifaceted sector that includes: observing tour destination, planning, making travel arrangements, organizing, staffing, leading or executing, and controlling of the total tour package. Tourism management works for expanding the attraction of people to different places. It's main objective is providing good hospitality, satisfaction of tourists and gain more profit. Tourism management executes by satisfying the requirements and preferences of visitors accordingly by providing all the services possible. Thereby, increasing customer flow to that place.

IMPORTANCE OF MANAGEMENT IN TOURISM

Effective management of tourism contributes to the expansion of native and national economies worldwide. In fact, fifth of all world jobs created over the past decade are among the travel sector. Nearly 10 % of all jobs are supported by this trade. A lot of people visit a town or country, the extra money they pay helps to grow the native economy and attracts investors. New hotels and vacation resorts open their doors, resulting in the creation of recent jobs because the native infrastructure and services improve, the quantity of tourists will increase even more to the commercial enterprise which drives into business growth. If customer area units are joined along with your services, they're contribute the business regarding your facility, whether or not it is a native saloon or buildings. This may bring you a lot of purchasers and provides you a competitive edge.

Types:**DIFFERENT TYPES OF TOURISM**

1. Domestic Tourism – Having free days and travelling within own country.
2. Inbound Tourism – People from other countries visit our nation.
3. Outbound Tourism – Travelling to another country for a visit or a holiday.

DIFFERENT TYPES OF TOURISM MANAGEMENT:

- Mass business enterprise It involves organized massive teams of individuals travelling to special locations. it's a group action. These tourists usually look for some souvenirs and site-seeing.
- Alternative business enterprise It involves when only an individual tourist travels to search out places, it's native culture and setting.

- **Business** It means people travelling to conduct business transactions, attending business conferences, workshops, or conferences.
- **Pleasure** It includes when people go for trips to acquire happiness, enjoyment and physical well-being.
- **Nature** It is for exploring the nature and serene beauty. It's main objective is to expertise and enjoy the nature, like farms and life.
- **Cultural** This type has associate objective of understanding the native history of the place, foods, native productions, and native culture.
- **Social** Social means trips having in families like friends, members of family or other relatives.
- **Recreational business enterprise** It includes a plan to flee from routine life. Typically means enjoyment, amusement, or pleasure.
- **Active business enterprise** It is conducted with a transparent objective like hike a mountain, road round the world, or learning native arts or languages.
- **Sports business enterprise** It is business enterprise for attending some sports event like tournaments, FIFA, or Olympic Games.
- **Religious business enterprise** It involves a move to places of temples to worship like Vaishno Hindu deity in Jammu-Kashmir and Golden Temple at Amritsar.
- **Health or Medical business enterprise** It involves move to boost one's health. It's with the target of visiting weight-loss camps, treatment centers, and health resorts.
- **Adventure business enterprise** It involves for various activities like ice climbing, rope jumping, sky-diving, hiking, horse-riding, surfing, rafting, or skiing.

IMPACT OF TOURISM

- **Social and cultural impact** Social & cultural impact signifies that it creates social changes within the lives of native individuals, enhancements in infrastructure etc. Touristry may completely make changes on the communal and ethnic aspects of life in that region. Tours collectively target exclusive innate or geological choices like health resorts, islands, rural areas and mountains etc. At such locations, the high inflow of travellers can make certain impacts on the ambience, economy, native social practices and also on the natives.
- **Economic impact** The economic impact will be figured in terms of financial edges and complete economic buildout of the society. The business dealings has contributed to the economic advancement through elements like strategic promoting, liberal trade policies, advanced technology, industry, better range of qualified professionals, education, gap of foreign markets, and higher advertising. These factors collaboratively foster the economic stocks of that zone therefore resulting in an uplift of financial gain and elevates the income. Business can also make the economies of regional and native levels flourish, as cash comes into rural and urban areas that consecutively stimulates new business enterprises, larger merchandise and improves the positive image of the world.
- **Environmental impact** Environmental impact implies to the effect on nature and hence the encompassing areas. The influence of touristry on the surroundings can be both positive or negative. For increasing the attraction, special stress is given on the general change of state of the surroundings. Regular planting of trees and landscaping are done to boost aesthetics. Huge effort and finance is invested to boost the facilities within the space such as resting areas, shades, correct sanitation, food and drinks, etc. Extra care is given to preserve the monuments, heritage structures to draw in more tourists.

IMPORTANCE OF PLANNING IN TOURISM MANAGEMENT

Tourism planning is an important part of any destination's tourism development plan in order to obtain the excellent results. Tourism planning is the key to maintain viable tourism and some destinations do this competently. Others (predominantly developing countries), fail to acknowledge the value of effective tourism development designing. Tourism development refers to the growth and nurture of the tourism industry in a given spot and tourism planning is its integral part. Basically, tourism development can be interpreted as constructing plans and ideas to escalate or uplift tourism for a destination. The primary reason behind planning and implementing policies for developing the tourism sector is to make money and to subsequently increase the Gross Domestic Product (GDP) of a country or an area.

The main levels of tourism development planning include: evaluation of the position of tourism in the area including competition, the analysis of previous tourist development, evaluation, formulation of relevant tourism policy provided by the Government.

IMPORTANCE OF MARKETING IN TOURISM MANAGEMENT

The motivation behind tourism marketing is to aid and upgrade the business, make it stand defended from rivals, captivate the customers, and generate brand perception. Several modern tourism marketing ways create use of the internet with websites, online adverts, email and social media platforms typically enjoying a key role. A solid marketing strategy is crucial in any business and also the tourism is not any different. Tourism is one amongst the quickest growing industries within the world and is additionally one amongst the most effective ways that spice up a country's economy. With a lot of destinations realising this and seeking to draw in a lot of tourists, the business is turning more and more competitive. This can be why it's currently more necessary than ever to ensure that your marketing strategy is up to scratch.

5 main reasons for a marketing strategy in tourism business:

1. Determine the best target market The first method is to develop a marketing campaign by finding the ideal target market.
2. Attract new customers and develop loyalty Once the best target market has been known, a method to succeed in these potential customers should be developed. As client loyalty is the key, plenty of your time must be dedicated to building complete awareness, making in progress, interconnecting campaigns that target previous guests, and attract new ones.
3. Perceive the client journey In tourism, the final word is 'experience' which is not an object and it suggests that the client journey to create an acquisition is totally different and comes with its own set of challenges. Understanding this 'journey' that the client takes before probing with an acquisition is vital to a sure-fire promoting campaign.
4. Stand out from competitors As tourism is becoming more competitive, it's vital to create positive that your business stands out. Highlight what's distinctive or what is totally different considering that this business is one amongst the most effective ways to attain an extremely smart promoting strategy.
5. Hone in on the prime effective ways Using analysis and analytical tools, a promoting strategy permits you to assess which resources are best helping to succeed in your customers. Then specialize in those resources to make sure that the most effective service is provided.

THE MORDERN TRENDS IN TOURISM BUSINESS

Tourism could be a fast business with new developments and trends.

Solo Travel : This is a progressive change, when people seeks for a new experience, to immense themselves in culture. As travel data is easily accessible nowadays, it's effortless for individuals to travel on their own. A good deal of travel agencies are currently supplying tour assistance for single travellers.

Eco-tourism : Eco-tourism is popular as more travellers become responsive and care to lessen their carbon footprints on the atmosphere. Eco-tourism means the move to a comparatively untouched atmosphere with the intension to offer bringing things back into the society. This sort of travel provides guests an insight understanding the earth. It's totally different from the industrial business that a lot of holiday makers proceed. Eco-tourism is one in all the quickest growing sectors of the business.

Food business : A lot of individuals are currently distinguishing as foodies and with a bigger quantity of individuals, these trips has become an activity jam packed with pleasure. Fast globalization means that we have a current tendency to try various international cuisines. For this reason, keen foodies travel abroad to satisfy their taste buds. June tenth is the national food tour day.

Accomodation and travel flexibility : The increase of platform business has become acquainted with new ventures that didn't exist one or two years past. Uber has become one in all the foremost triple-crown start-ups in recent times, operated in over three hundred cities. It's the sole taxi firm that's notable wide round the world. It's flexibleness offers help for tourists that navigate around a brand new town.

FUTURE OF TOURISM MANAGEMENT

It is quite obvious that tomorrow's tourists and tour operators will depend more on growing technology. With the introduction of succeeding generation apps and on-line services, tourism became more accessible. Economical booking services and apps can change the tourists to become versatile with affordable value. Future

tourists wouldn't value more highly to be confined to packaged tours. With the supply of huge variety of choices, the tourists would favor to understand options achievable. This will make the management of tourism more facile and straightforward.

OUTCOMES OF COVID-19

COVID - 19 pandemic has caused a good fall in virtually every sectors recently. The industry of tourism is perhaps the worst hit sector because of the pandemic and the resulting restrictions obligatory throughout the lockdown period and also on the far side. Revival of this business ought to be a primary for concern for next few years. Tourism industry in India needs a push for its revival and immediate reliefs underneath GST laws can bring an impetus to this present sector to survive from this never-seenbefore international financial condition.

CONCLUSION

Tourism is a sector that highly contributes to the revenue of the economy of a nation. It encourages the socio economic, cultural, environmental and employmental aspects of a nation. Effective management of tourism with proper planning, marketing and executing by making use of the technology available and understanding the latest trends, can make it attractive among people and outstanding among competitors.

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ARE LABOUR WELFARE SCHEMES EFFICIENT IN REDUCING THE INDUSTRIAL LABOUR ABSENTEEISM? AN EVALUATIVE STUDY OF BELAGAVI CITY

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ABSTRACT

In any economy land, labour, capital and organisation are not only the factors of production but also the pillars of the system. Out of these four factors labour and organisation are active factors and land and capital are passive factors. Despite the technological revolution, the dependence of the industrial sector on human resources has not diminished. The high degree of specialization and interdependence of all industrial operations has necessitated the devoted and regular attendance of workers. In India, the welfare benefit to the employees whether it be statutory or voluntary is available only to the workers employed in formal sector, who are hardly 10%. Left over 90% of the labours, who are more than 40 crores in number, and employed in unorganised / informal sector like construction, agriculture industry is either deprived their rights. In this project, an attempt has been made to study of the welfare measures available in construction industries. The statistics have been composed through primary survey by administrating a detailed questionnaire to section of the employees selected at random. The percentage analysis is used to know the satisfaction level of the employees regarding welfare measures as suggested in the Factories Act, 1948.

Keywords: Job, Labour, Productivity, Safety, Satisfaction, Security, Wages, Welfare

1. INTRODUCTION

Human resource is an significant factor in the growth of the construction industry and therefore understanding the labour behavior is very much essential to progress the effectiveness of production. Labour is considered to be most essential of a nation as they make all prosperity from natural assets and is the pillar for the development of the nation. Utilization of any resource largely depends on the efforts and the worth of the labour assets of the nation. Labours are essential as they need to operate the machineries and equipment. They holding responsibilities and modernizing new procedure in order to increase the effectiveness of the process and enable a nation to get industrially developed. Building and Construction industry is familiar as the unorganized sector involving financial activity after agriculture in India with massive temporary and casual labour. Such industries make demand for both skilled and semi-skilled labour power. The labors face inherent risk to life/vital body parts due to job-related dangers with lack of basic facilities and insufficient welfare amenities. Lack of safety, lack of skills, lack of quality materials, low wages, communication barriers like that mostly make mental pressure to the labours and it totally disturbs the labour production efficiency. The proprietors benefit from fulfilled personnel as they are more likely to revenue from lower staff income and higher productivity if their workers knowledge a high level of job satisfaction. However workforces are fulfilled with some work provision necessities, most of the labors are very displeased with working situation and work benefit of the work provision requirement. In spite of statutory requirements and enforcing agencies in the welfare amenities were absent and hence welfare examination and empowerment of welfare examiners are essential. Women building workers stated that labour welfare benefits and schemes were not at all appropriate to them. An administration's necessity to attract and hold valued workers in a highly competitive labour market is a strong inspiring factor for increased administrative awareness and action with regard to implementation and management of Work life Balance WLB policies (Helen De Cieriet al 2007). The female workforces that they were not provided with any basic facilities except drinking water on the sites and the women workers were engaged in unskilled jobs (manually carrying/transferring construction materials) facilities except drinking water on the sites) (SEWA 2000)

The Government of India passed the legislation namely, Building and Other Construction Workforces (Regulation of employment and conditions of services) Act, 1996 but not enforced properly. According to the Report of the Committee of Labour Welfare setup by the Government of India in 1969, labour welfare refers to "the measures, which promote the physical, psychological and general well-being of the working population.

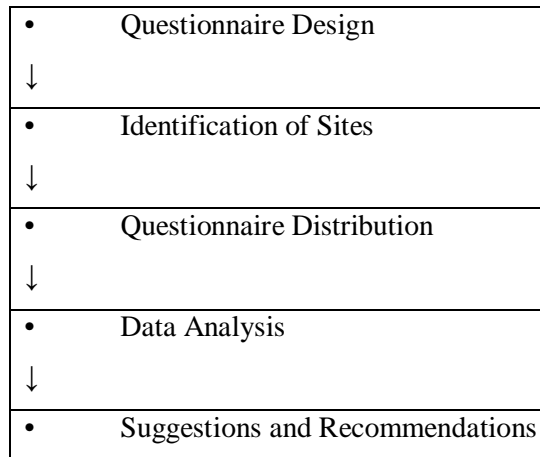
2 .OBJECTIVES OF THE STUDY

- To study the current welfare measures adopted by the organization.
- To recognize the impact of the welfare measures upon the worker's health and productivity.

- To pin point disparity in the existing welfare facilities.
- To identify the place of deviation in the implementation of welfare measurers from the statutory regulation of the Factories Act.
- To recommend suitable remedies related to welfare problem so as to increase the job satisfaction and productivity.

3. METHODOLOGY

The methodology followed in the project work is formulated in form of flow chart



4. QUESTIONNAIRE DESIGN

The investigation is carried out by framing a questionnaire and conducting a survey among numerous employees in nine construction firms to know about their view regarding the level of fulfilment in the welfare measures provided by their organization. Six point Likert scale is used in which the scale ranges from 0 to 5 with the level of satisfaction varying from highly dissatisfied to highly satisfy. The various categories of welfare measures analyzed in the questionnaire are as follows

- Statutory welfare measures
- Non-statutory welfare measures
- Wages and Leave
- Safety measures
- Recreation facilities
- Social security measures

Apart from the above listed welfare measures, the impact of these welfare measures are also analyzed.

5. WEIGHTED MEAN AVERAGE AND PERCENTAGES METHOD

The data examination is carried out by finding the weighted mean average of various provisional amenities under each category of welfare measures. For easier interpretation, the weighted mean average is converted into percentage score using the formula $\text{percentage score} = (\text{Mean score} - 1) \times 25$. It is carried out by making an assumption that mean score of 1 corresponds to 20 percent, 2 corresponds to 40 percent, 3 to 60 percent, 4 indicates 80 percent and finally 5 denotes 100 percent.

6. DATA ANALYSIS AND INTERPRETION

The welfare measures awareness among the employees is recognized from the survey and is presented in the form of graph:

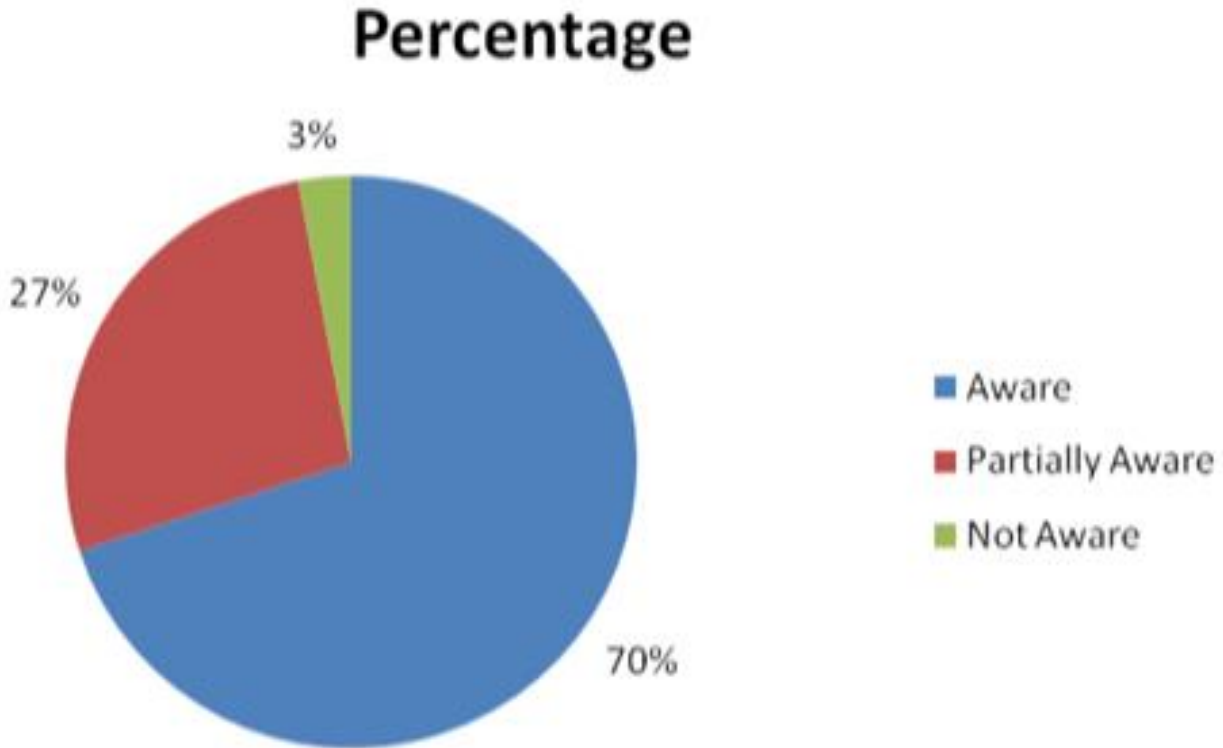


Fig. 1. Welfare Measure Awareness among Labourers

From Fig6.1, it can be observed that nearly 97% of the labourers are aware and partially aware about the existing welfare measures. This implies that they have enough information regarding the welfare measures and hence they can accurately specify their level of fulfillment in various welfare measures showed in the survey. The overall satisfaction level of welfare measures provided in the working area of the respondents are represented in the form of chart as shown in Fig6.2

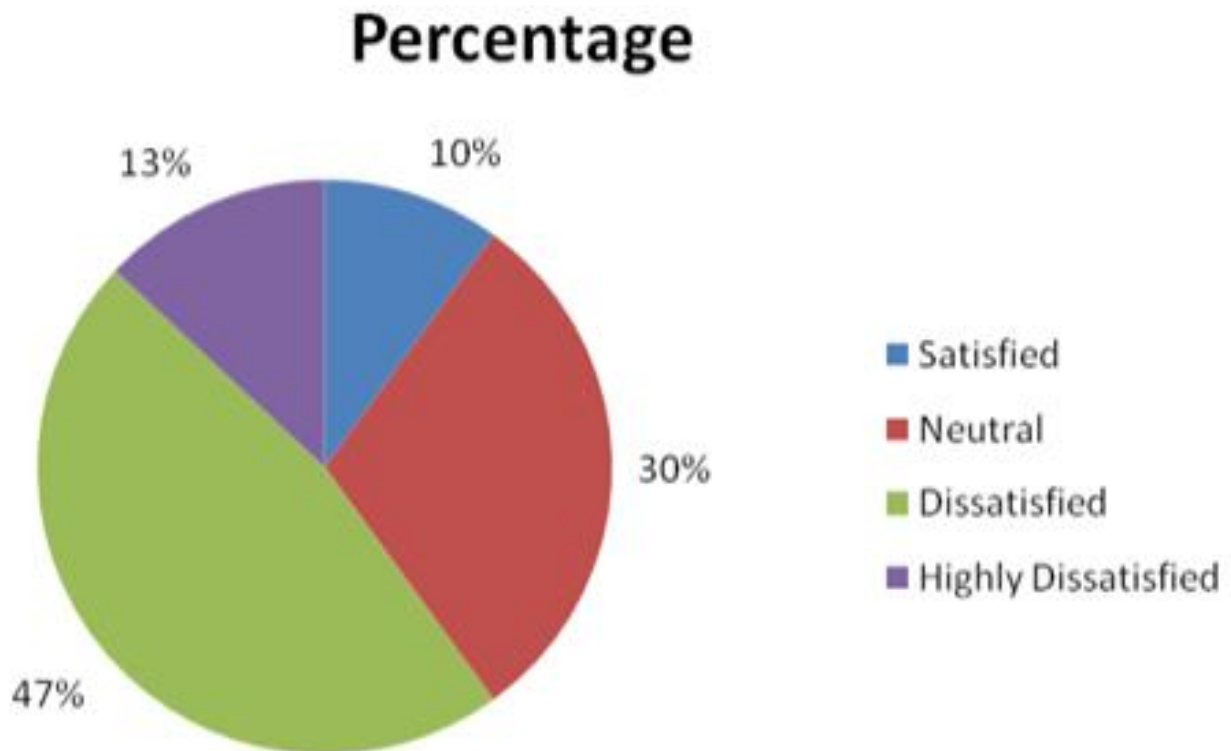


Fig6.2 Overall satisfaction among labourers

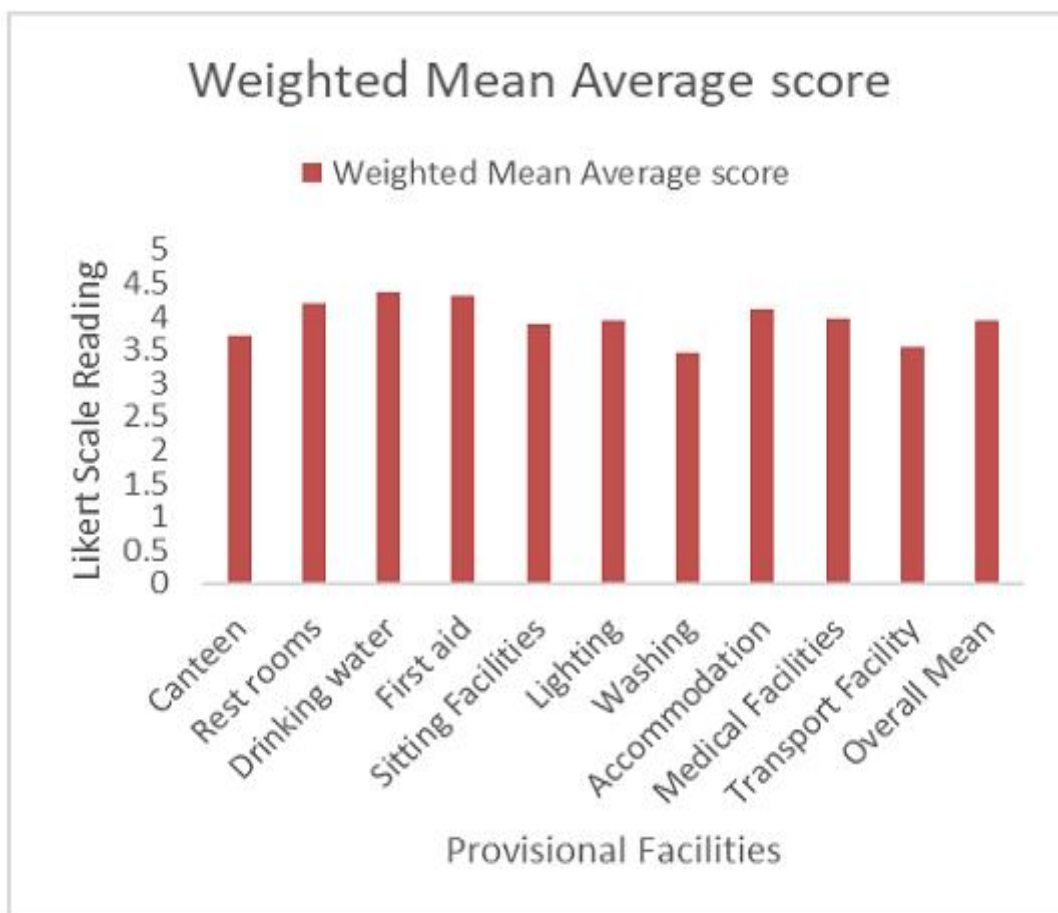
From Fig6.2, it can be inferred that only 10% of respondents are satisfied with the existing welfare measures provided in their working area, while nearly 50% are dissatisfied. This shows that the welfare measures must be enhanced for the satisfaction of the labourers to provide a better working environment.

7.1 STATUTORY WELFARE MEASURES

Table 7.1 Statutory Welfare Measures- Satisfaction

Provisional Facilities	Weighted Mean Average score	Percentage
Canteen	3.72	68
Rest rooms	4.20	80
Drinking water	4.38	85
First aid	4.31	83
Sitting Facilities	3.89	72
Lighting	3.93	73
Washing	3.46	62
Accommodation	4.11	78
Medical Facilities	3.96	74
Transport Facility	3.55	64
Overall Mean	3.95	74

From the table 7.1, it can be inferred that the level of satisfaction of restrooms, Drinking water and First aid facilities are above 80%. On the other hand, canteen, washing and transport facilities are in the range of 60 to 70%, while lighting, sitting, and medical and accommodation facilities are in the intermediate range of 70 to 80 percentage. Overall a satisfactory level of 74% is achieved in the statutory welfare measures among the respondents. These are the basic important amenities to be provided for the laborers to relieve them from their job stress and provide a healthy atmosphere. The relation between the numerous provisional amenities and their corresponding weighted mean average score is expressed in the form of graph as shown in Fig 7.1



7.2 NON-STATUTORY WELFARE MEASURES

Table 7.2 Non-Statutory welfare measures-Satisfaction

Provisional Facilities	Weighted Mean Average score	Percentage
Personal Health Care	3.52	63
Flexi time	3.24	56
Employee Assistance Programs	3.38	60
Higher Education	3.67	67
Training	3.76	69
Counseling Services	3.67	67
Overall Mean	3.54	64

From the table 7.2, it can be obviously noted that the fulfillment level of all the non-statutory measures among the labourers are up to a moderate extent. There is not much difference in the satisfaction level of different non-statutory measures as seen in statutory welfare measures. The flexi-time is the minimum satisfied provision in non-statutory measures with 56%, while the training is the maximum satisfied provision with a percentage of 69. Providing proper training conditions can improve the productivity of the laborers and benefit the organization. Counseling services improves the mind of the labourers to relieve from stress. A mean percentage of 64 denote that all the provisions need to be improved to a certain extent to enhance the satisfaction of the labourers. The relation between various non-statutory welfare measures is shown in Fig 7.2



Fig7.2 Non-statutory welfare measures –Weighted mean average score

7.3 WAGES AND LEAVE

Table 7.3 Wages and Leave-Satisfaction

Provisional Facilities	Weighted mean average score	Percentage
Salary	3.43	61
Overtime wages	3.34	59
Travel Allowance	3.52	63
Incentives	3.17	54
Holidays	2.65	41
Casual Leave	2.82	46
Sick & Medical Leave	3.73	68
Overall Mean	3.24	56

From the table 7.3, it can be observed that the labourers are normally not satisfied with their wages, allowances and the leave facilities provided by the organization. Incentives, Overtime wages and other additional allowances must be improved as a mean of motivation for the labourers towards their work. Regarding the wages, the level of satisfaction towards incentives is lesser. Though there is moderate satisfaction towards sick and medical leave, the holidays and casual leave provided in the construction industry does not satisfy the labour community. The level of satisfaction towards holidays is 41%. This can be improved by providing holidays at regular intervals for labourers to relieve their work pressure and work in a satisfying environment. The relation of the measures and their weighted mean average scores are represented in the form of graph as shown in Fig 7.3

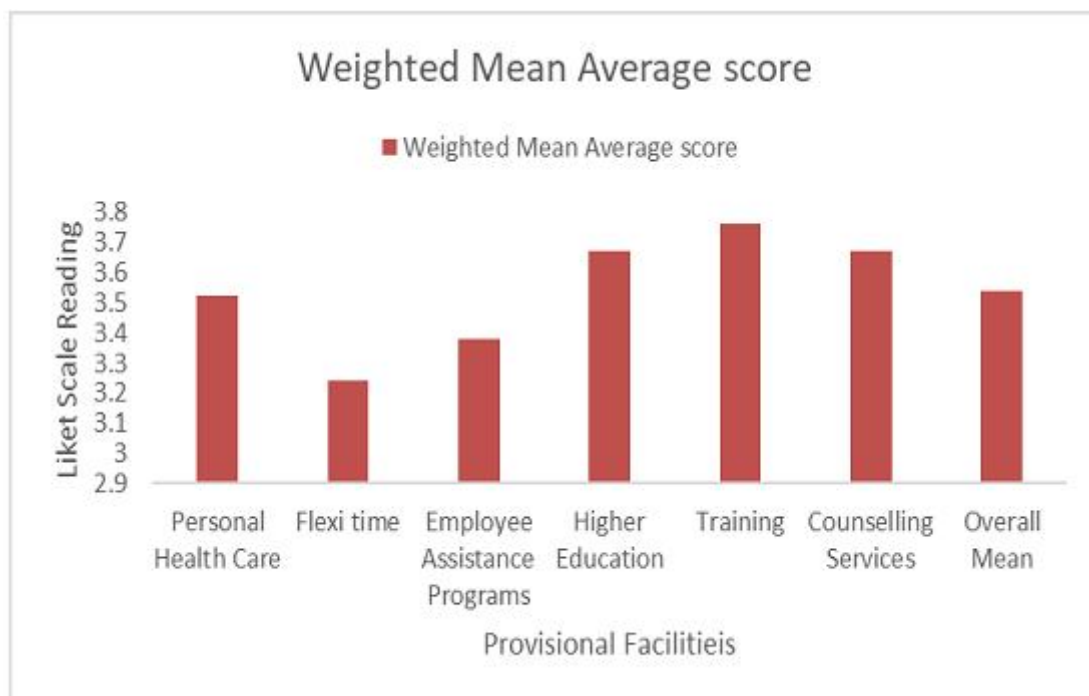


Fig7.3 Wages and Leave – Weighted mean average score

7.4 SAFETY AND RECREATION FACILITIES

Table 7.4 Safety and Recreation Facilities-Satisfaction

Provisional Facilities	Weighted mean average score	Provisional Facilities
Safety Guidelines	3.91	73

Helmets	3.8	70
Shoes	4.02	76
Eye and Ear Protection	3.49	63
Fire Extinguisher	4.18	80
Ambulance	3.75	69
Overall Mean	3.86	72
Recreation Facilities		
Cultural Programs	3.08	52
Tours	2.89	47
Reading Rooms	2.75	44
Indoor games	2.97	49
Overall Mean	2.92	48

From the table 7.4, the safety facilities provided is somewhat satisfactory but it still needs improvement to make the labourers work in a non-hazardous environment without risking their life. Shoes, Helmets and other protection equipment must be made mandatory to achieve complete satisfaction regarding their safety. Working in an atmosphere with utmost importance to safety generally increases productivity. The recreation facilities in the construction industry do not satisfy the labour force. The level of satisfaction is higher for cultural programs with 52%, while all other recreation facilities fall under 50%. Providing these facilities makes the labourers to relieve their stress and will be a part of an entertainment. The overall mean percentage of 72% in safety denotes moderate satisfaction among labourers. On the contrary, an overall 19 percentage of 48 in recreation denote dissatisfaction among labourers. The relation between the safety measures and their weighted mean average score is expressed in the form of graph as shown in Fig 7.4.1 and the relation between the Recreation Facilities and their weighted mean average score is expressed in the form of Fig 7.4.2



Fig7.4.1 Safety measures –Weighted mean average score

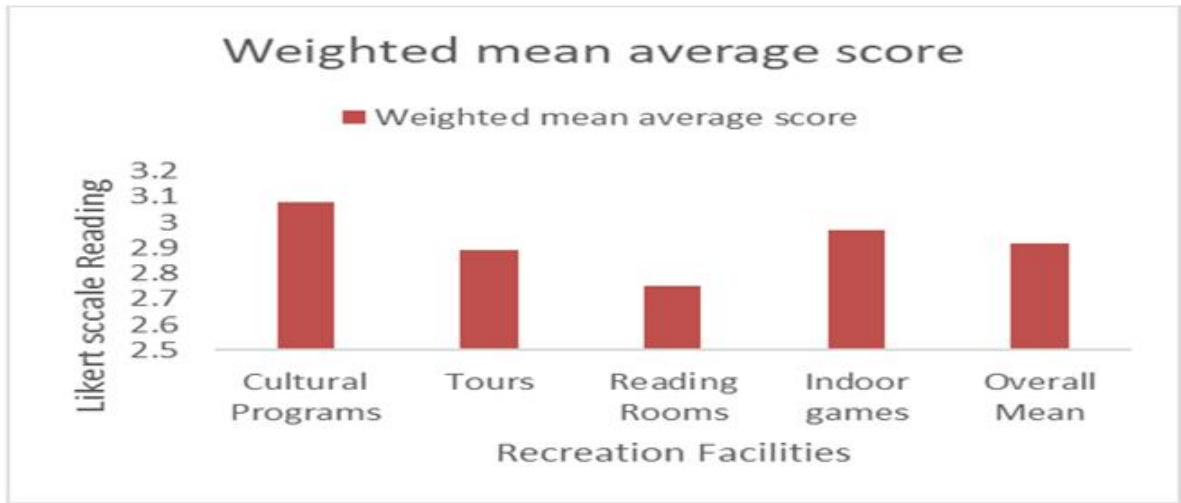


Fig7.4.2Recreational Facilities –Weighted mean average

7.5SOCIAL SECURITY MEASURES

Table 7.5Social Security Measures –Satisfaction

Weighted mean average score	Percentage	
Workers Compensation	3.53	63
Pension	3.75	69
Provident Fund	3.89	72
Gratuity	3.57	64
Insurance Scheme	3.72	68
Accident Benefit Scheme	3.95	74
Overall Mean	3.74	69

From the Table 7.5, it is identified that the social security measures provide only moderate satisfaction to the labour community. Accident benefit scheme provides maximum satisfaction of 74%, while all other social security measures fall in the range of 60 to 70 in percentages. Enhancing the social security measures instills job security in the minds of labour, which motivates them to work towards the goals of an organization. The overall satisfaction level is 69%. The relation between the social security measures and their weighted mean average score are represented in the form of graph as shown in Fig 7.5

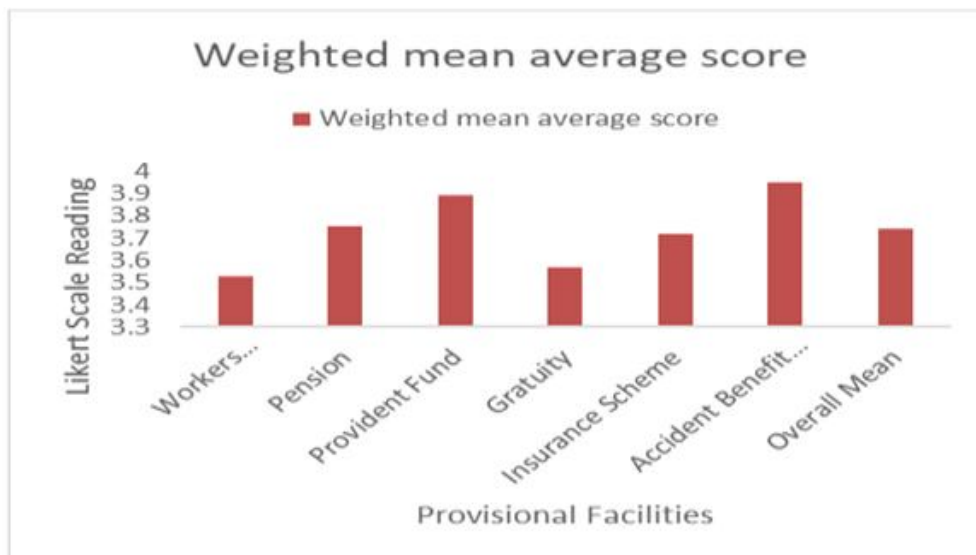


Fig7.5Social security measures –Weighted mean average score

7.6 IMPACT OF WELFARE MEASURES

Table 7.6 Impact of Welfare Measures

Provisional Facilities	Weighted mean average score	Percentage
Increases Productivity	3.97	74
Reduces Wastages	3.57	64
Creates Industrial Relations	3.74	69
Helps Team Spirit	4.10	78
Reduces Employee Absenteeism	4.06	77
Increases Job Satisfaction	4.07	77
Improves Physical and Mental Health	4.14	79
Improves Quality of Work Life	4.43	86
Overall Mean	4.01	75

From the table 7.4 data in which eight factors were considered for the survey, of which improvement in the quality of work life gives maximum satisfaction among the labourers with a percentage of 86. Other considered positive factors like productivity, team spirit, job satisfaction, Improvement in physical and mental health ranges from 70 to 80%. The labour workforce feels that when the previously discussed steps were implemented to elevate the satisfaction level of labourers, it in turn improves the various positive factors mentioned above and hence the organization can achieve their goals at a faster pace. The relation between the impact measures and their weighted mean average score are represented in the form of graph as shown in Fig7.8.



Fig7.8 Impact of welfare measures-weighted mean average score

8. RESULTS AND DISCUSSIONS

- From the survey conducted, it has observed that the company provides several welfare measures for its employees.
- In general, most of the employees are satisfied with medical facilities extended to them.
- From the data analysis it is clear that 70% employees are aware with the current welfare measure policies.
- 47% of employees are dissatisfied with their welfare facilities.
- Above the 80% of employees said that there are sufficient number of drinking water, restroom and first aid facilities.
- The training gives the maximum satisfied provision with a percentage of 69.
- Regarding the wages, the level of satisfaction towards incentives is lesser.
- The level of satisfaction towards holidays is 41%.
- The level of satisfaction is higher for cultural programs with 52%, while all other recreational facilities fall under 50%.
- Accident benefit scheme provides maximum satisfaction of 74%, while all other social security fall in the range of 60% to 70%.
- The quality of work life gives maximum satisfaction among the labours with a percentage of 86. Other considered positive factors like productivity, team spirit, job satisfaction, improvement in physical and mental health ranges from 70% to 80%.
- Most of the employees agreed that labour turnover can be reduced through proper motivational techniques

9. CONCLUSION

Employees are satisfied with various facilities like festival advances, medical, lighting, sitting and drinking water. It is observed that the welfare measures reduce the labour absenteeism and increase the efficiency of the employees. Also, they are directly related with productivity and to achieve it the companies provide many welfare packages to employees for increasing the efficiency and productivity. Fair wages to be provided based on the contribution of employees to the firm with job security, safe health working environment etc. which increases the productivity and minimize the cost.

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REVIEW OF NATIONAL POLICY IN THE RUSSIAN EMPIRE

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ABSTRACTS

The article is devoted to the phenomenon of nationality policy in the Russian Empire and presents views on the formation and development of a nation in the Russian and Western scientific traditions. The first defines a nation as the highest level of development of an ethnos, and the second considers an ethnos and a nation to be one concept denoting one phenomenon that either unites people or divides them. The article considers the national policy in the Russian Empire as a process based on the phenomenon of the nation. The conceptual field of work is formed by the following concepts: idea, principle, phenomenon, element, feature, characteristic, instrument, state, ideology, ethnos, nation, national policy. The article analyzes two principles of nation formation: the nation's right to self-determination and the state's right to the inviolability of the territory, as well as national policy as a tool for resolving the contradictions arising from the application of these principles. The consequences of acting on one of the two principles are considered in terms of war and peace. Special attention is paid to the historical substantiation of the national policy in the Russian Empire and the consideration of its elements: Russification as part of integration or as part of segregation, as well as the analysis of the content of the basic concepts of national policy in the Russian Empire: the border territory and its class analogue, the national outskirts. The features of the national policy of the Russian Empire are highlighted - complexity, differentiation, flexibility and relevance. The drawbacks are noted - the lack of vision of the future multi-ethnic state and its border territories from the point of view of the general ideology. National policy is presented in the aspect of state and public goals, as well as methods of implementing national policy on the territory of the state (development of national (colonial) outskirts), corresponding ideology, formal and informal characteristics inherent in the concept of national policy. In the above tables, you can see: comparison of ethnos and nation by the criterion of participation in politics, the administrative organization of territories (khanate, emirate, general government, kingdom, Great Kingdom, etc.), the status of a representative of the central government and the title of a position in the system of administrative power, as well as the peculiarities of the Russification policy in the border areas of the Russian Empire. Based on the above analysis, it is established that the nation in the Russian Empire was not formed, since the political sign of the nation at this stage did not become a factor in changes in public life and a peaceful solution to the problem of the development of the nation became impossible. The national policy in the Russian Empire had its own characteristics that distinguished it from other empires - the state (autocracy) recognized the need for a national policy, the process of uniting people (subjects) was carried out on the basis of a common ideology, which was not imposed on the annexed territories and peoples, but pursued the goals of unification based on common language and culture, but did not take into account the inevitable political development of peoples.

Keywords: border areas, national policy, state

From the point of view of knowledge about an ethnos, a nation is a large social group, presumably, the highest stage in the development of an ethnos, representing a certain extremely cohesive community of people, characterized by the unity of territory, language, culture, features of the national psyche, as well as very close economic ties. The study of the concept of a nation will be difficult without highlighting the problems associated with the formation and development of nations.

In the scientific tradition of Russia, the definition of a nation was formulated by M. Lomonosov, I. Zabelin, V. Lenin, I. Stalin, A. Chubaryan, A. Safonov, A. Orlov, S. Kachanov, B. Raizberg, V. Osipov, in the foreign tradition A. Comte-Sponville, E. Renan, O. Bauer, K. Kautsky, and others. For foreign researchers, the nation has long been identical to the ethnos. O. Bauer believed that the nation possesses "differentiating power" and divides the human world, while K. Kautsky, on the contrary, saw in the nation the beginning of the unification of the human world, although he did not use the term globalization, but left the term Europeanization to mankind.

The article is of an overview and analytical nature, in the process of working on the topic, comparative historical and comparative legal research methods were used based on a dialectical approach to social development.

The first thing to look at when studying a nation are two fundamental principles that contribute to the formation and strengthening of nations. The first principle establishes the nation's right to self-determination; it is enshrined in international and constitutional law. The unifying basis for the implementation of this principle is the recognition of a common fate (history), which is based on memory, but not necessarily the memory or biography of an ethnos. The verbal symbol of the principle of self-determination of nations is the slogan of not only many revolutions of the early 20th century “We are for the self-determination of nations!”, But also of the political platform of the US President W. Wilson. He paid special attention to it in connection with the outbreak of the First World War (1914-1918), from a geopolitical point of view, the United States was solving a very important problem of realizing its interests on other continents. The immediate threat to these interests was represented by the interests of the empires (Russian, Austro-Hungarian, German and Ottoman). The weak point of any empire can be found by studying its ethnic composition. Domestic intelligence historians note that this principle was a condition for the departure of future leaders of the Soviet state from emigration to Russia.

The right of nations to self-determination was declared in all Soviet constitutions, and to be more precise, in the constitutions of federal states such as the USSR and the SFRY, including the provision on the right of the union republics to secede from the union state, which the latter were. For accuracy, it should be noted that this right did not apply to autonomous formations within the union republics.

The second principle, opposite to the first, proclaimed the state's right to inviolability of the territory, and its change only with the consent of the state.

Two conflicting principles are also present in the 21st century; international law, the activities of international organizations, etc., are guided by them. Accordingly, an obvious contradiction gives rise to a long chain of interrelated events, often conflicting, with consequences for the life and health of people, as well as the sovereignty of states.

Peaceful resolution of the contradictions arising during the implementation of these principles is possible, as a rule, on international platforms and with the assistance of the institution of mediators-states and / or authoritative political leaders. The inability of the parties to find a peaceful solution to such a contradiction leads to the aggravation of intrastate or interstate conflicts, as a result, developing into military confrontation. At the same time, representatives of the central state power usually cite as an argument in defense of their position an assertion about the priority of the principle of territorial integrity in relation to the right to national self-determination, representatives of a nation claiming self-determination are guided by the opposite principle.

At the beginning of solving the problem of such conflicts lies the state national policy.

State national policy is designed to implement on the basis of a common view of the problem of unity, for example, a multiethnic, state or state, which includes social collectives that form a single nation. In this regard, a feature from the political sphere must be added to the features of a nation.

NATION AND POLITICS

Table 1

№ № №	common features	signs		required / not necessary	
		11	nation	participation in politics	+
22	ethnos	participation in politics	+	+	

The state policy can be called national with the continuation ... in the sphere of economy, in the sphere of defense, in the sphere of finance, etc. But, if a multi-ethnic state is considered, then the allocation of state nationality policy is mandatory.

State national policy, as a rule, has its own history, which contributes to the comprehension of experience and understanding of the processes taking place in the present. From this point of view, the state national policy in the Russian Empire (1724 - 1917) is important for us, although the real beginning of this policy lies in the depths of Slavic history.

To study the state national policy of the Russian Empire, it is necessary to familiarize oneself with the peculiarities of the territorial division of the Russian Empire, the leading among which was the principle of centralization of administrative management in the organization of the power structures of the territories, and

not the principle of the primacy of ethnic diversity. This did not exclude the recognition of a significant degree of independence of the territories annexed especially in the 19th - 20th centuries: the Greater Caucasus, the Grand Duchy of Finland, the Kingdom of Poland, the Kokand and Khiva Khanates, the Emirate of Bukhara, Primorye, Amur Region, Sakhalin. True, part of the land in these territories was confiscated in favor of the state, and then transferred to the Russian peasants with subsequent resettlement, as well as for the deployment of Cossack troops who carried the border service. The ethnic composition of the Cossack troops is the majority of Russians (78%), Ukrainians (17%), the rest are Kalmyks, Ossetians, Tatars, Buryats, Mongols, Yakuts.

In the 19th century, the concept of national outskirts appeared, this concept was formed in states that have the form of empires. The national outskirts are the border territories of the state, in the Russian Empire they are very vast, inhabited by ethnic groups different from the Russian. From the point of view of national policy, it is important to know one of the methods of this policy, called the term unification. Unification as a process of proposal and acceptance is preceded by a necessary condition for the participation of the state in this process by implementing the appropriate direction of state policy. In national politics, this process is aimed at changing the stereotypes of thinking and behavior, which begin to be formally and informally regulated under state control at the level of law enforcement (formal) and behavior (informal). In the case of the Russian Empire, cultural unification was called Russification, Russian was the state language and the language of judicial office work.

The concept of the colonial outskirts became a single-type concept for the national outskirts, it accompanies the formation and development of colonial empires, the power of which was provided by the capabilities of the military and merchant fleets and the wealth of the occupied territories, which became sources of cheap raw materials. Other colonial empires (except for the Austro-Hungarian) differed from the Russian Empire in their non-recognition of the achievements of modernity for the people who inhabited the colonies; issues of humanism, statehood, representation in politics, citizenship (citizenship) were not considered there at all. The Austro-Hungarian and Russian empires were continental in their spatial vector, and for them the issue of administration and the observance of the interests of the titular nation was important.

Border territories ("national outskirts") of the Russian Empire

Table 2

№	name	administrative status	the leader
11	Grand Duchy of Finland	general government	governor general
22	Kingdom of Poland (Privislensky region)	governorship, general government	viceroy, governor general
33	Baltic region (Estland, Livonia, Ingermanland)	general government	governor general
44	Turkestan	general government	governor general
55	Khanates - Kokand and Khiva, Emirate - Bukhara	protectorate	governor general
66	Caucasus (North and South Caucasus (Transcaucasia))	governorship	viceroy
77	Vladivostok (founded in 1860)	military fortress and open port, administrative center	fortress commandant, harbor master
88	Khabarovsk (founded -1857)	town, administrative center	mayor
99	Vladikavkaz	walled city	
110	Priamurskoe	general government	governor general
111	Transcaspian, Tersk, Kuban, Primorskaya, Transbaikal, Amur, Yakutsk	region	
112	Black Sea, Batumi, Sukhum, Okhotsk, Nikolaev, Sofiysk, Petropavlovsk, Gizhiginsky, Udsky.	district	

Russification was most difficult on the western borders of the Russian Empire, especially in the Kingdom of Poland (Privislensky Krai), which was mainly inhabited by Poles. In addition, the arsenal of methods of state

nationality policy, relying on examples of historical practice, may include: genocide, segregation (territorial, racial, cultural, etc.) and integration.

In total, 129 mln. Lived in the country. 142 thousand people at the end of the 19th century. The Russian Empire by its form of government was an Orthodox monarchy, with leading positions in the spiritual sphere of the Russian Orthodox Church and in the document proving the identity of a person, not his nationality, but his religion was indicated. The largest ethnic groups along with the Russians (55 667 469) were in the second half of the 19th century. Ukrainians, Belarusians, Poles, Tatars, Germans, Bashkirs, Finns, Jews, and others. Orthodoxy, Islam, Catholicism, Protestantism, Buddhism, Judaism, and corresponding church organizations had the right to organize and carry out their activities. But, the state did not welcome the transition from Orthodoxy to other religions, although there was no direct prohibition. The reverse process, on the contrary, was welcomed by the state. Ethical issues remained for public comment. Orthodoxy, as a state religion, welcomed the newly acquired spiritual brothers and sisters. They converted to Orthodoxy, this opened up the prospect of a social elevator, although this criterion was not the only one. The main feature of the state nationality policy in the Russian Empire is the recognition of its need in the upper echelons of government as a condition for the stability and integrity of the country with diversification across regions. Below are the main directions of the state national policy of this period for the national outskirts.

National policy of the Russian Empire for the national outskirts

Table 3

№	region	language / culture	customs / traditions	religion
1	Ukraine, Belarus	ban on printing educational literature in Ukrainian and Belarusian	the state was not regulated	the state was not regulated
2	Grand Duchy of Finland	official office work in Russian	the state was not regulated	the state was not regulated
3	Kingdom of Poland (Privislensky region)	русификация	the state was not regulated	the state was not regulated
4	Baltic region	official office work in Russian	the state was not regulated	the state was not regulated
5	Turkestan	official office work in Russian	the state was not regulated	the state was not regulated
6	Khanates - Kokand and Khiva, Emirate - Bukhara	official office work in Russian	the state was not regulated	the state was not regulated
7	Caucasus (North and South Caucasus (Transcaucasia))	the state was not regulated	the state was not regulated	the state was not regulated
8	Volga region, Altai, Yakutia.	development of writing and language, creation of an education system	the state was not regulated	the state was not regulated

Elements of segregation in the state national policy of the Russian Empire were present in relation to the Polish population, this was due to the irreconcilable position, first of all, of the Catholic Church in relation to the Russian Empire. Part of Poland, which after the three partitions of the Commonwealth became part of the Russian Empire, chose the path of uprisings, among the leaders of which were Polish priests (priests).

After the above-mentioned sections of the Commonwealth, the ethnic composition of the Russian Empire was replenished with Jews. Knowing one of the traditional forms of production of this ethnos and its contradictions with Orthodoxy, Catherine II introduced the Pale of Settlement for them, which, however, at that time was a common practice for European countries, since the loan interest contradicted the canons of Catholicism as a branch of Christianity. The Pale of Settlement was present, mainly on the territory of Belarus and Ukraine. The introduction of the Pale of Settlement can also be attributed to the element of segregation in the state national policy.

Was the Russian nation formed by the beginning of the 20th century? To answer this question, it is necessary to include the concept of a politician in the process of studying a nation. Politics is a system-forming element of the political sphere of society and implies complex relations between social groups on the implementation of power and government in the state. The peculiarity of the empire is that it, as a special form of the administrative-territorial structure of the state, represents the interests of large landowners, their interests formed the political sphere of the empire, state policy and government. This social group, for all its powerful power, was small in comparison with the peasantry. The ratio is natural, there was always a lack of property for everyone, as it is now, but the state had to take care of the preservation and augmentation of the property of landowners, protect their interests, and provide guarantees for the inviolability of property. The peasants are the main social stratum that ensures the collection of taxes, and taxes, in turn, ensure the implementation of state policy in the interests of the social stratum in power. The peasants in Russia were recalled in moments of real danger, for example, an attempt to seize the territory of the state, when the people's militia always rescued the armed forces, supplementing the history of the people with new glorious victories in a just war of liberation, which remains in the people's memory with examples confirming the existence of the self-consciousness of the people capable of feat for the sake of freedom and independence of the Motherland.

The peasants reminded of themselves by peasant uprisings, which at different periods of Russian historiography were called peasant riots or peasant wars. Recalling the definition of a nation and adding the criterion of a politician to all the others, it can be assumed that the nation in the Russian Empire was not formed, because the main social strata (classes) in the political sphere were not represented, their interests were not protected by public organizations and political parties, legislation was implemented besides their representation. The situation began to change after the First Russian Revolution (1905-1907) or the beginning of the Great Russian Revolution in 1905, but the changes carried out by the state were inconsistent and contradictory, lagging behind the development of the political consciousness of the main social groups, which at that time were already at the stage of formation national identity.

Formal signs of a nation - symbols and attributes of statehood, a document (passport) confirming the right to be a citizen (Russian Empire, Great Britain) or a citizen (Russian Federation, France) of the state and military duty, which includes general mobilization, if such signs are formal in nature by the state legalized for all social groups, then a nation is about to or has already declared itself, in accordance with all other signs. Conscription and general mobilization underline the determination to defend external sovereignty with the joint efforts of the entire people.

In this aspect, the example of Great Britain is interesting - the monarch is responsible for national goals before the nation, and the cabinet formed by one or another party is responsible for the success in implementing state policy to achieve these goals. One does not mix with the other, and the nation knows who to ask a question in case of "misunderstanding" or "bewilderment". In the Russian Empire, there was no such division, and the emperor was responsible for everything, but in his decisions he was free, it was called the Russian autocracy based on the Orthodox faith. At the beginning of the 19th century, carrying out structural reforms of the governing bodies, the ideology of the nation was formed, a complex concept based on ideology - a multi-level speculative structure, necessary for any.

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SALES PREDICTION USING EFFECTIVE MINING TECHNIQUES

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ABSTRACT

Data mining is extraction of hidden and predictive information from huge database; it is a strong new technology with great potential to help companies to focus on the most important information in their data warehouses. It captures the browsing behavior of users at a Company. So, proposed system is used to find most frequent combinations of item present in company. This will help in marketing and sales. This system can be used to discover interesting cross-sells and related products. The proposed system uses apriori algorithm with modification which will make algorithm more efficient. The analyst can perform data mining and extraction and finally conclude the result and make appropriate decision for company.

Keywords— Association rules, Apriori algorithm, Distributed data mining

INTRODUCTION

Mining frequent item sets from the large transactional database is a very critical and important task. Applications requiring large amount of data processing[1], consists of two huge problems, one is high storage and its management and the other one is the processing time, due to increase in data. Distributed databases do the work of solving the first problem to a tremendous extent but second problem boosts. As current era is of communication and association and people are interested in storing large data on networks, and hence, researchers are introducing various algorithms to boost the throughput of output data over distributed databases. In our research, we are introducing a algorithm to practice large amount of data at the various servers of same company that lie at different locations and collecting the practiced data on main server machine as much as admin is requiring. The local copy of found data is provided to the users if he/she needs it again, this allows causing a proxy server where constantly searched items can be saved with the density of their access. This not only grants affording fast access to the data but will also afford to maintain list of recurrently accessed data.

There are several approaches for accessing the data from the various servers, such as direct networked access, mobile agents, client-server techniques and LAN etc. We have used multi-threaded environment to calculate various distributed servers to gather data. For processing of data at the server end, the use of Apriori Algorithm has been done to get the outputs, which are then addressed to the client. At client data from various servers is assembled and then disciplined into data format.

As an association rule mining is defined as the relation between various item sets. Association rule mining takes part in pattern discovery techniques in knowledge discovery and data mining (KDD). As performance of association rule mining is depends upon the frequent item sets mining, thus is necessary to mine frequent item set efficiently. Association rules arrange information of this type in the form of "if-then" statements. These rules are count from the data and, inconsistent the if-then order of logic, association rules are probabilistic simultaneously, the antecedent (the "if" part) and the consequent (the "then" part), an association rule has two numbers that explicit the degree of ambiguity about the rule. In association partition the antecedent and consequent are sets of items (called item sets) that are disjoint (do not have any items in common).An Optimized Distributed Association Rule mining algorithm for geographically distributed data is used in this paper in parallel and distributed environment so that it lowers communication costs.

Association rule mining finds interesting associations relationships among large set of data items. Association rules view aspects value conditions that occur frequently together in a given data set. A classic and extensively-used example of association rule mining is Market Basket Analysis that is main aim and purpose of our system.

LITERATURE SURVEY

There is a need to develop a good algorithm which finds the desired information resources and their usage pattern and also to develop a distributed algorithm for geographical data sets that reduces communication cost and communication overhead. There are various algorithms which significantly work in this domain. Some are discussed below.

APRIORI ALGORITHM

Apriori, an association rule mining algorithm innovation has been advanced for rule mining in large firm databases by IBM's Quest project team. An {item set} is a non-empty set of items. They have breakdown the complication of mining association rules into two parts:

1. Find all combinations of items that have transaction support above minimum support. Call those sequence frequent item sets.
2. Use the frequent item sets to achieve the desired rules. The natural concept is that if, say, ABCD and AB are Frequent item sets, and then we can determine if the Rule AB CD holds by computing the ratio $r = \text{support}(ABCD) / \text{support}(AB)$. The rule holds only if $r \geq \text{minimum confidence}$.

CLASSIFICATION

The process of breaking down a data set into mutually absolute groups such that the representatives of each club are as "close" as possible to one another, and different clubs are as "far" as possible from one another where distance is measured with respect to specific variable(s) you are trying to anticipate for example, a typical classification complication is to break down a database of companies into clubs that are as homogeneous as possible as regards to a creditworthiness variable with values "Good" and "Bad".

CLUSTERING ALGORITHM

The process of dividing a data set into mutually exclusive groups such that the members of each group are as "close" as possible to one another, and different groups are as "far" as possible from one another, where distance is consistent with respect to all available variables given databases of sufficient amount and aspect, data mining technology can generate new business opportunities by providing these capabilities.

PROPOSED SYSTEM

A typical example of a predictive problem is target marketing. Data mining uses data on past informational expressing to identify the targets most likely to maximize return on investment in future addressing. Unlike other algorithms, O-DAM [Optimized Distributed Association rule Mining] attempt greater performance by minimizing applicant item set. It accomplish this by attract on two major D-ARM [Distributed Association Rule Mining] issues inter communication and integration. Inter Communication is one of the better extensive D-ARM objectives. D-ARM algorithms will achieve better if we can reduce inter communication [4]. D-ARM discovers rules from various geographically assigned data sets. However, the network connection between those data sets isn't as fast as in a parallel environment, so assigned mining usually intent to minimize communication costs. It is designed to operate on files. The algorithm finds the subsets which are common to at least a minimum number C (the cutoff, or confidence threshold) of the item sets.

In proposed system we have assumed 3 branches of a company and manager of that respected branch can have access to its database of that branch to find hidden pattern in database. There is one central server rather than having 3 databases at each branch which stores all records about company and it is managed by admin now interesting question is what access they do? Both manager and admin can alter data i.e. add, delete records in database. Now to find hidden pattern from database, they use system in which have implemented apriori algorithm to find frequent items in database, and they can view the output as report and pie chart. Pie chart is used for better understanding. So manager of each branch can find frequent item in its branch while admin can see or find frequent items in all branches as admin has to take important decisions about company.

We have implemented our system using 2 technologies. One is visual studio 8.0 for front end i.e. to take user input and display output second is Microsoft SQL server, it is used to store data and we have implemented apriori algorithm in database system only using cursor concept. The process is as follows:

1. Person (manager or admin) log in system with user name and password.
2. System will validate user name and password and allows access if they are matched in database.
3. Now person can modify (add, delete, view) data in database.
4. Now to find frequent item it will ask system using report button.
5. Now system will find frequent item in database.
6. Display output as report and pie chart.

PURPOSE

It has become increasingly necessary for users to utilize automated tools to find the desired information assets, and to clue and analyze their usage patterns. Association rule mining is an alive data mining analysis field. However, most ARM algorithms cater to a integrate environment.

Distributed Association Rule Mining (D-ARM) algorithms have been advanced. These algorithms, however, conclude that the databases are either horizontally or vertically divided. In the special case of databases populated from information extracted from extol data; existing DARM algorithms cannot discover rules based on higher order associations between items in divided items that are neither vertically nor horizontally assigned, but rather a hybrid of the two.

In our system admin have access to all branches and thus helps admin to find distributed association rules between the different databases branches located at different locations i.e. Apriori is working in distributed environment.

WHAT IS DIFFERENT IN OUR ALGORITHM IMPLEMENTATION?

Generally the process of extracting association rule mining consists of two parts firstly, mine all frequent item sets pattern each of these pattern should satisfy the minimum support threshold. Once these entire frequent patterns are mined, then only second phase of mining i.e. association rules are produced from these frequent item sets. These association rules must satisfy the minimum support and minimum confidence. This minimum support and confidence should be defined by the user.

A large number of algorithms with different mining efficiencies were proposed by many researchers for generation of frequent item sets. Any algorithm should find the same set of rules though their computational efficiencies and memory requirements may be different. The best known mining algorithm is Apriori algorithm. Apriori algorithm is associated with certain limitations of large database scans. Thus variations of Apriori come into existence.

In our system the item from candidate list immediately removed as soon as it doesn't satisfy support or confidence condition. Thus, it does not generate unwanted candidate thus takes less time to execute and makes system performance better. Also, rather than scanning entire database user (manger/admin) can specify the beginning and ending date. Only those records who fall between this two dates are only considered for association rule generation, thus make system more efficient. Thus we have added 2 new properties in conventional apriori algorithm.

DATA FLOW DIAGRAM

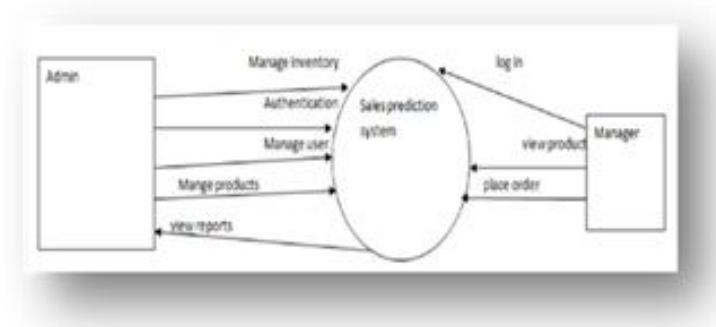


Fig. 1 DFD of our system

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step to create an overview of the system.

Fig 1 shows DFD for our system, it shows what functions of admin and manager are. In our system manager can manage inventory of products present in company of all branches.

CONCLUSION

Sales Prediction Using Effective Mining Techniques is the application of data mining techniques to discover usage patterns from data, in order to understand and better serve the needs of applications. The algorithm used in present research is the Apriori algorithm. This algorithm generates association rules that associate the usage pattern of the clients for a particular data.

The disadvantage of classical apriori is candidate set generation, thus we made 2 changes in algorithm that will make system more efficient.

FUTURE WORK

This system is applicable for very large databases where the available memory space is valuable and requires optimization. It can be further tuned for better performance and efficiency.

It can be applied in applications that deal in mining on live data on daily timely basis such as stock markets, financial statistics collection, weather forecasting etc.

Its application can be utilized for industrial usage where precise pattern study is required with a large data sets to work on and so it can be modified according to their requirements.

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CHARACTERIZING THE PUBLICATIONS OF EMINENT SCIENTISTS: THE CASE OF NOBEL LAUREATES IN MEDICINE

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ABSTRACT

Publications form the main out-put of all research works. Scientific publications serve a link between knowledge production and use (Kumaragurupari, Sieving & Lalitha, 2010). Publications from the reputed authors lay great impact on their respective fields. Thus, in this milieu current study makes an attempt to analyze the publication trends and patterns of Nobel Laureates (in the field of Medicine), to capture the overall traits and characteristics of their publications. Therefore, the study endeavours to analyze the publication productivity, citation impact and collaboration pattern of publications of Nobel Laureates.

The data for the study, which include various details pertaining to the article publications of Nobel Laureates of the time period 2005-2008 in the field of Medicine, were collected from the Web of Science (WoS) database, using the corresponding names of the individual Nobel Laureates which were prior traced from the Nobel Prize official website. The findings demonstrate that the prolificacy of publications is not the chief characteristic of Nobel Laureates in Medicine but for citation scores Nobel Laureates show a remarkable performance. Besides, Nobel Laureates in Medicine are mostly found to prefer collaborations in their research works.

Keywords: Scientometrics, Publication Productivity, Citations, Collaboration, Nobel Laureates.

INTRODUCTION

Publications are central to all research works and publishing the research results mandatory for all researchers. Publications reflect the standard of one's work. They exist as a blueprint of the research and serve the source for dissemination of new knowledge generated from the research besides being the basic indicators for evaluation programs, world over. Further, the works (publications) of elite scientists in a field influence the functioning of trends in that particular field.

Since publications are considered as important out-put of research works, therefore publication performance forms a relevant indicator for researcher recognition and this recognition, as per **Merton (1957)**, forms a driving force for future research endeavours.

Evaluation of research works is conducted using many a number of methods. Evaluation and analysis through scientometric indicators is currently much in vogue. These indicators of measurement aid in quantitative assessment of quality or performance and are derived from the field of scientometrics, where, scientometrics, as defined by **Nalimov and Mulchenkov (1971)**, include "the quantitative methods of the research on the development of science as an informational process" and is used to study all aspects of science and technology literature. These indicators are the key criteria through which research gets assessed and evaluated (**Garfield, 2003**). These indicators can be divided as- quantity indicators or productivity indicators and are based on publication count, quality indicators or performance indicators and are based on citation count and structural indicators or collaboration and correlation indicators and are based on author count (**Durieux & Gevenois, 2010**). Besides, these scientometric studies are conducted using data mostly from the bibliographical databases like Web of Science (WoS), Scopus etc.- where a bibliographic database stores bibliographic records and organizes references to published digital literature (**Kujur & Modac, 2019**).

Accordingly, this study analyses the publications of Nobel Laureates in Medicine utilizing these indicators. The quantity indicators that have been selected for this study to gauge the productivity of Nobel Laureates include-

Total publication count (TPC) - it includes total number of publications in a particular bibliographic database.

First Author Count (FAC) - this gives the publication count of primary or first author.

The quality indicators selected for the study to assess the worth/impact of research include-

Number of Citations/Total Citation Count (TCC) - it denotes the total number of citations recorded in a citation index, without self-citations.

Citation Impact (CI) – this denotes the average count of citations.

Structure indicators used are -

Degree of Collaboration (DC) – it determines the proportion of multi-authored papers. It is calculated by formula:

$DC = N_m / (N_m + N_s)$, where, N_m is the number of multi-authored papers and N_s - number of single author publications.

Collaborative index (CIn.) – this determines the mean number of authors per publication.

Thus, applying these indicators help reveal the traits and characteristics specific to the publications of any researcher or research group.

LITERATURE REVIEW

Scientometric studies have been conducted in the scientific fields which concern primarily with the metadata of publications. These studies based on elements like author, subject, citations etc provide insight in to the scientific productivity, trends, patterns, preferences etc in different fields. Thus, studies concerning analysis of publications of individual researcher or research groups, related to this study, have been reviewed.

Kademani, Kalyane, Kumar, and Mohan (2005) analysed the academic contribution and collaboration of eight Nobel laureate and found that Nobel laureates mostly prefer to undertake research works in collaboration. **Kumaragurupari, Sieving & Lalitha (2010)** in a bibliometric study analyzed the publications of Indian Ophthalmologists and vision researchers. The data source used was PubMed database. The total number of publications retrieved comprised 2163 research articles published during time-period 2001-2006. The study revealed almost a double annual increase in publication productivity- from 284 in 2001 to 460 in 2006. Two-thirds of the productivity was traced from international journals. Topics ranged mostly around clinical science while basic science topics were found to be the least. Besides, international collaborations were found having an increase from 3% in 2001 to 8% in 2006. **Saravanan and Prasad (2012)** assessed the research work of G. Thanikaimoni- a palynologist of high repute. The study reveals a total of 56 publications to his credit produced from 1965 to 1991. Majority (35) of the publications were found to be single authored. Similarly, **Bansal (2018)** carried out a scientometric analysis of the publications of Arieh Warshel- a Nobel Laureate in chemistry. The study has traced a total of 393 publications published during time-period 1968-2016. 89.57% of publications were found to have published in collaboration and most of the collaboration was traced with author Z.T.Chu. The majority of the publications were published in 'The Journal of Physical Chemistry B'. **Sharma and Chakravarty (2018)** analysed the collaborative publication trend among library and information science faculty members in some central universities of North India. The data for the study was collected from the university websites and through questionnaires. A total of 1292 publications were found published during the time-period 1978-2014. Majority (854) were traced as multi-authored, with double-authored publications being the highest published. Total count of authors in all publications was traced to be 2349.

Bhattacharyya and Sahu (2020) conducted a bibliometric study of the publications of Elinor Ostrom- the Nobel laureate in the field of economics. The analysed data comprised 197 publications harvested from Scopus database. The study found 85 of her publications as single authored. Further, years 2006, 2008-2013 observed as the most productive years of her life during which a total of 103 publications have been published by her. A total of 50552 citations have been recorded with recency index of 0.47.

SCOPE

Publications of Nobel Laureates, who have received the award during time-period 2005-2008, in the field of Medicine, have been analysed. The publication details for the said laureates have been retrieved from bibliographic database WoS from 1989 to 2018 and the selected scientometric indicators applied.

OBJECTIVES

The study endeavours to gauge the characteristic features of the publications and the publishing patterns of Nobel Laureates in the field of Medicine and accordingly the objectives set are as:

1. To gauge the publication productivity of Nobel Laureates in Medicine using quantity indicators of TPC and FAC.
2. To analyze their citation worth using quality indicators of TCC and CI.
3. To assess the collaboration trends in the publications of these Nobel Laureates using structure indicators of DC and CIn.

METHODOLOGY

To assess the publications of Nobel Laureates in Medicine, two data sets were required. One, names of Nobel Laureates from time-period 2005-2008, in the field of Medicine and second, publication details of the said laureates. All the data were harvested in September, 2020 and comprised following phases:

1. The names of Nobel Laureates, along with other details like affiliations etc. were retrieved from the official website of the Nobel Prize (<https://www.nobelprize.org/>). It gives free access to all the information related to Nobel Laureates.
2. Then, the publication details were harvested from the bibliographic database- Web of Science (<https://www.webofknowledge.com/>) by individually probing the prior retrieved names of Nobel Laureates in the 'author search' box of the database.
3. The displayed results were then refined for publication type of 'articles' only and then downloaded to excel file, individually for each Nobel laureate, using the 'export data' option of the database.
4. The resultant data-sets were then analyzed and interpreted according to the objectives set.

RESULTS AND DISCUSSION

1. Publication Productivity

The data reveals that, though, most of the Nobel Laureates have published more than 100 publications but none of the Nobel Laureates under study has above 200 publications. The highest (190) Total Publication Count (TPC) is shown by Smithies O, followed by Capecchi MR with 177 TPC. Evans MJ and Warren JR show the least TPC of 28 and 20, respectively. Table 1 presents the clear picture of the data.

As for the First Author Count (FAC) is concerned, Marshall BJ tops the list with 20 publications, while Evans MJ and BarreSinoussi have the least count for First Author (FA) publications of 4 each. Majority of the Nobel Laureates have less than 10 FA publications.

Thus, the data depicts that prolificacy of publications and being the primary author are not the chief characteristics of Nobel Laureates.

Table1. Publication Productivity of Nobel Laureates

Nobel Laureate	TPC	FAC
Marshall BJ	98	20
Warren JR	20	7
Fire AZ	137	9
Mello CC	85	9
Capecchi MR	177	7
Evans MJ	28	4
Smithies O	190	6
Hausen H	102	18
BarreSinoussi	173	4
Montagnier L	129	11

2. Citation Scores

Among the Nobel Laureates under study, Fire AZ has the highest (26557) Total Citation Count (TCC), followed by Smithies O having TCC of 25093. The lowest (303) TCC has been traced for Evans MJ, followed by Warren JR with 1129 TCC.

Mello CC despite having low publication productivity shows the highest (266) score for Citation Impact (CI) followed by Fire AZ having 194 as CI score. Evans MJ shows the least (11) CI followed by Marshall BJ having CI of 50. Table 2 gives a lucid view of the data.

Overall, the data reveals high citation trends among Nobel Laureates. Irrespective of the low publication counts, Nobel Laureates show remarkable TCC and CI scores.

Table2. Citation Scores for Nobel Laureates

Nobel Laureates	TCC	CI
Marshall BJ	4886	50
Warren JR	1129	56
Fire AZ	26557	194

Mello CC	22613	266
Capecchi MR	19228	109
Evans MJ	303	11
Smithies O	25093	132
Hausen H	6589	65
BarreSinoussi	9370	54
Montagnier L	7269	56

3. Collaboration Trend

The data depicts that all the Nobel Laureates prefer collaboration at higher levels. The highest score for Degree of Collaboration (DC) is 0.99 for each- Mello CC and BarreSinoussi while the least DC scores fall at 0.85 for Warren JR.

Collaborative Index (CIn.), which is the mean count of authors per publication for each Nobel Laureate, ranges from 4 to 10, with Barresinoussi having the highest (10) CIn. The least (4) score for CIn. is shown by Evans MJ. Table 3 offers a detailed view.

Thus, the data reveals that Nobel Laureates show conspicuous collaborative trends and thus, prefer team work.

Table3. Collaboration Trend among Nobel Laureates

Nobel Laureates	DC	CIn.
Marshall BJ	0.89	7
Warren JR	0.85	5
Fire AZ	0.98	8
Mello CC	0.99	7
Capecchi MR	0.97	7
Evans MJ	0.93	4
Smithies O	0.98	7
Hausen H	0.86	6
BarreSinoussi	0.99	10
Montagnier L	0.97	7

CONCLUSION

The works of elite and eminent scientists considerably influence the overall shaping of trends and functions in the respective fields. These works, usually in the form of publications, get the key consideration from every scientist. Accordingly the current analysis of the publications of Nobel Laureates characterizes their publication patterns. The findings of the current study reveal that Nobel Laureates in the field of Medicine, though, do not show that enormous publication counts, but have accumulated remarkable citation scores. Besides, the study has elucidated significant collaboration trends from their publications. Nobel Laureates having higher scores for citation indicators may be partly because of the high collaborations in the research works, since team works result in 'faster and fuller impact' than individual works (Bennet & Gadlin, 2012) and partly it may signify the research worth and influence, since citations are considered as proxy of impact. Further, citations start accumulating with the fame of the researcher too.

Thus, this study quantitatively unfolds the academic contributions and performance of Nobel Laureates. Besides, it can serve as a yardstick for other scientists mostly the one's standing at the beginning of their careers.

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PHYTOTOXIC EFFECT OF LEAD NITRATE ON GREEN GRAM (*Vigna radiata* L.)**T. Thiagarajan, K. Prakash, P. Munnaji, S. Karuthamma and T. Ravimycin***

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ABSTRACT

A pod culture experiment was conducted to determine the phytotoxic effect of Pb (NO₃)₂ on seed germination and seedling growth of *Vigna radiata* (L.). The seeds were treated under 2.5, 2, 7.5, 10 and 12.5 mg of lead nitrate Pb (NO₃)₂ concentration solutions individually. Each treatment was replicated thrice in a randomized block design. Observations were complete on root and shoot length, number of leaves, total leaf area, fresh and dry weights of seedling. Phytotoxicity, tolerance index and vigour index of green gram at 15, 30, 45, 60, 75th days of seedlings. Among the results gradual increase in Pb (NO₃)₂ concentrations under different treatments significantly leads to inhibition of seed germination and other growth parameters. Percentage of phytotoxicity showed an increasing trend with gradual increase in Pb (NO₃)₂ concentration for the green gram seedlings. Maximum inhibition in all growth parameters and morphological parameters were recorded.

Keywords: Lead nitrate, Green gram, Phytotoxicity, Morphological parameters.

INTRODUCTION

Environmental pollution has been converted into an explanation focus of distress for all the nations worldwide, as not only the developing countries but developed nations as well are affected by and suffer from it. Pollution has many forms, the air we breathe, the water we drink, the ground where we cultivate our food crops and even the increasing noise we hear everyday-all contribute to health problems and lesser quality of life. Heavy metals are defined as metallic elements that have a relatively high density compared to water (Fergusson, 1990). With the assumption that heaviness and toxicity are inter-related, heavy metals also include metalloids, such as arsenic, that are able to induce toxicity at low level of exposure (Duffus, 2003).

MATERIALS AND METHODS

The seeds green gram was obtained from Tamil Nadu Agricultural University (TNAU), Coimbatore, Tamil Nadu. The uniform seeds are selected for the experimental purpose. Source of Pb (NO₃)₂ Potassium dichromate (K₂Cr₂O₇) stock solution prepared by dissolving the molecular weight of Pb (NO₃)₂ and different concentrations viz., (Control, T1(2.5), T2(2), T3(7.5), T4(10) and T5(12.5) mg) of Pb (NO₃)₂ the solution were prepared freshly at the time of experiments. The plastic cups were filled with 1.5 Kg of garden soil, sunflower seeds were sown in the plastic cup and one set of plastic cup irrigated with normal tap water was maintained as the control.

Germination study was conducted with green gram seeds treated with Pb (NO₃)₂. The seeds of green gram were surface sterilized with 0.2 per cent of HgCl₂ for two minutes and they were thoroughly washed with tap water. The seeds arranged in plastic cup filled with garden soil and they were treated with different concentrations (Control, T1 (2.5), T2 (2), T3 (7.5), T4 (10) and T5 (12.5) mg) of Pb (NO₃)₂. The control set was maintained by using tap water, three replicates were maintained for each treatment. On the different days, shoot and root length, total leaf area, fresh and dry weight were taken. From these data, the following values of vigour index, and percentage of phytotoxicity were calculated.

Shoot and root length (cm/seedling)

Twenty seedlings were taken from each treatment and their shoot length and root length were measured by using a cm scale and the values were recorded.

Fresh weight (g/seedling)

Ten seedlings were collected from each treatment and their fresh weights were measured with the help of an electrical single pan balance.

Dry weight (g/seedling)

The same seedlings used for fresh weight were kept in hot air oven at 80°C for 24 hours. Then, the seedlings were taken from the oven and kept in desiccators for some time. Their dry weights were taken by using an electrical single pan balance.

Total leaf area

The total leaf area was calculated by measuring the length and width of the leaf as described by Yoshida et al. (1972). Where

$$\text{Leaf area (cm}^2\text{)} = K \times \text{length} \times \text{breadth}$$

K = Kemp’s constant (for dicot leaves 0.66)

RESULTS AND DISCUSSIONS

In present study on the seed germination, shoot and root length, fresh and dry weight, number of leaf, total leaf area and number of root nodules of green gram seedlings increased in with control and then it decreased at high level of lead nitrate treatment Tables 1-7. Reduction in seed germination percentage and growth at higher concentrations of metals might be due to the higher amount of toxicity, which caused changes in the osmotic relationship of the seed and water.

Many authors reported inhibition Seed germination by heavy metals (Farooqi *et al.*, 2009; Tantrey and Agnihotri, 2010; Heidari and Sarani, 2011; Gubrelay *et al.*, 2013). The study reported Rout *et al.* (2000) that the seed germination was reduced 25 % with the treatment of 200 mM Cr concentration. Moreover, mycorrhiza can facilitate Cr toxicity and influence plant growth in Cr polluted soil (Davies *et al.*, 2001). Shafiq *et al.*, 2008 during the seed germination, the heavy metal stress could be assigned to the accelerated breakdown of stored nutrients in seeds and alteration of selection permeability properties of cell membrane.

However, Wu *et al.* (2008) mentioned that the seedlings of *Citrus tangerine* and *Poncirus trifoliata* importantly higher shoot and root dry weights, plant height, leaf area, leaf number per plant, and stem diameter with the influence of mycorrhizal (AM). Further, studies reported inhibition of seed germination by the heavy metal (Neogy *et al.*, 2002; Cavusoglu and Yalcin, 2010).

Pb (NO ₃) ₂	Shoot length plants (cm plant ⁻¹)					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	17	14.38	18.83	13.5	15.5	13.83
30 DAS	19.83	16.5	20.3	15.5	17.5	15.83
45 DAS	23.7	18.83	30.2	17.5	20.2	16.33
60 DAS	40.46	20.26	47	19.5	39.33	18.33
75 DAS	46.96	33.93	53.5	29.16	50.53	28.8

Table 1. Effects of lead nitrate on the Shoot length of Green Gram *Vigna radiata* (L.)

Pb (NO ₃) ₂	Root length plants (cm plant ⁻¹)					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	9.3	9.03	10	8.2	9.73	7.76
30 DAS	11	10.86	12	10	11.93	9.23
45 DAS	13	12.33	13.5	11	13.1	10.26
60 DAS	14	13.6	15	12.63	13.73	11.9
75 DAS	15.5	14.63	16.5	13.93	15.33	13.3

Table 2. Effects of lead nitrate on the root length of Green Gram *Vigna radiata* (L.) Hepper

Pb (NO ₃) ₂	Number of leaf					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	36	33	39	30	36	27
30 DAS	39	36	45	33	39	30
45 DAS	42	39	57	36	45	33
60 DAS	48	42	57	39	51	36
75 DAS	51	48	60	42	57	39

Table 3. Effects of lead nitrate on the number of leaves of Green Gram

Vigna radiata (L.) Hepper

Pb (NO ₃) ₂	Fresh weight					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	25.23	20.32	28.55	19.75	21.63	15.84
30 DAS	45.22	40.15	49.87	37.53	42.42	35.65
45 DAS	48.97	42.97	55.92	39.55	45.66	36.74
60 DAS	71.88	65.86	75.98	62.75	68.55	59.64
75 DAS	79.42	71.35	87.26	75.64	72.15	68.97

Table 4. Effects of lead nitrate on the fresh weight of Green Gram *Vigna radiata*(L.) Hepper

Pb (NO ₃) ₂	Dry weight					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	8.51	6.77	9.51	6.58	7.21	5.28
30 DAS	15.07	13.38	16.62	12.51	14.14	11.55
45 DAS	16.32	14.32	15.64	13.18	15.22	12.24
60 DAS	23.96	21.95	25.32	20.91	22.85	19.88
75 DAS	26.47	23.78	29.08	25.21	24.05	22.99

Table 5. Effects of lead nitrate on the dry weight of Green Gram *Vigna radiata* (L.) Hepper

Pb (NO ₃) ₂	Total leaf area					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	7.7	7.43	8.1	6.53	6.9	6.4
30 DAS	9	8.5	9.1	7.33	8.16	7.2
45 DAS	11	9.63	10.83	8.23	9.26	7.86
60 DAS	12.2	10.56	13	9.66	10.96	9.53
75 DAS	14.5	12.83	15	10.56	13	9.6

Table 6. Effects of lead nitrate and on the total leaf area of Green Gram

Vigna radiata (L.) Hepper

Pb (NO ₃) ₂	Root nodules					
	Control	T ₁	T ₂	T ₃	T ₄	T ₅
15 DAS	18	16	19	13	16	11
30 DAS	22	17	26	15	18	14
45 DAS	25	20	32	22	22	18
60 DAS	36.33	26.33	42.66	24.66	32.66	23.66
75 DAS	48.66	36	55	34.66	47.66	29.66

Table 7. Effects of lead nitrate on the root nodules of Green Gram *Vigna radiata* (L.) Hepper

CONCLUSION

The germination percentage of seedling growth shoot and root length, fresh and dry weight, number of leaves, total leaf area and number of root nodules of green gram seedlings increased in with AMF and then it decreased at high level of chromium and lead nitrate treatment. Reduction in seed germination percentage and growth at higher concentrations of metals might be due to the higher amount of toxicity, which caused changes in the osmotic relationship of the seed and water.

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EMERGIN TRENDS IN E-COMMERS AND IT'S EFFECTS

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ABSTRACT

E-commerce and internet have become the daily routine of our life. It has been used by all kinds of people from rich to poor even from businessmen to even school going children. E-commerce boomed through in growth via the internet. The primary function such as buying, selling, distribution, marketing, advertisement, servicing of the product or services have been really easy with the help of the internet and other computer network.

Especially companies like amazon and E-bay have led their way in E-commerce. Because of these websites there was a substantial increase in the business in Western Europe and United States in 1998-2005. Also , by the growth of technology such as the smartphone and the 3G, 4G service, a person sitting in anywhere of world can accesses all the facilities to buy and sell the product. But along with these security of E-commerce is a crucial issue and there is still a lot of advancement yet to be made in these fields to ensure consumer safety.

Keywords: E-commerce, Trends, Effects.

INTRODUCTION

E-commerce is also known as electronic commerce or internet commerce. Commerce means interchange of goods. Similarly E-commerce means interchange of goods electronically. It refers to the buying and selling of goods or services using the internet. Because of internet there are a lots of mode like (b2b)) (b2c) (c2c) .Over through internet we can buy and sell any product at any time, it is an ability to buy or sell a product and services to anyone, anywhere and anytime .In simple word e-commerce means buying and selling of products through internet E-commerce helps to the selling and purchasing of goods and services over the internet where the exchange of money and data takes place via protected connections in order to execute a transaction.

Business-to-business transactions play an important part in e-commerce market; a share of e-commerce revenues in rapidly developing countries like India is generated from business to consumer transactions. E-commerce provides multiple benefits to the consumers in form of availability of goods at lower cost, wider choice and saves time. People can buy goods with a click of mouse button without moving out of their house or office. Similarly online services such as banking, ticketing (including airlines, bus, railways), bill payments, hotel booking etc. have been of tremendous benefit for the customers. Online businesses like financial services, travel, entertainment, and groceries are all likely to grow.

According to Jakob Nielsen e-commerce or electronic commerce is the conduct of financial transactions by electronic means. E Commerce usually refers to shopping at online stores on the World Wide Web also known as e commerce websites.

OBJECTIVES

1. To study the recent trends in Ecommerce.
2. To study the effects in Ecommerce.
3. To study why E-Commerce trends are important

METHODOLOGY

In the current study, primary data as well as secondary data have been applied. The most part of the survey is referring to primary data. Necessary secondary data also have been collected from various sources like articles, newspapers and websites.

REVIEW OF LITERATURE

Rina (2016) elaborates the different applications of e-commerce in “**Challenges and Future Scope of Ecommerce in India**”, at the same time, defining the degree to which they are operational in the country. **Gupta (2014)** also elaborates in her paper “**E-Commerce: Role of e-commerce in today’s business**”, presents a comprehensive definition of e-commerce while isolating it from e-business. The paper enlists the different ecommerce models i.e. B2B, B2C, B2G and C2C. **Priyanka Yadav (2017)** in her paper “**E-Commerce Emerging Trend of E-Commerce in India: Some Issues Advantages and Challenges**” have conducted the research with the aim of to understand Trend of E-Commerce, Some Issues Advantages and Challenges. The author finds that the role of government should be to provide a legal framework for e-commerce so that while domestic and international trade are allowed to expand their horizons, basic rights such as privacy, intellectual

property, prevention of fraud, consumer protection etc are all taken care of. In 2015 our Prime Minister Mr. Narendra Modi has been also innovate the idea of “**DIGITOL INDIA**”.

- **Why E-Commerce trends are important?**

In the today's world the E-Commerce and the competition increase rapidly. To stay ahead in the competition commerce friends need to be consistently monitories if you don't keep up with the Ecommerce trends you will risk falling drastically behind no matter how mature good your E-Commerce store is right now in order to take the advantages we should know about the recent trend of the 2021 we all way need to keep looking ahead to ensure future success it is very important to know the E-Commerce trends and analysed and adopt in a timely manner.

- **Ecommerce Trends 2021:**

If you are wondering about what future of e-commerce look like. Do you want to know what trends will shape the success of your online store. Here the few points E-Commerce trend for 2021 that you should know.

- 1. Online sales growth is unstoppable.**

Even though online shopping is one of the most popular online activities. E-Commerce sales have been growing continuous for good reason. It is one of the most popular activities in online. The sales are rapidly increase from 1.3 trillion to 4.5 trillion in the year between 2014 to 2021 and that's a massive figure. People are turning to online shopping by the increasing popularity of e-commerce stores.

- 2. The future of e-commerce after covid-19.**

Undeniably one of the biggest impact on the traditional marketing. But there is no more impact on e-commerce market in 2020 with government worldwide all mall and store are shutting and implement lockdown to restrict social movement for several months on end in a bind to combat the coronavirus, so many people move their business from traditional to E-Commerce, so many people prefer online shopping other than physical in lockdown. The CEO of Amazon Jeff Bezos has seen his fortune growing \$24 million dollar because increased demand for online shopping some expert predict that the impact of coronavirus will not be just short-term boost to E-Commerce but one that's here to stay.

- 3. Mobile shopping is growing.**

The mobile sale has increased by the 15% in 2016 and the end of 2021 it will be 73% of the E-commerce sales will take the place on mobile device. The growth of mobile commerce has been noteworthy. If the E-Commerce experience for mobile customer has improved it can be a huge opportunity for a business to tap into.

The customer cannot use your phone for a social networking with that they can also use for the browsing for shopping purpose. E-Commerce growth has been driven in part by the increasing in usage of mobile device. Once the consumer will secure about the online shopping, it will increase because consumer feel more comfortable shopping on mobile device rather than going outside for shopping. Going outside for shopping it is a very time consuming that's why most of the people prefer online shopping. They have n number of option to buy things with the help of online shopping at anywhere anytime.

- 4. Young consumer to change the business landscape.**

After the covid-19 hit the world, more than half of the consumer spending their time online to buy and sell products with the help of internet. E-Commerce cannot be denied with the effect of coronavirus pandemics. But even through this shift to online shopping is seen across consumer of all ages. The age groups of 18 to 34 are spending more money purchasing items or things online now that before the pandemic young consumer are driving the shift to online shopping. 67% peoples have spent more money online than before the pandemic. The age group of 35 to 54 is slightly more muted then the age group of 55 and above. By this we know we should target the young generation to increase the sales.

- 5. Evolving roles of social media in E-commerce.**

With the click on the buy button of Facebook and instagram the number of social shopper also increasing rapidly. It change our daily life also the way we buy the things, The consumer spend more time on this kind of social platforms so brand has great opportunities to start thinking about how their products improve position on social media. The e-commerce sealers get the help of the social media influencers to increase their product sale, by selling their products to targeting audience.

- 6. Environmental topics influence buyers.**

The brand needs to take the action because the green consumerism is on the rise. The people are becoming more conscious of the environment than before. Environment concern impact to their business says by the half of the

digital consumer for a creating the substantial practices the E-Commerce business should strive consumer feel more responsible towards the environment, so it is responsible of the brand to cater the eco-friendly needs of customers

- **E-commerce trends.**

“E-commerce is the use of electronic communications and digital information processing technology in business transactions to create, transform, and redefine relationships for value creation between or among organizations, and between organizations and individuals”

- 1. E-commerce after covid-19.**

As the every new year comes the E-Commerce will only get bigger and bigger because our world is changing and with the help of new technology it will possible all over the world. The things are changed by the coronavirus and its expected that buying behavior is likely to be boom people are not willing to step out Hendricks explosion show prefer to buying the more and more online product. The revenue growth has increased by 68% as of in mid-April on a year-over-year basis and 129% in USA and Canadian E-Commerce orders. There has been a sustained growth for the digital commerce industry all these years, but as the competition gets fierce and the situation worse, the industry has been reeling under tremendous pressure.

Nevertheless, the growth is here to stay as a large number of online shoppers have been switching to the internet for their needs and indulgences. In fact, contrary to the ongoing predictions, the Fashion and apparel report reveals that a large number of retailers are looking forward to a rise in E-commerce sales post the COVID-19 crisis, one of the E-commerce trends of 2021.

- 2. Contextual and programmatic advertising.**

The design or to cater this friends the social media is already revamping because of that contacts and programmatic ads will see a rise in this year. On the basis of consumer consumption the ads are shown to them so think they can buy a product. It is about offer the right ads at right movement to the right audience. As compared to the traditional method E-commerce store owners stand better chance to reach the longer customer by using programmatic advertising this result will makes better profit in future.

- 3. Marketing automation**

Scheduling social media post the business uses 49% of marketing automation and it's also show no sign of shopping.

If you can implement automatic marketing properly it will let you: - 1. Send out tailored emails to your customer's 2. Display new products and promotions as per the visitors' shopping history. 3. Retarget customers for necessary product sales. It allowed customizing the store offering for each and every customer.

It allowed customizing the store offering for each and every customer

- 4. Artificial intelligence**

According to the customer segmentation and identification of pattern and based on their browsing history our massive change for E-Commerce store in terms of automation and store personalization. If you do not have a large volume of data then it's create the challenge for your small e-commerce businesses. However this business can partner with third party provide to work around this restriction it indicate that more companies will tap into artificial intelligence

- **Effects of E-Commerce**

- 1. Site crash**

When we open site, we are looking information on it or we are working on it, and that particular site suddenly closed, it does not provide you data or the sources we can see on our sites such as videos, images, blogs become unavailable to us. It means something went wrong or that particular site is crash. This is the irritating thing that can happens a website owner is site crash. Especially your business is E-commerce you will lose your money.

- 2. Shipping delays can be irritating**

Shipping time is one of the aspects of e-commerce that can bring frustration to both business owners and consumers. The shipment can be delayed at the origin for various numbers of reasons including weather, missing documents, bad network etc.

- 3. Impact on consumer**

Customer satisfaction is aided by a secure payment platform. It has been made easy for the consumers as they can compare prices and products from a wide range of products. Websites further have very fair return policies so the customer is well satisfied at all times.

4. Impact on business.

A large number of people think that e-commerce has a negative impact on business due to the decline in sale of stores and brands in the market. They have made their presence online too. Businesses have also had to drive down prices in order to still be competitive in the market, as it is now easier than ever to compare prices across a wide range of companies. Despite the many negativities surrounding e-commerce, there are a lot of businesses who've generated revenues in billions like Amazon. Have across higher class brands that have stores as well as online presences

5. Downsides to E-commerce.

E-commerce does have its downfall the speed the speed and simplicity of which consumers can spend money online has become a serious financial issue for money. Gambling has also gone up since E-commerce was introduced.

CONCLUSION

With the help of the above data we can say that the internet has opened so many opportunities for doing business online and e-commerce is one of the most popular one's. The more technology continues to evolve, the more sophisticated e-commerce services become e-commerce is probably one of the biggest trends of 2020 but the future is wild and unpredictable. In general, today's businesses must always strive to create the next best thing that consumers will want because consumers continue to desire their products, services etc. to continuously be better, faster, and cheaper. The e-commerce has undeniably become an important part of our society. The World Wide Web (www) is and will have a large part in our daily lives. It is therefore critical that small business have their own to keep in competition with the larger website. E-Commerce has made easier faster and cheaper for a consumer and businesses to buy and sell a product and service and the traditional way are being sacrificed but the world growing and everyone needs to add up to the changes it has offer.

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CSR AND ITS PERFORMANCE IN SECL: A RELATIVE STUDY**Kameshwar Pandey¹ and Dr. Rajiv Harris Peters²**

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ABSTRACT

There is no relationship with CSR practices and the middle business of SECL. With the rapidly changing proficient work environment, more helpful self-rule, operational freedom, etc SECL has accepted CSR as an indispensable gadget for attainable improvement of society all in all. Based on the previously mentioned, it may be said that SECL is centered around having an effect on the social and biological limits material to its errands. Regardless, there are monstrous freedoms for empowering SECL bunch through commitment of the workers in CSR works out. This can uphold both, the social headway limits while improving the worker effectiveness through extension in motivation level.

Watchwords: Core Business, Operational Freedom, Strategic Tool, Social Development Parameters, Employee Productivity

INTRODUCTION

CSR VISION is India's (possible World's) first month to month magazine on paper devoted to CSR and Economic Development for joining all accomplices of SUSTAINABLE Advancement at a worldwide and neighborhood levels and go probably as a phase for propelling key CSR likewise, viable improvement practices through spread of data and data. SECL reliably anticipate to the overall population for its unforeseen development. SECL works with District Organization in like manner as Non-Government Organizations for utilization of CSR adventures perceived by close by networks, neighborhood specialists, Ministries, District Administration, Government Representatives, MLAs, MPs, Coal India Limited, etc Some basic zones of activities under CIL CSR Policy are clinical benefits programs like coordinating town prosperity camps, advancement of unprecedented units in crisis centers, Providing safe reward and sanitization by presenting hand-siphons, bore-wells, creating of lakes, advancement of organization latrines, Promoting tutoring by making establishment like homerooms, verandah, limit divider, lavatory blocks, social stage, fundamental room, modernization of library, gathering of staff, propelling work improving proficient aptitudes, Ensuring environmental practicality by expecting power over activities like road side estate under "Harihar Chhattisgarh" Scheme of Chhattisgarh Govt., Protection of workmanship and culture for social improvement through financial assistance to different social events, Advancing comprehensively apparent games by giving money related help, Rural improvement adventures like improvement of transport stops, CC roads, network building, channels, ghats and security divider for lakes, sheds, limit dividers, bathrooms, social stage, Swachh Vidyalaya Abhiyan:SECL has constructed/fixed 11,515 no. of restrooms in schools arranged in different zones of Chhattisgarh, Madhya Pradesh, Odisha states under the Swachh Vidyalaya Abhiyan, a mission under Swachh Bharat Abhiyan, a beginning from Hon'ble Prime Minister, India.

LITERATURE REVIEW

In 1980, Thomas M. Jones (1980) was apparently the fundamental maker to consider CSR a dynamic measure that sway corporate lead. Jones' (1980) responsibility offered way to another district of conversation around CSR which focused in more on its operationalization than on the actual thought. This changed over into the creation of latest constructions, models, and methods highlighted evaluating CSR from an operational perspective. Some remarkable instances of the 1980's came from Tuzzolino what's more, Armandi (1981), who presented a need-hierarchy framework through which the association's socially reliable execution are consistently assessed maintained five measures (profitability, progressive security, union and industry setting, market position and reality, and self-consummation); Strand (1983), who proposed a structures model to address the association between an affiliation and its social commitment, responsiveness and responses and who recognized inside moreover, external effects of association's lead; Cochran and Wood (1984), who used the joined Moskowitz list³, a standing record, to research the association among CSR and budgetary execution; and Wartick and Cochran (1985) who redid Carroll's appreciation of CSR (1979) into an arrangement of guidelines, cycles, and social systems.

As Carroll (1999) and Lee (2008) point out, these conveyances reflect another prevailing upon regards to the positions and obligations of associations. Besides, the Committee for Economic

Improvement (1971) perceived that the certain understanding among business and society was creating in considerable and critical manners and expressly saw that: "Business is being approached to acknowledge more

broad commitments to society than at some other time and to serve a more broad extent of human qualities. Business endeavors, basically, are being drawn nearer to offer more to the idea of American life than just giving measures of product and adventures. While business exists to serve society, its future will depend upon the idea of the board's response to the advancing cravings for everyone" (Committee for Economic Development 1971, p. 16).

The Club of Rome, outlined in 1968 by a social affair of experts that included scientists, business investigators moreover, business pioneers from 25 particular countries, dispersed in 1972 the report The Limits to Development (World Watch Institute n.d.), an assessment drove by the Massachusetts Institute of Technology (MIT) which examined the appropriateness of continued with advancement and its regular impression (The Club of Rome 2018). The report happened to congruity for the overall organization since it brought the thought towards the impact of people advancement, resource utilization and tainting, and raised the need of reliable vital methodologies and new regulatory constructions. South Eastern Coalfields Limited, a little ratna Mining Company with exercises in 6 locales of Chhattisgarh and 3 districts of Madhya Pradesh. Since starting, it had an astonishing record of outflanking its own creation figures, making new seat mark for coal creation, reliably.

During cash related Year 2015-16, SECL made 137.93 Million Tons of Coal, subsequently selecting an advancement of 7.52 % longer than a year prior. It holds a monster circumstance in the Indian coal mining zone with a normal topographical coal hold of 63,014.83 million tons in its request zone as on 1.04.2015, which is more than 20 % of the total geological coal saves in India. SECL was participated in 1985 with its headquarters in Bhatagaon Area. Bhatagaon Area City, the region settle is the greatest metropolitan spot (town/city) of the region. Bhatagaon Area is the second greatest city of Chhattisgarh state. Chhattisgarh High Court was is plan in Bhatagaon Area on first November 2000, the very day when the Chhattisgarh State was contained, by uprightness of which Bhatagaon Area has gotten the title of Nayaydhani.

IDEA

The vision of South Eastern Coalfields Limited (SECL) is to be driving energy supplier in the country, by accepting the acknowledged methods and driving development from mine to promote.

MISSION

The mission of South Eastern Coalfields Limited (SECL) is to convey and grandstand the masterminded measure of Coal continually things viably and fiscally with due regard to prosperity, assurance and quality. Assessment Methodology Examination Methodology is a way to deal with intentionally tackle the investigation issue. It may be seen as an investigation of concentrating how assessment is done deductively. In it we study the various advances that are generally embraced by researcher in considering his investigation issue close by the reasoning behind them.

GOALS OF STUDY

- 1) To think about the introduction of Corporate Social Responsibility by South Eastern Coalfield Ltd. (SECL) in Bhatagaon Area.
- 2) To think about the capacity of South Eastern Coalfield Ltd. (SECL) on the Corporative Social Obligation with respect to progression of sanitization in country and metropolitan Areas.
- 3) To consider the work profile of CSR correspondence in South Eastern Coalfield Ltd. (SECL).
- 4) To think about the impact on Society with Corporate Social Responsibility by South Eastern Coalfield Ltd (SECL).
- 5) To facilitate the destitution of the country people through improving the systems for work what's more, tutoring.

FINDINGS

SECL has contributed towards Swachh Bharat Kosh discovered by Govt. of India for advancement of sterilization in country and solid Areas. 2) SECL has added to CG Forest Department under Hariyar Chhattisgarh Program for the year FY2016-17. 3) endorsed for crafted by global of Multi Super Speciality Hospital at Raipur 4) Independent Director – Sunil Kumar (Retd. IAS, Vice-Chairman of Chhattisgarh State Planning Commission) is that the Chairman of CSR Committee 5) SECL is single biggest Coal delivering Company of India, with 140.00 Million Tons of coal creation in 2016-17. 6) Coal stores of SECL are cover the conditions of Chhattisgarh and Madhya Pradesh and hence the Company is working 79 mines remembering 49 mines for Chhattisgarh and 30 in Madhya Pradesh).

CONCLUSION

India CSR Network is India's biggest news gateway on CSR and Sustainability. Input, remarks will make it more intentional and creative. it's planned and kept up by India CSR Group. Despite the fact that all endeavors are made to check the precision, an identical shouldn't be interpreted as an official statement of law or utilized for any lawful purposes. simply if there should arise an occurrence of any equivocalness or questions, perusers are encouraged to confirm with the source(s). Corporate Social Responsibility (CSR) is progressively turning into a critical movement for organizations. CSR focuses on development manageable strategic policies while likewise contemplating the triple primary concern approach-individuals, planet and benefit. Thinking about the obligation of corporate towards society and natural assurance, the Ministry of Corporate Affairs had delivered CSR Voluntary Guidelines (VG) on Social, Environmental and Economic Responsibilities of Business in year 2009. These rules were created to urge organizations to report their exercises upheld triple primary concern approach for example Social, Environmental and Economic. Considering the new worldwide improvements during this field, these intentional rules are altered into Sustainable Development and friends Social Responsibility rules for Central Public Sector Enterprises (CPSEs). Peruse more here. Presently, the govt of India has made another stride during this respect and has as of late presented the new Companies Bill. the organizations Bill has been passed by parliament and can get Presidential consent soon. Corporate Social Responsibility (CSR) is being presented and with this in India, it'll currently be a legal arrangement.

South Eastern Coalfields Limited composed a free clinical prosperity enlistment camp in Bhatagaon Area. The Medical chief dispensary controlled the camp. Let free essential clinical check, glucose levels and BP were checked and free solutions were appropriated. 57 inhabitants benefitted from this new CSR movement of SECL The Girl Empowerment Mission (GEM) program is one such imaginative CSR action which targets drawing in young women.

Gives a 'Restroom Block' to the govt School. This 'Toilet Block' is totally painted with present status of-the-Art civilities. there's a H2O Point with contraption and a declaration RO Framework for young fellows and Girls. Corporate social commitment (CSR) in mining areas has extended power especially in countries like India where it's been made required. the central objective of this paper is to document genuine social troubles of mining in field locales and choose how associations inside the coal region can add an intelligent method to recognize rouse of impacted organizations. the fundamental a piece of the paper draws verification from three extraordinary assortments of composing, for instance CSR and coal mining, limit building and work age in mining areas. We attempt to join the composition to propose an absolutely excellent design for work age experience limit working with the assistance of CSR adventures. The paper also records a live occurrence of preparation and as needs be the execution of cutoff building practices in Muriadih coal mines inside the Jharkhand domain of India and offers activities to both business and methodology makers. The proposed structure has quite recently been tried in a close by setting, at this point can be reproduced in other mining zones.

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COMPARATIVE ANALYSIS OF COFFEE EXPORT IN FIVE LEADING PRODUCER AND EXPORTER COUNTRIES

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ABSTRACT

The aim of this paper is to share experiences among five leading coffee producer and exporter countries coffee export trends. A Judgmental/ purposive sampling method was used to select countries. To examine a difference in export Kruskal Wallis test was applied to examine five years coffee exports (2015/16- 2019/20). All test results confirm that there is difference in type of coffee exports among countries. The main reason for the difference is due to government policies, capacity and capability to use technology. In order to enhance coffee export and benefit gained from coffee sharing experience from Vietnam, focus on value-adding activities and applying secondary processing is essential.

Keywords: - Comparative analysis, Coffee Export Five Leading Countries.

I. INTRODUCTION

Among the various popular drinks, coffee has acquired the rank of most preferred drink. People having coffee dependence on the season, at cold seasons, they prefer hot coffee and at cold seasons they prefer hot coffee. There are many stories about the historical back ground of coffee. According to the legend, the rise of coffee began in the year 600 with the discovery of coffee Arabica. The story goes that a great herder by the name of Kalidi found coffee plant in the mountain forests of what is now called Ethiopia. It is also said by the people that word coffee was coined in the region of Kaffa zone, which is found in South west Ethiopia (WCR, 2018). It was also one of names of a region in ancient Abyssinia. Most of the authors agree that coffee plant is indigenous to Abyssinia while others believe that there was also cultivation of coffee in Yemen. Zaimeche (2004) had claimed that coffee was cultivated by Yemeni Muslims where it was brought from Ethiopia and then it was spread to several countries of Africa, Asia, and Latin America (Lokker, 2013; Smith, 1985). The three main commercial types of coffee are Robusta, Arabica, and Liberica. People prefer coffee Arabica and consider it more suitable for drinking compared to Robusta coffee. Taste of Robusta is somewhat bitter and is liked by few and has a better seed body than Arabica coffee. For this reason, about 3/4 of coffee plantation worldwide is of Arabica type. Plant of Robusta coffee has less risk of diseases than Arabica and it can be cultivated in those environments where Arabica coffee does not succeed (William, 1922).

Coffee is liked for its unique taste and flavor and one feels extremely fresh and energetic after taking coffee. ICO (2001) has Identified various feeling benefits of having coffee, such as increase in short-term memory, alertness, sharpness, activated performance, energy metabolism, reduces Alzheimer's and Parkinson diseases it is also a good source of potassium, magnesium and fluoride. Lire Wachamo (2017) has identified some of the negative impacts of taking coffee on health such as reduced appetite level for food, addresses impact on pregnant women, and risk of headache. Recent studies have reported that coffee intake is beneficial for our health when it is optimal to about four cups on an average in a day. Coffee is produced and exported by more than 70 countries and provides economic benefits at each step of the global value chain that links growers to consumers (UNACT, 2019)

The world coffee export have been increasing from time to time. Global coffee export in 1990 had increased from 80,675 thousands 60 kg bags to 131,694 thousand 60 kg bags, in the production year 2019. The five leading coffee producer and exporter countries total export in 1990 was 40,002 thousand 60 kg bags and their share in global coffee export accounted for 49.6%, the remaining 50.4% of coffee was exported by other countries; for the year 2019 the export capacity of five leading producer and exporter countries increased to 92,025 thousand 60 kg bags and their share in global coffee export also increased to 69.88% and the remaining 30.12% coffee was exported by other countries.

Brazil, the first largest coffee producer and exporter which produces both Robust and Arabica type of coffees; its export in 1990 was 16,936 thousand 60 kilogram bags who increased its export in 2019 production year to 40,698 thousand 60 kilogram bags; its share in the world coffee export accounted for 21 % in 1990 which increased in 2019 to 30.9%.

Vietnam, the second largest coffee producer and exporter which produces both Robusta and Arabica types of coffee, and is the largest producer of coffee Robusta and the fourth-largest producer of coffee Arabica, Vietnam

exported 1,145 thousand 60 kilogram bags in 1990 production year and its export increased in 2019 to 27,400 thousand 60 kilogram bags. Its share in the world coffee exports in 1990 accounted for 1.4% which was increased in 2019 to 20.8%. In coffee production and exports Vietnam showed radical progress.

Colombia is the third-largest coffee producer and exporter; the second-largest producer of coffee Arabica. Its export in 1990 was 13,944 thousand 60 kilogram bags which showed decline in 2019 which accounts for 13,672 thousand 60 kilogram bags and its share in the world market in 1990 declined from 17.28% to 10.38%.

Indonesia is the fourth largest coffee producer and exporter which produce both Robusta and Arabica types of coffee. It is the third largest producer of coffee Robusta and the fifth largest producer of coffee Arabica. Its coffee export in 1990 was 6,903 thousand 60 kilogram bags which declined in 2019 production year to 6,334 thousand 60 kilogram bags and its share in the world market declined from 8.55% in 1990 to 4.8% in 2019.

Ethiopia is the fifth-largest coffee producer and the third-largest producer of coffee Arabica. Its export in 1990 was 1,074 thousand 60 kilogram bags which increased in 2019 production year to 3,921 thousand 60 kilogram bags and its share in world market in 1990 accounted for 1.33% which increased to 2.97% in 2019. Among the five leading coffee producer and exporter countries, Colombia and Ethiopia produce only Arabica type of coffee (FAO, 2015; USDA, 2019). The coffee export share of Colombia and Indonesia showed decline while Vietnam showed radical growth. Brazil and Ethiopia also showed increment.

Marketing years for coffee producing countries are classified into three: - April to March, nine countries such as Angola, Bolivia, Burundi, Ecuador, Indonesia, Madagascar, Papua New Guinea, Peru, and Rwanda. The second classification marketing season starts from July-June, which includes six countries such as Brazil, Cuba, Dominican Republic Haiti, Philippines, and Tanzania. The third classification of marketing season starts from October –September and in this category are Ethiopia, Vietnam, India, and other 31 coffee producer and exporter countries and non- producing category of countries. Due to limited natural resources, capacity, capability, technology utilization, and government policy, there is a big difference in Coffee exports among coffee producer and exporter countries. This study compares the five leading global coffee producer and exporter countries in the matter of coffee export in different forms from 2015/16 to 2019/20 USDA estimation of an international coffee organization to identify the difference in coffee export in order to share their experiences to enhance benefits gained from coffee.

II. OBJECTIVES OF THE STUDY

The following hypotheses have been formulated to achieve the objectives of the study.

1. H1 (a) whether there is any significant difference in coffee beans export estimation among the five leading coffee producer and exporter countries between 2015/16-2019/20.
2. H1 (b) whether there is any significant difference in roasted coffee export estimation among the five leading coffee producer and exporter countries between 2015/16-2019/20.
3. H1 (c) whether there is any significant difference in soluble coffee export estimation among the five leading coffee producer and exporter countries between 2015/16-2019/20.
4. H₁ (d) whether there is any significant difference in total coffee export estimation among the five leading coffee producer and exporter countries between 2015/16-2019/20.

III. METHODOLOGY

Data used for this study has been collected from the International Coffee Organization for coffee export estimation 2015/2016 to 2019/20 production years. By using judgmental/ purposive sampling method, five leading countries such as Brazil, Vietnam, Colombia, Indonesia and Ethiopia were selected. A Kruskal-Wallis test was used to test the hypothesis. The statistical calculation was done through SPSS version 22 to find out the significance of the mean difference between countries' by export forms of coffee (beans, roasted, soluble) and total coffee exports. The statistical significance is denoted by a probability of 0.05 and below otherwise it is non- significant.

IV. RESULTS AND DISCUSSION

Coffee producer countries export their products in different forms like beans, roasted and soluble.

Table1 Coffee bean export

Country	15/16	16/17	17/18	18/19	19/20	Average	Share in %
Brazil	31,870	29,325	26,936	37,376	33,500	31,801.4	27.66
Vietnam	26,950	25,000	25,250	24,700	25,500	25,480	22.16

Colombia	11,490	12,700	11,700	12,500	12,300	12,138	10.55
Indonesia	7,938	7,309	6,940	4,907	6,500	6,731.4	5.8
Ethiopia	3,405	3,853	3,893	3,980	4,000	3,826.2	3.3
Total	81,653	78,187	74,719	83,463	81,800	79,977	69.56
World expot	112,970	113,801	111,133	120,094	116,821	114,963.8	

Source: (USDA, 2019)

As indicated in table 1, From 2015/16 to 2019/20 production years the average coffee beans export share of five leading producer and exporter countries was Brazil 31,801.4 (27.66%), Vietnam 25,480 (22.16%), Colombia 12,138(10.55%), Indonesia 6,731.4 (5.8%) and Ethiopia 3,826.2(3.3%) and total being at 79,977 (69.56%) while other countries exported 30.46 %. From 2015/16 to 2019/20, the share of Brazil in coffee beans export was 28.21%, 25.77%, and 24.23%, 31.12% and 28.67% respectively. Vietnam’s share of coffee beans export in the same years was 23.85%, 21.97%, 22.72%, 20.56% and 21.82% respectively. Colombia’s share of coffee beans export as indicated in table 1 was, 10.17%, 11.16%, 10.53%, 10.40% and 10.53% respectively. Indonesia’s share of coffee beans export indicated from 2015/16 to 2019/20 was 7.02%, 6.42%, 6.24%, 4.08% and 5.56% respectively. Ethiopia coffee beans export share was also 3.01%, 3.38%, 3.5%, 3.31% and 3.42% respectively. During those five years, five leading producer and exporter countries export of coffee beans an average Brazil was 23.53%, Vietnam 18.86%, Colombia 8.96%, Indonesia 5% and Ethiopia 2.83% in total 59.2% of coffee and 41.8% of coffee beans exported by other countries.

Table2. Kruskal Wallis test output Beans

$X^2 = 22.900$, DF= 4, P=0.000

	Name of country	N	Mean rank
Thousands of 60kg bags	Brazil	5	22.80
	Vietnam	5	18.20
	Colombia	5	13
	Indonesia	5	8
	Ethiopia	5	3
	Total	25	

Source: SPSS output

The chi-square value of beans export showed that $\chi^2 = 22.900$ and the P- value 0.000 is less than <0.05 . This shows that the means of five populations are not all equal and at least one of the means is different. The means of rank showed that Brazil was at the highest position while, Ethiopia at the least position. It proves that that there is a significant difference in coffee beans export estimation among the five leading coffee producer and exporter countries between 2015/16-2019/20

Table3. Roasted coffee exports

Country	15/16	16/17	17/18	18/19	19/20	Average	Share in %
Vietnam	550	550	550	550	600	560	14.92
Colombia	100	155	180	180	190	161	4.3
Indonesia	48	65	70	43	45	54.2	1.4
Brazil	28	31	20	23	20	24.4	0.65
Total	726	801	820	796	855	799.6	21.31
World export	3,417	3,737	3,750	3,926	3,931	3752.2	

Source: (USDA, 2019)

As indicated in table 3, From 2015/16 to 2019/20 production years roasted coffee exports share of four leading exporter countries an average was:- Vietnam 14.92%, Colombia 4.3%, Indonesia 1.4% and Brazil 0.65% out of total average 21.31% while other countries exports were 78.69% an average within five years. From 2015/16 to 2019/20, the share of Brazil in roasted coffee exports was 0.8%, 0.8%, and 0.5%, 0.5% and 0.5% respectively. Vietnam’s share of roasted coffee exports during the same years was 16.09%, 14.72%, 14.66%, 14% and 15.26% respectively. Colombia’s share of roasted coffee export during the same period as indicated in table 3 was 2.92%, 4.14%, 4.8%, 4.58% and 1.14% respectively. Indonesia’s share of roasted coffee export as indicated during the same period in table 3 was 1.4%, 1.73%, 1.86%, 1.1% and 1.4% respectively.

Table4. Kruskal-Wallis output Roasted coffee

$X^2 = 18.020$, DF= 3, P=0.000

	Name of country	N	Mean rank
Thousands of 60kg bags	Vietnam	5	18
	Colombia	5	13
	Indonesia	5	8
	Brazil	5	3
	Total	20	

The chi-square value of roasted coffee export showed that $x^2 = 18.020$ and the P- value 0.000 which is less than <0.05. This shows that the means of four populations are not all equal and at least one of the means is different. The means of rank showed Vietnam at the highest position and Brazil at the least position. Ethiopia did not export roasted coffee. Therefore, it was proved that there is a significant difference in roasted coffee exports among the five leading coffee producer and exporter countries between 2015/16-2019/20

Table 5 Soluble coffee

Country	15/16	16/17	17/18	18/19	19/20	Average	Share in %
Brazil	3,645	3,725	3,494	4,023	3,300	3,637	22.19
Vietnam	2000	2000	2,100	2150	2200	2,090	12.75
Indonesia	1,910	800	1000	1,200	1,300	1,242	7.58
Colombia	800	900	850	900	900	870	5.3
Total	8,355	7,425	7,444	8,273	7,700	7839	47.84
World export	17,001	16,009	16,263	16,629	16,025	16,385	

Source: (USDA, 2019)

As indicated in table 5. From 2015/16 to 2019/20 production years, soluble coffee exports share of five leading producer and exporter countries was at 8,355(49.14%),7,425(46.38%),7,444(45.77%),8,273(49.75%) and 7700(48.04%) respectively while other producer and exporter countries exports were at 50.86 %, 53.62%, 54.23%, 50.25% and 51.96% respectively. From 2015/16 to 2019/20, the share of Brazil in roasted coffee export was 21.44%, 23.26%, and 21.48%, 24.19% and 20.59% respectively. Vietnam’s share of roasted coffee export during the same years was 11.76%, 12.49%, 12.91%, 12.92% and 13.72% respectively. Colombia’s share of roasted coffee export also as indicated in table 5 was during the same years at 4.7%, 5.62%, 5.22%, 5.41% and 5.61% respectively. Indonesia’s share of roasted coffee export as indicated in table 5 was at 11.2%, 4.99%, 6.14%, 7.21% and 8.11% respectively. On an average within those five years, Brazil exported 22.19% its of soluble coffee, Vietnam exported 12.75% of their soluble coffee, Indonesia exported 7.58% of its soluble coffee, Colombia exported 5.3% total four countries export 47.84% and 52.16% of coffee was exported by other countries.

Table6. Kruskal-Wallis output soluble coffee

$X^2 = 16.879$ DF= 3, P=0.000

	Name of country	N	Mean rank
Thousands of 60kg bags	Brazil	5	18
	Vietnam	5	13
	Indonesia	5	7.10
	Colombia	5	3.9
	Total	20	

The chi-square value of soluble coffee export showed $X^2 = 18.020$ and the P- value 0.000 which is less than <0.05. This shows that the means of four populations are not all equal and at least one of the means is different. The means of rank showed Vietnam at the highest position and Brazil at the least position. Ethiopia did not export roasted coffee. Thus, it was evidenced that there is a significant difference in soluble coffee exports among the five leading coffee producer and exporter countries between 2015/16-2019/20

Table 7 Total coffee export

Country	15/16	16/17	17/18	18/19	19/20	Average	Share in %
Brazil	35,543	33,081	30,450	41,422	36,820	35,463	26.24
Vietnam	29,500	27,550	27,900	27,400	28,300	28130	20.82
Colombia	12,390	13,755	12,725	13,700	13,400	13194	9.76
Indonesia	9,896	8,174	8,010	6,150	7,850	8016	5.93
Ethiopia	3,405	3,853	3,893	3,980	4,000	3826.2	2.83
	90,734	86,413	82,978	92,652	90,370	88629.4	65.60
others	22821	22311	22890	23442	23017		
World T	133388	133547	131146	140,649	136777		

Source: (USDA, 2019)

Coffee producer and exporter countries export their products in different forms like beans, roasted and soluble forms. From 2015/16 to 2019/20, the average of exports showed that 65.6 % of coffee was exported by five leading coffee producer and exporter countries and 34.4 % of the coffee was exported by other coffee producer countries. The coffee exports share of Brazil on an average with in those five years was 35,463(26.24 %) and its share in different forms of coffee was 23.53% Beans, 0.41% roasted and 2.7% soluble. Vietnam is the second-largest producer and exporter of coffee whose share within those five years of export was 28,130 thousands 60 kg bags and its share in total coffee exports in the world was 20.82%. Its share in different forms of export: - 18.86% beans, 0.41% roasted and 1.5% soluble. Colombia is coffee exports average with in those five years indicated as 13194 thousands 60 kg bags and its share was 9.76% in total coffee export in the world. Its share in the total coffee export was 8.98 %, 0.12 % in the form of roasted and 0.64% in the form of soluble. Indonesia has the fourth-largest producer share at 8016 (5.93 %) thousands of 60 kg bags ,it's 5% is the form of beans, 0.001% in the form of roasted, and 0.92% in the form of soluble coffee.

Ethiopia is the fifth largest producer and exporter which exports on average within those five years 3826.2 thousands of 60 kg bags (2.83%) all in beans form. Ethiopia is the only country among five leading producers and exporter countries who export in the form of beans. The other four countries export their coffee in different forms. The major of coffee is exported in the form of beans for being roasted by other countries. More than 80% of the benefit obtained from the value chain goes to a secondary processor. Due to this reason, the profit ploughed back to farmers from the end-user is reduced to less than 10% (Beshah, *et al.*, 2013

Table8. Kruskal Wallis test output of total coffee export of producer and exporter countries

$$X^2 = 23.077, DF= 4, P=0.000$$

	Name of country	N	Mean rank
Thousands of 60kg bags	Brazil	5	23
	Vietnam	5	18
	Colombia	5	13
	Indonesia	5	8
	Ethiopia	5	3
	Total	25	

The chi-square value of total coffee export showed $x^2 = 23.077$ and the P- value 0.000 at is less than <0.05 . This shows that the means of five populations are not all equal and at least one of the means is different. The means of rank showed Brazil at the highest position Ethiopia at the least position. Therefore, it was proved that there was a significant difference in total coffee export among the five leading coffee producer and exporter countries between 2015/16-2019/20

V. CONCLUSION

Results of the study showed that among 70 coffee producer and exporter countries, five leading producer and exporter countries during the five years have on an average exported 88,629.4 thousands of 60 kg bags of coffee. Their shares accounted for 65.6% and of the countries have exported 34.4% of coffee within those five years (2015/16-2019/20) the average export of leading countries in different forms of coffee export showed that 79,977 thousands of 60 kg bags beans were exported by five leading countries. Their share in global market was 69.56% and the share of rest 30.44% beans exported. 799.6 thousands of 60 kg bags of roasted coffee were exported by leading countries. Their share accounted for 21.31% and 79.69% of roasted coffee was exported by

others and on an average 7839 thousands of 60 kg bags of soluble coffee were exported by five leading countries. Its share in global market accounts for 47.84% and the rest 52.16% in soluble coffee was exported.

Among five leading producer and exporter countries, Vietnam showed radical growth whereas Indonesia and Colombia showed declining trend in coffee export that Ethiopia did not export roasted and soluble coffee in global market. All test results confirm that there is difference in pattern of coffee exports among countries that are producing and exporting coffee. The main reason for the difference is due to government policies, absence of value adding activities and capacity to use technology. In order to enhance coffee exports and have more benefits gained from coffee sharing they should focus on value-adding activities and applying secondary processing methods essentially. Coffee production in Ethiopia have plenty of potentials to grow quality coffee by use of technology and investing more capital in the farming of this cash crop which can go a long way for marketing it possible for Ethiopia to export all types of coffee in different forms.

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NETWORK FORENSIC TOOL: NMAP A PORT SCANNING TOOL

Vikas Punia¹ and Dr. Gaurav Aggarwal²¹Student and ²Head of Department, JaganNath University, Jhajjar (Haryana)**ABSTRACT**

Cybersecurity domain or hacking is not possible without port scanning. Anyone who wants to learn cybersecurity or hacking the all started with the port scanning. Scanning is a procedure for identifying active hosts on a Network. System administrator and an IT Security person know that Port is an endpoint of the communication where data enters into and go out from the computer. It is serious or the first point that attackers, system administrators, and security administrators looking for. Port scanning is one of the popular techniques. Attackers used to discover services they can break into. A port scan consists of sending a message to each port, one at a time. Scanning procedures port scanning return information about which IP addresses map to live host that are active on the Internet and what services it offers. Scanning is one of three components of intelligence gathering for an attacker. In the scanning phase, the attacker finds information about the specific IP addresses that can be accessed over the internet. NMAP is a security scanner used to discover open ports and services running on that port in a computer network.

Keywords: Nmap, Port Scanning, Network Scanning, Operating System fingerprinting

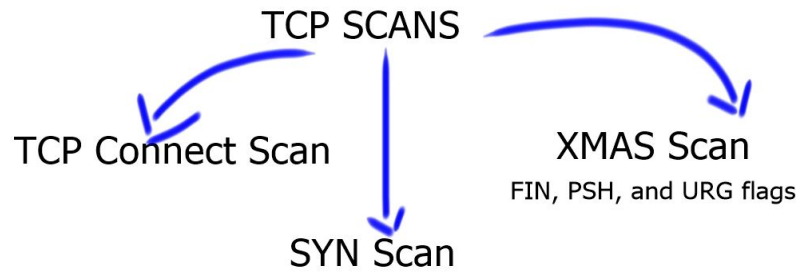
INTRODUCTION

Networking and Port scanning consist of network port scanning as well as vulnerability scanning, Port scanning is a method of scanning data packets via the network to the specified service port numbers like port 23 for telnet, port 80 for HTTP and so on, To identify the available network services on the particular system. Port scanning is a favorite approach of computer crackers, bring out an idea of where to probe for weaknesses. Nmap (or Network Mapper) is an open-source tool. It is a network scanning utility that can be used to discover, audit, and troubleshoot the networked system. Every network administrator should know about the Nmap and its features. Nmap can scan for open ports using TCP packet options with the large numbers of command-line options. It is a full-featured tool that includes several other great subprojects, such as Ncrack, Ncat, Nping, Zenmap and the Nmap Scripting Engine. It is a free utility for network discovery and security auditing. Nmap uses raw IP packets in novel ways to determine what hosts are available on the network like application name and version, Operating System and version, and what type of filters/firewalls are in use. The data collected consists of port scans, ICMP scans, vulnerability scans, successful attacks, and management traffic. It is designed to rapidly scan large networks. The other tools in the Nmap subprojects in the network are the specific needs of users. 1) Nping specializes in network packet crafting. 2) Ncrack is focused on network authentication cracking. 3) Ncat or Netcat is allows read, write redirect, and modify network data to the users. 4) Zenmap is a GUI platform, focusing on usability. Nmap is a powerful utility. Approximately fifteen different scanning methods and twenty different options to use when scanning and output can be presents at least four different ways, within Nmap. It's easy to understand how to use Nmap but it is a bit difficult to understand which option to use under which circumstances. It is most often time used by the network administrator and IT security professional to scan the network.

Full TCP, UDP Connection and SYN Scanners:

There are many tools available to determine a system's weakness and best for an attack. Nmap has fifteen separate scanning methods, and techniques. Each technique has its characteristics, advantages, and disadvantages. Some of the themes are simple to understand and in execution, and some themes are complex and require additional information. Nmap is the best tool used by the system administrator and Security Administrator for network exploration. Variety of activity probing techniques to determine live host, operating system, and what services running on that network used by Nmap.

- **TCP Connection:** This has been the fundamental form of TCP port scanning. In this connection Operating System to initiate a TCP connection to a remote device. The TCP connection() scan uses a normal TCP connection to determine if a port is available. This scan uses the same (i.e., using the full three-way handshake) TCP handshake connection that every other TCP-based application uses on the network. Every listening port, connect() will succeed, otherwise, a -1 is returned indicating that the port is unreachable. This is an easy technique to implement because connect() can be accessed by any user since, and no special privileges are needed to run the TCP connect() scan. Nmap uses the operating system's normal method of connecting to a remote device via TCP.



- TCP SYN Scan:** In this scan, Nmap sends a SYN packet to the TCP port of the target host. If the host replies with a SYN-ACK packet that means the port is open. If gets RST in reply that means the port is closed on that Host. If the target host doesn't replay that means SYN packet is blocked by the firewall or drop by router via port filtering rules. This is a half-open connection process. In SYN scanning process scan uses a half-open connection to the target system. The SYN packet is transmitted using the connect system call. The packet is transmitted with raw socket made by Nmap instead of the system call. When raw sockets are used, the attacker does not leave any information in the own local TCP/IP stack. Therefore, the attacker system judges that the SYN/ACK packet returned from the victim system is an unauthorized TCP handshake. Because of this process, the system, instead of Nmap, send the RST packet back to the victim system.

The TCP SYN scan never actually creates a TCP session, so isn't logged by the destination host's applications. This is much "quieter" scan than the TCP connect() scan and less visibility in the destination system's application logs since no sessions are ever initiated. Since an application session is never opened. It (SYN scan) is a common scan for open ports on a remote device, and simple SYN methodology works on all operating systems. It works on all the network, across all operating systems. The SYN scan only provides open, closed or filtered port information, and Operating system, or process version information.

UDP Scanning:

UDP scans used to determine which UDP ports are open on the host. UDP is a communication protocol that works over the Internet Protocol (IP). Even if UDP scanning plays a minor role in port scanning, UDP does not need SYNs, FINs, or any other fancy handshaking. It is a connectionless and stateless protocol. When a packet is sent to a UDP port, three responses are possible. If there is no service running on the UDP port, the system will reply "ICMP port unreachable" message. ICMP stands for Internet Control Message Protocol. If a service is running, and the UDP packet is not a valid query packet concerning the application protocol, it may silently drop the packet without giving any response. If the UDP packet is a valid packet concerning application protocol and to which a response is expected, the application running on UDP will send back a response packet. Accordingly, port scanning may report any UDP port to be in a closed, filtered, or open state. UDP port scanning is generally much more restrictive to perform as compared to TCP port scanning. This is because TCP port scanning techniques can the three-way handshake and combination of various TCP flags to determine open, close, and filtered ports. However, in the case of UDP port scanning, port scanner like Nmap generally send empty UDP datagram to the of the target machine. If the port is closed, the SUT replies with "ICMP port unreachable" messages, causing the port scanner to report all closed ports as "filtered" and thereby decreasing the efficiency of port scanning.

Operating System fingerprinting:

The operating system fingerprinting is the power full feature of the Nmap tool. It's not the port scanning process, and version detection scan. Nmap designers have devised 16 hand-crafted network probe packets animated at eliciting responses containing kernel specific differences. After probing a machine. Nmap extracts and condenses response features into a summary data structure that is featured in Nmap's classification model. Nmap was designed to solve the OS classification problem. After identifying the opened and closed ports, Nmap starts the os fingerprinting procedure. That process consists of an operating system probe, following by series of TCP handshakes that are used for testing responses to the TCP uptime measurement option, TCP sequence p[redictabilities, and IP identification sequence generation.

CONCLUSIONS

Nmap performs a port scan, Nmap gives us information about all port state and services running on that port by using many more techniques. It steals services and OS information about the target system. The idle scan consists of the probing stage and SYN scanning stage using a zombie PC. Each stage applies the principle of ACK scan and SYN scan. It helps us to narrow our choice to weather to attack that host or not. But here we

should keep in mind that these are the steps to get information about the system and protect any network after that lots more things are remaining to learn and understand the Network Forensic tools. So we should keep learning and find new tools for the keeps Network safer.

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**EVALUATION OF RESEARCH PAPERS ON PHYSIOTHERAPY DURING THE PERIOD 2016-2020:
A SCIENTOMETRIC STUDY**

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ABSTRACT

This study has examined the research output of the “Evaluation of research papers on Physiotherapy during the period 2016-2020: A Scientometric study”. The data interpreted by using software such as ‘Bibexcel tool’, VOS viewer, and tabulated using MS Excel. The results indicated that 7098 papers were published during 2016-2020 and the highest number of publications 1779(25.06%) was produced in 2020. The study also applied statistical tools such as Authorship pattern, Relative Growth Rates, Collaborative Index, Degree of Collaboration, Zips law. The trends in multi-authored papers have tremendously increased (95.73%) compared to (4.27%) single-authored papers. The relative growth rate 0.86 and degree of collaboration 0.95 is noted significantly and the highest number of 1210 records was contributed by the collaboration of four authors. It also noted that the value of the highest degree of collaboration was 0.96 in 2019 and 2020. The Maher CG author (34 records) contributed more number of papers in the domain of Physiotherapy. The Australia (1174) being the country producing more research papers followed by UK (1155). Followed by USA, Canada, and Germany, More than 400 papers had been published in Physiotherapy. The majority of authorship patterns are multi-author collaborations which is the highest contribution during the five years. Physiotherapy (837) is the most usable keyword.

Keywords: Authorship patterns, Bibexcel Physiotherapy, Scientometric, and Web of science.

INTRODUCTION

Scientometrics is the quantitative study of science, technology, and science policy. It has been evolved over time from the study of indices for improving information retrieval from peer-reviewed scientific publications (commonly described as the "bibliometric" analysis of science) to cover other types of documents and information sources relating to science and technology. Scientometric indicators contribute to standardize, collect, report and analyze a wide range of science, technology, and innovation activities. Physical therapy (PT), also known as Physiotherapy, is one of the healthcare professions. Physical therapy is provided by physical therapists that promote, maintain, or restore health through Physical examination, diagnosis, prognosis, Patient education, physical intervention, rehabilitation, disease prevention and health promotion. Physical therapists are known as physiotherapists in many countries.

In addition to clinical practice, other aspects of physical therapist practice include research, education, consultation and health administration. Physical therapy is provided as a primary care treatment or alongside, or in conjunction with, other medical services. In some jurisdictions, such as the United Kingdom, physical therapists have the authority to prescribe medication.

REVIEW OF LITERATURE

Palanisamy Dr, G. (2018) used a Scientometric method to quantitatively analyze the research articles that research productivity of Immunology in India during the year 1993- 2017 (25 years). The Web of Science (WOS) database was used in the data reclamation. The explore term used was “Immunology” and considered as a vital keyword of the topic discussed. Source and highly cited articles based on data obtained on Immunology beginning Web of Knowledge. It is found that the Country is India together contributed 397 articles during 1993-2017. The

Boopathi, P., & Gomathi, P. (2019) evaluated the distribution and scope of papers published in the diabetes research productivity in India and analysis to various parameters in the view of the scientometric analytical study. Collections include (Articles, Reviews, Meeting Abstracts, Letters and book chapter), etc. published 8016 diabetes journals in 2014 – 2018 were screened with the Web of Science database (Clarivate Analytics). The study mainly focused on the Author and journal wise distribution, Year and country wise output and Institution wise collaboration are discussed in this paper.

Kusugal, M. S., & Ravi, B. (2018) assessed the Physiotherapy during the period 2016-2020. This paper aims to know the impact of research developments in the Physiotherapy Journal for ten years from 2008 to 2017. This paper has analyzed various factors such as year-wise distribution of papers, institution and subject wise distribution, authorship pattern productivity and collaboration among multiauthors and many more features. The

result shows that the highest number i.e. 403 (96.88%) articles are published by multi author whereas the rest of lowest number i.e. 13(3.13%) of papers were published by single authors.

OBJECTIVES OF THE STUDY

- To analysis the year wise publication of Physiotherapy
- To examine the year wise authorship pattern
- To analyses the documents wise distribution
- To identify the country wise distribution
- To determine the most frequently used keywords.

METHODOLOGY

The required data were collected from Web of Science core collection Database using the following string retrieved on 17 Feb 2021 which is maintained by Clarivate Analytics. Topic: Physiotherapy. Time span: From 2016 to 2020. The total number record retrieved was 7098. The retrieved records were analyzed using Bibexcel software. Further analysis was using MS Excel and VOS viewer.

DATA ANALYZING AND INTERPRETATION

Table-1 Year-Wise Publication

Year	Records	Percentage
2016	1198	16.90
2017	1223	17.22
2018	1282	18.06
2019	1616	22.76
2020	1779	25.06
Total	7098	100.00%

Table 1 analyses the yearly output on physiotherapy research at world level from 2016 to 2020. There are about 7098 total output on physiotherapy research in the last five years. In the year 2020, the output measured is 1779(25.06%); this is the highest records out of 7098 records. In the year 2016 the output measured is 1198(16.90%); this is the lowest record of the research. Onwards the output performance is to more than 20 percentages on 2019 to 2020. The study includes the data covered in web of science data base from 2016 to 2020.

Table-2 Year-Wise Distribution of Documentation

Document Type	2016	2017	2018	2019	2020	Total
Article	811	867	898	1059	1204	4839
Review	207	222	255	321	380	1385
Meeting Abstract	138	80	81	192	144	635
Editorial Material	25	35	38	30	30	158
Letter	9	12	4	9	16	50
Correction	4	4	3	1	0	12
News Item	3	2	1	3	3	12
Reprint	1	1	1	0	0	3
Book Review	0	0	1	0	1	2
Biographical-Item	0	0	0	1	1	2
Total	1198	1223	1282	1616	1779	7098

Above the table distribution of various types of documents was analyzed in year wise using Bibexcel software. A total 7098 publication records were distributed in ten types of documents. The article is the most primitive type and it is published 1204 records in the year 2020. Review occupies the second position with 380 records in the year 2020. And another records Meeting Abstract, Editorial Material, Letter, Correction, News Item, Reprint, Book Review, Biographical-Item Publication are have published below 200 records in every year.

Table-3 Relative Growth Rate and Doubling Time

Year	No. of Publications	Cumulative	W1	W2	R(a)=W2-W1	R(a)	Doubling Time	Mean
2016	1198	1198	7.08	-	-	0.86	-	0.54
2017	1223	2421	7.10	7.79	0.69		1.00	
2018	1282	3703	7.15	8.21	1.06		0.65	
2019	1616	5319	7.38	8.57	1.19		0.58	
2020	1779	7098	7.48	8.86	1.38		0.50	
Total	7098							

Above the table analyzed growth of publication in physiotherapy by Relative Growth Rate (RGR) and Doubling Time (DT). The span of time during the period 2016-2020 has represented 0.86 as mean RGR. Doubling time of this study period is observed as 0.54 for the during the study period. RGR increased from the rate of 0.69 in 2017 to 1.38 in 2020. As the doubling same time doubling time decreased from 2017(1.00) to 2020(0.50). Thus as the rate of growth of research publications was increased and doubling time was decreased.

Table-4 Year-Wise Authorship Pattern

Authors Pattern	2016	2017	2018	2019	2020	Total
Single Authors	66	59	67	56	55	303
Two Authors	105	116	109	130	132	592
Three Authors	178	173	171	262	247	1031
Four Authors	197	212	224	290	287	1210
Five Authors	169	190	195	239	290	1083
Six Authors	148	152	181	233	266	980
Seven Authors	100	114	115	151	165	645
Eight Authors	82	73	77	76	109	417
Nine Authors	53	47	46	42	62	250
Ten Authors	34	28	34	34	57	187
More than Ten Authors	66	59	63	103	109	400
Total	1198	1223	1282	1616	1779	7098

The table shows that year wise authorship pattern over a period of five years. The maximum productivity is 290 in the year 2019 for four authored papers, and 290 in the year 2020 five authored papers. The overall analysis of the authorship pattern, four author is published more articles (1210), followed by five author published 1083 articles.

Table-5 Most Prolific Authors (Top 10 Only)

S.No	Author	Records	S.No	Author	Records
1	Maher CG	34	6	Denehy L	26
2	Taylor NF	33	7	Hinman RS	25
3	Bennell KL	32	8	Rushton A	24
4	Lamb SE	31	9	Foster NE	21
5	Shields N	27	10	Valenza MC	19

It showed top ten Authors during the research period between 2016 and 2020 in physiotherapy research. It observed the majority of the Author “Maher CG” in 34 records with got the first position and followed by the “Taylor NF” in 33 records with got the second position, followed by the “Bennell KL” 32 records with got the third position. And Lamb SE 31 records with got the fourth position other authors Shields N, Denehy L, Hinman RS, Rushton A, Foster NE and Valenza MC are published below 30 records.

Table-6 Single Author Vs Multi Authors

S.No	Author	Publications	Percentage
1	Single Author	303	4.27%
2	Multi Author	6795	95.73%
Total		7098	100%

It is observed from the table that the authorship pattern in terms of single authors and multi authors during the period of study. Out of 7098 research outputs, Multi-authors published the majority of 6795 (95.73%) papers and single authors published the rest of 303 (4.27%) articles.

Table-7 Degree of Collaboration

Years	NS	NM	NS + NM	DC
2016	66	1132	1198	0.94
2017	59	1164	1223	0.95
2018	67	1215	1282	0.94
2019	56	1560	1616	0.96
2020	55	1724	1779	0.96
Total	303	6795	7098	0.95

DC* = Degree of Collaboration, NM* = Number of Multi Authors,

NS* = Number of Single Authors

The table shows the details about the degree of collaboration which indicate tend in single and multiple authors during 2016 – 2020 as shown in Table. The degree of collaboration ranges from 0.94 to 0.96 and the average degree of collaboration is 0.95. The DC is calculated by using the formula K. Subramanian, 1982: where

$$DC = \frac{NM}{NM+NS}, DC = \frac{6795}{7098}, DC = 0.95$$

In the present study the value of DC is 0.95.

Table-8 Co-Author Index

Authors	2016		2017		2018		2019		2020		Total
	NA	CAI	NA	CAI	NA	CAI	NA	CAI	NA	CAI	
One Authors	66	129	59	113	67	122	56	81	55	72	303
Two Authors	105	105	116	113	109	101	130	96	132	88	592
Three Authors	178	102	173	97	171	91	262	111	247	95	1031
Four Authors	197	96	212	101	224	102	290	105	287	94	1210
Five Authors	169	92	190	101	195	99	239	96	290	106	1083
Six Authors	148	89	152	90	181	102	233	104	266	108	980
Seven Authors	100	91	114	102	115	98	151	102	165	102	645
Eight Authors	82	116	73	101	77	102	76	80	109	104	417
Nine Authors	53	125	47	109	46	101	42	73	62	98	250
Ten Authors	34	107	28	86	34	100	34	79	57	121	187
More than Ten Authors	66	97	59	85	63	87	103	113	109	108	400
Total	1198		1223		1282		1616		1779		7098

This table shows the Co-Author Index (CAI) during the year 2016 to 2020. The table shown co-author index for single authors decline from 72 in the year 2020 and 129 in the year 2016 and 2017, and then the CAI for the two authors is declined from 88 to 105, and three authors are declined starting from 95 to 102 and above three authors is declined starting from 94 to 96 during the year 2016 to 2020. Using the formula as

$$CAI = \{(N_{ij}/N_{io} / (N_{0j}/N_{oo})\} \times 100$$

Table-9 H-index of Documentation

h-index	Unit	Citation sum within h-core	All citations	All articles
50	Review	3754	13522	1385
40	Article	3414	23055	4839
8	Editorial Material	92	227	158
3	Letter	14	48	50
3	Meeting Abstract	10	57	635
2	Reprint	13	13	3
1	Biographical-Item	1	1	2
1	News Item	2	3	12
1	Correction	2	4	12
0	Book Review	0	0	2

Above the table shows the citation and h-index of documentation in the subject of physiotherapy. It is found that ten types of documents are there. Out of ten types of documents, review has the most number of citing papers with 13522 with 50 h-index. Followed by article 23055 citation and 40 h-index, and editorial material has 227 citations with 8 h-index, then another documents are followed below 50 citations with below 5 h-index. There are Letter, Meeting Abstract, Reprint, Biographical-Item, News Item, Correction and Book Review.

Table-10 Most Productive Countries (Top 10 Only)

S.No	Countries	Records	S.No	Countries	Records
1	Australia	1174	6	Brazil	466
2	UK	1155	7	Spain	428
3	USA	609	8	Italy	361
4	Canada	569	9	Netherlands	355
5	Germany	470	10	China	276

From the analysis of the table, countries wise publication output Australia is the top list with highest records of 1174 and China is the last in the list with 276 records of publication. UK is the second in the list of countries with 1155 publication. Followed by USA, Canada, Germany and etc has got below 1000 publications. And India is in twentieth place with 130 records in research publication.

Table-11 Language-Wise Distribution

S.No	Language	Records	S.No	Language	Records
1	English	6784	9	Polish	5
2	German	165	10	Chinese	2
3	Spanish	45	11	Italian	2
4	French	44	12	Swedish	1
5	Portuguese	17	13	Serbian	1
6	Hungarian	12	14	Dutch	1
7	Czech	11	15	Icelandic	1
8	Turkish	6	16	Japanese	1

Above the table analysis, The Language wise distribution of research output is the top 10 languages. The majority of the scientists prefer publishing output in English language with 6784 records. The next language is German which is accounted to 165. The third Position is Spanish in which 45 publications are brought out. The languages Portuguese, Hungarian, Czech and etc are found at appreciable levels. The language Swedish, Serbian, Dutch, Icelandic and Japanese seems to be the last preferred language among them.

Table-12 Time Series Analysis

Year	No. of Publications	X	X ²	XY
2016	1198	-2	4	-2396
2017	1223	-1	1	-1223
2018	1282	0	0	0
2019	1616	1	1	1616
2020	1779	2	4	3558
Total	7098		10	1555

The Straight Line equation is applied to arrive at estimates for future growth under the time series Analysis. Straight line equation: $Y_c = a + bX$

Since $\sum X = 0$

$$a = \sum Y / N = 7098 / 5 = 1419.6 \quad b = \sum XY / \sum X^2 = 1555 / 10 = 155.5$$

Estimated literature in 2030 is when $X = 2030 - 2020 = 10$

$$= 1419.6 + (155.5 \times 10) = 2974.6$$

Estimated literature in 2035 is when $X = 2035 - 2020 = 15$

$$= 1419.6 + (155.5 \times 15) = 3752.1$$

On the application of the formula of time series analysis and subsequently, from the results obtained separately for the years 2030 and 2035, it is found that the future trend of growth in the study Physiotherapy research output may take increasing trend during the years to come. The inference is that there is a positive growth at the global level in research output in the Physiotherapy Research.

Table-13 Most Used Keywords (Top 10 Only)

S.No	Keywords	Records	S.No	Keywords	Records
1	Physiotherapy	837	6	Reliability	459
2	Management	729	7	Therapy	436
3	Rehabilitation	580	8	Pain	372
4	Exercise	519	9	Low-Back-Pain	366
5	Quality-Of-Life	480	10	Care	357

The table reveals the word frequency of physiotherapy research. A few words are repeatedly used here by the physiotherapy scientists. For this analysis the research has taken top 10 frequently occurring words. The word “Physiotherapy” has been repeatedly used 837 times by the physiotherapy research scientists during the study period, Followed by “Management” used 729 times. The word “Rehabilitation” occupies the third position being used 580 times. This is followed by the word “Exercise” used 519 times. Then followed keywords are used below 500 times.



Figure 1 Visualization of Keyword

FINDINGS AND CONCLUSION

- ❖ It was computed the year wise distribution of contributions and out of 7098 articles, the highest 25.06% of papers were published in 2020 and The lowest number 1198 (16.90%) papers were published in 2016.
- ❖ The total publication count is found to be 7098 and the maximum output occurred by article in the year 2020 numbering 1204 records of the total output.
- ❖ The relative growth rate of publications has shown an increasing trend from the started value is 0.69 to 1.38 and the average value is 0.86, the doubling time of publications have decreased value started from 1.00 to 0.50 and the average value is 0.54.
- ❖ Among the most prolific authors, “Maher CG” have contributed highest number of articles and also identified as the most productive author of the Physiotherapy research output during 2016-2020.
- ❖ Single authors formed 4.27 % (303) of the total research output, while the multiple authors formed 95.73 % (6795).
- ❖ The degree of collaboration ranges from 0.94 to 0.96 and the average degree of collaboration is 0.95.
- ❖ Co-authorship values are categorized single, two, three, four, five, six, seven, eight, nine, ten and above ten authors. That co-authorship index is high in one author’s papers.
- ❖ The finding of documentation with citation and H-index, review is the most cited (13522) documents with having 50 H-index in Pysiotherapy research output during the period 2016-2020.
- ❖ The findings of countries with physiotherapy research output, Australia were contributed more number of articles (1174) published.
- ❖ In the analysis of language wise resorted, English language is the most preferred language in this study, 6784 records published in English language.
- ❖ The results found that the estimated future growth increased as 1419.6 (2020), 2974.6 (2030) and 3752.1 (2035), it clearly explains the progressive trend continued up to estimated year. It is inferred that the rate of growth is relation by the year wise publications of physiotherapy research.
- ❖ In this regard, the prime keyword observed in the study is “Physiotherapy” 837 publications of published in research papers. It is occupied in the first position.

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IMPROVE THE GUEST HAPPINESS IN HOTEL'S BY CONSUMING IOT DEVICES

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ABSTRACT

The Indian Hotel Industry in the recent past has shown growth at a fast pace, which could be accorded to increase in disposable income, growth in tourism not only from foreign countries but also within the country, permission for FDI in hotel industry, change in spending habits of people, various government initiatives to boost tourism, etc. The aim of this research was to look at the emergence of wearable technology and the internet of things (IoT) and their current and potential use in the hotel industry. There is a wide and ever-expanding range of wearable's, devices, apps, data aggregators, and platforms allowing the measurement, tracking and aggregation of a multitude of lifestyle measures, information and behaviours. The use and application of such technology and the corresponding richness of data that it can provide brings the health and care insurance market both potential opportunities and challenges. It is clear though that technology is only part of the solution, on its own it won't engage or change behaviours and insurers will need to consider this in terms of implementation and goals. But it must be remembered that with change in life style and standard of living, it is indeed a tough task for the hotels to live up to the demands and expectations of their customers belonging to diverse cultures. In order to be successful in the market it is not sufficient to attract new customers but hotels must concentrate on retaining existing customers through effective services and gaining their loyalty. In hotel industry customer satisfaction chiefly depends on quality of service. Hence, exploring the importance for customers of hotel attributes in hotel selection are indispensable and more important is to find out the areas where they can enable their customers to experience wow elements. This paper traces the factors which allow the customers to experience wow element which could be achieved by filling the gap between customers' expectations and hotel's service attributes. The findings of the research are intended to assist hoteliers to concentrate on customer satisfaction through effective strategies for providing tangible and intangible services as well as thriving for good customer relationships management. This business case model and product development journey, over which they can build up their understanding and interpretation of the data that this technology can provide.

Keywords Wearables; Internet of Things; Customer satisfaction and needs, Technology

INTRODUCTION

21st century has seen hotel industry turning into one of the most competitive industries. Hotel industry too is a part of service industry and thus the satisfaction depends on quality of service provided. Thus, to have an edge over others one of the vital aspects is enhancing customer loyalty which will not only ensure its survival but also stability and growth in the long run. With competition increasing every hotel tries to provide services to utmost satisfaction of customers. Customer satisfaction is now gone and what is required that consumers experience Wow elements from hotels. Providing and sustaining customer satisfaction to the extent of customers experiencing Wow is one of the major contemporary challenges. Technology is changing our lives. The pace of change is daunting – the first smartphone (the iPhone) was only introduced in 2007 and is now pervasive. The types of sensor already available in miniature packages mean that the 'quantified self' revolution is well established. Those involved come from a range of backgrounds and experience but are united by a passion for, and interest in, the evolving world of digital health. The core focus has been on the health and care sector, although our findings have unavoidably drawn us to applications of the technology in other areas. The three most essential things of human are – food, clothing and shelter. Hotel or hotel industry alone provides two basic things: food and shelter i.e., accommodation. 'Home away from Home is what hotel is referred as. The main purpose of hotels is to provide travelers with shelter, food, refreshment, and similar services and goods on a commercial basis thing that are customarily found at home but are not available when on journey away from home. This paper explores just some of the products and solutions currently available¹. Additionally, hotels also offer telephone call services, laundry services, travel services, internet services, recreational facilities, entertainment activities in the hotels. Thus, other than accommodation the umbrella of services included are restaurant, spa, gyms, swimming pool, travel, internet, etc. The hotel industry consists of multiple groups such as facility maintenance and direct operations servers, housekeepers, porters, bartenders, kitchen workers, management, marketing, and staff, etc. It is in no way meant to be an exhaustive review of all the digital tools

and in a constantly evolving market can only reflect current times. However, it aims to provide a valuable overview of the current customer's space in hotel with more technology.

CUSTOMER SATISFACTION AND HOTEL INDUSTRY

Being a part of hospitality industry, it requires practice of being hospitable which involves the act of welcoming, receiving, hosting or entertaining the guest. It involves generous welcome and care of the hotel guests to ensure that customers are satisfied and return back to it whenever requires and suggest to others to so that hotels get word of mouth publicity. Roy Hollister Williams⁵ rightly states, "The first step in exceeding your customer's expectations is to know those expectations." Service providers need to understand their customers and design their services in such a way that extreme possible approval is attained by the customer. Because customers are most likely become loyal and keep spreading good word of the hotel. In case they are not satisfied, they will talk bad about the hotel to different customers and change the hotel. As consumers' expectations are increasing, the hotels will have to take extra efforts to create a feeling of wow in customers. When a customer experiences WOW, this implies that the hotels are giving them a pleasant surprise by exceeding the customers' expectations. They are addressing their needs thoughtfully and in unexpected ways. It is an expression of their authentic interest in the person who seeks their services, not just in the transaction. However, many hotel managers face problems trying to satisfy their customers and end up experiencing high levels of customer dissatisfaction. The problem can be solved by learning customer needs and using the knowledge to increase satisfaction. Customer satisfaction being of utmost important, every hotel should strive to have a good relationship with its customers to enhance loyalty and thus increase its effectiveness through loyalty. For this hotels should be willing to adapt to the needs and expectation of the customers. They must put a lot effort in understanding customer needs and fulfilling them end up learning many factors that contribute to customer satisfaction. Customer satisfaction should be given utmost consideration by the management, because it would be more expensive to draw in new customers that retaining the existing ones. In order to be fruitful, managers must focus on holding existing customers actualizing compelling arrangements of customer loyalty and steadfastness. This is mainly valid in the hotel industry.

OVERVIEW OF WEARABLE DEVICES AND THE INTERNET OF THINGS

The Employed Event was commissioned to look at both wearable technology and the Internet of Things (IoT). As wearable technology often feeds the IoT, the difference among the two is not always clear and perhaps unimportant. In general terms, this paper investigates technology that can be the source of additional information that might be useful in the world of health and care insurance. Anything that provides relevant data for the risk-taking community is therefore deemed to be in scope for our review.

With that in mind, the technology of interest falls into 2 types:

- Wrist-borne wearables
- Internet of Things

WRIST-BORNE WEARABLE TECHNOLOGY

When commencing this project, the Working Party logically started with wrist-borne devices, not least because most members of the Working Party were users of such technology or had made use of it in the past. The reader should, however, think more broadly as the limitations of the wrist-borne devices will become apparent later. Examples of manufacturers and their current products at time of drafting are listed in Annexure A1.1.

The larger providers (Fitbit, Garmin, Jawbone, Xiaomi) offer a range of products to meet various needs and budgets, although most measure fundamentally the same things (see Section 3). Doubtless this market will see the emergence of large numbers of Chinese imitators, like Xiaomi, which will drive down the price and make the technology more affordable. Currently, basic devices are available at £40-50, with top end devices ranging from £100 to over £200 for the Apple Watch.

INTERNET OF THINGS

The Internet of Things is a vast and growing source of data potentially useful for evaluating relative risk in an insurance environment. A complete analysis of this space has not been attempted and this paper rather highlights some examples of the types of data that might prove interesting.

BEHAVIOUR MONITORING

One of the most interesting potential sources of data is mobile phones. Our smartphones carry a range of sensors which track motion and location, making collection of such data 'frictionless' in the sense that users do not need to do anything different from what they would normally do on a day to day basis.

One Belgian company, Sentiance, has created a tool for collecting smartphone data to monitor what people are doing, and then uses AI to attribute certain behavioral characteristics to them. For instance, the data they collect allows the user to be categorized as a dog walker or restaurant goer, a fast or safe driver and a commuter or homemaker, amongst many others. It can also provide real-time nudges based on context at a time when the user is in a particular place or behaving in a specific way.

SmartPlate Top View is an Intelligent Nutrition Platform that uses photo recognition and AI technology to identify, analyse, and track everything you eat, and has a wide range of applications. The AI technology is capable of recognizing individual food items on a plate, combining that information from the weight information from the SmartPlate and can hence derive calories and nutrients consumed.

WELLBEING LED USE OF WEARABLES & IOT

Increasingly, health and life insurers are recognising that wearables and IoT themselves are unlikely to create significant change on their own. To address this, they are integrating wearables into a broader “healthy lifestyle” proposition which, amongst other things, educates customers about the underlying virtues of improving their lifestyle.

Hotel industries are using many apps to assist customers in developing more positive behaviours.

For example(Health care) in 2015 Punter Southall Health & Protection partnered with Aviva to provide an insurance product that offered an onsite health kiosk enabling employees to measure key health stats, a health app, and corporate challenges (Punter Southall, 2015). Another example is the Bupa Boost app which incorporates wearables into a more comprehensive mobile app-based wellbeing platform to enable customers to develop more positive nutrition, mindfulness and relaxation habits (Bupa, 2018).

A continuing move towards integrating wearables into broader wellbeing strategies is likely. Wearables provide a relatively quick feedback loop for individuals looking to target improvements in health through behaviour change. As behaviour becomes the focus of wellbeing programmes seeking to drive health improvements, so wearables can provide valuable data for the user and the change agents (like coaches, the insurer, AI-led learning) seeking to guide the user through lifestyle changes.

TECHNOLOGICAL CAPABILITIES

1. Data quality and processing

The quality of data obtained from wearables, as discussed in Section 5.2, is a key consideration for insurance companies for two main reasons. Firstly, historically obtained data will be required to help design and price insurance products that make use of wearable technology. Secondly, data will have to be continually collected going forward in a consistent manner to ensure that any assumed benefits of the wearable-integrated product (beyond the collection of data itself) are materialising, and if not, then to understand why and whether any changes are needed.

Section 3.3 and Section 5.2 address accuracy and reliability limitations of data from wearable technology respectively. These limitations mean there is a risk that, even if an insurance product could be developed that makes use of data from wearable technology or tracking apps, the validity of the conclusions drawn may be questionable. This could lead to inconsistencies between product design and reality, with potential associated financial consequences. If products are to progress, consistent and reliable historical data will be needed, or insurers will be forced to make leaps of faith based on unreliable information and research.

2. CUSTOMERS DISSATISFIED AREA:

1. At Entrance

Car Parking: For those who come by car it is cumbersome to park the car and struggle with car parking. Sixteenth AIMS International Conference on Management 551

2. Reception Service

- Check in: Most guests at the hotel arrive tired and then they find that there is time to check in either because of the procedures or because of room not being ready in spite of prior booking.
- Check-out: Most guests are in a hurry to leave and once they arrive at the counter the bill is not ready or there is an issue relating to billing.
- Sitting Arrangement in Lobby: No sitting place if there is a huge rush of guests arriving at one time or an event. The sitting arrangement at times is not comfortable.

- Attention of Front Desk: Staff at the front desk talks more amongst each other than paying attention to the guest.

3. ROOM

- Electric Fittings: Customers have to go on a treasure hunt to find all the switches to switch off all the lights. Also, however luxurious the hotel, plug points for charging too have to be hunted and are not enough. At times mobiles have to be charged in the bathroom.
- Lighting: Dim lights which makes to feel depressed. Foreigners like low and yellow lights. Many complained about the bad reading lights in the bedroom.
- Bedding: All complained that ultra-luxurious beds make them sink into the floor and they wake up with back ache and neck ache. The same with over fluffy pillows which causes neck ache.
- Room Safe: Room safe which is always placed so you have to bend low to open it. No overhead or closet lights to see the numbers that you punch into safe
- Luggage Keeping Area: Most of the time cupboard is large but space for keeping luggage to enable it to be opened and used is less. Most of the people do not have the habit of keeping clothes in the cupboard if they are going to stay just for

3 -4 days. If luggage is kept down then bending every time is a problem.

- Cooling of Room: Most hotels have centralized AC system. But bearing of that temperature by customers differ. Some may find it too hot and some too cool. This leads to health problems too.
- Bathroom: Many found turning on the shower, hot and cold options to use complicated. Bathroom fittings were not easy for many to understand.
- 39% found hairdryer in the closet amusing, which was earlier found in bathrooms.
- All complained of no water in toilet and water being replaced by tissue paper.
- Glass partition for bathrooms was not at all liked by anyone. This was especially true when they shared the room with some acquaintance or business partner. They were uncomfortable.
- Room Key: For security purpose room key is used to operate lift to go to one's room. Many complained that for a double bed room a single key is issued and if that key is taken away by one person, the other person gets handicapped.

4. RESTAURANT SERVICE

- Food: No one had any problem with quality of food and neatness with which it is served. But a few health-conscious customers felt that diet food should be available. This health conscious is increasing and the demand for diet food too will increase. A few who fast a lot opined that food that could be eaten during fasting should also be made available. At times people are hungry in the night, food is not available and not what required.
- Food Delivery: 64% felt that food ordered takes time to come too. That too 2 to 3 reminders have to be given.
- Complimentary Breakfast: 32% said that they hate going to the area where complimentary breakfast is served. They would prefer it in their room.

5. GENERAL

- Wifi Facility: Almost more than 90% complained that some hotels do not provide free wi-fi or every 24 hours they have to reconnect.
- Pick Up and Drop Facility: It is not provided which creates a problem if in new place. At times it is provided but the charges are too high.
- Stay of Drivers: This is either not provided or provided at a high cost leading to problem.
- Porters: Porters arrive late while checking out of the hotel to pick up the luggage
- Smoking Area: A few hotels do not have separate smoking area which creates problems for customers who are allergic to smoke.

- Hotel Feedback or Guest Comment Cards (GCCs):As per study undertaken by Holjevac Ivanka Avelini, Marković Suzana and Raspor Sanja (Jan 2010)²⁵, GCCs can be found in a folder on a room table but are not filled up. Also, they are designed not scientifically but according to managers' personal experience.
- Check-in Time: Some hotels are strict regarding check-in and check-out time. It is mostly as per schedule of flights.
- Shuttles to Town: In case of business trip with family, the head goes for business, but family is left behind in the hotel. Since it is a new place they do not know where to go if they wish to go out.
- Staff Ability:53% of respondents felt that the staff at the desk is not too helpful to solve room problems. The above analysis of problems faced by customers' shows that customers are not satisfied with the various tangible and intangible aspects of services provided by hotels. Insurers are likely to face challenges in collecting, aggregating and processing the real-time data from wearables and IoT as this data is different from the static databases that insurers currently use for underwriting and claims processing. Most health and life insurers don't currently have the capability for mining and interpreting large dynamic datasets in near real-time. Insurers may look to build these capabilities in time or work with data aggregators (see Section 5.3) who can assist in data analytics, but this could require significant investment for them to meet changing future demands and, as discussed in section 6.4.2, data security requirements.

3. CUSTOMER NEEDS AND ENGAGEMENTS

Today's guests should be provided with Digital Hospitality. Online access at home, work or on journey enables them to be multi-connected. Internet is now their lifeline. Internet services provided free of charge will be appreciated.

- Provide free pick up and drop facility from nearest railway station or airport. Else have a tie up with those at railway station and airport to pick them up and drop them.
- A separate small dormitory kind of place with separate exit may be kept for drivers. Sixteenth AIMS International Conference on Management 553
- Have a separate Non-Smoking Floor/Area
- Customers should be motivated to complete the GCC and incentives be provided for it such as lucky draw of GCCs, coupon for dining or spa or discotheque as per wish of the winner be given.
- Flexi check-in and check-out time option be given.
- The hotel can provide shuttles to the town for a charge. Since it is by the hotel, it creates more trust and confidence in the minds of the customers.
- Other Suggestions: These are from secondary sources, researcher's friends and researcher herself: Customer relationship management is the strategies used by businesses to manage their interaction with customers throughout the customers' lifecycle. The process involves creating a good relationship with customers to increase their satisfaction and develop a culture of mutual understanding.
- The complaints of the customers ought to be well respected. It must be answered and dealt with appropriately and without much waste of time.
- 24 hours Doctor on Call
- With people becoming health conscious Health Club Facilities will be provided.
- Staff should be trained for following attributes:
 1. Responsiveness: Readiness to help clients and provide prompt service
 2. Competence: Employees possess the required skills and knowledge necessary to perform the service adequately is able to address customers' questions with the correct answers.
 3. Courtesy: Be polite, respectful and considerate toward guests.
 4. Friendliness: The extent to which employees are approachable and easy to find.
 5. Communication: Good communication implies good listening skills and using language and terms that all customers can understand.
 6. Understanding: Making the effort to know the customers' needs.

7. Reliability: Ability to complete the promised provision dependably and accurately.
8. Appearance: Appearance is neat with a smile on the face.
9. Greet Guests: This is common in foreign countries which is missing in India
10. Empathy: Give individual attention with emotional expression, deal with guests in a caring fashion and have guests best interests at heart.

4. BEHAVIORAL CHANGE

There is a risk that insurers embark on this journey believing that technology will change customers' behaviour for the better. The indication about behavior alteration remains mixed (Hajat, 2016). One of the major evaluations that comprised more than 200 separate studies of internet and mobile interventions found that internet interventions improved diet, physical activity, adiposity, tobacco use, and additional alcohol, and mobile interventions improved physical activity and adiposity.

5. DATA PRIVACY AND WILLINGNESS OF CUSTOMERS TO ADOPT NEW TECHNOLOGIES

Under GDPR, which comes into effect in the UK from 25 May 2018 to replace the Data Protection Act 1998, firms will only be able to collect information that is relevant, adequate and not excessive; meaning they will not be allowed to collect categories of data that are not strictly necessary to perform the purposes of an insurer. In an environment where insurers and reinsurers need to gather data, but the reasons for doing so might not be clear at outset and might only become clear after behaviours and outcomes are correlated, there are likely to be problems. In practice, insurers will have to build products that require the data without necessarily having the confidence that the impact is fully understood – and then adjust terms as the data becomes available.

6. RISK MANAGEMENT

Technology companies are working with manufacturers of sensors, collecting fire, flood and other preventable risk-related measurements, to develop analytical tools which aggregate and draw conclusions about risk from the measures collected. General insurers are partnering with these companies to utilize this novel data for both the short-term prevention and prediction of risk.

In the home insurance space, smart-home technology can monitor and protect insured spaces and act as a theft deterrent. For example, Neos offers smarter home insurance with a 3-year no-claim fixed price guarantee to customers who install Neos sensors and an indoor security camera (Neos, 2018).

CONCLUSION

Being scaled down from the earlier 8-10%, constrained by the regulatory hurdles the industry is currently facing. The growth is expected to come from the rise in online bookings. Hotel bookings are one of the least penetrated segments in the travel categories in India. The long-term outlook for the Indian hospitality business continues to be positive, both for the business and leisure sectors. "Technology might be the ultimate occasion and threat for the insurance industry. In the best case, technology could allow the sector to significantly improve the long-standing client engagement and trust problem and create a range of new products meeting currently unmet needs, or existing needs in better ways. A loyal customer is a customer who keeps consuming the services of a hotel and keeps recommending the services of the hotel to other people. Commitment to customer satisfaction increases the chances of winning their loyalty. Different parts of the hotel operation like rooms, reception, lobby, restaurants, gym, spa, etc. directly affect the image of the hotel. Hotels being part of service industry, hotel staff is the key to customer satisfaction. Their flawless appearance and the conduct of those providing the services is a major factor when it comes to satisfaction. The ultimate aim should be the feeling of the customer that "Triumph! I got more than what I paid for" In terms of how to collect the data accurately and consistently, the advantages of 'frictionless' tracking are worth highlighting. There is a big difference in the data flowing from devices and sensors that are integrated into the fabric of daily life – like mobile phone data and, in the future, implanted sensors – versus those where the customer needs to choose to wear or use the device, like wrist-borne activity trackers. Frictionless data is more likely to be accurate and complete, whereas any data derived from a vehicle based on a choice is open to abuse and manipulation.

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PLACEMENT DRIVE APPLICATION USING PEGA

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ABSTRACT:

Training and Placement Cell is an important part of any educational institute, in which most of the work till now is being done manually. Hydra, an application that provides on demand placement services is using a special initiative called as Placement Application. This application will provide placement services for colleges, to conduct tests and also the partners meet. The entire process would be automated and it was developed using PEGA version 8.3.

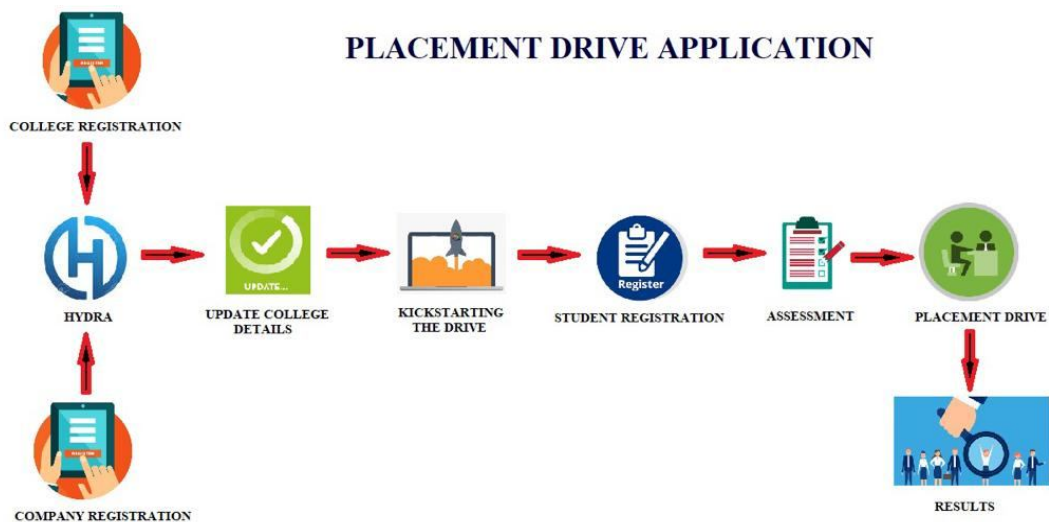
INTRODUCTION

Placement drive Application is a one which creates a platform between Placement cell and Companies. It helps in providing placement services for Colleges, Companies and conducting assessment for students. It mainly consists of three portal namely TPO Portal, SPOC Portal and Student Portal in which entire transaction will exists. This Application is developed using Pega, a business process management tool in which developers can built an end to end transaction. An automatic email notification is set for the entire process involved in placement drive. An SLA is established, which provides a deadline for ontime completion.

LITERATURE SURVEY:

“A survey to understand the nature of recruitment and selection for a company” by Jackson. This paper emphasizes on generating the appropriate knowledge against which the job seekers can be accessed. “Human resource management theory by Korsten and Jones. It emphasizes on techniques of recruitment and selection and outlines the benefits of assessment and its selection process. “Realistic approach to recruitment and selection process” by Taher. This study focuses on the essence of organizational success by understanding the flow of recruitment and selection process. “Expertise Recruitment Assessment” by Alan Price. In this survey, it formally defines recruitment and selection as the process of retrieving applications for the purpose of employment. “Building recruitment process to enhance employable skills in Engineering Students” by Hiltrop. This paper discusses the process of selective hiring and introducing various such strategies to the students taking part in hiring process.

Flow Diagram:

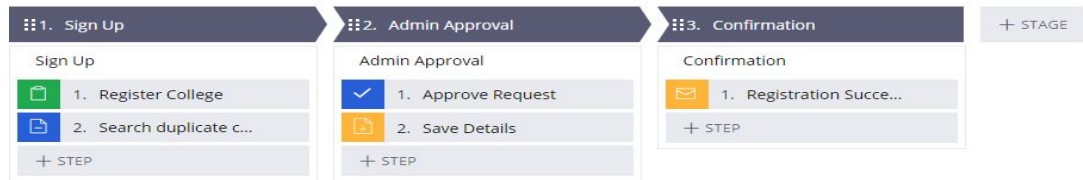


METHODOLOGY:

College TPO and Company SPOC will be registering in Hydra Application. Once their requests is approved by Admin of Hydra, an email notification will be sent to College TPO and Company SPOC. Now, College TPO will upload their student details and they request for a company to initiate drive. Once SPOC of a company approved the request of a College, an email notification will be sent to students for taking assessments. Students will register in Hydra Application and they will take assessment. Once they cleared, they will be attending technical interview. Once interview gets over, Students who cleared interviews will be shown to College TPO and Feedback from interviewers will be shown to Students individually.

ASETYPES:

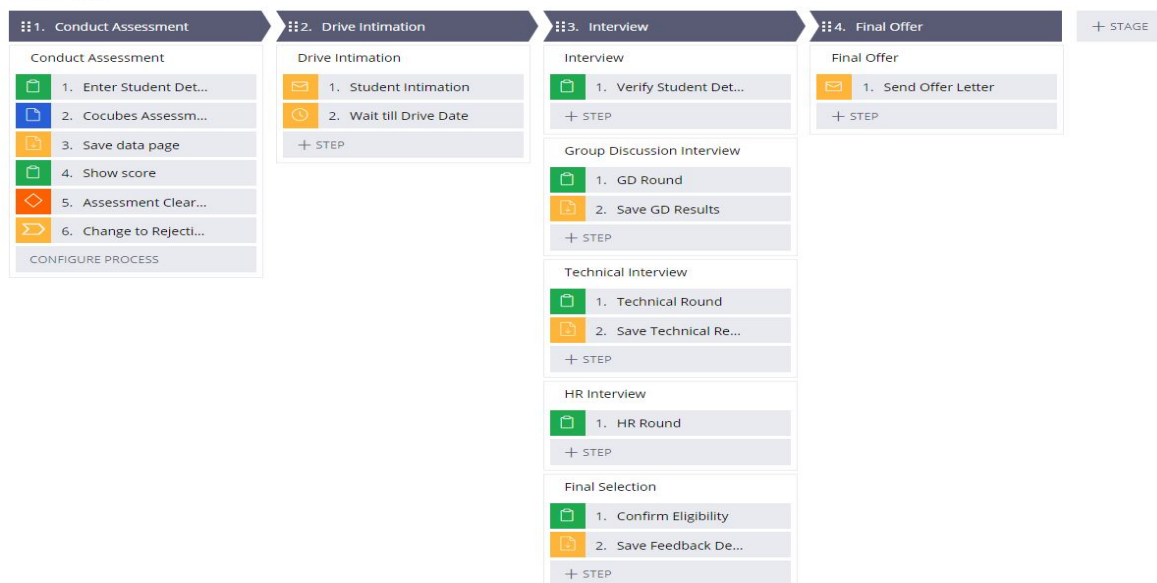
Case life cycle



Case life cycle



Case life cycle



SCOPE FOR FUTURE AND CONCLUSION:

Since many process are automated, it reduces manual work.

The work of College TPO is comparatively less compared to normal placement drive process. Students who attended the interview can see the feedbacks which was given by interviewer, so that it will be useful for them

for future interviews. Assessment have been conducted in this application. So Company don't need to depend on third party for conducting assessment. Eveything will be done in on time. If there is delay in someone's work, they would be getting an repeated email notification until they complete their work.

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IMPROVING HEALTHCARE RECORDS IN SENSITIVE PATIENT e-DATA ACCESSIBILITY USING BLOCKCHAIN BASED HEALTHCARE SYSTEM

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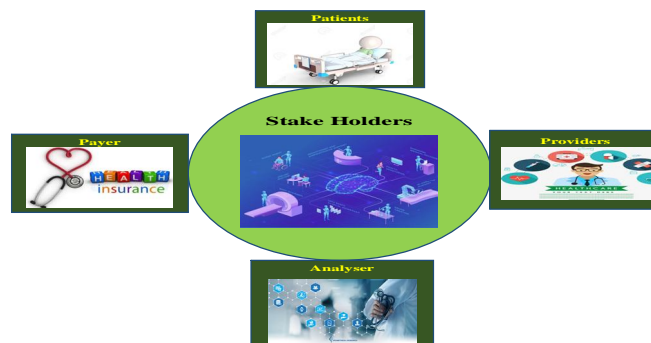
ABSTRACT

Blockchain technology is the one of the greatest key inventions in the field of information technology. Healthcare data is the patient's most sensitive and confidential data information system. Strong authentication procedures are required to manage this healthcare data accessibility. The use of blockchain technology in the healthcare industry enables monitoring of patient's medical records, device tracking, referral databases and the operating system of the healthcare database. Analysis of blockchain research is conducted in this systematic review. Its purpose is to identify applications, challenges and possible directions of the healthcare sector in blockchain research. In this context it is imperative to select the most effective blockchain framework for secure and trustworthy EHR in the healthcare sector. Healthcare sector requires an accurate algorithm to estimate the impact of the various blockchain consensus models available for it future. In this paper we review current developments in the healthcare sector by implementing the blockchain as a model.

Keywords: Consensus Algorithms, Challenges, Electronic Health Record, Framework, Opportunities

INTRODUCTION:

In the healthcare Industry have more data branches than any other sector and more than 95% of medical organizations reveal patient medical data have been theft. ten times more cybercrime crimes than credit card data plays a key role in stealing a patient's electronic health records and selling them on the black market [1]. Blockchain is an effective technology for healthcare system, in which sensitive patients' records are maintained for medical management. Blockchain technology is among the most significant developments and innovations of the healthcare industry. Blockchain is an effective technology for healthcare system, in which sensitive patients' records are maintained for medical management. The health providers rely on smart technologies to manipulate the data of their registered patients. This smart technology greatly enables electronic health record management to send, receive and store updated patient information. These Electronic Health Records plays a key role in more efficient access to health records by health professionals and patients. Improper medical treatments may be provided if a patient's data is altered. In the current practice most, healthcare companies handle improper and insecure data [2]. All of these issues create many challenges in the data access system in healthcare system. Given the current security needs of healthcare systems, patients need to be provided with enhanced electronic data accessibility and secure and most updated electronic data accessibility for other stakeholders affiliated with blockchain. The main goal of this paper is an efficient Literature Review is to illustrate the current data accessibility techniques that are used by the researchers to secure the healthcare data. With the patient's permission the network administrator can update patient data in the electronic health record [3].



Different Stake Holders of Healthcare Blockchain

Fig. 1 presents the stakeholders of healthcare big data. To perform a detailed analysis of medical records, there must be adequate collaboration and communication among these four stakeholders.

A Blockchain is a decentralized digital ledger (distributed database in the cloud) . Its stores information in data structures called blocks. The information stored in Blockchain are secured using cryptography. You can add new blocks in the existing Blockchain each block contains timestamp and link to previous block. Blockchain are immutable. You cannot change or delete the information once they are written on the Blockchain. So, the data cannot be altered or deleted. Any updating is done by adding one newer block in already existing block. Blockchain is a chain of blocks. You can trace back any block. So, it has super security. Currently, the main healthcare big data stakeholders are patients, payers, providers, and analysers.

RELATED WORK:

Sudeep Tanwar et al [4] propose a new access control policy algorithm for healthcare providers and also how entries in the electronic health record are shared in a hyperledger chain code. Their Performance metrics helps to make better decisions such as the latency, throughput and round-trip time of networks. Mohammad Moussa Madine et al. [5] propose a novel protocol in the patient's controls in their medical records in a secure manner. They propose two Ethereum based smart contracts. These contracts fetch with different systems and technologies like IPFS, re-encryption and trusted oracles. The authors explain how costs and security analysis operate through the proposed system. The authors also explain how patient data works through the proposed smart contracts. Hao Jin et al. [6] propose a multi-authority attribute-based encryption algorithm. They have developed a taxonomy policy to categorize multiple records of a patient's medical records and to protect their privacy. They also developed an Ethereum based framework to connect HIPAA clouds. Here the authors create a software defined network layer under the blockchain is used that helps to determine a user's final connection to a medical database. This new technology solves an essential problem of enforce strict privacy control for medical information. Raifa Akkaoui et al. [7] create a new framework, called EdgeMediChain, it uses in smart contracts in blockchain. while preserving the privacy of patients' confidential information they proposed Ethereum based framework for greater control of data access. This smart contract-based schemes, responsible for all the entities of the healthcare system in terms of uploading and sharing patients' health data. Their Experimental results show that proposed protocol is effective. Yi Chen et al. [8] propose a novel plan to store patients' personal medical data in blockchain. They also Introduce a service framework for describing the process of personal medical data and sharing medical records. Clinical blockchain properties are analysed by comparison with traditional systems. Their proposed system provides patients with instructions on how to securely store their medical data. Mehrdad Salimitari and Mainak Chatterjee [9] propose the pros and cons about the blockchain processes are described. This paper discusses whether the private blockchains are the best alternative to IOT networks. The authors also explained Hyperledger based frameworks such as hyperledger Fabric, Hyperledger sawtooth and Ethereum framework are suitable for IOT networks. This paper is also Explained about the limitations of each framework throughput, latency, computational overhead, network overhead, scalability and privacy. Dinh C. Nguyen et al. [10] They propose an EHR sharing scheme implemented through mobile cloud computing and blockchain. They have designed a new access control policy based on the smart contract to ensure the reliability of the project. Medical entities that use the Ethereum framework use the EHR sharing system to store a patient's electronic data on an Android mobile through the Amazon cloud. The result shows that it can permit users to share their medical data over mobile cloud environments in a trust and quick manner. access control can identify and prevent effectively unauthorized access to the e-health system. C. Ananth et al [1] propose top three level multiple watermarking schemes [Dual tree - complex wavelet transform]. This scheme preserves the privacy of patients. This proposed system electronic medical record method are defined by using private Blockchain technology. Vidhya Ramani et al [3] they analyze Patient data is stored in the blockchain with their consent following a blockchain based healthcare system. The results show only authorized physicians can view patient's data with their consent. Sanjeev Kumar Dwivedi et al [11] They propose to allow the network admin to add a new entity to the drug supply chain management network. The results illustrate the current status of the new entity. It also evaluates the performance of smart contracts.

CONSENSUS PROTOCOL:

Every transaction is considered reliable only because of the consensus protocol which is an important part of the blockchain network. A consensus algorithm is the process by which all peer in the blockchain network reach a consensus on the current state of the distributed ledger. This allows consensus mechanisms to become reliable. Consensus algorithms also ensure reliability in a distributed computing environment for unknown peer [9],[12].

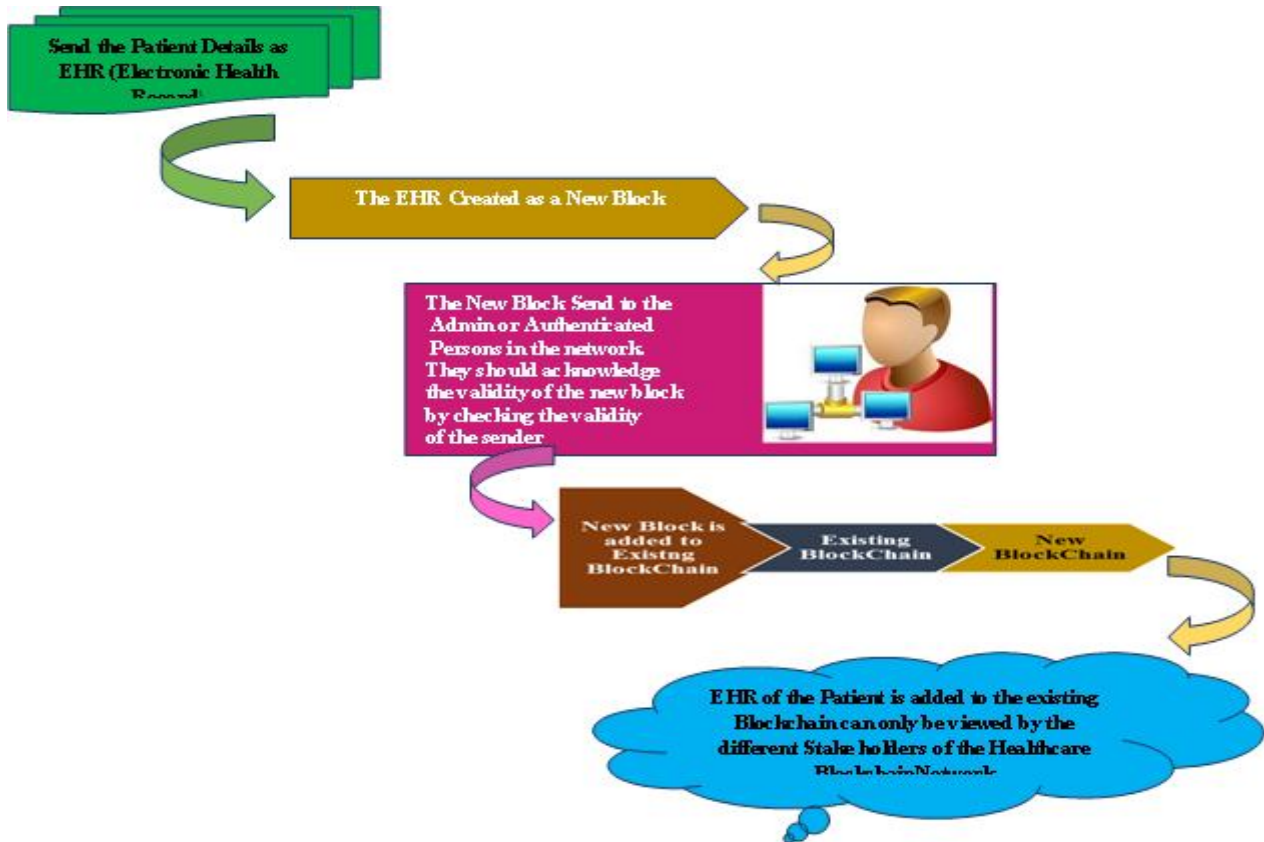
BLOCKCHAIN PLATFORMS:

Blockchain frameworks are needed to allow the development of blockchain-based applications. These blockchain based frameworks have either permissioned or permissionless being private or public module structures. All these features affect the characteristics of a blockchain framework. Ethereum, Hyperledger

Fabric, Hyperledger Sawtooth, Hyperledger Indy, Hyperledger Iroha, Hyperledger Burrow and Ripple frameworks play a major role in the development of blockchain structures. These structures allow people to create and host blockchain applications. Ethereum framework has permissionless block structure. High level Languages are used to execute smart contracts. Ethereum framework participates in the consensus process using the derivation of the Proof of Work. Hyperledger fabric Framework has permission block structure. It participates in the consensus process using the PBFT. Hyperledger Sawtooth platform allows large scale implementation of both permissioned and permissionless ledgers [9].

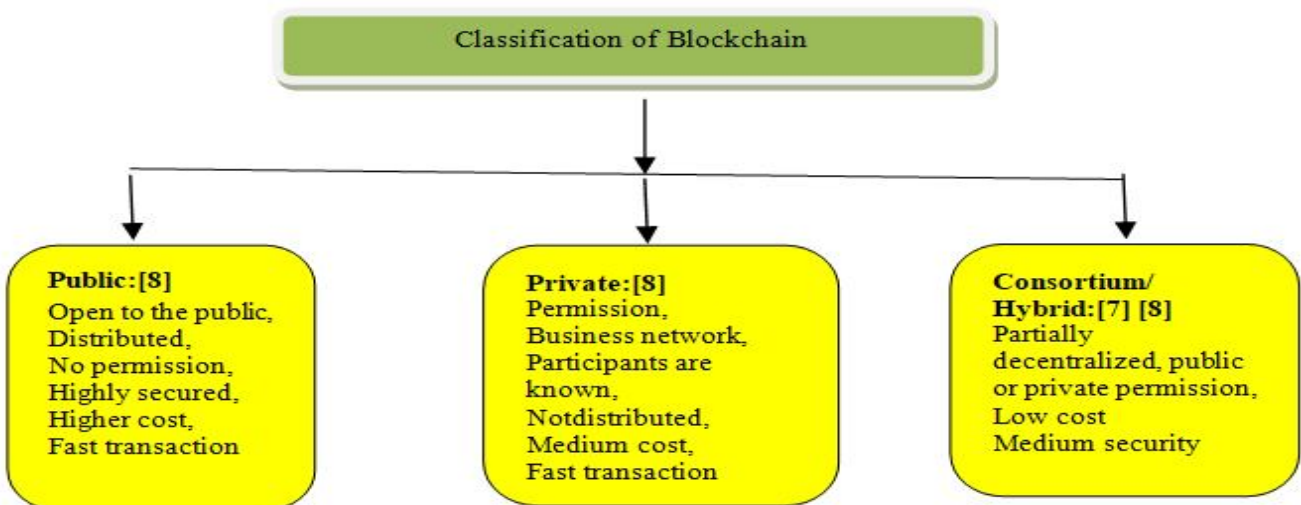
PROPOSED ARCHITECTURE OF ELECTRONIC HEALTHCARE SYSTEM IN BLOCKCHAIN:

In a Blockchain technology architecture, each patient controls ownership of the medical record, as against traditional architecture, where a central authority controls accesses and distributes data across network. Shared data across the Blockchain network enables near real time updates across all healthcare entities.



Classification of Blockchain:

According to access and managing permission, Blockchain is divided into four categories, public Blockchain, private Blockchain, consortium Blockchain and Hybrid block chain.



THE EFFECT OF BLOCKCHAIN ON HEALTHCARE SYSTEM:

A quick access system is required to send patient-protected data to healthcare system. The following are the features of Blockchain technology enhances in the operation and management of Healthcare System.

TRANSPARENCY:

The patients can view their record whenever they need it and these details can be used by Stake holders of the healthcare blockchain [13].one of the blockchain application in healthcare is Blockchain consortia for enhanced interoperability and collaboration. But the fragmented nature of many existing health management information systems continues to hamper such inter professional interactions. Blockchain consortia are replaces it. The blockchain consortia provides cooperation, service and maintenance to its stakeholders. A blockchain consortium enables patients to receive high quality care quickly by facilitating electronic health record integration. That’s because the different physicians or stakeholders access shared and decentralized EHR system, which provides a patient’s diagnostic information and their medical history in real time.

DATA SECURITY AND INTEGRITY:

The Electronic Health Records (EHR) of the patients must be protected from unauthorized access and corruption. The validity of the patient health history must be assured for the sake of decision making in the field of various stake holders. [14] [15]. Another application of blockchain in healthcare system is Decentralized credentials exchanges the blockchain exchange can help speeding up professional credentialing.

DECENTRALIZATION:

On a Blockchain identity and ownership of assets are more closely associated with a user’s device rather than login details. Blockchain utilizes consensus protocols across a network of nodes to validate transaction and record data in a manner that is incorruptible.[13]. Another application is Smart contracts in healthcare this will facilitate the stakeholders to send and receive payment within themselves like payment of patients to the doctors, paramedical company, insurance and vice versa.

TIMESTAMP:

Whenever the date and time of a transaction is recorded is called timestamp. Timestamps are used to keep the creation exchange or deletion of a transaction. The timestamp mechanism is used for of synchronization between multi event transactions, if a failure occurs the transactions can be voided. The Tracking prescription drugs is an application of time stamped blockchain. The Blockchain technology helps to build a permanent, time-stamped audit trail, ensuring that each party accounts for all drugs supplied to them. A Patient’s details like case history medicines taken, Doctor’s diagnosis and Treatment advised, Cause of the illness, Whether Surgery needed or Not, all are important for patients, doctors and Healthcare industry. The Blockchain technology in healthcare system provide the patient’s data for efficient, sharing processing clients, medical research and thus enhanced the health care system.

Applications, Opportunities and Challenges of Blockchain Technology in Healthcare

Applications [16]	1.A Digital Electronic Health record on a Blockchain is guaranteed with integrity	2.Decentralization Enable Secured Sharing of data with group of researchers that enhance the clinical research	3.Immutable helps in medical fraud detection not allowing any duplication or modification and allows transparent and secure transaction.	4.Complex Algorithm and Bigdata used in Neuro science will utilize blockchain philosophy to store brain signals.	5.Using Blockchain one can keep the Pharmaceutical supply chain. The Patient details and medicinal requirements will enhance Pharmaceutical industry and research.
Opportunities	Transparent	Reduced Transaction Time	Secure	Cost Efficient	Irreversible Transaction
Challenges [16]	Inter Operability	Scalability	Storage	Social Acceptance	Requires Standatization

CONCLUSION:

Blockchain in healthcare systems provides patients with better protection, sharing, storage and data accessibility to electronic information data. In this study suggests that it is possible to design an efficient data access

mechanism for existing healthcare systems using blockchain technology. Challenges such as scalability and security indicate blockchain technology will require further research. Blockchain provides an opportunity to protect patient privacy and ensure data integrity. Blockchain electronic health records efficiently and securely as it manages the healthcare industry is moving towards patient-centric models.

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MAGNETORHEOLOGICAL FLUID AND ITS APPLICATIONS

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ABSTRACT

Magnetorheological suspensions are smart and complex fluids which show their behavior from liquid to solid is dependent the on off state of the current to the MR fluid. The basic mechanism of transformation is the attractive dipolar forces between the particles which have been created by magnetic field. The formation of particles chains throughout the fluid is the occurrence of the strength of the magnetorheological fluid. This paper represents the overview of the MR fluid and also examines the forces (hydrostatic, hydrodynamic, dipolar, magnetization) which play important role in the solid form of the fluid. These forces help to understand the rheology of the MR fluid. This article explains the working modes of the MR fluid and latest applications of the magnetorheological fluid.

Keywords—Smart fluid, Rheology, Carbonyl iron particles, Abrasive particles.

1. INTRODUCTION

MR fluid is controllable fluid which respond on the magnetic current with considerable change in the rheology of the MR fluid [1]. MR fluid is in liquid state at the off state ($H=0$) of the magnetic field like a Newtonian fluid. Noroozi et al, (2013) [2] on state of the magnetic current the dramatic transformation shows in the viscosity of the magnetorheological fluid. Mainly significant advantage of MR fluid over traditional processes of finishing is their changing capacity of the viscosity in a fraction of milliseconds. The strength of the fluid is described by yield stress. Premalatha et al (2012) [3] in MR fluid basically three important forces are working like hydrodynamic, magnetization and dipolar repulsive forces [4]. Hydrodynamic forces play an important role in yielding behavior of the fluid. Bica et al (2013)[5] dipolar repulsive force exactly balances the magneto static forces of attraction between the particles which are control and aligned with the help of magnetic field [6].

2. MR FLUID COMPONENTS**2.1 Magnetically active phase (CI particles)**

The MR fluids are contained is an idealistic combination of many components. However, the major components in many of the MR fluids today have probably remained the same. Highly purified carbonyl iron (CI) powder plays the main role in the MR fluid compositions [7]. Iron particles made by chemical vapour deposition (CVD) decomposition process [8]. The spray atomisation process is not preferred, main reason is that the CI particles are magnetically soft, chemically pure, and spherical in nature, which can be produced by the CVD process [9]. Meso scale particles are produced the more magnetic domains in the CI particles. The upper level of chemical cleanliness (about >99%) decreases the domain pinning defects and also the spherical shape of particles is help to decreases the magnetic shape anisotropy [10]. Due to high saturation magnetization (2.1 Tesla), the carbonyl iron particles are used. Choi et al (2006) [11] the MR fluid also used the alloy of the iron and cobalt which has improved the saturation magnetization (up to 2.4 Tesla). Volume fractions are varies from the ranges of 0.1 to 0.5.

2.2 Carrier fluid

The carrier liquid in the MR fluid also plays a major role. Carrier fluid is supplied the MR fluid to the magnetically active particles for the suspension [12]. The many type of oils used as a carrier liquid like mineral, synthetic hydrocarbon, esters, water is also used as a carrier liquid in the MR fluid. Goncalves et al (2006) [13] clarify that the water is more effective than the oil carrier fluid in the finishing application of the MR fluid [14]. To select the proper carrier fluid the important parameters of the carrier fluid into the mind like thermal properties (temperature of boiling), physical properties, and chemical properties of the carrier fluid. Carrier fluid is non-reactive to the magnetic particles [15].

2.3 Additives in MR fluids

Additives can be integrated into MR fluids to improve their characteristics and performance to make the fluids more durable. Additives are adding into the fluid it depends on the composition and application of the MR fluid. In the application of MR fluids finishing the additives are help to minimising the settling problem of magnetic particles [16]. In some applications the additives are used to coat the particles to improve the performance [17]. Some additives are improved the anti-wear and anti-oxidation characteristics of the fluid. For example in magnetorheological fluid which the water as a carrier liquid is used, pH control additives are used.

3. COMPOSITION AND RHEOLOGY

3.1 Composition

Proper composition which helps to provided the good magnetic effect to the magnetorheological fluid [18]. Vekas et al, (1999) [19] modify the composition of the carbonyl iron particles (CIP), which help to transform the rheology of the fluid. Rheology identifies the MR fluid shear forces which changes with the change of the composition of MR fluid [20]. In MR fluid the carbonyl iron particles (CIP) size varies from 10 to 70 μm and the particle size is less than 10 μm then this fluid is known as ferro fluid [21]. The size of CIP particles is more than 10 μm then this fluid is known as a magnetorheological fluid [22]. In MR fluid the composition of the CIP particles which made the magnetic domains. Magnetic field applied to the CIP particles the magnetic domains is generated. These magnetic domains create the dipolar reactive forces [23]. Susan et al (2010) [24] the dipolar reactive forces are the inter-particles forces which act between the CI particles and also help to generate the chain formation in the MR fluid. These forces help to generate the zipping type chain formation in the MR fluid [15]. Park et al (2001) [25] the inter-particle attraction is generated when supplied the magnetic field. Higher the inter-particle attraction which improves the magnetorheological effect of the fluid. Jiang et al, (2011) [26] increase the inter-particles attraction between the CI particles, which results improving the particles saturation magnetization. Iron is element which has a higher saturation magnetization (2.1 Tesla) [17]. In the magnetically active phase as it know about the carbonyl iron particles [27].

3.2 Flow Regime (Viscosity and Mason number)

Shetty et al (2011) [28] to know about the shear force of the MR fluid particles studied the different type of models. These models help to prediction the how the viscosity changes will affect the steady shear flow and the Mason number [29]. These models also help to find out the collection of the particles which produced by magnetic field and find out the slant among the centreline of the particles chain in the direction of magnetic field line [30]. When Mason number is increased, a critical angle is obtained in between the particles which break the collection of particles into equal parts and further increases in the Mason number breaks the all collection of particles and this affect to decreases the equilibrium length of the particles [31].

3.3 Rheological Effect

MR fluid is consisting of carbonyl iron particles (CIP), abrasive particles with different size and composition with carrier liquid, and various surfactants. MR fluids are affected by the size, shape, density and concentration of the CI particles [32]. When MR fluid is off state the fluid act similar to a newtonian fluid [33]. When fluid is on state the carbonyl particles arranged in a chain like pattern in the field direction [34]. When this happen, the fluid behave like a non- newtonian. To show the relation of the shear stress and shear strain rate usually the two magnetorheological characteristic equations are used. These are described as follow:-

3.3.1 Bingham plasticity model

3.3.2 Herschel bulkley model

3.3.1 Bingham plasticity model

In this model the relation between the yield stress and shear stress is described, which shows that the yield stress is greater than the shear stress in magnetorheological fluid. After this fluid still behave like a solid state properties when MR fluid begins to flow [35]. Magnetic field at on state the viscosity of the fluid is described the property of the fluid. Magnetization current increase, which help to increases the fluid viscosity [36].

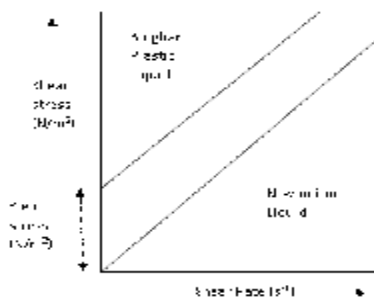


Fig. 1 Bingham plasticity model profiled the relation between shear stress and shear rate

1.1.1 Herschel bulkley model

In this model shows the description of the non-newtonian fluids which express the behavior of the strain to the stress [37]. Model shows the complicated experience of the nonlinearity between the shear strain and shear

stress. Amount of the stress which helps to define the experience of the fluid facing it start to flow is defined the yield stress [38].

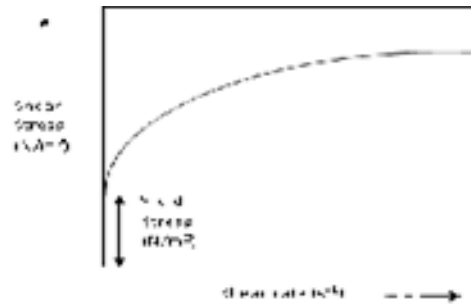


Fig. 2 Shear stress-shear rate profile by herschel-bulkley model

2. MODES OF OPERATION OF MR FLUIDS

Modes of operation are defined by the application of the MR fluid in the various devices. These are classified as follow: - a) Flow mode, b) Shear mode, c) Squeeze mode [39].

2.1 Flow mode

In flow approach the working fluid is placed between the set of two fixed paramagnetic poles. Fluid movement or resistance is controlled by the magnetic field, which working perpendicular to the working fluid [40].

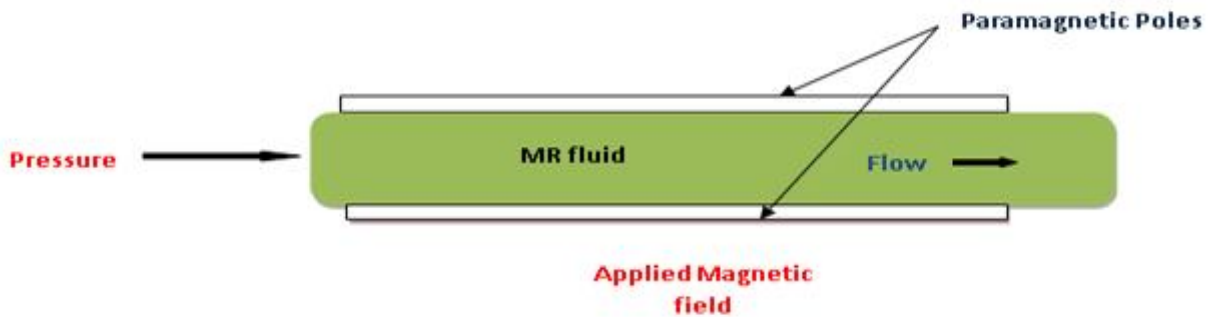


Fig. 3 Flow mode

2.2 Shear mode

In shear approach working fluid is placed between the set of two moving paramagnetic poles. The motion of the working fluid between the moving poles can be translation or rotational motion. Displacement of the working fluid is parallel to the moving poles. Viscosity and drag forces are handled by modified supplied current to the working fluid, between the moving paramagnetic poles [41].

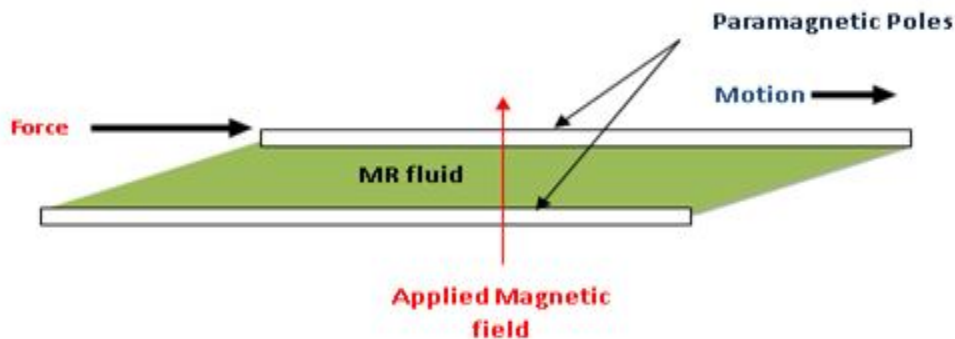


Fig. 4 Shear mode

2.3 Squeeze mode

In squeeze approach the working fluid is placed between the set of two moving paramagnetic poles. Displacement of the working fluid is perpendicular to the moving poles. In this mode the working fluid experiences the compression force which varying periodically [39]. Comparing to the other two modes in this mode displacement is very small but resistive forces are high.

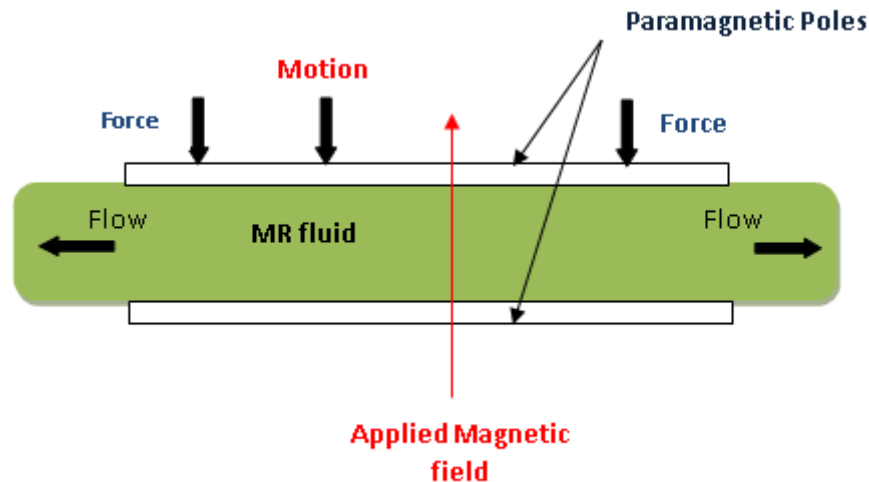


Fig. 5 Squeeze mode

To control the resistive forces the modified magnetic field is used. MR fluids applications clear about the theoretical understanding about the material uses and practicality of the MR fluid in the various devices [42]. MR fluid operated devices recently beneficial for the various equipment like automobile vehicles vibration controlled in the seat system to provide the comfort to the drive [43]. MR fluid main area of application in the torque transmitting devices like breaks and clutches [44]. The MR fluid operated breaks and clutches very soon used in the various automotive applications [45]. MR fluid operated rotary brake made by Lord Corporation [46]. The controlling component of the rotary brake is a compact, smooth functioning and low input consumption. MR fluid rotary brakes are used in the cycling and stair climber type machines [47]. This rotary type brakes are used with the velocity feedback system which help to control the forces for the desired speed profile [48].

3. MR FLUID APPLICATIONS

This ease of controlling their response is making the MR fluid for a broad diversity functionality in various devices [49]. MR fluid an additional functional region is used in the dampers and the vibration controlled mounting to the automotive parts [50]. This technology is significance for the automobile sector in vibration control of the seating system, suspension system and various vehicle mounts [51].

4. CONCLUSIONS

MR fluid products or devices have less maintenance and longer life. MR fluid also have a drawbacks when used heavy density magnetic particles the weight of the product is higher and also used prolonged in the place of particles which is also heavy the product of the MR fluid. MR fluid technology used in automobile industry in shock absorbing devices etc. This technology also used in aerospace and medical applications. The main scope now days on the MR fluid in finishing processes. MR finishing processes are used in various engineering applications and provide the best finishing and improve on the total product quality. The improved technology of the MR finishing is making it the smart technology of the future.

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DEVELOPMENT OF NON-TOXIC LEAD-FREE SOLDER FOR ELECTRONIC INDUSTRY

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ABSTRACT

Global concern over the environmental impact and health effects of lead (Pb) based solder in consumable electronic has led to development of Pb-free solders alternatives. The development of new Pb-free solder and composites especially with Tin (Sn) base is of recent interest for the researchers around the world. In the present work a nontoxic binary Pb-free Sn-9Zn solder alloy was developed successfully by melting and casting. The cast ingot was drawn into solder wire. Microstructural characterization of solder was carried out using optical microscope. The elemental analysis was carried out using X-ray flourocense technique. XRD analysis was performed to determine the phases present in the solder. Differential scanning calorimeter (DSC) was used to determine the melting temperature [3]. The performance of this solder was compared with the commercially available Sn-9Zn solder of similar composition as well as Pb bearing solder. Sn-Zn solder alloy has drawn more and more people's attention for its relatively low melting temperature and superior mechanical properties in the room temperature. But some properties like wettability, oxidation and corrosion resistance can be improved by alloying another element such as Pr, Ce, Cu, Al, Ag, Bi etc.

Keywords: - Lead free, tin-zinc, oxidation resistance, wetting properties, tensile properties

1. INTRODUCTION

Sn-37Pb solder has been the most dominant material for interconnection and packaging of modern electronic components and devices. Sn-Pb solder is used because it is cheap and has good material properties. However, lead and lead-containing compounds are considered toxic substances. Due to environmental and health concerns, efforts to replace conventional Sn-Pb eutectic solder with lead-free alternatives have begun.1–5 Considering performance, reliability, cost, and resources, the Sn-Ag and Sn-Zn alloys have received the most attention. Compared with Sn-Ag solder, Sn-Zn solder has some advantages, such as low melting point (198°C), adequate mechanical strength, low cost, and abundant supply; thus its prospects for development are numerous, and it has great market potential.6–10 Its eutectic structure consists of two phases: a bodycentered tetragonal Sn matrix phase and a secondary phase of hexagonal Zn containing ,1% Sn in solid solution.11 The solidified microstructure is reported to exhibit large grains with a fine, uniform, two phase eutectic colony. However, because the Zn element is quite active, the Sn-Zn solder is easily oxidized, poorly wetting, and forms dross. There is no doubt that the key issue is improvement of the wettability of Sn-Zn solder. Recent research shows oxidation to be the major factor behind poor wetting during soldering to electrodes. In wave soldering, oxidation causes excessive dross formation. Not only does it waste solder, but it also causes solderability problems that worsen the reliability of the solder point. It is important to improve the oxidation resistance of Sn-Zn solder. Generally, the wettability of the Sn-Zn solder can be improved by two ways: developing a new kind of flux appropriate for lead-free soldering and improving oxidation resistance by alloying. In this paper, we focus on the second method. Some research has shown that phosphorus and lanthanum can improve the oxidation resistance of Sn-Zn solder, and Lin et al. reported the effect on oxidation resistance of additions of alloying elements Al and Ga to Sn-Zn solder. However, research into oxidation resistance of Sn-Zn solder is extremely limited. In this work, we have also studied the effects of alloying elements, such as lanthanum, titanium, aluminum, and chromium, on the oxidation resistance, wetting properties, and tensile properties of Sn-Zn-based lead-free solder.

2. LITERRATURE REVIEW

There are two main classifications of soldering methods in use today:

- 1) Wave soldering
- 2) Reflowing soldering

Wave Soldering

Wave soldering is a large-scale soldering process by which electronic components are soldered to a PCB to form an electronic assembly. The name is derived from the fact that the process uses a tank to hold a quantity of molten solder; the components are inserted into or placed on the PCB and the loaded PCB is passed across a pumped wave or cascade of solder.

Reflowing Soldering:

Reflow soldering is the most common means to attach a surface mounted component to a circuit board. In a reflow process, solder paste is put on the component sites of the printed circuit board, and then the components are put on the board on top of the solder paste. The board and attached components are then heated to activate the flux, elevate the temperature of the base metals, and melt (or "reflow") the solder.

Tin-Lead Solder:

Solder used for electronics is a metal alloy, made by combining tin and lead in different proportions.

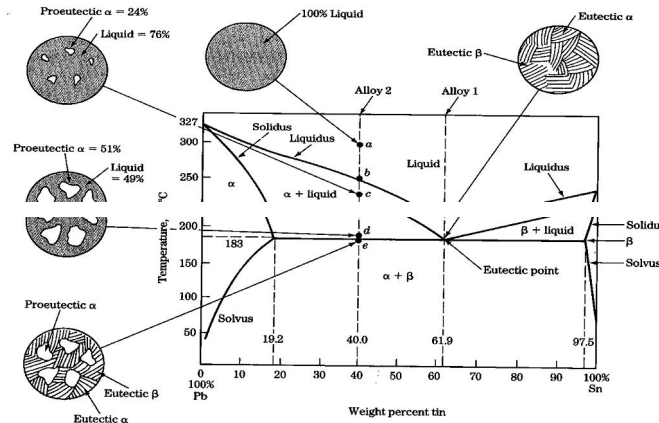


Fig. 1. Tin-Lead Alloy

With most Sn-Pb solder combinations, melting does not take place all at once. Fifty-fifty solder begins to melt at 183°C, but it's not fully melted until the temperature reaches 216°C [12]. Between these two temperatures, the solder exists in a plastic or semi-liquid state. Figure 2.2 shows the eutectic diagram for tin-lead solder. The plastic range of a solder varies, depending upon the ratio of tin to lead. With 60/40 solder, the range is much smaller than it is for 50/50 solder. The 63/37 solder, known as eutectic solder has practically no plastic range, and melts almost instantly at 183°C as depicted in Figure 1.

Solder Alloy Properties

- 1) **Wetting:** The efficiency of wetting depends on the degree of surface cleanliness as well as the interfacial tensions of the solid/liquid contact systems.
- 2) **Surface Tension:** Surface tension is a contractive tendency of the surface of a liquid that allows it to resist an external force. Surface tension has the dimension of force per unit length or of energy per unit area. The two are equivalent—but when referring to energy per unit of area, people use the term surface energy.

3. MECHANICAL TESTING

Tensile Test: Tensile testing, also known as tension testing is a fundamental materials science test in which a sample is subjected to a controlled tension until failure.

Table 1 Tensile Strength and Percentage Elongation of Various Solder Alloys

Solder Alloy	Tensile Strength (Mpa)	Elongation (%)
Sn-3.5Ag	26.7	24
Sn-56Bi-2In	58.1	40
Sn-3Ag-4Cu	48.1	22
Sn-3Ag-2Sb	42	25
Sn-3Ag-2Bi	54	30
Sn-3.4Ag-4.8Bi	71	16
Sn-3.5Ag-1.5Bi	34	26
Sn-10Bi-20In	55	9
Sn-5Sb	35	22

Research on lead free solder is expanded every day. In this study the focus is on the development of Sn-9Zn lead free solder alloy which is having eutectic temperature close to the eutectic temperature of Sn-Pb solder alloy and is expected to have good solderability properties and considerable manufacturing cost. The main objectives of this research are to develop Sn-9Zn eutectic solder alloy compare the physical and mechanical properties of developed Sn-9Zn solder with commercially available Sn- Pb solder.

4. RESEARCH APPROACH

In this research, solder alloy was produced by melting raw materials (weight percent - wt %) mixture based on eutectic composition. The selection of composition is based on previous research. Raw materials used in this research are tin and zinc having 99% purity. After alloy development several testing were carried out to determine the properties of the solder alloys. Thermal analysis was done to determine the melting point of solder alloys.

5. EXPERIMENTAL PROCEDURE

Development of Sn-9Zn solder alloy: The lead-free Sn-9Zn solder alloy was prepared from commercially available Sn (99%), Zn (99%). After weighing the material according to the eutectic composition (Sn-9Zn). The zinc was placed in a graphite crucible and melted in muffle furnace at about 500°C. Then the tin was added into the melted zinc, the molten alloy was held for about 10min while stirring was performed. The melted solder was chilled to cast and cut into a solder bar. Figure 2 shows the alloy after solidification. 63Sn-37Pb solder alloy which is presently used for commercial applications was procured from market for comparing the properties of Sn-9Zn alloy with 63Sn-37Pb alloy.

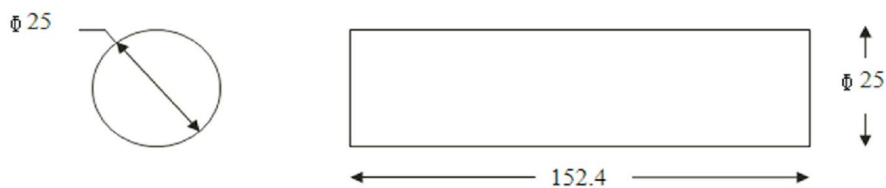


Fig 2. Dimension of alloy in (mm)

Annealing:

In order to get homogeneous structure annealing was performed on cast Sn-9Zn alloy at 100°C for 9 hours in muffle furnace. After 9 hours the furnace was switched off and sample was allowed to cool in the furnace. Figure 3 shows the three-step annealing process. Density of the solder was measured by using Archimedes principle. Weighting the samples sliced from Sn-9Zn and Sn-37Pb alloys using balance. Then take a beaker of water and placed it on the balance and tare the balance. The wires were suspended in water using dental floss and note the reading from the balance. Then calculate the density of the wire by using formula as expressed in Eq. (1).

$$\text{Density of the solder wire} = \frac{\text{Mass of the solder wire}}{\text{Mass of the water displaced by the wire(volume of the wire)}} \tag{1}$$

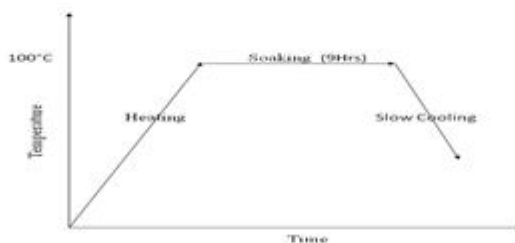


Fig 3. Annealing time and temperature of solder alloy

Solder Wire drawing:

Solder wire was drawn from Sn-9Zn alloy using rolling and drawing machine as depicted in Figure 4. Rolling operation was carried out to decrease the diameter up to 5mm using rolling machine. After that the drawing operation was performed to make a wire of 16 gauge using drawing machine.

6. CHARACTERIZATION

Sample Preparation:

The metallographic specimens were sliced from the cast Sn-9Zn and Sn-37Pb alloy for microstructural investigation. For removing scaling and scratches rough polishing was performed using sand paper of grit size 600 and 800 on rough polishing machine. Samples were rotated perpendicularly after each sand paper. After rough polishing samples were fine polished with 0.5µm alumina powder (Al₂O₃) on fine polishing machine. The polished samples were etched with a solution of 4% HNO₃-alcohol for about 10 sec.

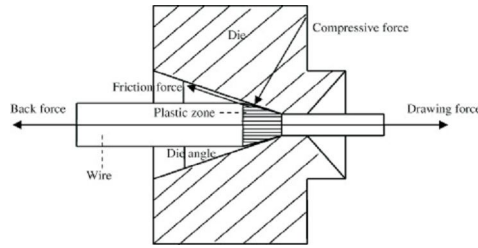


Fig. 4 Drawing Operation

Metallographic Studies:

The microstructural analysis of as cast Sn-9Zn, as annealed Sn-9Zn and Sn-37Pb alloys was investigated using an optical microscope of inverted nature.

X-Ray Fluorescence (XRF):

The elemental analysis of Sn-9Zn alloy was carried out using the X-ray fluorescence spectrometer (PW1606). For XRF analysis the required sample size was 25mm diameter and 2mm thickness. Figure 5 shows the XRF sample.

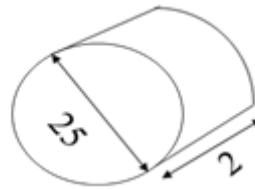


Fig.5 Dimensions of XRF Sample (in mm)

X-Ray Diffraction (XRD): XRD analysis was performed on Sn-9Zn cast alloy using Cu K α radiation, $\lambda=1.540\text{\AA}$, $2\theta= 0^\circ$ to 90° , step size = 0.0170° , time per step = 20.0393sec. Phases present in the cast Sn-9Zn alloy were determined by comparing with JCPDS file no. 00-004-0673 and 00-004-0831 respectively.

7. RESULT AND DISCUSSION

Microstructure

SEM photographs of the alloy solders are presented in Fig. 2. Sn-Zn alloy manufactured by the slow cooling rate exhibits a coarse dendrite structure and large, long, rod- or needle-like Zn-rich precipitates. With alloying elements, Sn-Zn-X alloys exhibit a much finer and more uniform microstructure within which was dispersed rod-like, needle like, or particulate Zn-X-rich (X 5 Al, Cr, Ti, La) phase in the b-Sn matrix.

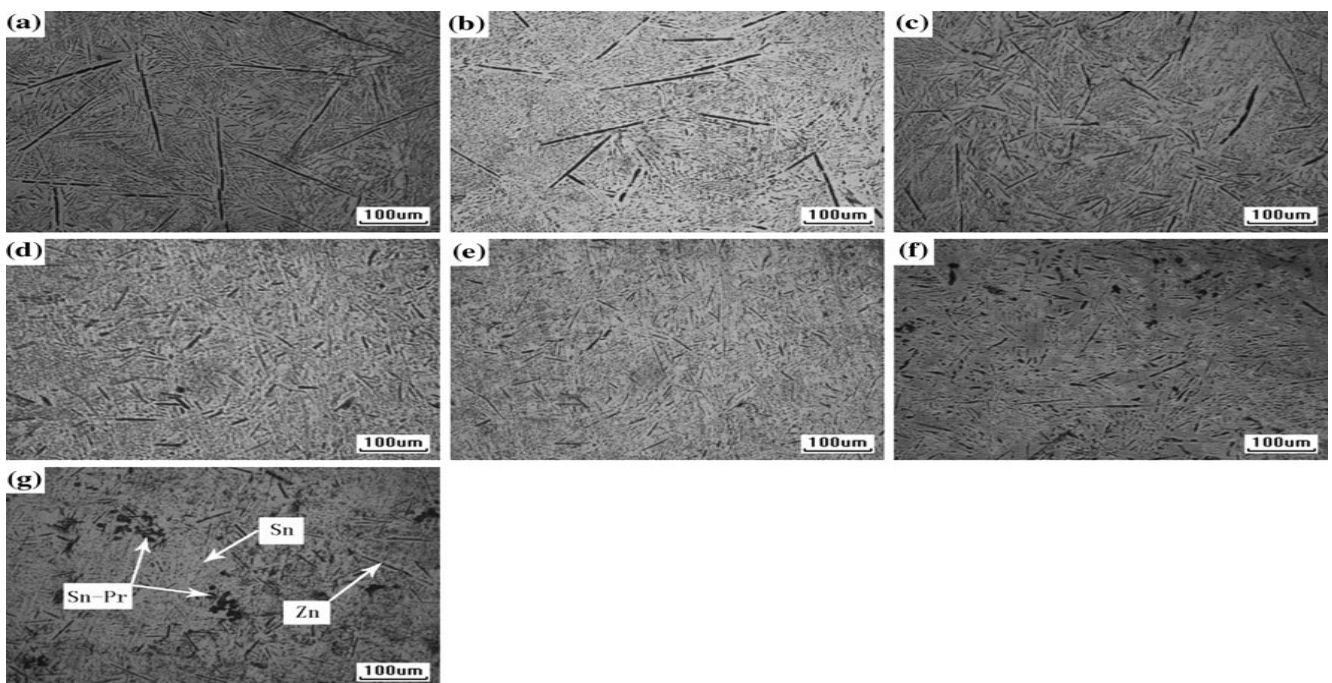


Fig. 6 Optical micrographs of a Sn-9Zn, b Sn-9Zn-0.01%Pr, c Sn-9Zn-0.02%Pr, d Sn-9Zn-0.04%Pr, e Sn-9Zn-0.08%Pr, f Sn-9Zn-0.1%Pr and g Sn-9Zn-0.25%Pr

TGA Analysis

To quantitatively study the effect of different alloying elements upon oxidation resistance, the alloys were investigated by TGA. The results are shown in Fig. 3. Al and Cr can distinctly improve the oxidation resistance of Sn-Zn alloy, as can Ti. However, the presence of La accelerates the oxidation process. The ability of alloying elements to improve oxidation resistance decreased in the order of Al, Cr, Ti, and La.

Antioxidation Mechanisms of Alloying Elements

To understand the antioxidation mechanisms of different alloying elements, especially of Al and Cr, the solder alloys were investigated by Auger electron spectroscopy (AES) after oxidation at 250°C and compared with eutectic Sn-9Zn and Sn-37Pb solder alloys. Distinct differences can be observed in the surface composites of the specimens (Fig. 4). Because of preferential oxidation at high temperature, the concentration of alloying elements in the surface layer is quite different from that in the alloy matrix. Zn and Sn are the dominant elements in the surface layer of the Sn-9Zn and Sn-37Pb solder alloys. Alloying elements except Cr were oxidized in the surface layer instead of Zn. Al, Ti, and La were respectively concentrated in the surface layer of Sn-9Zn-Al, Sn-9Zn-Ti, and Sn-9Zn-La. However, Cr was concentrated in the near-surface layer of Sn-9Zn-Cr, which was quite different to others in the Sn-9Zn series. These results are in accord with thermodynamic criteria.

X-Ray Fluorescence:

The composition of Sn-9Zn solder alloy cast in present work is given in Table 2.

Table 2 The Composition of Cast Sn-9Zn Solder Alloy

<i>Sn</i>	<i>Zn</i>	<i>Na</i>	<i>In</i>	<i>Al</i>	<i>Mg</i>	<i>Cl</i>	<i>Fe</i>
87.37%	9.69%	1.44%	0.11%	0.07%	0.03%	0.02%	0.04%

<i>Si</i>	<i>Cu</i>	<i>Ni</i>	<i>Sr</i>
0.22%	0.04%	0.01%	0.01%

X-Ray Diffraction:

The XRD pattern of solder shows that no other phase than β-Sn and Zn phase could be identified. All Sn and Zn peaks matched ICDD file numbers 00-004-0673 and 00-004- 0831 respectively.

Table 3 The Important XRD Data Observed in Sn-9Zn Alloy

<i>Pos[°2θ]</i>	<i>Rel. Int.[%]</i>	<i>Matched by</i>	<i>(hkl) Values</i>
32.0771	100	β-Sn	(201)
44.9892	79.58	β-Sn	(211)
43.2645	6.85	Zn	(101)
36.3887	4.02	Zn	(002)

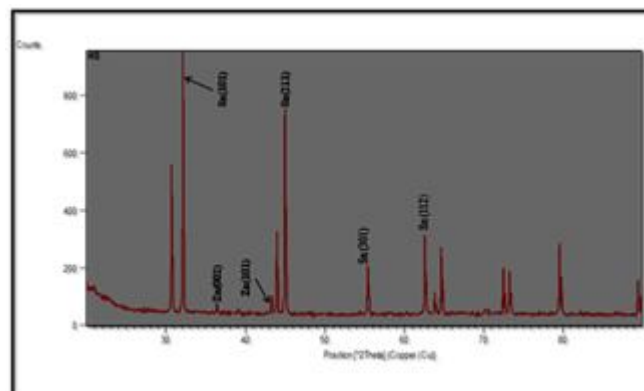


Fig. 7 XRD Pattern of Tin-Zinc Solder Alloy

Physical Properties: Differential Scanning Calorimetric

DSC analysis of the solder was done in order to investigate the thermal reactions during the heating of the solder alloy and to find out the melting range of the solder. Figure 8 shows typical DSC curve obtain for Sn-9Zn

solder. The endothermic peak was prominent for solder around 200.4°C, which correspond to the eutectic temperature of the Sn-9Zn binary system.

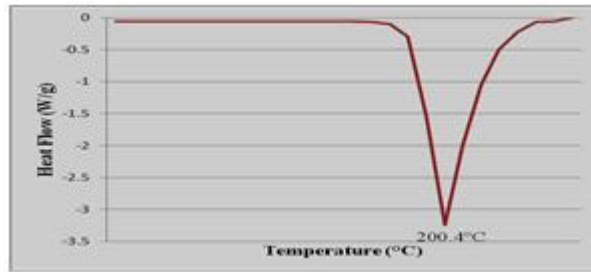


Fig.8 DSC Curve for Sn-9Zn Solder Alloy

Density Measurement:

Table 4 Density of Sn-9Zn and Sn-Pb Solders

Sample	Density (gm/cc)
Sn-9Zn	7.13
Sn-Pb	8.4

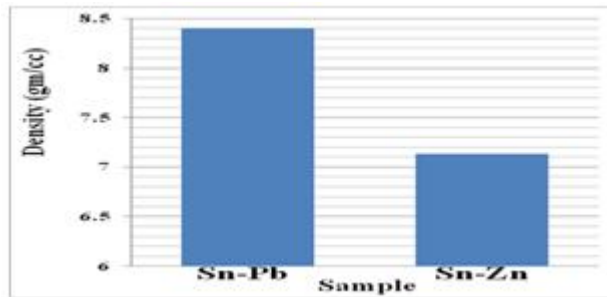


Fig. 9 Density Values of Solders

Figure 9 shows that the density of Sn-9Zn and Sn-Pb solder alloy. For same mass of wire the volume occupied by Sn-9Zn was more in comparison to the Sn-Pb solder alloy.

Mechanical Properties:

Hardness Measurement:

Figure 10 shows the hardness of Sn-9Zn and Sn-Pb solder alloy. The results indicate that the Sn-9Zn solder alloy was harder than Sn-Pb solder alloy. The zinc was responsible for the hardness of Sn-9Zn alloy which was present in the form of needles.

Table 5 Hardness of Sn-9Zn and Sn-Pb Solders

Sample	Avg. Hardness (Hv)
Sn-9Zn	8.1
Sn-Pb	4.6

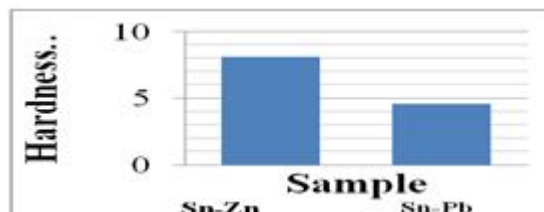


Fig. 10 Hardness Values of Solders

Tensile Test:

Figure 11 shows that the tensile strength and elongation of Sn-9Zn and Sn-Pb solder alloy. The results indicate that the Sn-9Zn solder alloy was having more tensile strength and less elongation than Sn-Pb solder alloy. The zinc was responsible for the high value of tensile strength which was present in the form in needles.

Table 6 Tensile Strength and Elongation of Sn-9Zn and Sn-Pb Solders

Sample	Tensile Strength (MPa)	Elongation (%)
Sn-9Zn	44	26
Sn-Pb	39	38

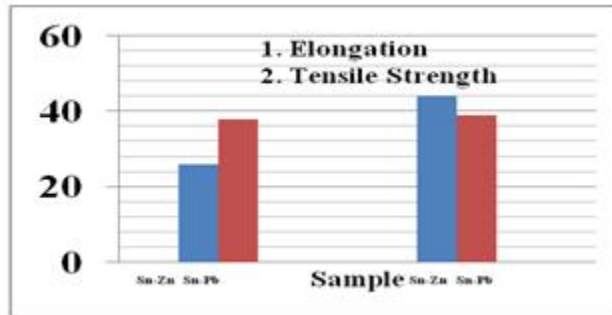


Fig. 11 Tensile Strength and Elongation of Alloys

Influence of Alloying Elements on Wetting Properties

Generally, two reasons explain the poor wetting of Sn-9Zn: one is ZnO at the interface of the solder and substrate,¹² and the other is the increase in the surface tension caused by Zn.¹³ We suppose that the first one is the major reason. A stable and compact oxide can improve oxidation resistance, but it is difficult to remove. So we studied the influence of alloying elements on the wetting properties of Sn-9Zn solder and compared it with the eutectic Sn-37Pb (made by Yunnan Tin Company Limited, Gejiu, China) and Sn-3.5Ag-0.75Cu (made by Senju Metal Industry Co., Ltd., Tokyo, Japan) solder. Figure 7.7 shows the results.

The wetting properties of Sn-9Zn series are generally Poorer than those of Sn-37Pb and Sn-3.5Ag- 0.75Cu. Additions of Cr, Ti, and La do not affect the wetting properties of Sn-9Zn much, and Al even worsens them. Because of difficulty of its removal, we considered a stable, compact oxide, such as Al₂O₃ or TiO, to be detrimental to the wetting properties of Sn-9Zn solder. As shown in Fig. 5, the more stable and compact the oxide, the poorer the wetting behavior.

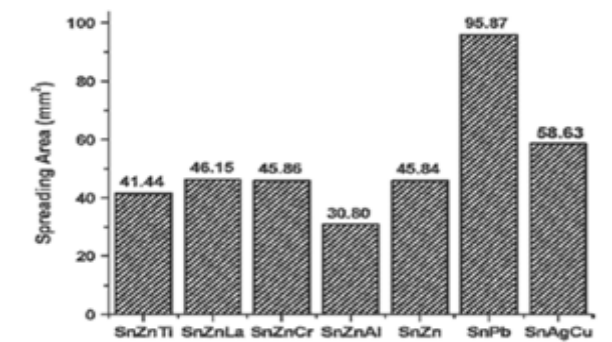


Fig. 12 Spreading areas of the solders.

Influence of Alloying Elements on Melting Point

Melting point is one of the most important properties

of solder. It also is the primary factor behind use of lead-free solder. We investigated the effect of alloying additions on the solidus and liquidus temperatures. The DSC results of the solder alloys (see Table II) show that alloying additions have limited effects on the melting point of Sn-9Zn solder. This phenomenon can also be seen in SEM micrographs. Because of their small quantities, alloying elements do not cause great changes in the microstructure or thermal properties of Sn-9Zn solder.

8. CONCLUSIONS

Sn-9Zn solder was successfully developed in present work from micro structural characterization of Sn-9Zn solder alloy it was found that large needle like Zn-rich phases were distributed irregularly in the Sn matrix. The

needle like Zn-rich phase was formed during solidification because of the conglomeration of small Zn-rich phase. The melting temperature of Sn-9Zn solder alloy was 200.4°C which was 17.4°C higher than that of Sn-Pb solder alloy. From XRD pattern it was found that no other phase than β -Sn and Zn were present.

The density of Sn-9Zn solder alloy was 7.13gm/cc which was 1.27gm/cc less than that of Sn-Pb solder alloy. The microhardness of Sn-9Zn solder alloy was 8.1Hv which was 3.7 higher than that of Sn-Pb solder alloy. The tensile strength of Sn-9Zn solder alloy was 44MPa which was 5MPa higher than that of Sn-Pb solder alloy. The percentage elongation of Sn-9Zn solder alloy was 12% less than Sn-Pb solder alloy.

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A NOVEL FRAME WORK FOR TASK SCHEDULING ALGORITHMS IN MOBILE EDGE COMPUTING**S.M. Muthukumari¹ and Dr. E. George Dharma Prakash Raj²**Research Scholar¹ and Associate Professor², Computer Science Department, Bharathidasan University, Trichy

ABSTRACT

Mobile Edge computing (MEC) is a principle of network architecture that allows the capabilities of cloud computing. MEC's important concepts push the associated activities closer to the mobile user. The basic technology in MEC is all incoming tasks to be send to the nearest base station. And there are several challenges in Mobile Edge Computing they are Task Distribution, Content Offloading, Resource Allocation, Execution Time etc., these challenges can be carried out through the Enhanced Task Scheduling Algorithms. In this paper, we give a novel, efficient and distributed framework for Task Scheduling in Mobile Edge Computing and Resource utilization of the task. And this framework has efficient performance of the given task.

Keywords: Cloud Computing, Mobile Edge Computing, Task Scheduling Algorithms.

1. INTRODUCTION

Cloud Computing is quickest growing platform in both business and society today. This is not an entirely new idea built on the basis of grid computing and distributed computing. One of the cloud service's main benefits is that these services be used anywhere at any time. In addition, the cloud is often a service paradigm for which user can only pay a used service. In cloud computing all incoming request where send to the cloud environment for processing this makes time latency and increase the cost [1]. In Mobile Edge Computing where all incoming tasks are push into the base station located closer to the mobile user. On the basis of traditional cloud computing the approaches are fundamentally different. MEC aims to enable the number of connected mobile devices to reach the network edge without delay in implementation of the task. In this paper, the author defines three Enhanced Task Scheduling Algorithms in Mobile Edge Computing [2].

Remaining of the paper is organized as follows: Section I has Introduction part. Section II contains related works of Task Scheduling Algorithms in Mobile Edge Computing. Section III has Existing Task Scheduling Algorithms in MEC. Section IV contains Enhanced Task Scheduling Algorithms in MEC. Section V defines framework for Task Scheduling Algorithms in MEC. Section VI concludes the research work with future directions.

2. TASK SCHEDULING IN MOBILE EDEG COMPUTING

Task Scheduling is used to improve the Quality of Service (QoS) and increase the performance of the user request. There are some issues occurs in Task Scheduling are based on the performance of the cloud environment or Edge Computing. There are two types of Task Scheduling are available which of them are Static Scheduling algorithms and Dynamic Scheduling algorithms. Some of the advantages of Task Scheduling algorithms are improve the load balance, Increasing the Quality of Service (QoS), Minimize the Completion Time of the tasks.

In Mobile Edge Computing, different Task Scheduling Algorithms have been proposed. The main use of all algorithms is to achieve Minimize the Execution Time and Completion Time and increase the Throughput of the tasks.

3. MOBILE EDGE COMPUTING TASK SCHEDULING ALGORITHMS**Minimum Execution Time**

The important concept of the Minimum Execution Time (MET) is to send each and every user request (task) to machine in random order to get the better execution time of the task without identify the availability of the resources to process the task. MET algorithm is very easy to implement but it leads load imbalance due to the unavailability of the resources [3].

Minimum Completion Time

Minimum Completion Time (MCT) algorithm is similar like MET algorithm. In MCT the task can be randomly send to the resource with knowing the availability of the resource but in MCT all task is not allocate to the resource because every time the execution time of the task get vary [4].

4. ENHANCED TASK SCHEDULING ALGORITHMS IN MOBILE EDGE COMPUTING

Ageing Based Task Scheduling Algorithm for Mobile Edge Computing (ATSA)

In MEC the tasks came from various workflows due to this reason Ageing is considered to reduce the queue length and avoid starvation of the incoming task waiting in the queue. Ageing is a process used to reduce the starvation of the low priority of the task. Depending on the waiting time of the task the ageing process has the time duration if the arriving task retains the waiting queue for long time means automatically that task promote the highest priority task to get server for processing. In ATSA algorithm the Total Waiting Time (TWT) of the tasks can be calculated. Before assigning the task to server calculate the Estimated Completion Time (ECT) and Estimated Execution Time (EET) of the task. This algorithm compared with MCT and MET at last ATSA only gives the better result.

Server Efficiency based scheduling Algorithm for Mobile Edge Computing (SESA)

In SESA algorithm, first we have to choose efficient server based on the incoming task. All incoming tasks where first send to the data center then the data center decides which task can be send to which server. Server selection is based on the capacity of the incoming task i.e size of the task, storage space of the task etc based on this attributes efficient server can be choose. Each server has the different processor and storage capacity. This server selection process will increase the fast execution of the task. This algorithm is compared with ATSA finally SESA gives better result.

Multiple Tasks Scheduling Algorithm based on Server Efficiency in Mobile Edge Computing (MTSA)

In MTSA algorithm task has been identified and verify the task where it came from and also identified the attributes of the task then two or more task with the relevant attributes and send that task to the efficient server to execute the task. All incoming task was formed queue and calculate the Local Waiting Time (LWT) of the task in the queue based on the LWT priority of the task can be identified only two priority levels is set one is High priority and another one Low priority. Based on this two levels task can be generated to one or more task then send to the server for further execution of the task. Data Center only decides to locate the task to server. This algorithm compared with SESA and the performance of MTSA algorithm gives better result

5. FRAMEWORK FOR TASK SCHEDULING ALGORITHMS IN MOBILE EDGE COMPUTING

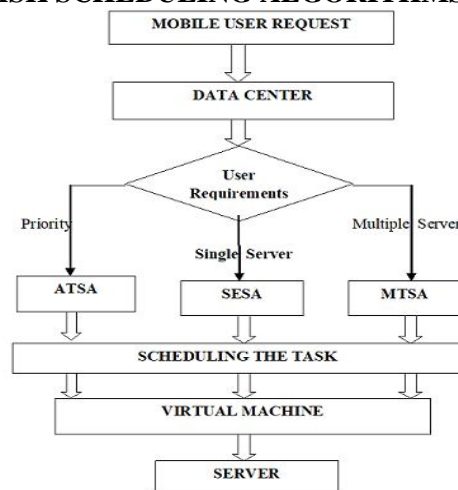


Figure 1: Framework for Task Scheduling Algorithms in Mobile Edge Computing

In this section, a framework for task scheduling in mobile edge computing has been proposed. The main aim of this framework is to enhance the efficiency of the Task Scheduling Algorithms in Mobile Edge Computing. As shown in Figure 1, the first part discuss about the user request. Here the request is comes from different workflows where each user request is different from one another. The second part is about Data Center. Data Center is the controller of the task where all user request is send to the Data Center (DC), the work of the DC is to store all user request. In Third part, the user request is send to the task scheduling algorithms based on the requirements of the request. Next part is to schedule the task and send the task into Virtual Machine for calculating the Local Waiting Time (LWT) of the task. After calculating the LWT task is send to the server for calculating the execution time and completion time of the task.

Table1: Resource Utilization in Percentage

Algorithm	Resource Utilization
ATSA	65.6

SESA	67.3
MTSA	71.8

Table 1 shows the resource utilization for the three algorithms in this MTSA utilize the highest resource to give the best outcome. For resource utilization take 100 task, in ATSA the resource utilization of 100 task 65.6%, in SESA the resource utilization of 100 task is 67.3%, finally MTSA utilize the high resource 71.8% which means MTSA only give the best outcome when compare with others.

6. CONCLUSION

This framework shows the Task Scheduling Algorithms in Mobile Edge Computing with three algorithms ATSA, SESA and MTSA. The main purpose of this algorithm is to reduce the execution time of the task and increase the resource utilization of the task. In the above table MTSA algorithm gives the better outcome compare with others. The aim of the future work is to increase more task to schedule and enhance the algorithm to reduce the execution time into minimum seconds.

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STUDIES OF FORMATION CONSTANTS OF THE COMPLEXES OF SUBSTITUTED THIAZOLYL SCHIFF'S BASES PH-METRICALLY WITH SOME LANTHANIDE METAL IONS IN 70% ETHANOL – WATER MIXTURE

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ABSTRACT

The Present work is undertaken to make a systematic solution study of the complex formation of La(III), pr(III) and sm (III) with 2-[3-(4-methoxy phenyl)-1-(4-phenyl-thiazol-2-ylimino)-allyl]-phenol. And 2-[3-phenyl-1-(4-phenyl-thiazol-2-ylimino)-allyl]-phenol. have been determined by the p^H -metric method in media of 70% ethanol -water mixture at 0.1 M ionic strength and at $(30 \pm 0.1)^\circ\text{C}$ temperature.

Keywords: thiazolyl substituted Schiff's bases, pH-metric study, La(III), Pr(III), Sm(III), Metal-ligand stability constants.

INTRODUCTION

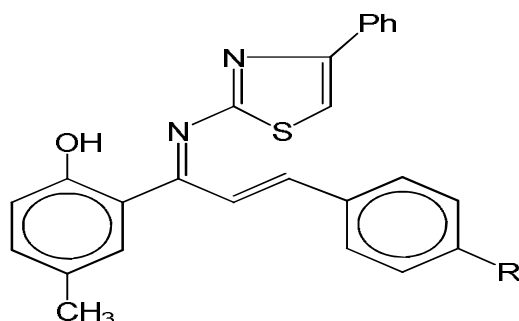
Most of the binary complexes of transition and inner transition metals have been studied Potentiometrically¹⁻². Literature survey³⁻⁴ reveals that the thiazole nucleus is the centre of attraction in developing various chemical entities of biological interest. Metal complexes of thiazoles have been extensively studied because they possess good synthetic flexibility, selectivity and sensitivity towards the central metal atom. Some thiazole derivatives reported as antiphycoctics, antimalarial antibacterial⁵ and antiinflammatory⁶. Metal ligand stability constant determination has wide significance in different fields of physical chemistry, medicinal chemistry and thermochemistry.

The study of coordination compounds specifically the metal complexes containing thiazole based ligand is of much interest due to their importance in various chemical and biological systems. A perusal of literature has revealed that schiff's bases belongs to a widely used group of organic intermediates, important for production of specialty chemicals such as pharmaceuticals, rubber additives and as amino protective groups in organic synthesis.

The studies on complex formation by tripositive rare-earth metal ions with biologically important ligands are in progress because of their role in biological process⁷.

KB Vyas et al⁸ have studied the stability constants of Ferrous (II) complexes of substituted derivative of Coumarin. Doshi and Pawar⁹ has studied the interaction of Cu(II), Co(II), Fe(III), Al(III) and Nd(III) with isoxazolines. They showed the formation of 1:1 and 1:2 complexes in the pH range at about 2-9 in 70% dioxane-water mixture.

The stability constants of synthesized compounds have been studied pH-metrically by Irving and Rossotti method¹⁰. The present paper reports pH-metric studies on the interaction of rare earth metal ions La(III), Pr(III) and Sm (III) with 2-[3-(4-methoxy phenyl)-1-(4-phenyl-thiazol-2-ylimino)-allyl]-phenol L⁴, 2-[3-phenyl-1-(4-phenyl-thiazol-2-ylimino)-allyl]-phenol L⁵ and 2-[3-(4-chlorophenyl)-1-(phenol-thiazol-2-ylimino)-allyl]-phenol L⁶ in 1:1 ratio at $30 \pm 0.1^\circ\text{C}$. For this study 70% Ethanol-water mixture were used as solvent. The ionic strength was maintained constant at 0.1M. The proton-ligand and metal-ligand stability constants were calculated by point wise calculation method and half integral method.



Where R = H, OCH₃ and Cl

EXPERIMENTAL**MATERIALS AND SOLUTIONS**

The microwave irradiation was used for the synthesis of the ligands. Purity was verified by analytical and spectral study i.e. melting point determination, IR and NMR spectra. The stock solution of the ligands (0.01N) were prepared by dissolving the required amount of the ligands in a minimum volume of 70% ethanol-water mixture. 0.01 M metal solutions were prepared by dissolving the requisite quantities in distilled water. The concentrations of metal ions were estimated by titrating against disodium salt of E.D.T.A. solution by procedure of Schwarzenbach¹¹ The standard NaOH solution was prepared by Vogel's method¹².

APPARATUS AND PROCEDURE

The pH of the solutions was measured with a EQUIP-TRONICS microcontroller pH meter (Model EQ-621) equipped with a combined electrode and magnetic stirrer. The instrument was calibrated before each titration with an aqueous standard buffer solution of pH 4, 7 and 9 prepared from Qualigens buffer tablets. All the weighings were done on electronic balance [ConTech CB-Series with accuracy ± 0.001].

The following titrations were carried out pH metrically.

- Acid titration
- Acid + ligand titration
- Acid + ligand + metal. titration

Ionic strength 0.1M was maintained by using HNO_3 and KNO_3 solutions. The titrations were carried out by using Calvin Bjerrum pH metric titration technique.¹³ The same techniques were applied for 70% ethanol-water mixture and 70% acetone-water mixture. The total volume of each system was made up to 25ml. The proton-ligand stability constants were calculated from the pH values obtained from the titrations using the Irving-Rossotti method was mentioned in Table1.

Table1: Proton ligand stability constants (pK) of ligand L^1 to L^3 at 0.1 M ionic strength and at $(30\pm 0.1)^\circ\text{C}$ Temperature.

Medium	Ligand	pK (half integral method)	pK (point wise calculation method)
Ethanol-water	L^4	4.80	5.10
Ethanol-water	L^5	4.80	5.10
Ethanol-water	L^6	5.8	5.8

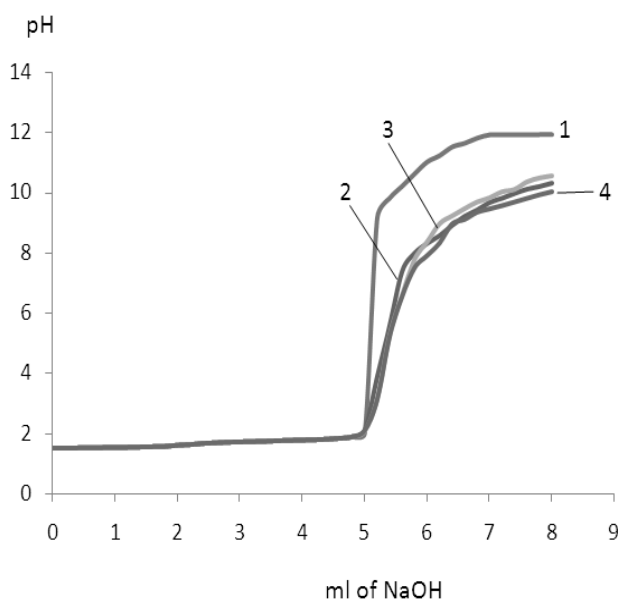


Fig.1.pH against volume of 0.10 mol dm^{-3} NaOH at

$I = 0.1\text{M}$ at $(30\pm 0.1)^\circ\text{C}$; 1 = Acid curve, 2, 3 and 4 are the curves of ligands L^4 L^5 & L^6 .

RESULTS AND DISCUSSION.

The Ligands L⁴ L⁵ and L⁶ used in the present investigation contains only one dissociable proton from hydroxyl group. In general ligands can be represented as HL and dissociated as.



$$K' = \frac{[H^+][L^-]}{[HL]}$$

The proton-ligand formation number \bar{n}_A was calculated by Irving Rossotti expression. The proton ligand stability constant pK were calculated from formation curves by point wise calculation method & half integral method. From formation curves drawn from \bar{n}_A Vs. pH (half integral method) by noting pH at which $\bar{n}_A=0.5$. showing fig-1. The accurate values of pK were determined by point wise calculation method. The \bar{n}_A values were calculated with the help of following equation (1)

$$\bar{\eta}_A = \gamma - \left[\frac{(E^0 + N)(V_2 - V_1)}{(V_0 + V_1)T_L^0} \right] \quad \dots\dots\dots (1)$$

$$\bar{\eta} = \left[\frac{(E^0 + N)(V_3 - V_2)}{(V_0 + V_2)T_m^0} \right] \quad \dots\dots\dots (2)$$

Where γ is number of dissociable proton.

N is concentration of NaOH (0.1 moldm⁻³)

E^0 is resultant concentration of acid.

T_L^0 is resultant concentration of ligand.

V^0 is initial volume of the reaction mixture.

V_1 and V_2 are volume of alkali added in acid, ligand titration and metal titration.

T_m^0 is concentration of the metal ion in the reaction mixture.

Similarly metal ligand formation number \bar{n} values was calculated by using equation (2) and metal ligand stability constants were determined from formation curves by point wise calculation method and half integral method mentioned in Table -2.

During titration process there is a color change of solution. In La(III) titration color becomes off white or yellowish .For Pr(III), light green color of solution gets darken & for Sm (III) color changes from yellow to orange. This color change during titration confirms 1:1 complex formation due to replaceable H⁺ from -OH group. Due to formation of coordination bond at N site ,there is formation of 1:2 complex.

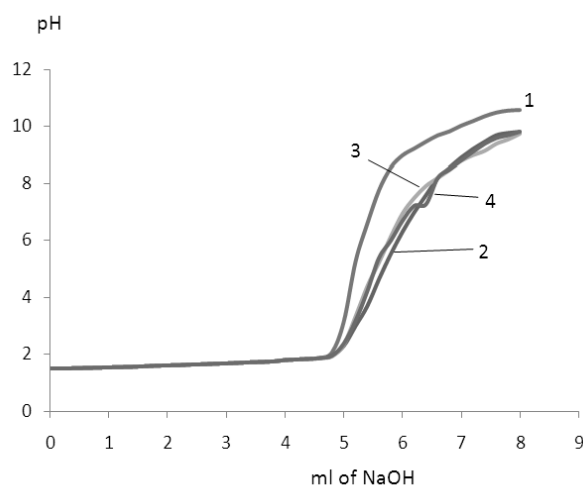
The deviation of metal titration curve from ligand curve commenced from p^H 2.7 for La, p^H 2.6 for Pr and p^H 2.9 for Sm. The significant departure of ligand curve from acid curve indicates chelate formation between metal ion & ligand gets confirmed. As solutions used are very dilute possibility of formation of polynuclear species is very less.

There is no specific trend in proton-ligand stability constant. This is due to variation in polar nature of solvents and solvent-solvent interactions.

In the present investigation there is no specific trend in metal-ligand stability constants as in table-2. This may be due to the fact that (i) difference in redox potentials E^0 values of La, Pr & Sm is very less. Hence though they have strong tendency to lose electron and undergo oxidation, the reducing power of La, Pr & Sm differs to very less extent. (ii) For trivalent lanthanide ions, increase in ionic size, increases the stability of complexes . This is due to lanthanide contraction²³. But the variation in results may be due to metal solvent interactions.

Table 2: Metal ligand stability constants of complexes La(III), Pr(III) and Sm(III) with ligand L⁴, L⁵ and L⁶ in 70% Ethanol-water medium.

Medium	System	Constants	Method	
			Half integral	Point wise calculation
70% Ethanol-water	La(III)-L ⁴	Log K ₁	4.5	4.38
		Log K ₂	7.10	7.26
	Pr(III)-L ⁴	Log K ₁	3.20	3.30
		Log K ₂	6.0	5.72
	Sm(III)-L ⁴	Log K ₁	3.5	3.30
		Log K ₂	5.7	5.72
70% Ethanol-water	La(III)-L ⁵	Log K ₁	3.5	4.85
		Log K ₂	6.60	7.94
	Pr(III)-L ⁵	Log K ₁	3.05	3.89
		Log K ₂	5.5	7.13
	Sm(III)-L ⁵	Log K ₁	3.10	3.410
		Log K ₂	5.7	5.72
70% Ethanol – water	La(III)-L ⁶	Log K ₁	5.5	5.53
		Log K ₂	8.9	8.9
	Pr(III)-L ⁶	Log K ₁	4.5	4.5
		Log K ₂	8.1	7.9
	Sm(III)-L ⁶	Log K ₁	5.2	4.6
		Log K ₂	8.30	8.26

Fig. 2 pH against volume of 0.10 mol dm⁻³NaOH at

I = 0.1 M at (30±0.1)°C; 1= ligand curve, 2, 3 and 4 are metal curves of La(III), Pr(III) & Sm(III) respectively.

CONCLUSION:

From the data presented in table-2, it can be concluded that there is stepwise complex formation between trivalent lanthanide ions and thiazolyl substituted schiff's bases. From the stability constants of complexes it can be concluded that for trivalent lanthanide metal ions basicity decreases with decrease in ionic radius. This results in decrease in complexes formation tendency in case of hydrated ions.

The metal-ligand stability constant has significance in determination of thermodynamic parameter in thermochemistry.

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MOLECULAR DOCKING OF PHYTOCOMPOUNDS AGAINST DENGUE NS2B/NS3 PROTEASE: A STUDY FROM VIRTUAL PERSPECTIVE

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ABSTRACT

Dengue virus is a growing problem in tropical countries. Dengue virus (DENV) infection is an important arthropod - borne viral infection infecting about 2.5 billion people worldwide. To overcome these problems, the present study was undertaken to investigate the antiviral activity of compounds present in the ethyl acetate leaf extract of *Aegle marmelos* against non-structural protein of dengue virus (DENV) using molecular docking study. The active plant extracts were also purified and characterized by GC-MS. An *In silico* approach was undertaken to report the antiviral (dengue) activity of mined 12 phytochemical compounds from the leaf extract of *Aegle marmelos* against potential dengue target NS2B-NS3 Protease in comparison to the docking studies with existing five anti viral (dengue) drugs. The energy minimized 3D structures of selected twelve compounds were docked with NS2B/NS3 protease using i-GEMDOCK 2.1 docking software. Out of screened 12 phytochemical compounds Marmeline, O-halfordinol-1 and Aegelenine were inferred as the best compounds based on their binding affinity, drug likeliness, ADMET property and toxicity. Hence, based upon our results we would like to suggest for further analysis of these phytochemical compounds to confirm their efficacy and to evaluate their anti viral drug potency.

Keywords: *Aegle marmelos*, anti viral drug, Dengue virus, i-GEMDOCK 2.1, NS2B/NS3 protease

1.0 INTRODUCTION

Dengue is a man kill disease transmitted by bites of *Aedes aegypti* mosquito in several regions and it also spreads through tropic countries. Aedes mosquitoes breed in clean water. It serves diseases, especially in children. The second highest state in dengue outbreak 2017 is Tamilnadu in India. As per the state government health department report, 4400 dengue cases are recorded. In Tamilnadu, deaths have been reported due to the dengue rising to 87 included three girl children and a teenage boy. Meanwhile, South Delhi Municipal Corporation (SDMA) report said, of the total 4,545 dengue cases, 2152 were residents of Delhi, while the rest were from other states. According to the SDMC, Aedes mosquito breeding has been reported from 1, 80,687 households in Delhi (Pandiselvam and Kathirvalavakumar, 2018).

It was reported that dengue virus has four serotypes DENV-1, DENV-2, DENV-3 and DENV-4 having structural and sequence similarities (Mirza *et al.*, 2016). Each serotype has different interactions with antibodies in human blood serum (Guzman *et al.*, 2010). It was also observed by other researchers that the viral genome is translated into three structural proteins such as capsid (C), pre-membrane (prM), envelope (E) and seven types viz. NS1, NS2a, NS2b, NS3, NS4a, NS4b and NS5 non-structural proteins (Suganya and Mahendran, 2016). Generally, NS2B-NS3 protease is a combination of two dengue viral proteins as NS2B and NS3 and these two proteins in complex replicate faster during dengue fever. NS2B cofactor was essential for the protease catalytic activity of NS3. This protein complex is very important for the recent research on anti-dengue drug development. Till date several small molecules against DENV NS2B/NS3 protease showed less success in case of *in silico* study and confusing results have obtained in drug development.

In silico study with special reference to molecular docking determines easy screening of receptor-ligand binding position and interaction with residues to know potent lead in the drug development process (Kontoyianni, 2017). It was known that the lead compound(s) is whether effectors' or inhibitor for each receptor. The pharmacokinetic and toxicological profiles support the bioactivity of the compound(s) as drug likenes.

The main objective of this study was to target the hydrophobic pockets of NS2bNS3 Protease of the dengue serotypes with novel bioactive compounds that could help in the inhibition of dengue infection. The results from this study have shed useful insights into drug development and computer-aided screening of the drugs against DENV infection and the potential drug candidates against dengue infection using which further investigations can be carried out in the future.

Still the present study an *In silico* approach of virtual screening and molecular docking was undertaken to report the antidengue activity of 12 phytochemical compounds extracted from *Aegle marmelos* against potential

dengue target NS2B-NS3 Protease to the docking studies with existing five anti viral (dengue) drugs. The result of this study will offer useful information on development of novel anti viral drugs against DENV infection with a cut off of many wet lab experimental studies required in development process of a novel drug. Finally the screened compounds are required to undergo in-vitro and in-vivo analysis to confirm their efficacy and to evaluate their drug potency (Cheng. F, *et al.* 2010).

2.0 MATERIALS AND METHODS

2.1 Plant Extract Evaluation

2.1.1 Preparation of plant extract

The two selected herbal plant samples (30gm) of the leaves of *Aegle marmelos* was extracted separately with 200ml of ethyl acetate for 72 hours until extract was obtained. The solvent extracts were concentrated separately under reduced pressure in a rotator evaporator. After complete solvent evaporation, each of these solvent extracts were weighed and subjected to TLC finger printing, and GC-MS analytical techniques.

2.1.2 Thin layer chromatography

The thin layer chromatography result confirmed the presence of different bioactive compounds. The results and observations were summarized in Table 2 and Figure 3. Thin layer plates were prepared by using silica Gel- GF 254 as adsorbant. 15gm silica gel-G was mixed with 30ml of dis.H₂O (1:2) to make slurry. The slurry was immediately poured into the plates. Plates were then allowed to air dry for one hour and layer was fixed to drying at 110°C for one and half hours. Using a micropipette, about 10µl of extracts were loaded gradually over the plate and air dried.

The plates were first developed in Chloroform: Methanol in 5:1 ratios. The plates were again loaded with sample and developed in Toluene: Chloroform: Acetone (5:3:1:4:3). The plates were then reloaded with sample and developed in Phenol: Chloroform: Isoamylalcohol (25:24:1). According to the solvent systems showed that the different Rf value (formulae 1) for the plant extract. The chromatograms were observed under visible light and were photographed.

$$R_f = \frac{\text{Distance travelled by the solute (cm)}}{\text{Distance travelled by the solvent (cm)}} \quad \dots\dots (1)$$

2.1.3 GC-MS Analysis

The GCMS analysis was conducted at the Instrumentation Laboratory, Ayya Nadar Janaki Ammal College, Sivakasi. Which was carried out on a GC clarus 500 Perkin Elmer system comprising a AOC-20I auto sampler and gas chromatograph interfaced to a mass spectrophotometer. Interpretation of the mass spectrum of GC-MAS was conducted using the database of National Institute Standard and Technology (NIST) which consists of more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known component inherent in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained. Identified compounds were used to dengue virus NS2bNS3 Protease blocking studies (Kanokwan, J and Nobuo. N, 2008).

Further it helps to determine the most appropriate methods of extracting these compounds. These results will consequently be discussed in the light of their putative biological or therapeutic relevance.

2.2 MOLECULAR DOCKING STUDIES

Molecular Docking was done using iGEMDOCK v2.0 tool, to arrive at a consensus solution.

2.2.1 Mining of phytochemical compounds from *Aegle marmelos*

A dataset of 12 phytochemical compounds from *Aegle marmelos* were mined from GC-MS reported by Instrumentation Laboratory, Ayya Nadar Janaki Ammal College, Sivakasi.

The Structure Data Format (SDF) 3D structures of 12 compounds were retrieved from the NCBI PubChem database (<https://pubchem.ncbi.nlm.nih.gov>) along with its PubChem ID, Molecular weight and Molecular formula. The compounds were converted into pdb format structure using the and online SMILES translator web server (<https://cactus.nci.nih.gov/translate/>) as per requirement.

2.2.2 Retrieval of anti viral drugs and its potential DENV Target

The information of five different anti viral drugs and DENV targets/receptor protein was retrieved from literature survey and Protein Data Bank screened for the Insilico analysis. The three-dimensional (3-D) structure of this protease associated with NS2B cofactor available in the European protein data bank (PDB). The 3-D

structure of DENV-2 as NS2B/NS3 protease was retrieved from the protein data bank (<http://www.ebi.ac.uk/pdbe/>), PDB ID: 2FOM. There are 46 numbers and 151 numbers of residues found in chain A and B respectively. The three-dimensional (3-D) crystal structure of NS2B-NS3 protease is exhibited in Figure 1.

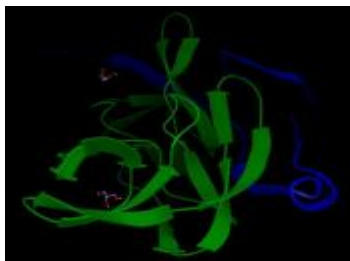


Figure 1 Crystal structure of dengue virus protein NS2B/NS3 protease

[(subunit A = blue colour (NS2B) and B = green colour (NS3 protease) as ribbon structure; GOL = line structure in CPK)]

2.2.3 Preparation of ligand

The twelve different compounds obtained in GC-MS analysis which was used as ligands. The ligands were saved in mol 2 format. The OPEN BABEL software (www.vcclab.org/lab/babel/start.html) was used to convert mol format to pdb format. Rapid virtual screenings of these compounds were performed in the docking tool iGEMDOCK v2.0. A population size of 200 is set with 70 generation and one solution for quick docking (<http://www.rcsb.org>).

2.2.4 Protein-ligand docking

iGEMDOCK is used for the integrated virtual screening through post-screening analysis with pharmacological interactions. First, iGEMDOCK provides interactive interfaces to prepare both the binding site of the target protein and the screening compound library. Each compound in the library is then docked into the binding site by using the in-house docking tool GEMDOCK (Anushree. S, 2018).

2.2.5 Post docking analysis

iGEMDOCK generates protein-compound interaction profiles of electrostatic, hydrogen-bonding and Vander Waals interactions. Based on these profiles and compound structures, iGEMDOCK infers the pharmacological interactions and clusters the screening compounds for the post-screening analysis. Finally, iGEMDOCK ranks and visualizes the screening compounds by combining the pharmacological interactions and energy-based scoring function of GEMDOCK. After the completion of the docking the post docking analysis was performed to find the docking pose and its energy values.

3.0 RESULTS AND DISCUSSION

3.1 PLANT EXTRACT EVALUATION

3.1.1 Phytochemical analysis of *Aegle marmelos*

For the discovery of any novel drug having pharmacological importance, the essential information's regarding the chemical constituents are generally provided by the qualitative phytochemical screening of plant extracts, since it gives information about the presence of any particular primary and secondary metabolite in the extracts of the plant which is having a clinical significance. If any such significant bioactive natural product is present, it is necessary to separate that compound from the mixture of compounds by using suitable chromatographic technique. The TLC profiling of ethyl acetate extracts of *Aegle marmelos* was carried out using Hexane: Ethyl acetate (9.8:0.2) solvent system which confirms the presence of diverse potent biomolecules in the plant. TLC analysis provides an idea about the polarity of various chemical constituents, in a way such that compound showing high R_f value in less polar solvent system have low polarity and with less R_f value have high polarity. These potent biomolecules can be further used for the development of different drug in future (Table 1 and Figure 2).

Table 1 Results of TLC Fingerprinting of Ethyl acetate extracts of *Aegle marmelos*

Plant source	Solvent system used	R _f value obtained
<i>Aegle marmelos</i>	Hexane : Ethyl acetate (9.8:0.2)	0.1, 0.2, 0.57, 0.60, 0.64, 0.80, 0.90



Figure 2 TLC Fingerprinting of Hexane: Ethyl acetate (9.8:0.2) solvent system of *Aegle marmelos*

3.1.2 GC-MS analysis of *Aegle marmelos*

GC-MS is one of the best techniques to identify the constituents of volatile matter, long chain, branched chain hydrocarbons, alcohols acids, esters etc. The GC-MS analysis of *Aegle marmelos* leaves revealed the presence of several compounds. The identification of the phytochemical compounds was confirmed based on the peak area, retention time molecular formula. The active principles with their Retention time (RT) and Molecular formula are presented in Figure 3.

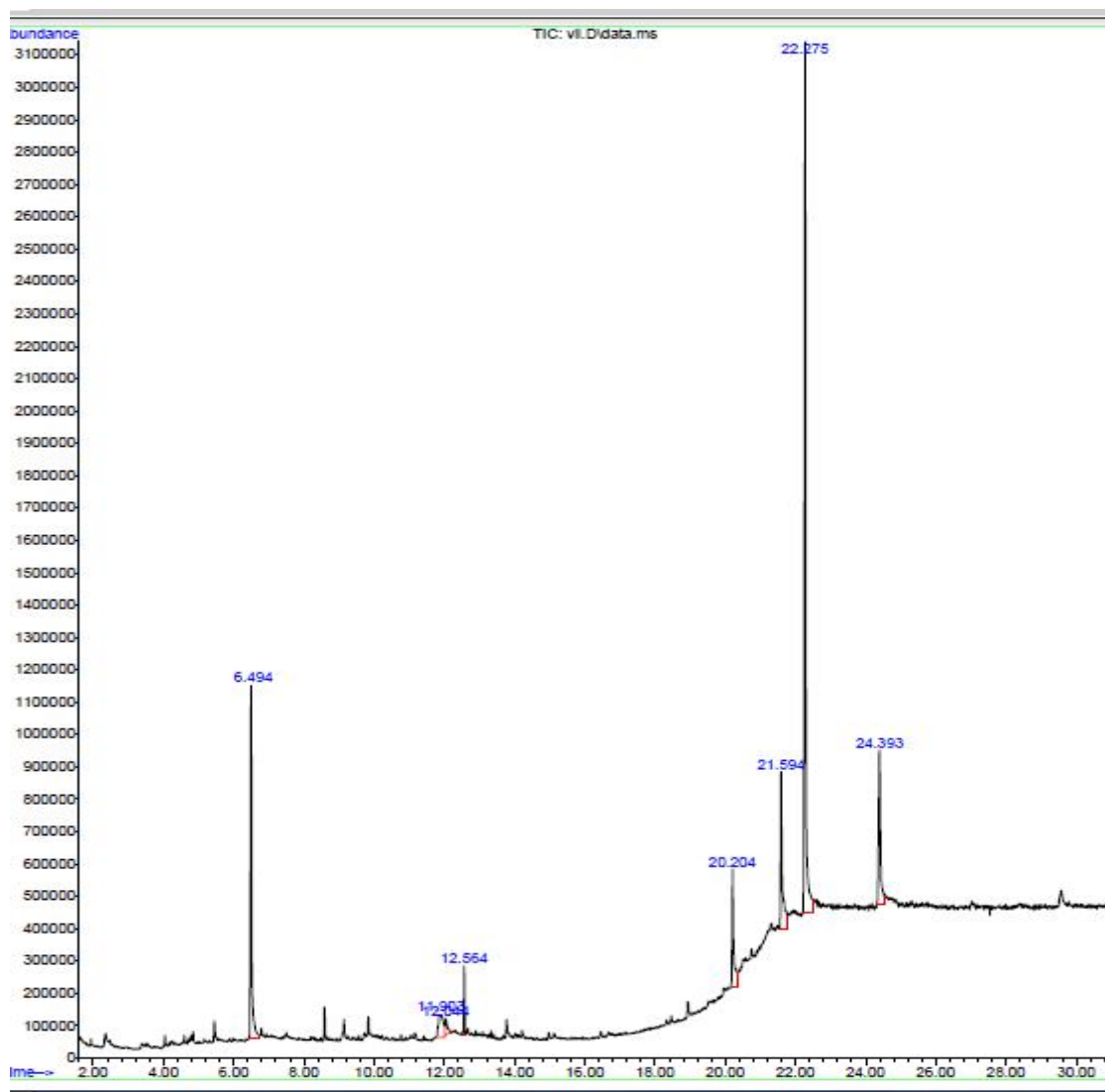


Figure 3 GC-MS Analysis of ethyl acetate extract of *Aegle marmelos*.

The comprehensive lists of the phyto constituents isolated from the different plant parts are mentioned below. It has been observed that there are numbers of phyto constituents which are common to the different parts of the plant. At the end of the list the structures and analytical data including Mass spectra of selected major phyto constituents have been considered to the present study.

The similar results were obtained by the another study, the major phyto-constituent present in the leaf extract were 1-Dodecanol (4.83), 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-(1.11), 2,3Dioxabicyclo[2.2.2]oct-5-ene,1-Methyl-4-(1-Methylethyl)- (Limonene dioxide 85 1) occupying two peak areas i.e. (0.53) and (0.40)., Bicyclo[3.1.1] heptane-2,3-diol, 2,6,6-trimethyl (2,3-Pinane diol) (0.97), 2-Cyclohexen-1-one, 4-hydroxy-3-methyl-6-(1-methylethyl)-(0.63,0.41,0.17), Phenol, 2,6-bis(1,1-dimethylethyl)-4-methyl- (BHT) (0.87), Tetradecanoic acid (Myristic acid) (2.00), 2(4H)-Benzofuranone 5,6,7,7 A Tetrahydro-6-hydroxy-4,4,7a-trimethyl,1,3-cyclohexadiene,2-methyl-5 (1methylethyl)- (1-Phellandrene), 2-Propenoic acid, 3-(4-hydroxy-3-methoxyphenyl)-, methyl ester (Cinnamic acid, 4-hydroxy-3-methoxy-, methyl ester), 3,7,11,15-Tetramethyl-2- hexadecen-1-ol commonly known as phytol a diterpene has significant antimicrobial properties against many bacterial strains. 9,12,15- Octadecatrienoic acid, methyl ester (Linolenic acid, methyl ester) showing antibacterial and anticandidal activity, 2-Hexadecen-1-ol, 3,7,11,15-Tetramethyl (Phytol isomer) (6.37), Octadecanoic acid (Stearic acid) (4.07), Benzene, 1,2-dimethoxy-4-[(4 methylphenyl)sulfonyl]methyl (10.76), fatty alcohols such as Ergost-5-en-3-ol, (3.beta.) (campesterol), Stigmasta-5, 22-dien-3-ol, Stigmast-5-en-3-ol, (3.beta.)- may be synergistically responsible for the antimicrobial activity (Sermakkani et al., 2012).

3.2 MOLECULAR DOCKING ANALYSIS

3.2.1 Pre-Docking study

This present study aimed to understand the binding interactions between the twelve compounds of ethyl acetate extract and the NS2B-NS3 protease (PDB code 2FOM). The docking results clearly indicated that the interaction of two phytochemicals (ligands) present in the leaf of *Aegle marmelos* Linn. against NS2B/NS3 protease (receptor), data were energetically favourable.

From the Table 2, the 3D structure coordinates of NS2bNS3 Protease is optimized and 12 compounds from leaves of *Aegle marmelos* are identified. Their total binding energy was calculated using iGEMDOCK. Evaluation of binding conformation of 12 compounds with NS2bNS3 Protease is performed using iGEMDOCK. From docking study, we listed binding affinity of 12 compounds based on ligand binding energy.

The binding pose for each ligand molecule into the NS2bNS3 Protease is analyzed and the one having lowest ligand binding energy with the target protein among the different poses are generated. The lower energy scores represent better target protein-ligand binding affinity compared to higher energy score. Among the 12 analogs, It was observed that the low energy value (kcal/mol) was obtained in Marmeline (-107.63) followed by O-halfordinol (86.033), aegelenine (-86.026), anhydromarmeline (-81.098), marmesin (-80.332) but marmenol (-79.064), skimmianine (-77.962), aegeline (-77.328) and marmelide (-76.701), were showed close value while high value obtained in anthocyanins (-70.406) and idrocilamide (-68.534). We further analyzed the docked pose for finding the binding mode of all compounds in to the target protein to validate the reasonable binding conformations (Table 2 and Figure 4).

3.3.2 Post-screening analysis

Using iGEMDOCK post-screening analysis tools, all the docked poses were clustered based on the default "identity consensus residues" parameters where pharmacological energies of Electrostatics, H-bonding and van der Waal's were set at -2.5, -2.5 and -4.0 respectively. Their Z-scores were set at 1.645, 1.645 and 1.645 respectively. Using the clustering options, hierarchal clustering was done on basis of protein-ligand interactions and heat maps. The 30 poses (10 each of CLP and DDVP, and 5 each of MP and ML) were selected with all their interacting residues to generate a data tree "gene matrix" which are shown in Figure 5.

Table 2 The fitness and interaction profile for NS2B-NS3 protease with the ligands.

Compound name	Total Binding Energy (kcal/mol)	Vander Waal's Force (kcal/mol)	H -Bond Energy (kcal/mol)	Electrostatic Force (kcal/mol)	AverCon Pair (kcal/mol)
Aegelenine	-86.026	-71.551	-14.475	0	25.3889
Aegeline	-77.328	-70.328	-7	0	21.4091

Anhydromarmeline	-81.098	-74.098	-7	0	20.08
Anthocyanins	-70.406	-70.406	0	0	25.875
Idrocilamide	-68.534	-54.557	-13.978	0	24.7857
Marmelide	-76.701	-72.879	-3.8222	0	23.2
Marmeline	-107.63	-107.63	0	0	24.8846
Marmenol	-79.064	-58.285	-20.779	0	18
Marmesin	-80.332	-60.492	-19.84	0	20.8889
O-halfordinol	-86.033	-71.537	-14.496	0	25.3889
Shahidine	-77.815	-74.418	-3.3971	0	20.8095
Skimmianine	-77.962	-67.482	-10.48	0	21.8947

The summary of their various energies plotted in Graph is shown in Figure 4.

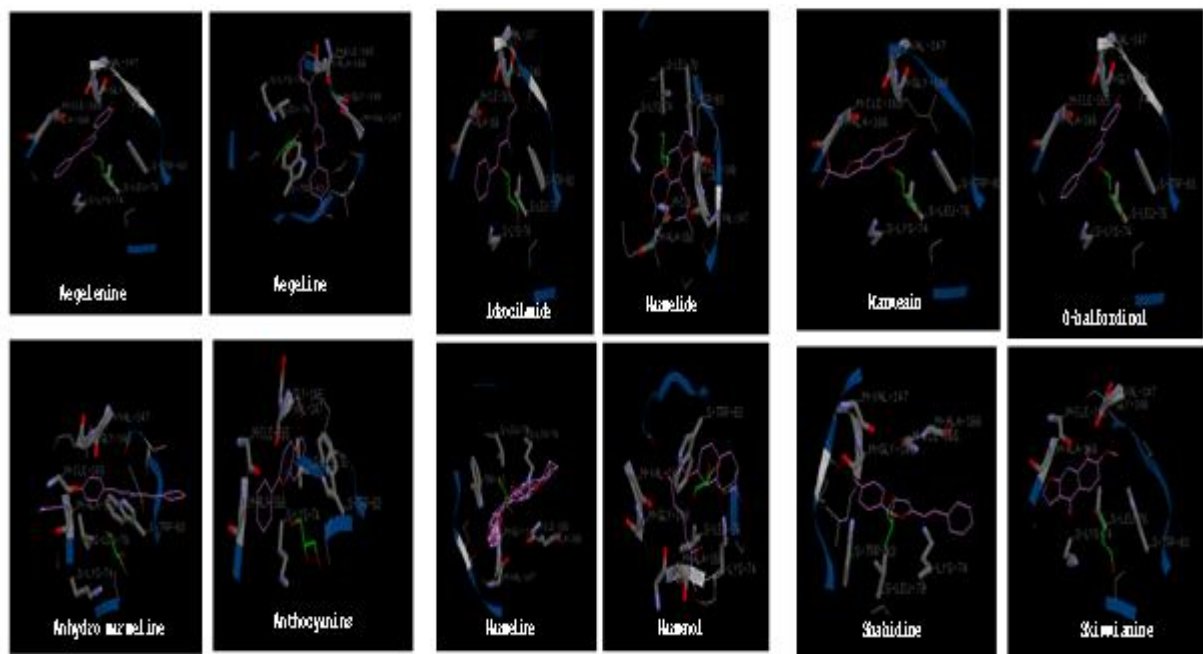


Figure 4 Interaction of compounds with NS2bNS3 Protease.

Results of clustering of Interaction Profiles of ligands

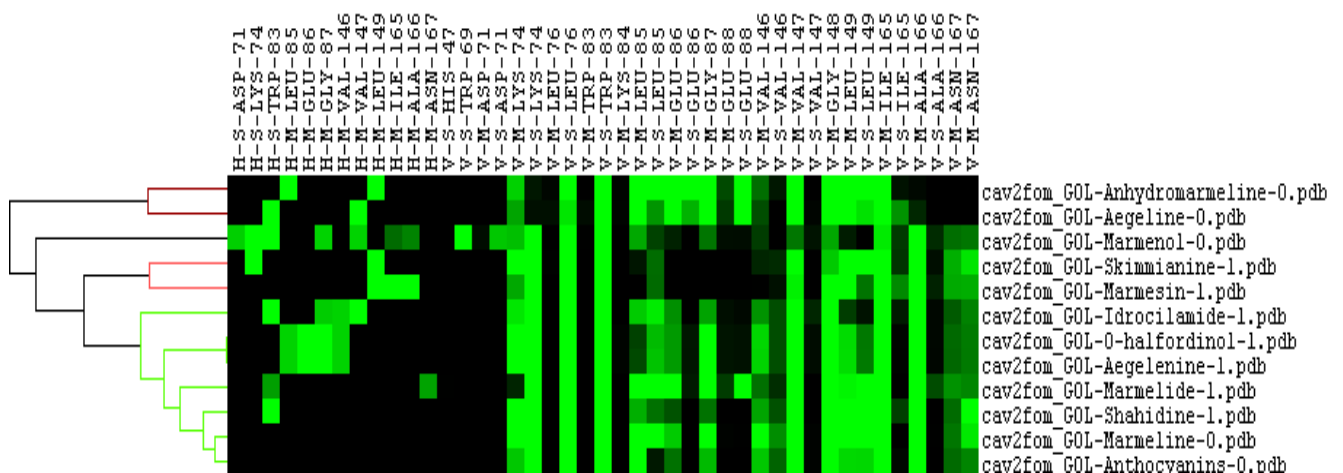


Figure 5 Results of clustering of Interaction Profiles of ligands A) Hierarchical clustering of the interaction profile for the active compounds and top- ranked compounds selected by the pharmacological and energy-based scoring. (B) The “gene matrix” display of profile of interactions of the ligands with 2FOM for electrostatic, hydrogen bonding and van der Waal’s interactions, respectively. The “V” interactions are colored in green when the energy is less than -4. The hydrogen bonding and electrostatic interactions are colored in green if the energy is less than -2.5. M and S indicates main chain or side chain of interacting residues.

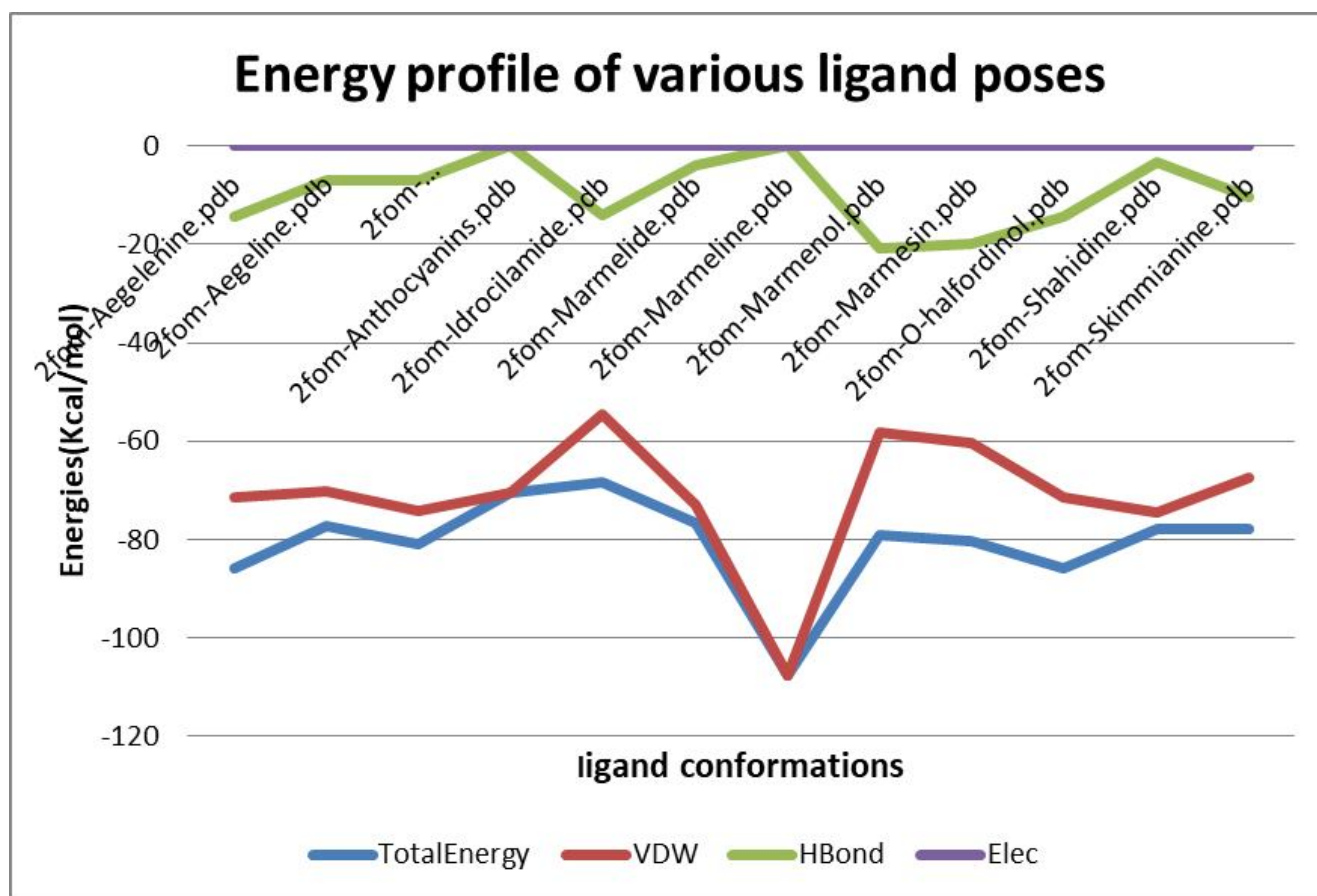


Figure 6 Graphical representations of the docking profiles of the ligands sorted by increasing order of the total interaction energy

4.0 CONCLUSION

. Antiviral substances obtained from natural products, including medicinal plants, are potentially good targets to study. Extracts from the *Aegle marmelos* are commonly prescribed for the dengue patients for curing fever but there are no scientific evidences for its activity against dengue which is reported earlier. An attempt was taken to investigate the anti-viral activity of compounds present in the extracts of *A. marmelos* against viral protein. The current study was focused on evaluation of the inhibitory activity, druglikeness, toxicity, binding affinity, ADME property and bioactivity of 12 phytochemical compounds of *Aegle marmelos* and reported antiviral drugs against potential dengue targets NS2B-NS3 Protease using an *In-silico* approach and molecular docking analysis. The study revealed that the molecular docking and *insilico* approach represented better results for phytochemical compounds than existing anti viral drugs. Among 12 phytochemical compounds four compounds namely Marmeline (-107.63 kcal/mol), O-halfordinol (-86.033 kcal/mol), Aegeleline (-86.026 kcal/mol) and Anhydromarmeline (-81.098 kcal/mol) shows best result when compared with all among existing compounds were the screened out based on its binding affinities for molecular docking analysis with its corresponding targets respectively. Therefore, based upon our results we would like to suggest for further analysis of these phytochemical compounds to confirm their efficacy and to evaluate their anti viral drug potency.

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EFFECT OF SEARCH ENGINE OPTIMIZATION ON THE MARKETING PERFORMANCE OF SMALL BUSINESS

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ABSTRACT

The search for online information has led to the evolution of online "Search Engine" over last few years and are the mostly widely used instruments currently. Small business also use this platform for marketing their product or services. Search engines have become an important channel for increasing small business global reach as well as competing with larger companies. With effective SEO techniques, small companies can appear ahead of well-known companies on search results. In this study, the concern of this study has been to gain insight into the use of SEO by small business and the factors that enable Small business to be successful in adopting SEO in business. Due to this there has been an increase in number of visitors to the site, the average time duration of users visiting the site, more user engagement and an increase of annual sales revenue.

Keywords: - Adopting, annual sales revenue, Search Engine, SEO techniques, time duration, Visitors

INTRODUCTION:-

Search Engine Optimization (SEO) refers to the process of making a Websites visible in the search result in search engine's like Google, Bing. In search engines all the search are on primary search results that are ranked based and more convenient to the user. It helps the small businesses easily to create user friendly websites that will rank high in the search engine, which will bring them more potential customers and increases conversion rate. Use of SEO practices for the online marketing of any product, services or business is SEO marketing.

For Example; when we search for any Product or services the websites that are displayed on the top are the one who have implemented the best SEO practices.

A small business can complete with the existing one by generating more organic traffic. As per research 40% of the revenue comes from organic traffic (the genuine visitors).

REVIEW OF LITERATURE:-

Search engines are an important promotional method for e-Commerce websites and they represent an effective way new e-Commerce sites market themselves.

Jansen and Molina (2006)

Evaluated the effectiveness of search engines to recover of relevant e-Commerce links. They examined the effectiveness of five different types of search engines in response to e-Commerce queries by comparing the quality of e-Commerce links using relevancy ratings. They found that links retrieved using a major search engine is significantly better than those obtained from most other engines. Search engines are likely to have an impact on organizational performance.

Hansell (2007)

Search engines are responsible for many visitors to a company's website, specifically new customers who search for information regarding products and services. Small companies that do not use SEO to increase their website rankings tend to remain unnoticed and limited in its geographical reach.

(Scott Willoughby, 2009)

The SERP of the websites will be given to the webpage's of the crawler type of a search engine depending on the degree of significance. The significance of a matching of the phrase with the key words is done by employing the algorithm that will differ with each type of a search engine however the functioning of the algorithms is similar:

Key constraints tracing: The headlines, title tags or the opening two snippets are checked by the search engines to trace the at most matching phrase with the content.

Key constraint frequency: The frequency of a particular site is checked by the search engine such that the frequency of the word will predict the accuracy of the site.

Spam prevention: The spam formation for example like assessing of click through and examination of the link etc. is not restricted by the search engine optimization.

1. SEO Advertising:-

There are millions of business out there in the world and there is no such thing as an industry that's not competitive. Every business try to compete with other and tries to keep upper hand over its competitors. SEO advertising is a different, it gets you to the top search instantly, but also focuses on earning you those top spots for organic traffic. SEO works to improve your organic rankings by targeting keywords that are important to your key audience, including plenty of links to the other pages of your site. It recognizes that unless you have millions to spend it takes time to rise in ranks because of this it is supplementary by pay-per-click advertising.

2. Pay- Per- Click:-

Pay- Per- Click (PPC), a mode of internet marketing in which advertisers pay a fee each time when one of their ads is clicked. It is a way of buying visit to your site, then trying to get organically. It is a digital marketing channel that businesses use to drive traffic and conversion from search engines. Pay- per- click can be a great way to market your business and reach new customers, but it can be confusing of new users. PPC as a marketing channel covers a number of different ad platforms, with the most common of these being google Ads and Bing Ads, and within each of these platforms are different Ads format.

- Search Ads
- Shopping Ads
- Display Ads
- Video Ads
- Gmail Ads

It can be a profitable channel as it brings wealth of benefits that don't exist with others, and it is easy to get started.

3. Organic Listing:-

Search Engine Optimization organic listing refers to the natural listing of a website on a search result page. It is based on relevance to the user's search query, links and domain authority and other organic ranking factors. Organic listing will appear in the body of search engine results page (SERP). This listing space is free and is arguably more trustworthy may be very profitable provided you can get in a high position you for a high search keyword. The sites listed first are those that are identified most relevant by the search engine's algorithms.

DATA ANALYSIS AND INTERPRETATION:-

This research aims to study the effect of Search Engine Optimization on the marketing performance of small business. SEO is important for small business for increasingly, interaction between business and customers occur through search. As per a research conducted by Clutch Firms in the year 2019-2020 a survey of 529 small business, all the data is represented in the statistical format.

- ❖ More than one-third (36%) of small businesses have an SEO strategy. An additional 23% plan to have an SEO strategy in 2019.
- ❖ An additional 38% plan to have an SEO strategy in 2019 or later. This indicates that small businesses are beginning to recognize the value of investing in SEO.

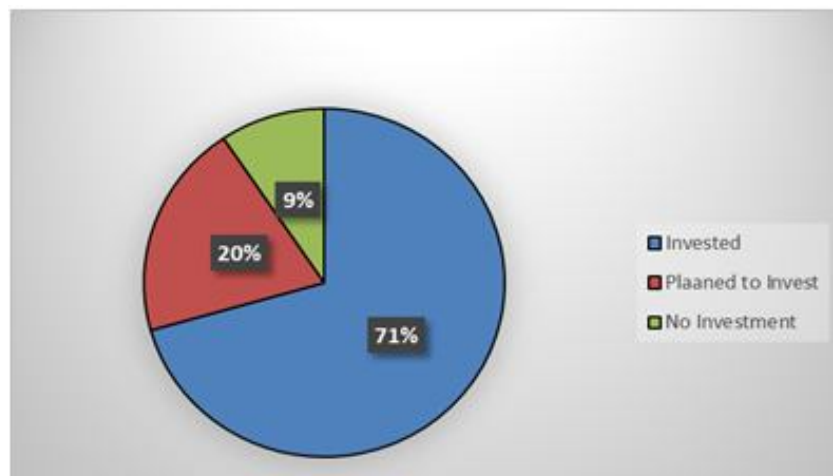


Fig 1.1

- ❖ Social media marketing (63%) is the most common SEO effort for small businesses, followed by a mobile-friendly website (54%) and keyword research (51%).

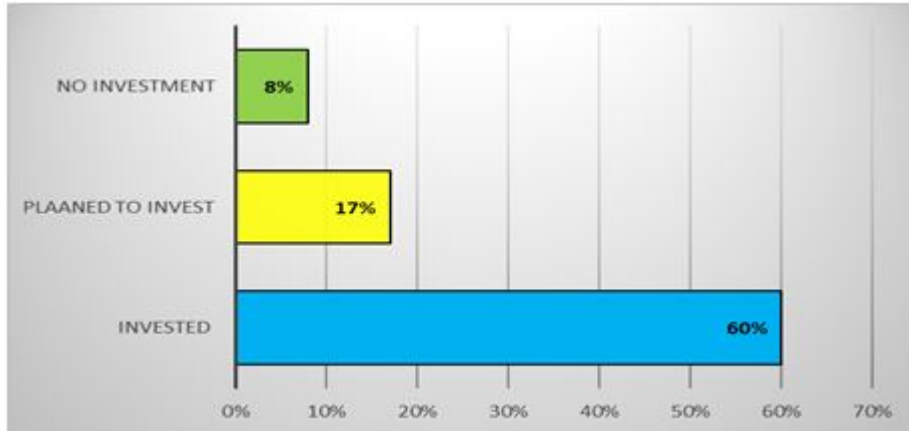


Fig 1.2

- ❖ Nearly half of small businesses (48%) invest in content marketing for SEO, an increase of 16% from 2018. But without content, digital marketing is not very effective.

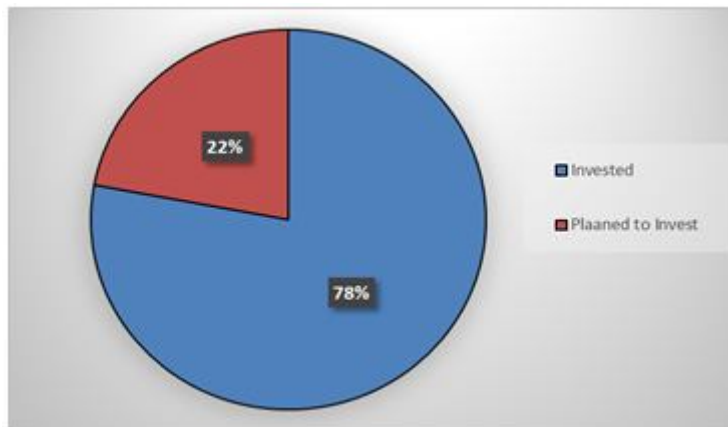


Fig 1.3

- ❖ More than half of small businesses (54%) depend on in-house staff for SEO services, nearly double the number that hire an SEO agency (28%).
- ❖ Fewer small businesses rely on experts to ideate and execute their SEO strategies. Forty-two percent (42%) hire an SEO consultant or freelancer, and 28% use an SEO agency.
- ❖ In-house employees for SEO appeal to small businesses for two main reasons: cost and control
- ❖ Over half of small businesses that invest in SEO (54%) rely on in-house teams for SEO services. Half (50%) use SEO software such as SEMrush or Moz.

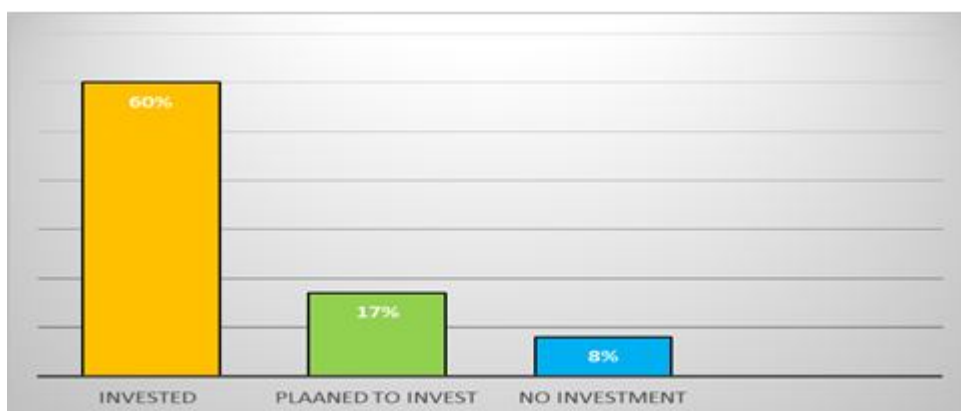


Fig 1.4

- ❖ Traffic from search engines (25%) is the primary metric small businesses track to determine the success of their SEO strategies, followed by leads and conversions (19%) and backlinks (14%).

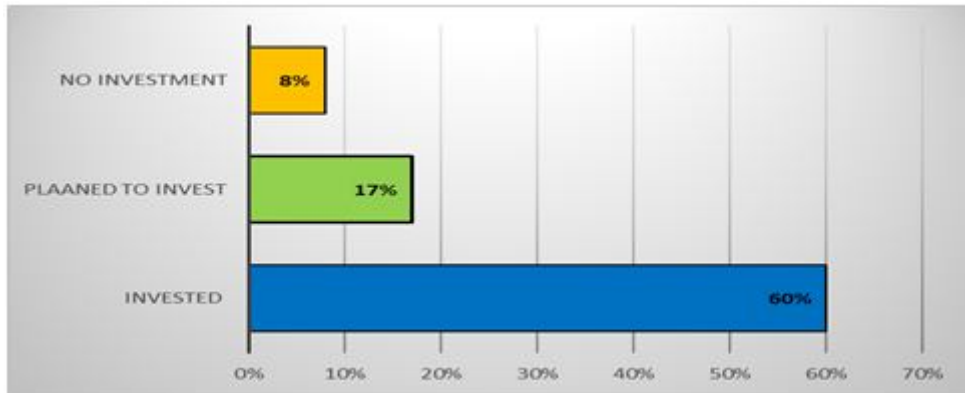


Fig 1.5

- ❖ Sixty percent (60%) of small businesses with SEO strategies also invest in PPC advertising, an increase of 15% from 2018. An additional 17% plan to invest in PPC in 2019.

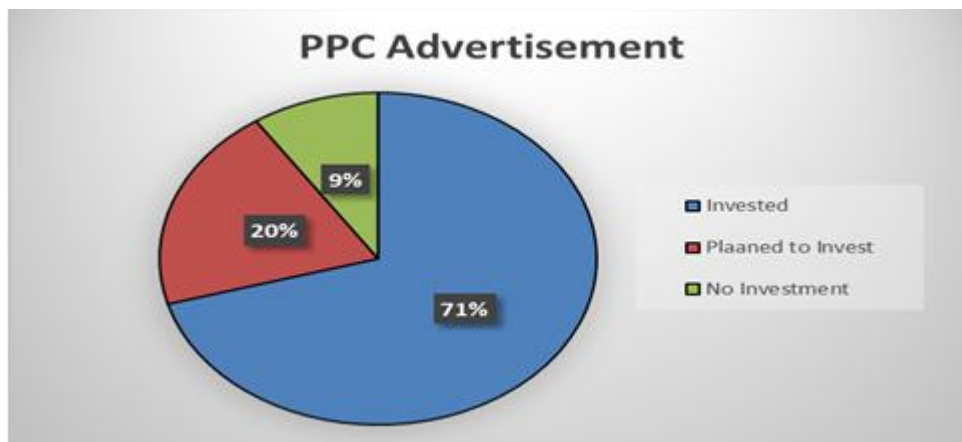


Fig 1.6

Source: - <https://clutch.co/seo-firms/resources/small-business-seo-2019>

CONCLUSION:-

It has been observed that search engine optimization (SEO) has made a huge impact on small businesses. Though search engine optimisation and Pay per Click will have a positive impact on most firms, it will be suggested that a small tourism company utilizes search engine optimisation due to its Return on Investment, preference, click rate, traffic rate, and result relevance. However, search engine optimisation also has challenge. Accordingly, firms need to use social networking service to maximize the effect of search engine.

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THE INFLUENCE OF INDONESIAN RICE IMPORT PRICES FROM VIETNAM AND INCOME PER CAPITA INDONESIA ON THE VALUE OF INDONESIAN RICE IMPORTS FROM VIETNAM FOR THE PERIOD 2000-2018**Sugartiningsih¹ and Eddy Winarso^{2*}**¹Muhammadiyah University of Bandung²Jenderal Achmad Yani University (UNJANI)

ABSTRACT

The purpose of this study was to determine the effect of Indonesian rice import prices from Vietnam and Indonesia's Per Capita Income on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods. The research method used is descriptive quantitative with multiple regression modeling. From the results of data processing, it was found that there was a positive or unidirectional relationship between the price of Indonesian rice imports from Vietnam and the value of Indonesian rice imports from Vietnam. Meanwhile, Indonesia's income per capita has a negative relationship with the value of Indonesia's rice imports from Vietnam. This statement is in accordance with the basic microeconomic thinking that Vietnam's superiority in producing rice at a low price will be a competitiveness for Indonesia to import rice from Vietnam so that it has the impact of increasing the value of Indonesian rice imports from Vietnam. Likewise, in terms of the public economy, rice is an essential good that must be provided by the government for the welfare of the people even though it is imported. Conversely, an increase in income per capita will encourage people to focus more on consuming secondary and tertiary goods so that the tendency of rice consumption in Indonesia to decrease. From the production side, the government has overcome the need for rice by implementing a food security program which has ultimately reduced the value of Indonesian rice imports from Vietnam.

Keywords: rice import price, per capita income, rice import value

BACKGROUND

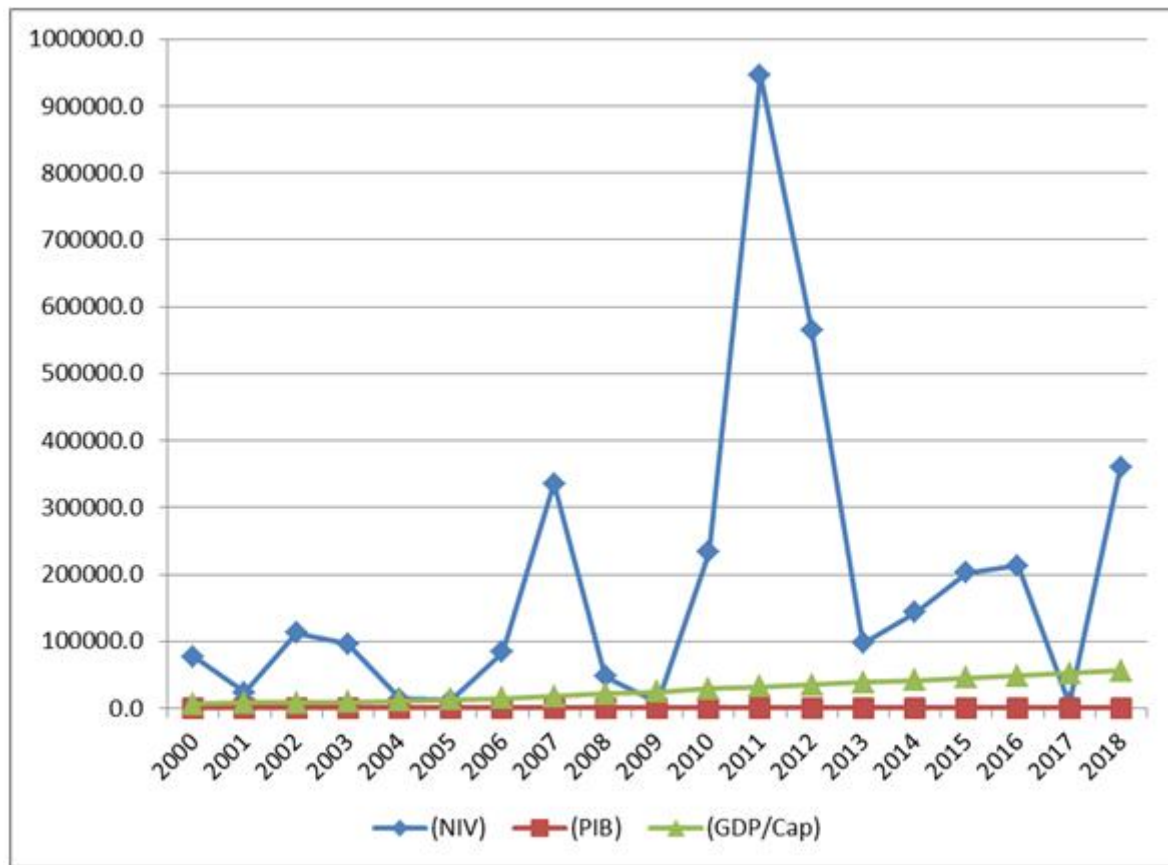
The country's economic stability is largely determined by the government's ability to provide basic necessities (Sugartiningsih, 2018). During the Old Order, Indonesia was faced with a staple food crisis, especially rice, which ended in a political crisis (Tulus Tambunan, 2014). This rice food failure prompted the New Order Era government to work hard to be able to easily meet people's needs for rice. With the opening of cooperation between Indonesia and abroad, the Green Revolution program in rice cultivation was implemented which aims to optimize rice production. As a result, Indonesia's rice productivity is abundant and has even been able to help other countries hit by hunger to the top of being awarded the title of Self-Sufficient Rice (Sugartiningsih, 2012).

However, after the Reformation era, the volume of rice production in Indonesia is predicted to experience a decline due to various factors such as the conversion of agricultural land to housing (Sugartiningsih, 2020). This reality has forced the government to implement an import policy to guarantee adequate rice stocks. One of the countries which is an important rice import destination for Indonesia is Vietnam. Judging from the ten main countries of origin during the 2000-2018 period, it is evident that Vietnam is the largest import destination for Indonesia. Where the import value of Indonesian rice in 2000 was US \$ 77075.6 thousand and there was fluctuation with the highest value of US \$ 946490.1 thousand in 2011 and the lowest amounting to US \$ 6761.3 thousand (Publication of Indonesian Statistics, 2020).

Meanwhile, the stock of rice that the Indonesian government must prepare is quite large during the 2005-2013 periods, namely an average of 39120 thousand tons / year. In fact, Indonesia is listed as the third largest country in the world in providing rice after China and India (USDA, 2013). The logical reason is that these three countries are densely populated in the world so that the need for rice consumption will be relatively large. The issue that arises is that the domestic farmers' crops sometimes have not been able to reach the rice stock targeted by the government.

In addition to the insistence on meeting a high enough stock, it is suspected that Vietnamese rice has lower prices than other countries as well as domestic prices. This factor is predicted to have an impact on the purchasing power of Indonesians for imported rice from Vietnam. Likewise, if it is related to the increasing level of welfare of the Indonesian people, it is likely that it will increase the demand for Indonesian rice imports from Vietnam.

This is to determine the development of Indonesia's rice import value from Vietnam and the main factors that influence it as shown in Figure 1 below:



Source: Indonesian Statistical Publication

From Figure 1, it can be seen that during the 2000-2018 period, the value of Indonesian rice imports from Vietnam fluctuated and was unstable. On the other hand, the import price for rice from Vietnam, despite fluctuations, has an increasing trend. Where the lowest price was US \$ 164,482 in 2001 and the highest was US \$ 568,073 in 2013. Moreover, Indonesia's income per capita variable has always increased from US \$ 6738 in 2000 to US \$ 55990 in 2018.

The gap between this phenomenon and reality is very interesting to know the effect of rice import prices and income per capita on the value of Indonesian rice imports from Vietnam during the 2000-2018 periods.

FORMULATION OF THE PROBLEM

Based on the description on the background of the problem, the problem formulations are:

- 1) How does the import price of Indonesian rice from Vietnam affect the value of Indonesian rice imports from Vietnam for the 2000-2018 periods?
- 2) How does income per capita affect the value of Indonesia's rice imports from Vietnam in the 2000-2018 periods?
- 3) How are the simultaneous effects of Indonesian rice import prices from Vietnam and Per Capita Income on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods?

RESEARCH PURPOSES

The aim of this research is:

- 1) To determine the effect of Indonesian rice import prices from Vietnam on the import value of Indonesian rice from Vietnam for the 2000-2018 period.
- 2) To determine the effect of Indonesia's Per Capita Income on the value of Indonesian rice imports from Vietnam for the 2000-2018 period.
- 3) To determine the effect of Indonesian rice import prices from Vietnam and Indonesia's Per Capita Income on the import value of Indonesian rice from Vietnam for the 2000-2018 period.

LITERATURE REVIEW

The Relationship between Import and Demand Theory in a Microeconomic Perspective

Import Theory

In the international trade process, imports are defined as the demand of a country for other countries, both bilaterally and multilaterally. Various imported commodities are based on various factors, including absolute and comparative advantages. Products that are classified as having absolute advantages are due to the inability to produce the required commodities themselves due to weather differences. This condition will make importing countries completely dependent on other countries. On the other hand, a commodity that has a comparative advantage will create power for two or more countries to decide to produce or import. If it turns out that it is more profitable to import than to produce it yourself, the consequence is that a country will import the same commodity domestically.

Imports of a country are generally influenced by: 1) Consumer tastes for domestic and foreign manufactured goods; 2) Prices of goods at home and abroad; 3) Exchange rates; 4) Domestic and foreign consumer income; 5) The cost of transporting goods from one country to another; and 6) Government policies towards international trade (Mahyus Ekananda, 2014).

For agricultural commodity imports, the relationship between these various factors can be described as follows:

Ad 1 Consumer tastes

Imports of agricultural commodities may increase due to high consumer appetite for imported products, which are considered superior, especially in terms of quality. High love for imported products will result in an increase in import value and this condition can reduce the welfare of domestic farmers who produce similar commodities.

Ad 2 Prices of goods at home and abroad

The difference between domestic and foreign prices is the main reason why in the short term a country prefers to import. Especially if the distribution of domestic goods is not smooth, it will encourage a country to expect more imported goods that can be purchased at lower prices and higher quality.

Ad 3 Exchange rate

The tendency of a country's domestic currency to depreciate against other foreign currencies will affect the value of imports made. If the price of imported goods in foreign currency is relatively low, it will help increase the purchasing power of imported products when valued in the domestic currency. This condition will have the potential to increase the import value of a country.

Ad 4 Domestic and foreign consumer income

Consumer income that reflects the welfare of a country will affect the purchasing power of the desired agricultural commodity. If the income of domestic consumers increases, it is likely that the purchasing power of imported agricultural commodities will increase, if these commodities are considered to be better than domestic competitive commodities. Conversely, if the consumer's preference for domestic goods is higher, the increase in consumer income will actually reduce the demand for imported commodities.

Ad 5 Transportation costs

Trade advantages can be realized if they are good at making efficiency in reducing transportation costs. In general, trade between countries is characterized by a high quantity considering the transportation costs that must be incurred. This strategy is able to reduce the price of imported agricultural commodities to a lower price than domestic products that require transportation costs and the costs of the damage they cause.

Ad 6 Government Policy

Trade success to some extent requires intervention from the domestic government of a country. Especially for imported products, government efforts are needed to be able to establish good relations so that they are willing to accept imported products which are likely to become competitiveness for domestic producers from an economic perspective. Sometimes government policies are more influenced by domestic instability which must be immediately restored by providing import opportunities for entrepreneurs.

Demand Theory

Demand for goods and services from a microeconomic perspective is divided into two, namely individual and market demand. Where the demand curve depiction generally assumes that it is only influenced by the price of the good itself. There are three possible recognizable forms of demand graphs. If the item requested is classified

as normal, the curve moves from top left to bottom right. This is in accordance with the law of demand which states that if the price of goods increases, the quantity of goods demanded decreases, and vice versa.

However, if the inferior goods are faced, the opposite condition will occur because of the negative income effect so that it is classified as the Giffen case. Where an increase in the price of goods causes real income to fall, it is followed by a higher increase in commodity demand. The unidirectional relationship between commodity prices and output demanded can also occur in the case of speculation and prestige goods.

Speculation case due to events that are expected to affect the amount of goods available. For example, fear of crop failure, natural disasters and uncertain political situations will lead to speculation. Meanwhile, the case of prestige goods is based more on one's prestige for a commodity. The higher the price of a commodity will encourage to buy it because of a sense of satisfaction /self-worth.

The relationship between income and output demanded will be more visible from the form of the Engel Curve. If the goods requested are classified as normal and luxury goods, the relationship between the two variables will be positive. This can be seen from the Engel Curve moving from bottom left to top right. Conversely, if the goods requested are inferior goods, there will be a negative relationship between income and output. Thus the Engel Curve will be drawn from top left to bottom right (Lia Amaliawati, 2019).

Consumption Theory

In a classical economy or two-sector economy, it is stated that the main variables in the economy are consumption and saving. Consumption is public expenditure on goods and services to meet human needs. Types of goods seen from their intended use are divided into two, namely consumer goods and production goods. Consumer goods have the nature to fulfill their own needs while manufactured goods are used for further processing.

The consumption of a country is affected by the National Income after deducting by taxes. Likewise, saving as the difference in personal income after tax is reduced by consumption has a direct relationship with National Income. The basic elements of consumption can be categorized into three categories, namely durable goods, non-perishable goods and services. The service sector is growing in importance because the basic needs / primary for food are met. Meanwhile, consumption for health, recreation and education demands a larger share of the family budget.

The 1998 survey of personal consumption expenditure in the United States stated that food falls as a percentage of income as income increases. Poor families have to spend their income mainly on food and housing needs. This has the impact that when income increases, expenditure on food items also increases, because people eat more and have better quality. However, there is a limit to the extra money people will spend on food when their income rises. As a result, the proportion of total expenditure devoted to food decreases as income increases.

Expenditures on clothing, recreation and vehicles are more than comparable to after-tax income, until high incomes are achieved. Expenditures on luxury goods increase in a greater proportion than income. Finally, along with looking at the families of a country, it is evident that savings increase very quickly because income increases (Samuelson Nordhaus, 2001).

Framework

Economic globalization, which is marked by the fading of boundaries between countries, will have an impact on the ease of flow of goods and services both out and about between countries (Faisal Basri, 1995). Indonesia as a country with a strategic position must be prepared to accept these consequences both positively and negatively. In its development, Indonesia has become an important market share for other countries not only by developed countries such as the United States and Japan, but also ASEAN countries such as Malaysia, Vietnam and Thailand.

One of the important commodities that symbolize Indonesia's close bilateral relationship with Vietnam is rice. More than 90% of Indonesia's population uses rice as a staple food need. Where the provision of rice by the government is carried out by adding up the rice output plus imports, minus exports and changes in stock in the following year (Food Consumption Bulletin, 2013).

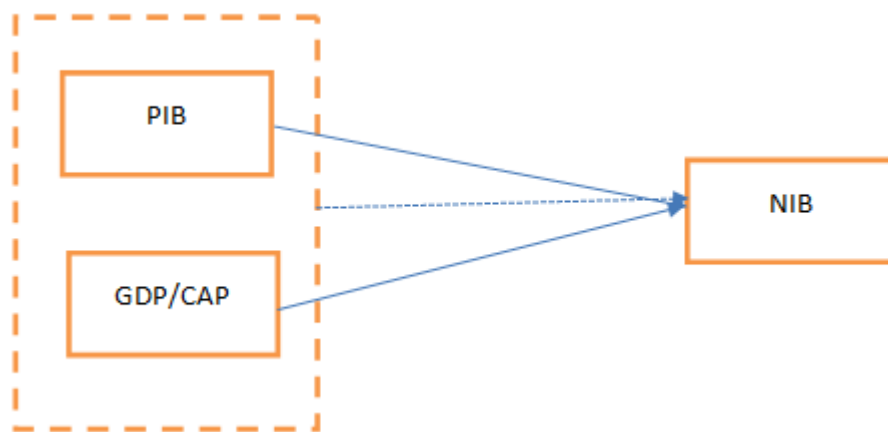
The statement shows that rice imports are not a dependency for Indonesia but only as a complement. Rice is an essential commodity that greatly affects the economic stability of a country, such as high inflation. Efforts to stabilize the Indonesian economy have been taken by the government by trying to strengthen food security programs, especially rice production that can guarantee the welfare of the people.

Thus, the import value of Indonesian rice from Vietnam is a reflection of commodity demand which can be influenced by various factors such as rice import prices and Indonesia's per capita income. The price of Indonesian rice imports from Vietnam is likely to increase the value of Indonesian rice imports from Vietnam. This condition is based on the idea that Vietnam's rice price, which is much lower than that of Indonesia, can increase its purchasing power which is quite high, thus increasing the volume of imports. Finally, the value of Indonesian rice imports from Vietnam also increased.

Per capita income is the main variable that affects people's decisions to consume commodities. If the level of welfare of the population is high enough, then consumption is more towards secondary and tertiary products. Because rice is classified as a primary product, an increase in income per capita actually reduces the demand for imported rice. Moreover, the implementation of the Food Security Program will more or less help supply the need for rice in Indonesia.

The effect of Indonesian rice import prices from Vietnam and Indonesia's per capita income on Indonesian rice imports from Vietnam for the 2000-2018 period can be described as follows:

Figure 2



RESEARCH HYPOTHESIS

The Effect of Indonesian Rice Import Prices from Vietnam and Indonesian Income per Capita on the Import Value of Indonesian Rice from Vietnam for the 2000-2018 Periods.

Based on the results of the framework, the hypothesis proposed is:

Ha₁: The price of Indonesian rice imports from Vietnam has a positive effect on the value of Indonesian rice imports from Vietnam.

Ha₂: Indonesia's income per capita has a negative effect on the value of Indonesia's rice imports from Vietnam.

Ha₃: The import price of Indonesian rice from Vietnam and Indonesia's Per Capita Income have an effect on the value of Indonesian rice imports from Vietnam.

RESEARCH METHODOLOGY

In this study, a descriptive approach will be used on the causal relationship between the import price of Indonesian rice from Vietnam and Indonesia's per capita income to the value of Indonesian rice imports from Vietnam. The data used are classified as secondary data. Data on the value and price of Indonesian rice imports from Vietnam are sourced from the Indonesian Statistical Publication. Meanwhile, the income per capita data comes from the Asian Development Bank (ADB). The research period is limited from 2000 to 2018. The limit in 2000 with the initial consideration of the stability of the Indonesian economy after entering the Reform era. Meanwhile, the limit in 2018 is that the analysis carried out can limit the time dimension of the causal relationship and ultimately provide more realistic results.

The modeling used to analyze the causal relationship between the price of Indonesian rice imports from Vietnam and Indonesia's per capita income and the value of Indonesian rice imports from Vietnam for the 2000-2018 periods is a multiple regression equation as follows:

$$NIB = a + b1 PIB + b2 GDP / CAP$$

Where:

NIB : The import value of Indonesian rice from Vietnam is in US \$ thousand.

PIB : The import price of Indonesian rice from Vietnam is in units of US \$ thousand/ton.

GDP/CAP: Indonesia's Gross Domestic Product / Capita in US \$.

Hypothesis Test Design

In this study, the t, F and R2 tests will be used. The three tests can be described as follows:

Partial Test of Regression Equations

The Equation of the Effect of Indonesian Rice Import Prices from Vietnam and Indonesia's Per Capita Income on the Value of Indonesian Rice Imports from Vietnam for the 2000-2018 Periods.

The price of Indonesian rice imports from Vietnam had a positive effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods

Ho: $\rho < 0$ the price of Indonesian rice imports from Vietnam has a negative effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods.

Ho: $\rho > 0$ the price of Indonesian rice imports from Vietnam has a positive effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods

Ho is rejected if $\rho > 0$

Indonesia's per capita income has a negative effect on the value of Indonesia's rice imports from Vietnam for the 2000-2018 periods

Ho: $\rho > 0$ Indonesia's per capita income has a positive effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods

Ho: $\rho < 0$ Indonesia's per capita income has a negative effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods

Ho is rejected if $\rho < 0$

Simultaneous Test of Regression Equations

The Equation of the Effect of Indonesian Rice Import Prices from Vietnam and Indonesia's Per Capita Income on the Value of Indonesian Rice Imports from Vietnam for the 2000-2018 Periods. The price of Indonesian rice imports from Vietnam and Indonesia's per capita income have an effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods.

Ho: $\rho = 0$ the price of Indonesian rice imports from Vietnam and Indonesia's per capita income have no effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods.

Ho: $\rho \neq 0$ the import price of Indonesian rice from Vietnam and Indonesia's per capita income have an effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 period

Ho is rejected if $\rho \neq 0$

RESULTS AND DISCUSSION

The results of processing data on the multiple regression equation for the period 2000-2018 obtained the following results:

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-220846,7079	152092,975	-1,452050681	0,165814961	-543269,4096	101575,9937	-543269,4096	101575,9937
(PIB)	1425,243418	599,6307909	2,376868298	0,030279866	154,0829349	2696,403901	154,0829349	2696,403901
(GDP/Cap)	-4,091971008	4,637897912	-0,882290013	0,390683008	-13,9238753	5,739933287	-13,9238753	5,739933287

From the regression results, NIB is the variable value of Indonesian rice imports from Vietnam and PIB is the import price of Indonesian rice from Vietnam. Then GDP / CAP is Indonesia's income per capita. If the import price of Indonesian rice from Vietnam and Indonesia's per capita income were zero, the import value of Indonesian rice from Vietnam would be US \$ -220846.7079 thousand. The statement shows that if the price and income per capita have not been operational, the import value of rice will decrease by US \$ 22846.7079 thousand. The import price of Indonesian rice from Vietnam during the 2000-2018 periods had a unidirectional relationship to the value of Indonesian rice imports from Vietnam. Where an increase in the import price of rice by US \$ 1 will increase the value of Indonesian rice imports from Vietnam by US \$ 1425.243418. Indonesia's per capita income has a negative relationship with the value of Indonesia's rice imports from Vietnam. Where an

increase in Indonesia's income per capita by US \$ 1 will reduce the value of Indonesia's rice imports from Vietnam by US \$ 4.091471008.

Statistical Testing

The significance analysis of the coefficient value of the regression equation used in this study used t test and F statistic.

Partial Test of Regression Equations

Ha: The price of Indonesian rice imports from Vietnam will have a positive effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods.

Ha: Indonesia's income per capita has a negative effect on the value of Indonesia's rice imports from Vietnam for the 2000-2018 periods.

From the results of the t-statistic test, it was found that the variable price of Indonesian rice imports from Vietnam had a t-count value of 2.376868298. The t value is proven to be greater than the t-table at a significance level of 5% (t-table = 2.120). Meanwhile, Indonesia's income per capita variable has a t-count value of -0.882290013. The t value is proven to be lower than the t-table at the significance level of 1%, 5% and 10% (Salvatore, 2003).

Although the income per capita variable is not significant, it tends to be useful, both in producing a suitable model and in adding to the contribution of the Income per Capita variable to the value of Indonesian rice imports from Vietnam which can be explained compared if only using the variable price of Indonesian rice imports from Vietnam alone.

Simultaneous Test of Regression Equations

Ha: The import price of Indonesian rice from Vietnam and Indonesia's per capita income have an effect on the volume of Indonesian rice imports from Vietnam for the 2000-2018 period.

From the results of the F-statistic test, it looks like the following table.

ANOVA					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	3,30599E+11	1,653E+11	3,994926065	0,039150678
Residual	16	6,62038E+11	41377381248		
Total	18	9,92637E+11			

This F-statistic value of 3.9949 is seen to be greater than the F-table at a 5% significance level (F-table = 3.59) (Salvatore, 2003).

R² test

To find out how much the contribution of the variable price of Indonesian rice imports from Vietnam and Indonesia's per capita income to the value of Indonesian rice imports from Vietnam for the 2000-2018 period can be seen in the following table:

<i>Regression Statistics</i>	
Multiple R	0,577105994
R Square	0,333051329
Adjusted R Square	0,249682745
Standard Error	203414,3093
Observations	19

From the results of the table, it can be seen that the contribution of Indonesian rice import prices from Vietnam and Indonesia's per capita income to the value of Indonesian rice imports from Vietnam was 0.3331 or 33.31%. While the rest 66.69% is a variation outside the independent variables used.

DISCUSSION

The Equation of the Effect of Indonesian Rice Import Prices from Vietnam and Indonesia's Per Capita Income on the Import Value of Indonesian Rice from Vietnam for the 2000-2018 Period

Ha : The import price of Indonesian rice has a positive effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 period

The variable price of Indonesian rice imports from Vietnam is positively related to the import value of Indonesian rice from Vietnam. This statement is in accordance with the concept of microeconomic economics

that states that low commodity trading prices will increase competitiveness against other countries to enter the international market (Case Fair, 2007). The price of imported rice from Indonesia from Vietnam is a reference for the government to determine the size of the rice import volume that will be carried out by Indonesia. The survey results show that Vietnamese rice has similarities with Indonesia in terms of both price and quality.

The type of rice that Indonesia imports from Vietnam is milled rice which suits the taste of the Indonesian people. In contrast to Japanese rice which is known to be more suitable for people with diabetes because of its very low sugar content. Even in terms of processing, it does not use rice fields but through artificial media which is supported by high human resources and technology. The impact is that Japanese rice prices are the highest in the international market, namely US \$ 4.86/kg or IDR 48,779/kg. Meanwhile, Vietnamese rice processed through an agricultural system which is generally carried out using land areas such as in Indonesia has the lowest value, namely US \$ 0.71/kg or IDR. 7,126/kg (Bloomberg and Worldbank, 2013).

Taking into account the quite striking difference in the price of imported rice between Japan and Vietnam, Indonesia's purchasing power of Vietnamese rice has increased relatively despite the increase in the price of imported rice. This statement is also supported by the Public Economic Theory which states that the nature of rice is a public good that must be purchased by the government to meet the needs of society (Joseph E. Stiglitz, 1999).

Ha: Indonesia's Per Capita Income has a negative effect on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods

Indonesia's income per capita if there is an increase will be followed by a decrease in the value of Indonesia's rice imports from Vietnam. This hypothesis is acceptable because it is supported by a macroeconomic approach which states that the pattern of public consumption of goods and services is strongly influenced by their income per capita. If the per capita income of the community increases, the consumption pattern will be more focused on secondary and tertiary goods and services. Because rice is classified as a primary good, consumption expenditure on imported rice will be relatively low or there will be a decline (Samuelson Nordhaus, 2001).

Based on data from the SUSENAS - BPS (2002 and 2012), Indonesia's per capita rice consumption tends to decline, from 107.71 kg/capita/year in 2002 to 97.65 kg/capita/year in 2012. Average rice consumption during the 2002-2013 periods of 103.18 kg/capita/ year with an average reduction rate of 0.88% per year. This rice consumption behavior is indicated by an increase in welfare and urbanization (Food Consumption Bulletin, 2013).

Talking about welfare, it has been proven that since the Indonesian economy rose from the economic crisis, it can be seen that Indonesia's income per capita has increased. Starting with the opening of employment opportunities in various economic sectors to some extent helps people to be more progressive in fulfilling their life needs, not only basic food but also secondary needs such as transportation and even in ownership of a place to live. This has an impact in terms of the quantity of rice consumption per capita of the Indonesian population on a decreasing tendency (Food Consumption Bulletin, BPS, processed by Pusdatin, 2013).

Likewise with urbanization, which continues to increase, consumption expenditure for rice in cities is actually lower than in rural areas. Especially in terms of distribution, it is evident that the household sector living in cities has lower elasticity than rural areas. For example, the lowest 40 percent income group in the city has an elasticity value of 0.795, while in the village it reaches 0.884. Even for the aggregate, all households have an elasticity of 0.699 for urban areas; 0.786 for rural areas and 0.696 for cities and villages. These figures reinforce the condition in Indonesia that rice is an essential good that must be available in sufficient quantities (SUSENAS, 2008). The character of these staple goods can reduce the value of Indonesian rice imports from Vietnam.

Meanwhile, in terms of rice productivity growth in Indonesia during the 2000-2005 period it was 0.78% and the 2005-2011 period was 1.38%. This increase in rice productivity is in line with the implementation of the food security program in Indonesia. The effort taken is to introduce technology that can control the activities of farmers from planting to harvesting. For example, an innovative lecturer at the Bandung Institute of Technology and his team developed an Agribusiness Intelligent Information System (SICA) to help Indonesia's food security. This application provides information based on weather prediction with high resolution and high accuracy.

The making of SICA was initiated in 2008 from a long-term rainfall prediction model. SICA is designed for smart phones based on the Android operating system which is widely used by farmers. This application includes information services in the menu Weather Prediction, Climate Prediction, Vulnerability Index Prediction and

Planting Calendar. Furthermore, it contains Market Information which displays the distribution of farmer and rice shops complete with the shop owner's name and address.

To maintain accuracy, the weather prediction model must be rerun with the latest data after two years of use. SICA has developed additional features, such as water management for irrigated areas and plantations as well as the potential for pest distribution and the potential for landslides. The implementation of SICA for rice commodities has been carried out in the Indramayu region, West Java. From the results of weather predictions, SICA helps farmers in Indramayu by accelerating the planting period during El Nino in 2015 which resulted in drought (Armi Susandi, 2020).

With the innovation of human resources, we encourage agricultural productivity in Indonesia to increase in an effort to achieve food security. Collaboration with universities, local governments, non-governmental organizations and extension workers will help improve rice stocks from within the country. This condition can increase income per capita for the Indonesian population which in turn will eliminate our dependence on imported rice. Therefore, the value of Indonesian rice imports from Vietnam may decrease.

Ha: The import price of Indonesian rice from Vietnam and Indonesia's income per capita affect the value of Indonesian rice imports from Vietnam for the 2000-2018 period.

The import price of Indonesian rice from Vietnam and Indonesia's per capita income simultaneously affect the value of Indonesian rice imports from Vietnam. This statement is in accordance with the demand theory which states that the import value of a commodity is strongly influenced by external and internal factors. These two variables are the two main internal factors that support the government's import decisions as well as a strategy to win the competition. Moreover, rice is the main staple goods needed for both direct consumption and further production processes such as packaged baby porridge, wet cakes and so on (Food Consumption Bulletin, PSKPG-IPB Study, 2013). The high types of food that can be produced in Indonesia can be realized if the price of rice is affordable by the people.

Likewise, Indonesia's income per capita is also a determinant of the rice commodity that it wants to consume. Most of the Indonesian people already consume white rice, so the demand for milled rice is relatively high. As long as rice supplies have not reached the expected target, rice imports from Vietnam are an important consideration for the government to secure domestic stocks.

These two variables are the main strategy for a country to import rice so that it strongly influences the pattern of Indonesian rice imports from Vietnam. Thus simultaneously the import price of rice and Indonesia's per capita income greatly influence the value of Indonesian rice imports from Vietnam.

CONCLUSIONS AND SUGGESTIONS

CONCLUSION

In the equation of the effect of Indonesia's rice import prices from Vietnam and Indonesia's Per Capita Income on the value of Indonesian rice imports from Vietnam for the 2000-2018 periods, the following conclusions are obtained:

- 1) The import price of Indonesian rice from Vietnam is positively related to the value of Indonesian rice imports from Vietnam and is in accordance with the basic concepts of microeconomic and public economic thinking.
- 2) Indonesia's Per Capita Income has a negative relationship with the value of Indonesia's rice imports from Vietnam and is in accordance with the basic concepts of microeconomic and macroeconomic thinking.
- 3) The import price of Indonesian rice from Vietnam and Indonesia's Per Capita Income simultaneously affect the value of Indonesian rice imports from Vietnam.

SUGGESTION

For future research, it is better to study the influence of socio-political factors as independent variables in order to obtain a real picture of Indonesia's rice imports from Vietnam.

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AN ENERGY EFFICIENT PROTOCOL BASED WIRELESS SENSOR NETWORK

C.Thenmozhi¹ and N. Tamilarasi²¹Research Scholar, Department of Computer Science, Sri Akilandeswari Women's College,²Head & Assistant Professor, Department of Computer Science, Sri Akilandeswari Women's**ABSTRACT**

An efficient Cluster based Wireless Sensor Network (CWSN) energy effective protocol selection is configured to enable network connectivity tracking and regulating scenarios. Wireless Sensor Network (WSN) has a key prerequisite to expand network life. The aim of this paper is to establish energy-saving WSNs to reduce and boost energy spending. WSN architecture is built in the proposed CWSN, taking advantage of the advantages of cluster head and multi-hop run. Node Dependent Cooperative Clustering Protocol is in this report, a scheme to improve the reliability of the cluster by choosing a higher cluster head and to improve the routing efficiency of hostile nodes and avoiding attacks to improve the protection of the WSN. The suggested CWSN expands the existence of the network with multi-hop drive. A modeling tool is used for the proposed CWSN model. In this article, the efficiency of proposed CWSN is analyzed by energy use, by put, packet distribution time, and transmission delay and intrusion detection indicators.

Keywords—Cluster based WSN, Node Based Cooperative Clustering Protocol, Wireless Sensor Networks, Improved Chain-based Clustering Hierarchical Routing (ICCHR), Multi Hop.

I. INTRODUCTION

The battery is the principal source of life for hubs in wireless sensor networks (WSNs). The contact with numerous hubs or sensors expends a great deal of energy in the planning and conveyance of the knowledge obtained at the sink. Wireless is a set of wireless nodes that configure themselves to create a network without any infrastructure. In mobile ad-hoc networks, there are a variety of features, including the complex network topology, restricted capacity and network energy restriction. For various uses, for example, the wireless network is useful to provide contact with the squads, emergency conditions in areas outside the room, medical tests, and so on.

Because wireless sensor networks (WSNs) are extremely restricted on the amount of energy they can tolerate, energy management is considered to be a critical problem for such systems. Due to the random characteristics of them deployment and the large number of nodes deployed in the environment, it is expected that WSNs will be able to operate for an adequate amount of time without human intervention. In traditional wireless sensor network (WSN) approaches where the users get more traffic on them, the nodes near the static data sinks are depleted of their batteries before other nodes, making these nodes less attractive for other device to connect to. This can lead to congestion of the fixed sinks in these nodes. Clustering is used throughout the routing process to minimize flow. Clustering involves breaking the network into multiple virtual classes on the basis of laws to differentiate the nodes allotted to each sub-network. The aim of clustering in the presence of broad networks and high versatility is to achieve scalability. Node functions are divided into four classes: the cluster head, the gateway nodes, the participant nodes, and the guest nodes.

- Cluster-head: the local coordinator for the cluster is a cluster-head node. The cluster head transmission spectrum defines the cluster limits.
- Nodes of the portal: gateway nodes are at the cluster border. The data within clusters may be forwarded.
- Nodes of the member: Member nodes as a normal node are often named. Member nodes are cluster owners, and these nodes have their own cluster neighbors
- Guest Node: The guest node is a cluster node.

WSN increases people's capacity to track physical locations and regulate them from afar. Each sensor node operates individually, so loss of any nodes does not impact other network operations. Networking is the way to pick network paths to send network traffic.

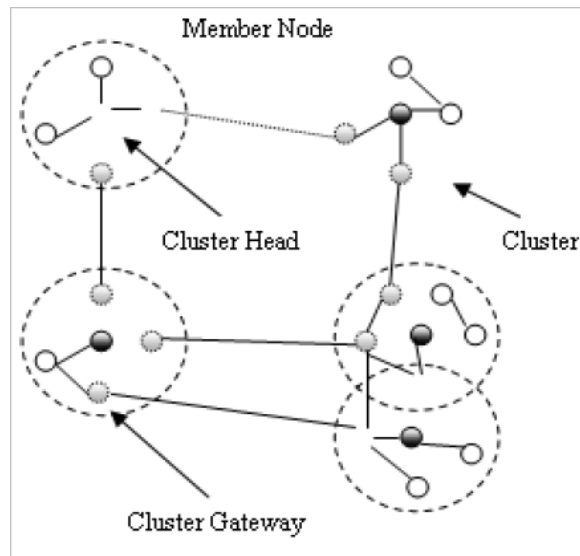


Fig 1: Cluster Model

The WSN consists of nodes – of hundreds to several hundred, or even thousands, where one (or even many) sensor is attached to each node. Typically, each of these sensor network nodes has many parts: a radio sensor with an internal or external antenna attachment, a microcontroller, a circuit interfacing with the sensors and a power source, typically a battery or an embedded type of energy harvesting. In Wireless Sensor Networks (WSN), a modern unequal protocol for clustering the energy balance, based on network isolation & distance for WSN, is used for mobile education (e.g. mobile learning) in order to sustain an increased and lower energy usage, reduce the energy void and extend the network life cycle. In addition, Fig 1: we construct standardized clusters through the creation of different competitive radiuses, which help balance the energy usage of the grid [20]. This paper proposes a Node Centered Clustering Cooperative Routing Algorithm to increase the reliability of the clusters and the turnaround by picking a better cluster head. Section 2 provides a thorough study of the literature review. The essay is structured in the following manner. The suggested algorithms are illustrated in Section 3. Chapter on success review and summarize outcomes. 4. The article is done in Section 5.

II. LITERATURE SURVEY

Wireless network sensor technology has recently been significantly promised to increase crop yield in cultivation, enhance productivity and cut costs. This paper presents the coverage of wireless sensors in a mixed cropland network. This analysis reveals that models of generic vegetation diminution do not extend to wireless sensor low-power networks. In this article, a log-linear model is suggested and tested for mixed crop applications. This study reveals, contrary to mono crop, that the network coverage with asymmetric channel is heterogeneous between node-pain communications. For every sensor node, an adaptive energy usage model will be proposed and used to measure the network's energy usage. A cluster head and two antenna-high implementation model, Ndzia DL et coll.[7], are also offered and simulated in order to minimize brief network lives. The Internet of Things wireless sensor network (WSN) is made up of several nodes. A new way for the data aggregation at WSN is to propose compressive sensing technology. This paper proposes a kind of powerful data aggregation mechanism focused on the clustering structure of WSN based on compressive sensing. In a cluster, the sink node sets the corresponding seed vector on the basis of network propagation and then submits it into each community head. The phase is then split into two sections. Based on its seed vector obtained, the cluster head will create its own random space-sparse matrix, and collect data using Zhang D [13] compression sensing technology. The WSN Medium Access Control Layer (MAC) offers an efficient way to save node energy usage by arranging nodes dependent on daily listen / sleep. In the event of non-affected data transfer, the nodes are reduced; protocols centered on the asynchronous MAC are strengthened. This paper explores a protocol that is a low-service energy effective MAC protocol for WSN which can be modified adaptively based on the weakening period of prediction nodes. This is what we term AP-MAC. The nodes are not uploaded or distributed in the same duration within AP-MAC protocol and wake up in an algorithm set by random time. The network will in this case prevent the collision issue, cross chat, etc., triggered simultaneously by all nodes, and save more resources. The node sending data will predict how long the receiving nodes will wake up, ensure that receiving Nodes wake up in time and create a link to Zhang D[14], the secure transmission of network data. In this document descriptions of the travel characteristics of cars and the reasons behind the connections are studied to predict the reliability of links between vehicles efficiently and design a consistent routing service

protocol to satisfy the different specifications of the QoS application. The relation length model is then suggested based on the period of the time. The durability of ties is measured and used for a modern routing protocol as a parameter key. Rapid shifts in topology render discovering and preserving the best route a massive challenge, but the heuristic Q-learning algorithm will modify the routing direction dynamically by communicating with the surroundings. A stable RSO (RSAR) based on the heuristic service algorithm, Zhang D, is proposed in this article. The fast mobility of automobiles allows the relation between nodes in the cluster less secure.

A small difference in the pace of cluster heads impacts the cluster participants significantly and allows the head of the cluster to turn regularly. These concerns threaten the consistency and efficiency of conventional clustering algorithms. To address the above shortcomings, this paper proposes a new passive multi-hop clustering algorithm (PMC). The PMA-algorithm builds upon the idea of a clustering multihop algorithm which ensures clustervisibility and stability. A preference neighboring strategy is being suggested during the cluster head selection process to pick the best neighboring nodes to be included in the same cluster. This technique renders Zhang D [19] extremely reliable and secure for cross-cluster nodes. Liu S [24] The ad hoc networks are designed on the basis of randomly set up nodes, whereas nodes in actual networks appear to be placed in locations the users choose.

A MANET based network model based on the evolution of a local-area choice is proposed for internet. The proposed model not only considers how quickly and efficiently a node is able to move, but also how much energy a node consumes. Errors occur often in MANET. Much of the current research looks at network topology shifting by random network nodes malfunctioning. In order to describe the real impact of random network failures we focus on the average shortest path length (ASPL) which is an important characteristic of network topology and propose a formula for calculating the average shortest path length after a random failure. Zhang D [25] it is understood that entire mobile ad hoc network (MANET) is more vulnerable to all sorts of disruptive attacks and that the reliability of data transmission is sometimes interrupted as a consequence. In this paper we propose a new metric for Ad hoc Networks and explain its values (MANET). First, the device gets the network trust value by working the number of data packets between nodes and predicting the trust based on the frequency of this sum; then gets the direct trust value by considering the context trust with the predicted amount and the communication trust based on the direct trust value and the residual security of the nodes; and then gets the energy trust value by considering the direct trust value and the contact trust based on the direct trust value and the residual energy of the nodes.

In order to give trust to the advice, the strategy promotes recommendation recommendations and collects the familiarity of the recommendations from the patients. In additionally, it uses the adaptive weighting system, which calculates the integrated direct trust, depending on the input direct trust and the integrated direct trust. To measure the indirect confidence between the two nodes, trust is first be measured based on the amount of trust inside a direct trust, and then have an impact. The paper states why the suggested approach is based on the finding that those who are naughty prefer to remain with each other, while the good stay apart. Thus, these nodes are able to be linked with greater ease, which allows disconnecting them fast. Tunca C [26] Load-balancing delivery and uniform energy use across the network is a feature of cloud storage devices. In comparison, keeping the machine and network situated near together allows it more effective to utilise all computers concurrently as compared to having them in disparate places. In this post, we propose Ring Routing, a novel distributed energy-efficient mobile sink routing protocol. The aim of this protocol is to reduce the overhead of multiple I.E.P.s wasting energy along a route and to maximize the bandwidth along a path, while also maintaining the advantages of the mobile sinks. Zahedi ZM [28] Wireless sensor networks are rapidly evolving technological structures that easily have many applications in several different domains.

The sensors are battery operated and they are frequently used in areas that humans cannot see. This is a struggle to repair or recharge sensor node power supplies as they are missing or impaired. Gathering data from a wide range of instruments helps one to cover a large region and discover similarities from which energy conservation can be accomplished. For clustering-based routing, a sensor is determined from the position of the entire sensor. Then, a cluster is created between this single sensor, and the cluster head is chosen from the sensors, giving each sensor the nearest cluster head. The biggest drawback of the kind of projection is that there is no influence about the distribution of charge to the cluster heads over the network. On top of the problem of being being able to satisfy the demands of all applications, all routing protocols do not operate for all forms of applications. In this paper, we introduce SIF, a fuzzy routing protocol that uses a self-organizing team of agents as the routing method. SIF automatically clusters sensory nodes using a fuzzy c-means algorithm and then uses the Mamdani type of fuzzy inference to choose which cluster head to use. Using balanced clusters promises to generate

balanced clusters throughout the network. In addition, this method may also be used to measure the exact number of clusters.

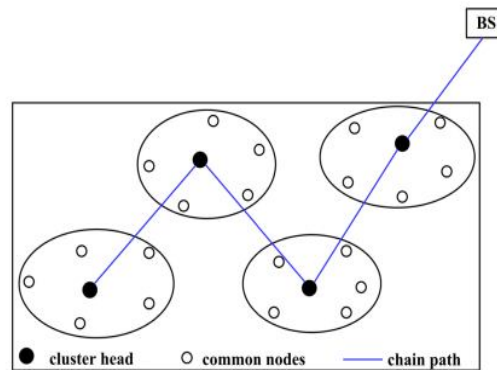


Fig 1: Existing system architecture

In established systems improved chain-based clustering hierarchical routing (ICCHR), elected CHs adopt a selfish technique to become part of a chain, and the new access CH is situated at the farthest end of the row. The CH farthest from the sink node can be set as the new connection node and can be named as the neighbor node.

Fig 1: Once all CHs are labeled, it means that all the CHs are related. Considering that the chain leader has the most forwarding activities as well as the fastest total energy usage, the chain nearest to the BS is chosen to interact directly with the BS. As can be seen, each node sends their position and energy details to the BS. Then, the cluster of the nodes with the shortest distance from each other, the farthest distance from the computation core and the highest sum of energy proceeds to be elected as a cluster head. After the CH information is submitted, the BS concurrently sends the CH information to particular participants of the cluster, and then collects the confirmation information from each individual cluster member. The largest voting block of CHs reside and are arranged in a line. Each is the representative with the shortest distance of CHs from the BS. Each of the CHs with the shortest distance will explicitly interact with the BS.

III. PROPOSED ENERGY EFFICIENT PROTOCOL

This paper suggests the selection of energy-efficient protocol for the Cluster based Wireless Sensor Network (CWSN). Hop-to-hop connectivity is used to minimize network capacity by the effective usage of WSN battery power. This network strengthens WSN's network existence. By choosing cluster node and cluster head, the proposed CWSN decreases power consumption. The present paper discusses CWSN focused on the parameters of node-based co-operative clustering routing protocol's energy usage, throughput, average retardation, intrusion detection and packaging supply ratio.

The main contributions of this paper are:

- Selection of the capacity effectiveness of the Underwater Wireless Sensor Network cluster routing protocol is protocol.
- A contact hop-to-hop system is used to decrease battery capacity and maximize the lifespan of the WSN.
- To achieve optimum network life, the productive head and cluster coordinator of the cluster is chosen.
- An efficient routing protocol is suggested for wireless sensor networks that should be well suited for clustering solutions.
- [control message to each node that] "hops to hop" allows it simpler to minimize battery power and therefore make WSNs longer.
- To get a full lifetime of the network, a cluster head and cluster coordinator are chosen who is the most effective.
- The suggested routing protocol is tested for its efficiency.
- There is a study of energy use done.
- Evaluation is performed to make sure that the WSN dependent energy usage, throughput, packet distribution ratio, interruption, and latency requirements suits under the limitations.

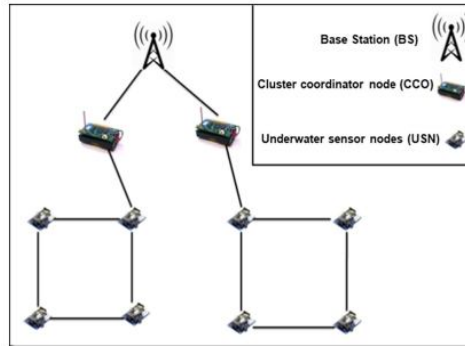


Fig 1: Architecture of energy efficient routing protocol

The framework suggested should locate, if not the shortest, an optimum route in WSN nodes between source and destination. And if the intrusion is identified to prevent reverse discovery if the connection is failure or the node failure, get an alternate route or backup path. Fig 1: In order to prevent a hot spot problem, unequal clustering approaches are adopted, creating hop account and neighbor discovery in any data transmission route between the source and the destination, which eliminate energy waste.

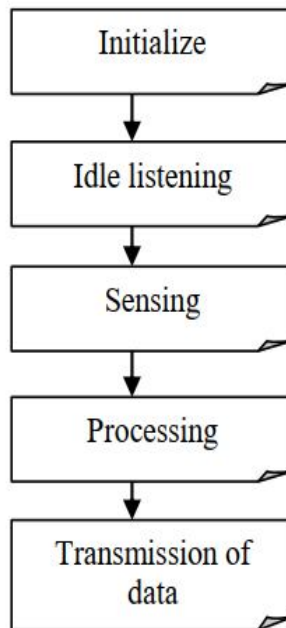


Fig 2: Energy processing in sensor nodes

The procedure of the algorithm is carried out as follows in the proposed CWSN:

Step 1 Sensor node deployment: WSNs are distributed using a grid-based method across a region.

Step 2 Start neighbor path explorations.

Step 3 Cluster formation: clusters are created after deployment of WSNs.

Step 4 Cluster head selection: any cluster selects a cluster head following the cluster creation, which can be easily sent and retrieved by WSN info. WSN is responsible for reducing energy use by CHs (Cluster Head).

Step 5 Transmission: cluster coordinators that relay data between source and destination are deployed.

Step 6 Select alternative routes: if an assailant is interested in routing the transfer path, he updates the alternative path to begin transmitting data.

The suggested cooperative protocol is a typical collaboration protocol. Substantial layout of cluster requested. The arrangement is focused on a series of clusters, each with its head.

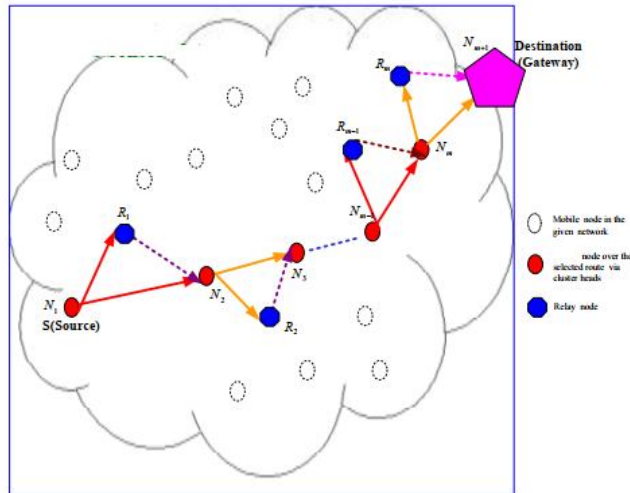


Fig 3: System Model

We consider a clusters of wireless networks with clusters and a preferred route with the $N_1, N_2, N_3, \dots, N_m, N_{m+1}$ across cluster heads as shown in Fig 3: Where N_1 is a source node and where N_{m+1} are a target node. Every hop has a relay that allows the node to forward the information to the next hop. So we take advantage of mutual hop diversity.

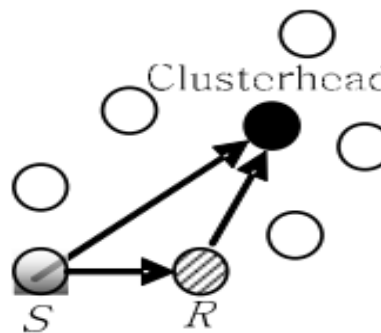


Fig 4: Transmission scenario

Detail of cluster node selection:

- (a). Initially, there is no cluster node set containing the cluster node of interest so the importance of a community set containing the cluster node of interest is zero.

i.e. Set $SCN := 0$;

where, SCN is Set of cluster nodes

- (b). Repeat the phase of creating clusters, and begin to introduce additional cluster nodes to the collection of cluster nodes.

- (c). Measure the residual energy for each node current in each cluster. i.e.

$$RN_e = IN_e - CN_e$$

For the energetic method, where RN_e is the residual energy of node n , IN_e is the original energy of node n , CN_e is consumed energy of node n .

- (d). Pick a cluster node with a greater residual energy among the sensor node that are numbered 1 through 8 in the cluster.

- (e). Connect the cluster node in the list of cluster nodes i.e. to the output set.

$$UCN = \{CN_1; CN_2; CN_3; \dots; CN_j\}$$

- (f). Under the condition (that is specified) before all nodes in a cluster is done implies to do a full analysis of each node in a cluster. This is also known as round "terminating" conditions.

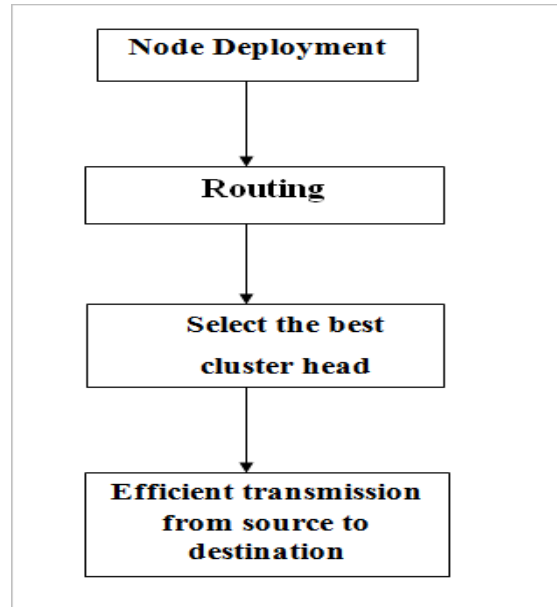


Fig 5: Flow Diagram

This protocol is a multi-hop protocol expansion, which requires the recipient to merge the data from the requested source node and all relays in lieu of only the last relay in a multi-hop protocol. However, as most protocols include the canal calculation, such protocols contribute to a more rise in energy knowledge collection while also providing various benefits, including diversity gains, scope extensions, energy saves, etc. The highest order of diversity of these protocols is proportional to the total number of cooperating nodes.

IV. RESULT AND DISCUSSION

The protocol simulation in this article uses the Network Simulator 2 platform to test and compare the algorithm with the classical protocol.

- The co-operative Node clustering algorithm is simulated in an 85-node region randomly distributed over a 1,451 * 1,000-mile area network.
- The nodes are uniformly located on the aircraft. Nodes begin their journey randomly from an arbitrary position to a random destination.

Module Explanation:

1. Node deployment

The Network can be initialized with certain amount of nodes that have a value of 85, along with the region of 1,451* 1,000 square yards, each node can be defined with their position with the initial location properties, the initial energy of the node is tiny, and even nodes can be classified based on the specific number.

2. Source and Destination Selection

After Network initialization, the next step is to pick a Source and a Destination for transmitting information from its Source to its Destination. And users will dynamically pick the appropriate nodes to be configured.

3. Cluster Formation:

The cluster created by the source and destination varies by the value of the source and the destination.

4. Data Transmission:

To find a secure route to an uncertain location, firstly find a low energy cost routing architecture. After a trust rating to the destination is published, data can be transmitted with optimum precision. If there is a failure to connect, it will find an alternative direction of data transmission without interference by way of routing.

5. Alternate path:

If connection errors arise between devices due to a network problem or network accessibility problems, or when data has been lost entirely, a re-route happens, utilizing the existing connectivity path that is nearest to the target, as the "second" better path.

PERFORMANCE ANALYSIS

A. Node Creation

They build and customize wireless nodes with specific mobile node parameters. Set up the topography object after making the name file. To build nodes, set node_ I [\$ns node]. The node position is fixed by the code X, Y, Z is still zero coordinate. Here, by using initial node pos we set the original size of each node.

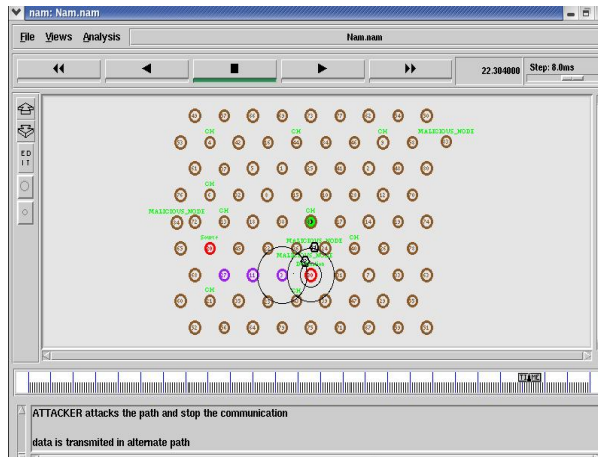


Fig 1: Node Creation

B. Intrusion Detection

Interference is the interruption of connectivity in a whole network. Network intrusion contributes to electricity waste in a device. Therefore, the disturbance is cancelled by reassigning the network.

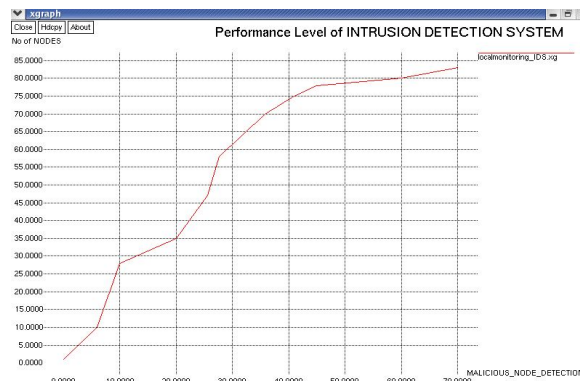


Fig 2: Intrusion Detection

C. Packet Delivery ratio

The number of packets returned relative to the amount of all packets sent is called packet distribution ratio (PDR). Fig 3: A great Distributed Network Delivers packages efficiently will take a long time. The Distribution Ratio metric reflects the amount of data packets obtained at the sink to the overall data packets transmitted by the source including retransmissions. The higher this figure, the more accurate the fit between data transmission time interpreted by the end user and real transmission time. One of the most significant factors of standard of service is the amount of returned packets (Quality of Service).

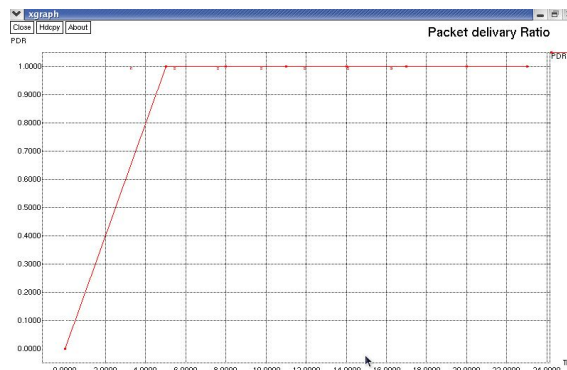


Fig 3: Packet Delivery Ratio

D. Throughput

Knowledge held by a node over a comparatively small time period known as data rate. Full throughput implies maximum quality.



Fig 4: Throughput

E. Delay

Duration of time information was transmitted through a network, if it was effective. Minimally intermittent delays are beneficial for a productive and reliable network. The estimated reaction time is dependent on the amount of seconds.



Fig 5: Delay

F. Energy Consumption

Data packets are sent from one node to another and absorb energy and are used in the transmission. Minimizing the volume of energy used by the nodes is during data processing increases network lifespan. Fig 6: The energy usage of the network nodes, though nodes of the network themselves, gives a straightforward picture of the network's energy performance. Energy conservation implies holding the network running for a longer time span, particularly relevant when it comes to a broad network like a college network.

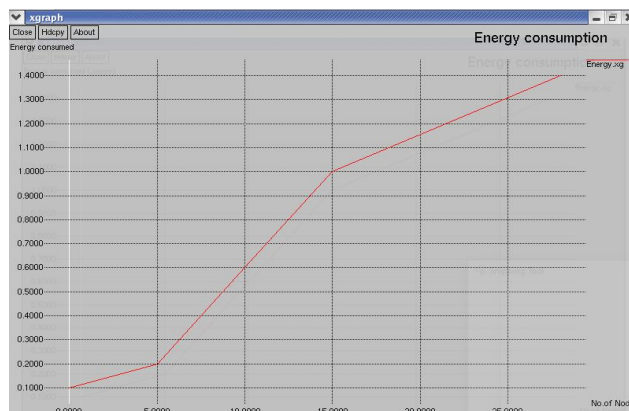


Fig 6: Energy Consumption

The proposed perform of the recorded protocol had been compared to the efficiency of the current protocol in terms of various performance measurement criteria.

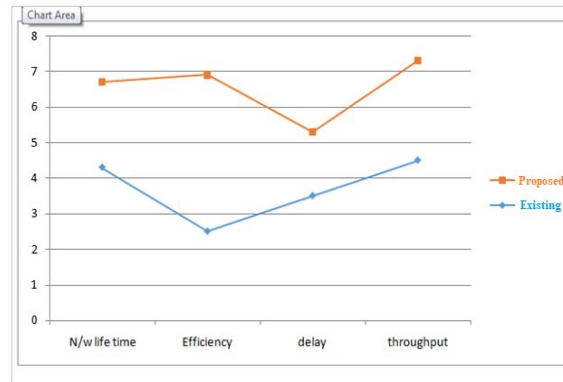


Fig 7: Comparison

Present method is definitely stronger than planned new tests, however, all test metrics, including protection ratings, demonstrated better quality for proposed legislation.

V. CONCLUSION

There are four key factors responsible for fast energy efficiency, flow rate, reliability and transmission delay in a proposed algorithm for clustering. To stop hot spot issues with unitary energy dissipation in the network of wireless sensor heads. The node-based cooperative algorithm used for this project was to boost cluster reliability and efficiency by choosing better cluster heads. Through the optimization of the propagation spectrum, the algorithm can be enhanced by network configuration estimation and improved energy consumption.

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REMOTE ACCESS – A SPECIAL SUPPORTER TO THE FACULTIES, STUDENTS, AND STAFF DURING COVID 19

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ABSTRACT

Remote access is the oldest technology in Engineering. We use remote control for television, Air condition and switch on the electric motors, fans etc. In the same sense Remote access allows the best use of the e-resources and offers easy access to various resources of the library through its boundary from anywhere. Remote access has enabled all leading institutions (academic or research) in optimizing usage of the precious electronic Resources and nurturing research interests of faculty and their students.

Nowadays e-resource is the backbone of any digital library. In all the educational institutions during this COVID 19 pandemic period this remote access technology is very much helpful to the faculties and students for handling their online classes. It facilitates a single sign-on using existing library-issued credentials, such as a library card number and PIN, or username and password. Most of the users felt that it is an excellent facility and helpful for them as they could access the resources of a library anywhere 24 hours in a day, 7 days in a week, and 365 days in a year, viewing, downloading, copying, printing and saving individual articles, using e-resources for scholarly, educational or scientific research, teaching, private study, and clinical purposes sending a copy of an article to another authorized user. To access library online resources without installing any software, Library Remote Support Hub has been designed to help you with all your information needs.

Keywords: Remote Access, e-resources, digital library, Library Remote Support hub

INTRODUCTION:-

Remote access has enabled all leading institutions (academic or research) in optimizing usage of the precious electronic Resources and nurturing research interests of faculty and their students

Remote access has an ability to provide secured access to scattered e-Resources of the institution, bringing them under one umbrella, along with subscribed electronic Journals, eBooks, and all other electronic Content, that too anytime from anywhere, the cost-effective cloud-based service model has enabled progressive libraries in creating their own Digital Library Portal with facilities to reach their target audiences in an efficient manner

Remote access has also freed institutions from investing and maintaining huge hardware infrastructure of e-Mail servers, central servers, bandwidth costs, IP address registrations, etc. This has helped them to focus on core-academic-activities and use saved funds aptly.

Remote access has empowered institutions in systematically imbibing research values among faculty and students and take the right steps in creating a knowledge-base of their own

Remote login access to e databases is the best run-through of any library which helps the users to access their desired information wherever they stay without wasting time. It allows the best use of the e-resources and offers easy access to various resources of the library through its interface from anywhere.

This access and authentication software allow libraries to deliver remote secure online access to e-content. It facilitates a single sign-on using existing library-issued credentials, such as a library card number and PIN, or username and password. With simple modifications, Manage remote online access to licensed e-content without cumbersome log-in screens and multiple passwords.

REMOTE ACCESS SOFTWARE:-

- Team Viewer (Windows/Mac) Popular tool that will allow you to access your computer remotely.
- Remote Desktop Web Connection.
- Anydesk
- Remote Utilities
- UVNC.
- Real VNC.

- Chrome Remote Desktop.
- Bomgar.
- Lite Manager

FUNCTIONS :-

Data Backup services, mail server hosting, digital Library portal designing.

Features :-

Management dashboard, Provides a snapshot of activities on a single screen, Secure and Dependable, Data download limit for end-users, robotic downloads prevention, auto-check for system abuse, Comprehensive reporting module for decision making MIS Reports generated by Remote access can very well help in optimizing budget allocations towards e-Resources and e-Subscriptions

Virtues of remote access :-

Better Work Productivity and Flexibility, Better End-to-end Security, Lower Costs

Improved Business Continuity, Better Talent Acquisition.

The solidarity of all countries will be essential to ensure equitable access to COVID-19 in education and business. Every person is attending their office work from home itself during this COVID 19 pandemic lockdown period. During this critical and crucial period, remote access technology is very much helpful to the users.

Library users are enjoying the remote access facility provided by the library. Most of the users felt that it is an excellent facility and helpful for them as they could access the resources of a library anywhere 24 hours in a day, 7 days in a week, and 365 days in a year, viewing, downloading, copying, printing and saving individual articles, using e-resources for scholarly, educational or scientific research, teaching, private study, and clinical purposes sending a copy of an article to another authorized user (i.e. current faculty, students or staff)

The Library subscribes electronic resources like e-journals, e-books, and other databases for use by authorized users (current faculty, students, and staff). The terms and conditions for using these resources are set out in license agreements with each publisher. It is the responsibility of individual users to ensure their use of electronic resources does not breach the terms and conditions specified in the license agreements.

Library Remote Support Hub - To access library online resources without installing any software, teaching, learning, or researching remotely? We're here to help! The Library Remote Support Hub has been designed to help you with all your information needs. From accessing books online and connecting to electronic resources remotely to requesting a research consultation and seeking media creation support, the Library Remote Support Hub is here for you.

Unified e-Mail services :-

Allows the administrator to easily send system generated email messages (like welcome email, password reset, custom messages, usage statistics, etc) to all or select user categories and publishers

Nimble :-

User category-based resource grouping and access to resources, Responsive multimedia capability to provide SDI services, Libraries and Publishers can classify content to increase resource usage by displaying videos, presentations, images, articles, documents relevant to special user categories, Interactive content management, help in related to using contents of e-resources can be made available through training videos, articles, events, webinars, etc

The library is an awareness hub where all the resources, irrespective of print and e-resources are made available to the user. At present e-resource is the backbone of any digital library in this information superfluous era. Most of the modern library users are referring to e-resources for their learning, teaching, and research activities. In all the educational institutions during this COVID 19 pandemic period this remote access technology is very much helpful

Remote access is the act of connecting to IT services, applications, or data from a location other than headquarters or a location closest to the data center. This connection allows users to access a network or computer remotely via an internet connection or telecommunications.

Remote Access Tools for Library Collections:-

Tools for Library Users and Managers are crucial to understanding these changes and the new expectations that library users have in the 21st century. Identifying, implementing, and updating new technologies, understanding copyright and fair use laws, creating metadata for access to digital collections, and meeting user needs. Libraries have become the electronic information commons of the new information age and this reference provides a vital exploration of the future.

CONCLUSION

Whether we need to access our work computer from home, view a file from our home computer while traveling, or share our screen with friends or colleagues, Chrome Remote Desktop connects you to your devices using the latest web technologies. The remote login access to e-resources is the best practice of libraries because it offers an opportunity for the best use of the electronic information resources and provides easy access to multiple resources subscribed by the library through its interface from anywhere. From that, it is observed that there is a strong demand for seamless access (without interruption) to e-resources subscribed by the library through a remote access facility provided by the library. This observation is also understood the need to resolve the access problem while downloading the full-text articles from the online databases, e-journals, etc. remotely. This is further calls for a solution to authentication problems while accessing e-resources remotely. It is, however, commendable that Library users are enjoying the remote access facility provided by the library. Most of the users felt that it is an excellent facility and helpful for them as they could access the resources of a library anywhere 24 hours a day, 7 days in a week, and 365 days in a year.

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A SURVEY ON MACHINE LEARNING TECHNIQUES USED FOR INDUSTRIAL AUTOMATION

R. Kavitha¹ and P. Subha²¹Department of CSE, Vel Tech Rangarajan Dr.Sagunthala R & D Institute of Science and Technology, Chennai²Department of IT, Sri Sai Ram Institute of Technology, Chennai**ABSTRACT**

Digitization and intelligence of manufacturing process is the need for today's industry. The manufacturing industries are currently changing from mass production to customized production. The rapid advancements in manufacturing technologies and applications in the industries help in increasing productivity. Apart from manufacturing, analytics also plays a major role for improving production. The aim of this proposed work is to build an application which gets the data from an industry database, and provides valuable conclusions, so that industries can monitor the asset performance and health of their equipment and can take corrective actions to meet the production goals, achieve desired product quality. These conclusions are usually in the form of trends, patterns, and statistics that aid business organizations in proactively engaging with data to implement effective decision-making processes. Apart from this we will predict the behaviour of industrial components with the aid of machine learning algorithms. In this proposed work we will be analyzing the performance of reactor, distillation column and fermenter.

Keywords: Digitization, Data Analytics, Machine Learning.

1. INTRODUCTION**Introduction To Industry 4.0**

Industrial production is currently driven by global competition and the need for fast adaptation of production to the ever changing market requests. These requirements can be met only by radical advances in current manufacturing technology. Industry 4.0 is a promising approach based on integration of the business and manufacturing processes, as well as integration of all actors in the company's value chain (suppliers and customers).

Industrial Revolutions

The first industrial revolution began with the mechanization and mechanical power generation in 1800s. It brought the transition from manual work to the first manufacturing processes; mostly in textile industry.

The second industrial revolution was triggered by electrification that enabled industrialization and mass production.

The third industrial revolution is characterized by the digitalization with introduction of microelectronics and automation. In manufacturing this facilitates flexible production, where a variety of products is manufactured on flexible production lines with programmable machines.

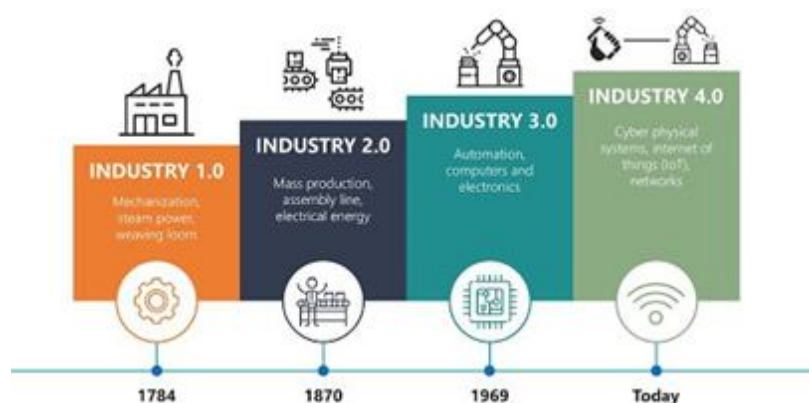


Figure 1.1: History of industrial revolution

The scope of the proposed work is to build an application which fetches the data, analyses it and provide conclusions that includes reports, trends of the selected equipment, corresponding to the selected parameter which allows to monitor the asset performance and can take corrective actions to meet the production goals, to achieve the desired product quality. This system also predicts the behaviour of the selected equipment for any unknown data using existing data by training a machine learning algorithm with the help of existing data.

2. LITERATURE REVIEW

H. Yahoui, N. Siauve, T. K. Tran, 2017, "Functional Safety and Industrial Communication Associated for the Smart Factory" [1] introduced an innovative platform designed to be used in industrial automation practical work. The platform includes the different technologies used in functional safety: safe relays, safe programmable logic controllers that can be programmed with the specific software of each manufacturer, various safe sensors, and actuators. For building a safety application system with a safety PLC or a safety relay and eventually an associated safety network, users shall consider to not only a safety programming but also technology, configuration, installation, operation, and maintenance. So, the platform helps to acquire the theoretical knowledge and experimental technical skills in industrial safety.

Ke-Sheng Wang, et al. 2017, "Intelligent Predictive Maintenance for Fault Diagnosis And Prognosis In Machine Centres" [2] proposed a framework as in Figure 2.2 to formulate a systematic approach and obtain knowledge based on Industry 4.0 concepts for predictive maintenance in machine centers based on the DM (Data Mining) result in fault diagnosis and prognosis. Harpreet Singh, Mohit Agarwal, Shantanu, Shruti Sehga, V. Bhasker, 2014, "Data Analysis Using Principal Component Analysis" [3] evaluated an algorithm using Principal Component Analysis (PCA) for its application in data analysis. In the research field, it is very difficult to understand the large amount of data and is very time consuming too.

3. METHODOLOGIES

The entire setup comprises of four stages. They are Collection of Data, Uploading Data into a Database, Retrieving the Data for Knowledge Acquisition and Prediction of Unknown Data.

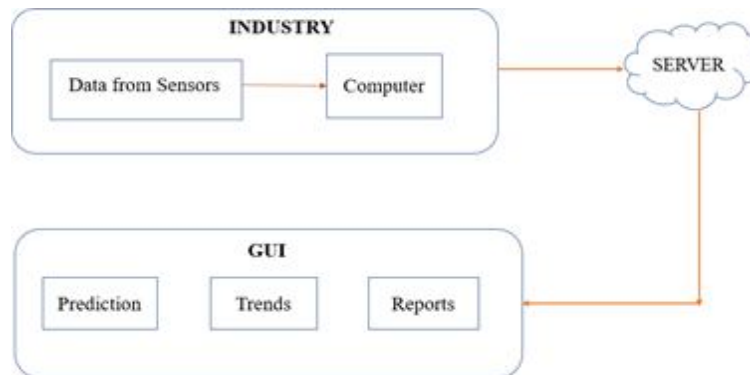


Figure 3.1: Block diagram

Module 1 : Collection Of Data

In the first stage i.e. at the industry side all the data from sensors is collected. For each equipment based on its parameters the data is collected.

Module 2 : Uploading Data Into Database

After entire data is received, it must be uploaded into any of the database like MYSQL.

Module 3 : Retrieving The Data For Knowledge Acquisition

Finally, when we run the application based on the selected equipment, selected parameter and the corresponding data will be retrieved by the application and displays the result in the form of reports, trends.

Module 4 : Prediction Of Unknown Data

In order to predict the state of the equipment for unknown data created based on our assumptions, we can use K Nearest Neighbors Algorithm (KNN).

K Nearest Neighbors Algorithm

KNN is a non-parametric method used for classification and regression. the input consists of the k closest training examples in the feature space. The output depends on whether KNN is used for classification or regression. In KNN classification, the output is a class membership. An object is classified by a plurality vote of its neighbors, with the object being assigned to the class most common among its k nearest neighbors. In KNN regression, the output is the property value for the object. This value is the average of the values of k nearest neighbors.

Algorithm

1. Determine parameter K = number of nearest neighbors.
2. Calculate the distance between the query-instance and all the training samples.

3. Sort the distance and determine nearest neighbors based on the Kth minimum distance.
4. Gather the category y of the nearest neighbors.
5. Use simple majority of the category of nearest neighbors as the prediction value of the query instance.

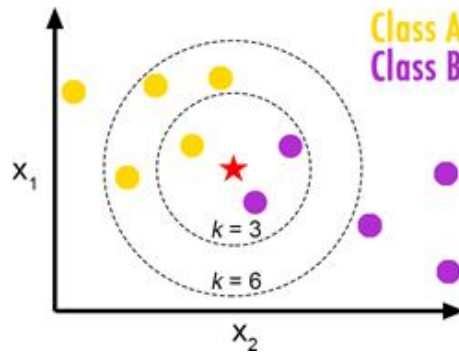


Figure 3.1: KNN Algorithm

4. COMPONENTS OF PHARMACEUTICAL INDUSTRY REACTOR

A chemical reactor is an enclosed volume in which a chemical reaction takes place. In chemical engineering, it is generally understood to be a process vessel used to carry out a chemical reaction, which is one of the classic unit operations in chemical process analysis.

TYPES OF CHEMICAL REACTORS

Batch Reactor:

Batch reactors are operated with all the material placed in the reactor prior to the start of reaction, and all the material is removed after the reaction has been completed. There is no addition or withdrawal of material during the reaction process. Figure 4.1 shows the operation of batch reactor.

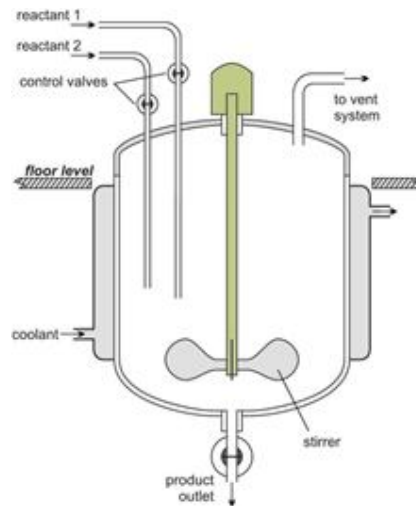


Figure 4.1: Batch reactor

Continuous Stirred Tank Reactor (CSTR):

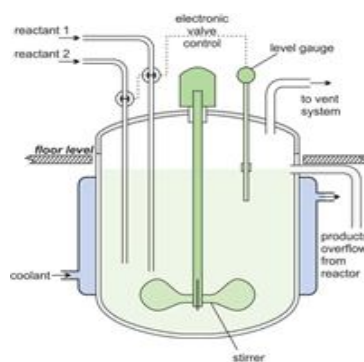


Figure 4.2: Continuous stirred tank reactor.

In a CSTR, one or more reactants, for example in solution or as a slurry, are introduced into a reactor equipped with an impeller (stirrer) and the products are removed continuously. The impeller stirs the reagents vigorously to ensure good mixing so that there is a uniform composition throughout. The composition at the outlet is the same as in the bulk in the reactor. Figure 4.2 depicts the working principle of CSTR.

Factors Affecting The Product Quality In A Reactor

Heat Transfer In The Chemical Reactor:

Chemical reactions are either exothermic (release heat) or endothermic (absorb heat). Therefore, heat transfer in reactor systems is extremely important. For exothermic reactions, heat may have to be removed so that the temperature in the reactor does not increase above safe limits. For endothermic reactions, heat may have to be added so that the reaction will occur at an acceptable rate.

Control:

With the help of a temperature sensor, we can monitor the temperature sensor within the reactor and can prevent any abnormal situations like hotspots, runaway reaction to maintain the equipment health. Multiple sensors can be used to obtain the accurate temperature value.

pH:

When aqueous solution has a pH less than or equal to 2, or more than or equal to 12.5 it is considered corrosive. Acidic corrosion starts as pitting corrosion (develop pin hole leaks).

Fermenter

A fermenter is an enclosed and sterilised vessel that maintains optimal conditions for the growth of a microorganism. The microorganism undergoes fermentation to produce large quantities of a desired metabolite for commercial use. Figure 4.3 shows the working principle of fermenter.

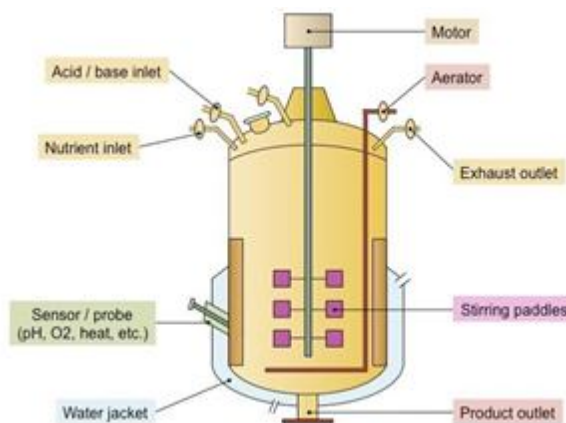


Figure 4.3: Fermenter

Critical Parameters

pH:

The best pH range for yeast fermentation is 4.5-5.5. One of the reasons, lower pH increases the fermentation rate is because the pH affects the shape of the enzymes (proteins) that help fermentation reactions.

Temperature:

If the temperature gets too warm, off-notes will be produced that will spoil the flavour you are trying to achieve and it is effect to the yeast health.

Foam:

During this process substrates containing different sugars and starches are transformed by using yeast into alcohol and carbon dioxide. During aerobic processes air is blown into the fermentation vessel in order to supply the microorganisms with oxygen. The excess air is re-leased and generates foam. Following are the disadvantages of foam overflowing vessels, increasing housekeeping costs, Interferences with processing, Damage to materials and slow drainage during drying.

Distillation Column

Distillation is the process used to separate pure liquid from mixtures of liquids, it works when the liquids have different boiling points as shown in Figure 4.4

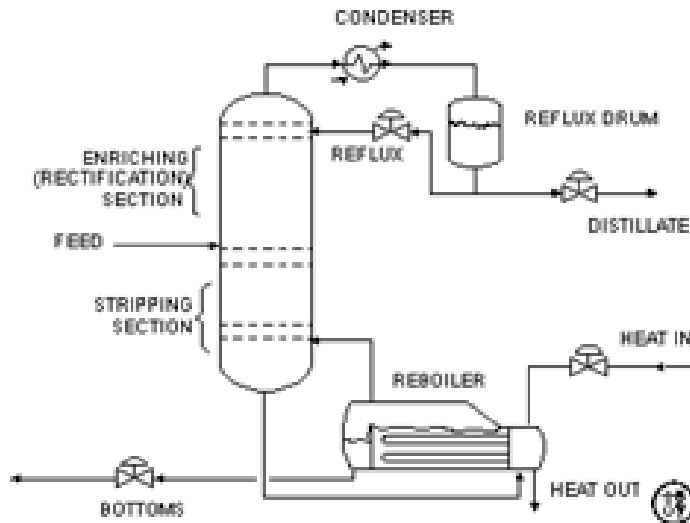


Figure 4.4: Distillation column

5. RESULTS AND DISCUSSIONS

Authentication

Admin had unique user name and password to login the application.



Enter the User name and password.

Figure 5.1: Authentication window

Dashboard



Figure 5.2: Dashboard

The dashboard contains three buttons Reports, Trends and Prediction. The admin can click on any of the buttons which opens the new window for each of one.

Reports

Entering into the reports button, opens up a new window like Figure 7.3, consisting of check buttons of equipment and a close button to close the window immediately after clicking it.

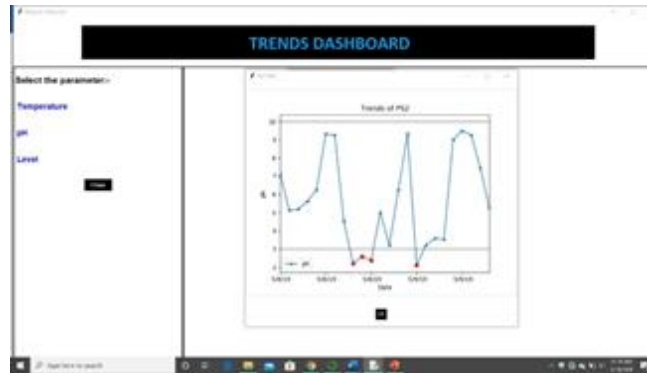


Figure 5.3: Trends of the selected parameter



Figure 8.13: Prediction window

After clicking the predict button, a new window as in Figure 7.14 will be opened displaying the prediction of the state of the selected equipment and corresponding to the selected parameter. An ok button is embedded at the bottom of the result window, on clicking it closes the result window itself.

6. CONCLUSION AND FUTURE ENHANCEMENTS

CONCLUSION

Thus by building an application, we provide a platform for pharmaceutical industries to analyze raw data and acquire useful conclusions and valuable information about each progression of working of the equipment, ensuring industrial safety and product quality. Application of Machine learning algorithms to predict the status of the equipment helps to know the upcoming faults that may occur based on previous experiences.

FUTURE ENHANCEMENTS

We can upgrade the system by sending alert messages through mail or SMS to mobile phone so that there will not be any requirement of a person to control the system. In emergency situations we can able to know the situation of the equipment immediately through SMS or mail.

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RECOVERY TECHNIQUES OF DATA SECURITY IN CLOUD USING ENCRYPTION AND DECRYPTION BY IMPLEMENTING HYBRID (RSA & AES) ALGORITHM

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ABSTRACT

This paper presents Hybrid (RSA & AES) encryption algorithm to safeguard data security in Cloud. Security being the most important factor in cloud computing has to be dealt with great precautions. This paper mainly focuses on the following key tasks:

1. Secure Upload of data on cloud such that even the administrator is unaware of the contents.
2. Secure Download of data in such a way that the integrity of data is maintained.
3. Proper usage and sharing of the public, private and secret keys involved for encryption and decryption.

The use of a single key for both encryption and decryption is very prone to malicious attacks. But in hybrid algorithm, this problem is solved by the use of three separate keys each for encryption as well as decryption. Out of the three keys one is the public key, which is made available to all, the second one is the private key which lies only with the user. In this way, both the secure upload as well as secure download of the data is facilitated using the two respective keys. Also, the key generation technique used in this paper is unique in its own way. This has helped in avoiding any chances of repeated or redundant key.

Keywords— Cloud; RSA Algorithm; AES Algorithm; Key Generation; Private key; Public key; Secret key; Authentication; Encryption; Decryption

I. INTRODUCTION

Security is one of the most difficult task to implement in cloud computing. The paper basically deals with the security issues that are experienced during the storage of data on the cloud. The cloud vendors generally store the client's data and information in cloud without following any security measures.

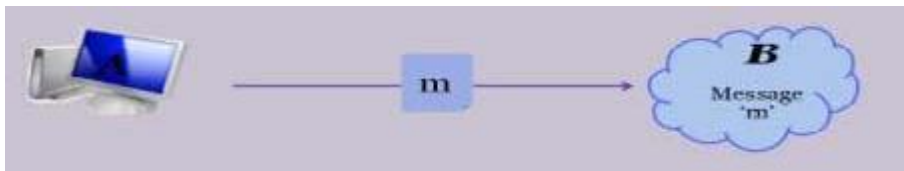


Fig.1. Data Uploaded in Cloud

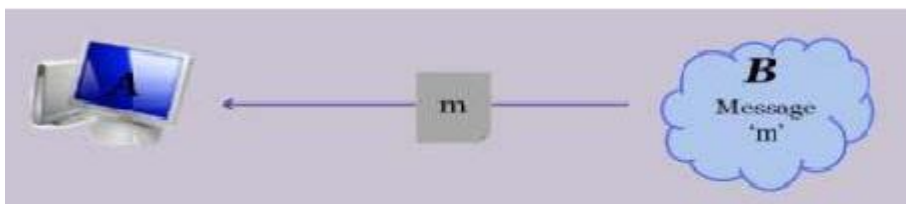


Fig.2. Data Downloaded from Cloud

Almost every cloud provider does not provide enough security measures to ensure the data safety and that's why clients waver keeping their data at some place which is very easy to be accessed by someone else.

Proposed System

The proposed system is implemented in Eye os that is one of the cloud providers. In order to apply security features, a hybrid encryption technique using the AES and RSA algorithms is used where 128 bit secret key for AES and 1024 bit key for RSA is used. Upload option leads to a generation of

RSA public key-n, RSA public key-e, RSA private key-d and AES secret key, user will require to save the RSA private key and AES secret key, As soon as user tries to upload the data on cloud, the data is first stored in a temporary directory and after calling AES and RSA algorithm, requiring the user to enter the AES secret key the file will get stored into the data base permanently corresponding to the user account and the temporary file get deleted.

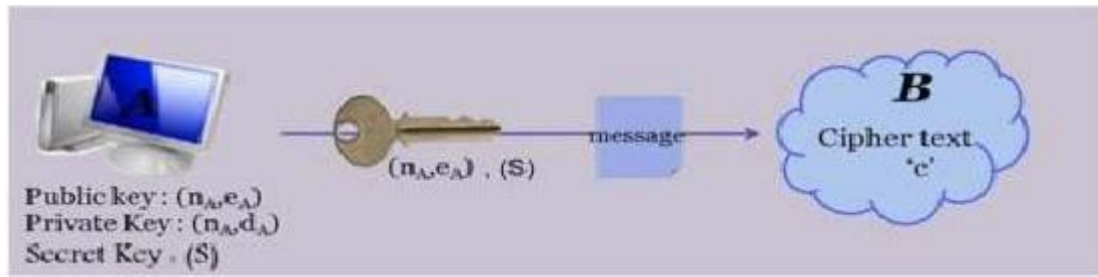


Fig.3. Data Uploaded in Cloud

Now, when the user wants to access the data stored in cloud or wants to download the data, it goes through the download procedure whereby user has to specify the filename to be downloaded and has to provide the AES secret and RSA private key which is kept secret by the user and is known only to him.

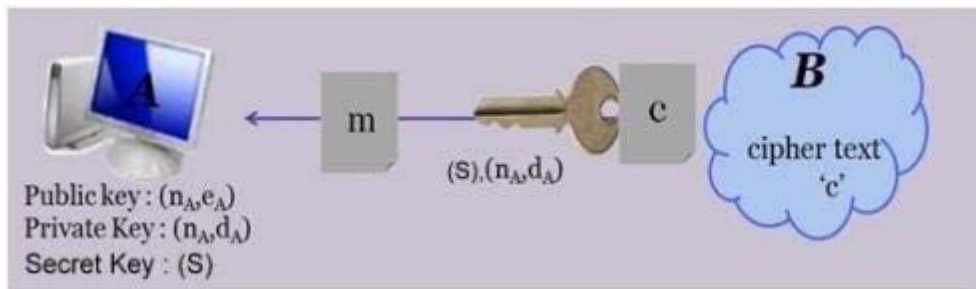


Fig.4. Data Downloaded from Cloud

II. MATERIALS AND METHODS

The proposed system basically consists of two modules

- (I) Upload Module (II) Download Module

(I) Upload Module: It consist of four parts

- (i) Authentication: User authenticates himself to the Cloud with his unique username and the password.
- (ii) Upload: This module allows user to upload his files in a secure way. Uploads the encrypted form of that data (file) in his document directory of cloud through this gateway.
- (iii) Key Generation: A key generation is based on system timing.
- (iv) Encryption: The data after uploading is first stored in the temporary file of the server that is in the Cloud. Then encrypt the data by using the public key of the user and stores the encrypted form of data in the documents of the user. The temporary files are then unlinked.

(II) Download Module: It consists of two parts

- (i) Decryption: When user wants to download his secure data, he is prompted to enter his user name along with the secret private key. By using the private key of the user the cloud decrypts the data.
- (ii) Download: Cloud send the Decrypted data to the user thereby giving the user his original data.

III. ALGORITHMS

(I) Upload Module:

Keygen procedure: It consist of different procedures primeNoSelection():

This procedure is used to generate two distinct prime numbers P and Q of specified length (i.e. bigger than the size of integer) using current system time.

- i. Set XSTRING = NULL
- ii. Set YSTRING = NULL
- iii. Repeat (iv) to (vi) until length (XSTRING) != specified length iv. XSTRING = concat (XSTRING, getCurrentSystemTime);
- v. YSTRIN = concat(YSTRING, etCurrentSystemTime*11);

- vi. Wait(50)
- vii. P=StringToBigInteger(XSTRING)
 //converts obtained string to big int viii. Q=StringToBigInteger (YSTRING)
 //converts string to biginteger
- ix. Repeat(xiv)until prime(P)!= TRUE
- x. P = P + BigInteger("1")
 // building P a prime biginteger
- xi. Repeat(xvi)untilprime(Q)!= TRUE
- xii. Q = Q + BigInteger("1")
 // building Q a prime biginteger xiii. DONE.
 keyGenerator (P,Q)

This procedure is used to generate RSA public key, private key pair by using two big prime integers P and Q, E is Public key and D is Private Key.

- i. $N=P*Q$ //Calculating public key N
- ii. $\text{PHI} = (P - 1) * (Q - 1)$
- iii. Take E, a BigInteger value of length $\text{length}(N)-1$ iv. Repeat (v) until $\text{gcd}(E,\text{PHI}) \neq 1$
- v. $E=E+1$
 //selecting random number E which is relatively prime to PHI
- vi. $D=\text{modInverse}(E,\text{PHI})$ // $E * D = 1 \pmod{\text{PHI}}$
- vii. Publish E as Public key and D as Private key
- viii. Repeat (xiv) and (xv) until $\text{length}(\text{AES_key}) \neq \text{specified length}$
- ix. $\text{AES_key}=\text{concat}(\text{AES_key}, \text{Rand om no.});$
 // Generating key x. Wait(50)
- xi. $S = \text{stringToBigInteger}(\text{AES_key})$
 //converting number obtained to big integer xii. Publish S as secret key
- xiii. DONE
 Uploadfile():

Procedure uploads desired file in the cloud by encrypting the contents of file and storing it in cloud.

- i. START
- ii. CALL keygen.class
- iii. Retrieve username filename and secret key from user
- iv. Check for validity of file
- v. If file already exists on cloud vi. Display ERROR_MESSAGE
- vii. ELSE upload file to temporary directory
- viii. CALL AESEncrypt(FILENAME, SECRET KEY) // Encrypting
- ix. Open file in read mode, $\text{FD} := \text{open}(\text{FILENAME})$
- x. Open file in append mode,

FD1 := open(concat(FILENAME,X))

xi. CALL Encryption(FD,FD1, USER NAME)

// Encrypting with RSA

xii. close FD

xiii. close FD1

xiv. Move FD1 file from temporary directory to

Documents. //Encrypted file saved

xv. Unlink FD file from temporary directory.

// deletion of file from temp folder xvi. END

AESEncrypt(FILENAME, SECRET KEY) :

This procedure is used to encrypt the given file with the help of FILENAME, SECRET KEY and AES encryption algorithm

i. START

ii. Retrieve filename and secret key iii. Create AESEncrypt object

iv. CALL setkey(secret key) v. CALL KeyExpansion() vi. CALL ReadMessage() vii. CALL test.Encrypt()

viii. addRoundkey

ix. CALL subByte() x. CALL shiftRow() xi. CALL mixcols() xii. END

Encryption (FILENAME, USERNAME, PUBLIC KEY)

//RSA Encryption:

This procedure encrypts the input file by taking username, filename from user and public key fstored in the database generated by the keygenerator

i. Read file in FD

ii. Retrieve PUBLIC_KEY_E and UBLIC_KEY_N from database with the help of USERNAME

iii. WHILE FD!=EOF

iv. FOR (i = 0 to i = 41) and (fd != EOF)

v. CALL Stringtoascii_conversion()

vi. Set ASCIISTRING:=

concat(ASCIISTRING,OFFSET)

vii. END FOR

viii. NUM=stringToInteger(ASCIISTRING)

ix. SetENCRYPT:=

[NUMPUBLIC_KEY_E] mod[PUBLIC_KEY_N]

x. Set TEMPVAR := integerTo String [ENCRYPT]

xi. Write TEMPVAR to FD1 xii. Write a Delimiter '|' to FD1 xiii. DONE.

(II) Download Module:

download (): This procedure sends the decrypted file to user i. RetrieveUSERNAME,FILENAME, PRIVATE_KEY from user

ii. Check validity of user entered data

- iii. IF(validdata)THEN//RSA Decryption Starts
 - iv. Call decryption(FILENAME, USERNAME, PRIVATE_KEY)
 - v. ENDIF
 - vi. CALL AESdecrypt(FILENAME, SECRET KEY) //AES Decryption
 - vii. Setting proper header for downloading of decrypted file
 - viii. Unlink the decrypted file ix. DONE.
- ```

Decryption (FILENAME,USERNA ME,PRIVATE_KEY)
//RSA Decryption

```

This procedure is used to decrypt the given file with the help of RSA PRIVATE\_KEY, PUBLIC\_KEY\_N and RSA decryption algorithm]

- i. Retrieve PUBLIC\_KEY\_N from database using USERNAME
  - ii. Open file for reading,
 

```
FD1 = open(FILENAME)//Decryption with RSA
```
  - iii. Open another file for writing,
 

```
FD2 = open(substr(FILENAME,-1))
```
  - iv. Repeat (v)to (ix) until FD1 != EOF v. Repeat (vi) and (vii) until CH = '|' vi. NUM = concat(NUM, CH)
  - vii. Read a charcter from FD1 into CH
  - viii. SCIISTRING= (NUMPRIVATE\_KEY ) mod (PUBLIC\_KEY\_N)
  - ix. CallSTRS=asciiToString (SCIISTRING)
  - x. Write STRS to FD2. xi. Close FD1 and FD2
  - xii. CALLAESDecrypt(FILENAME, SECRETKEY);//Decryptionwith AES
  - xiii. DONE.
- ```

AESdecrypt (FILENAME,SECREKEY)
    
```

This procedure is used to decrypt the given file with the help of FILENAME, SECRET KEY and AES decryption algorithm

- i. START
 - ii. Retrievefilenameand secret key iii. Create AESdecrypt object
 - iv. CALL setkey(secret key) v. CALL KeyExpansion() vi. CALL ReadMessage() vii. CALL test.decrypt()
 - viii. addRoundkey
 - ix. CALL subByte() x. CALL shiftRow() xi. CALL mixcols() xii. END
- ```

asciiToString (SCIISTRING)

```

This procedure is used to convert ASCII value to String which is further used in decrypting the file contents

- i. Declare STRS, OFFSET
- ii. FOR(I=0;I< length (SCIISTRING); I = I + 3)
- iii. STR1 = "";

- iv. STR2="" ;(TR1= substr (ASCIISTRING, I , 3)
- v. STR1 = STR1 – OFFSET
- vi. STR2 = char(STR1)
- vii. STRS=concat(STRS, STR2)
- viii. END FOR
- ix. Return STRS.

(IV) IMPLEMENTATION AES ENCRYPTION: Figure 1 Start Application Process, Figure 2 Login using Data Owner and Data User, Figure 3 : Login Data Owner,

Figure 4 ; Login Data User

Figure 1 Start Application

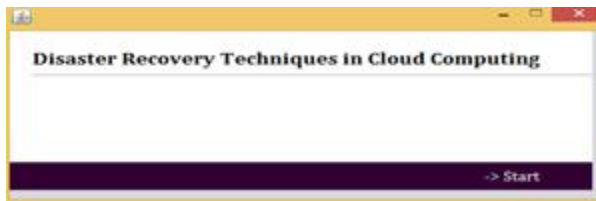


Figure 2 Data Owner and Data User Application

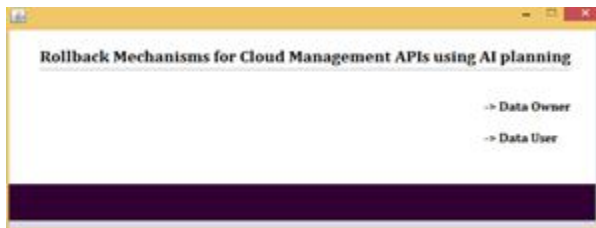


Figure 3 Login Data Owner



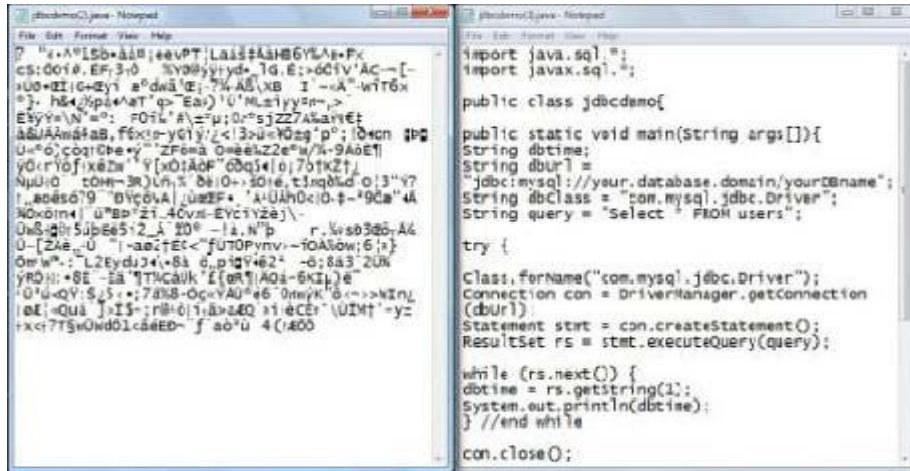
Figure 4 Login Data User



**V. RESULTS AND BENEFITS OF THE PROPOSED SYSTEM**

1. High Security is provided by using hybrid (RSA&AES) encryption algorithm.
2. 1024 bit of RSA and 128 bit of AES keys are used, so one cannot guess the private key with the help of the public keys generated.
3. Using hybrid encryption leads to high security of text file and make the access of original file by intruders near to impossible.

- 4. If a user logins and forgets to log out or leaves the system idle. In that case if a trespasser tries to download the data from the system then that person will be asked to enter the private key. In any case if a trial to guess that private key and then try to download, he will get the data as seen on the left side of the diagram shown below. He not get the original data.



- 5. To download the data in a secure way the user is always required to enter the private key and secret key. Since the private key and secret is not even known to the Cloud’s Administrator. Thus, the main advantage of proposed system is that even the Cloud’s Administrator cannot access the data of the user. In case he tries to see the data he will see it in the encrypted form as seen on the left side of the figure shown below.



V. CONCLUSION

This paper proposed a hybrid encryption algorithm using RSA and AES algorithms for providing data security to the user in the Cloud. The biggest advantage it provides us is that the keys are generated on the basis of system time and so no intruder can even guess them there by giving us increased security along with convenience. Private Key and Secret key is only known to the user and therefore user’s private data is not accessible to anyone not even the Cloud’s Administrator. The main purpose behind using RSA and AES encryption algorithm is that it provides three keys i.e. public key for encryption, and private key and secret key for decryption. The data after uploading is stored in an encrypted form and can be only decrypted by the private key and the secret key of the user. The main advantage of this is that data is very secure on the cloud.

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**EFFECTIVE MANAGEMENT OF DYSLIPIDEMIA WITH KUTAKI (PICRORHIZA KURROA ROYLE EX BENTH)**

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**ABSTRACT**

*Dyslipidemia is a metabolic disorder of lipoprotein metabolism characterized by elevation of the total cholesterol, the low density lipoprotein (LDL) cholesterol and the triglyceride concentration and a decrease in the high density lipoprotein (HDL) cholesterol concentration in the blood. Dyslipidemia is an important risk factor for atherosclerosis, coronary artery disease and cerebrovascular disease, for every 1% increase in cholesterol level there is 1-2% increase in the incidence of Coronary Heart Disease. As per Ayurveda, it can be considered as a Medadhatu Dushti that is "Medoroga". Acharya Charaka described drugs having deepana, pachana, medohar, lekhana and strotoshodhaka properties for management of Medoroga. Kutaki (Picrorhiza kurroa Royle ex. Benth) can be used in such conditions due to its lekhana and medohar properties. Various animal research studies conducted on Kutaki proved its antihyperlipidemic and hepatoprotective property. Hence a patient of dyslipidemia was treated with single dravya Kutaki in tablet form. A 55 years old male patient visited the OPD of the department of Kayachikitsa, with the complaints of weight gain, heaviness in the body and lethargy. After investigation, he was diagnosed as a case of dyslipidemia due to abnormality in cholesterol levels. He was treated with Kutaki tablet (500mg) two times a day in the morning and evening (8am-8pm) empty stomach with water for 60 days. After completion of treatment, patient was assessed by comparing Serum lipid profile value as with baseline after completion of treatment. It showed that his serum cholesterol level was decreased to 194 mg/dl from 253 mg/dl, serum LDL was reduced to 132 mg/dl from 166 mg/dl and serum Triglyceride was reduced to 178 mg/dl from 233 mg/dl. His weight was reduced to 75 kgs from 78 kgs and BMI was reduced to 28.9 kg/m<sup>2</sup> from 30.1 kg/m<sup>2</sup> with feeling of lightness in the body. Hence, it can be concluded that Kutaki is safe and effective in dyslipidemia for normalization of lipid in the blood due to its lekhana, Kapha-Medohara (alleviation of vitiated Kapha and Meda) properties.*

*Keywords- Dyslipidemia, Kutaki, lekhana, medoroga, Picrorhiza kurroa.*

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**INTRODUCTION**

Dyslipidemia is a disorder related to lipid metabolism which is manifested with abnormal levels of either one or all lipoproteins in the blood; It is characterized by elevation of the total cholesterol, the low density lipoprotein (LDL) cholesterol and the triglyceride concentration and a decrease in the high density lipoprotein (HDL) cholesterol concentration in the blood<sup>[1]</sup>.

Dyslipidemia is a significant risk factor for atherosclerosis, coronary artery disease and cerebrovascular disease, for every 1% increase in cholesterol level there is 1-2% increase in the incidence of Coronary Heart Disease<sup>[2]</sup>. The prevalence of dyslipidemia varies geographically; though, it has been estimated that more than 50% of the adult population has dyslipidemia worldwide<sup>[3]</sup>. WHO has predicted that, by 2030, cardiovascular diseases will affect approximately 23.6 million people around the world<sup>[4]</sup>.

The direct reference of dyslipidemia is not found in *Ayurveda*, but it can be correlated with *Meda Dhatu dushti* (abnormality in adipose/fatty tissue) and can be included under *Santarpanjanya vyadhi* (disease caused due to over nutrition) as "*Medoroga*". *Agni* (digestive fire) is essential for all metabolic processes in the body. Proper functioning of *Agni* results in maintaining balance of *Dosha* (bodily humour), *Dhatu* (body tissues) and *Mala* (Waste products). Derangement of *Agni* causes imbalance of *Dosha*, *Dhatu* and *Mala*. *Mandagni* (Decreased digestive fire) results in formation of "*Ama*" (undigested/partially digested food), which is the root cause for formation of all diseases. When *Mandagni* is present at the level of *Meda Dhatu* then successive formation of *Dhatu*s will not take place and *Apachita Meda Dhatu* (partially formed adipose/ fatty tissue) formed in excess. This excess formed *Meda Dhatu* gets accumulated in the body causing *Medoroga*<sup>[5]</sup>.

*Aam* is the primary cause of all metabolic disorders in *Ayurveda*. This *Ama* causes obstruction in the *strotasa* (channels) leading to the disease formation. Cholesterol is considered as one such product that produced due to metabolic impairment of fat metabolism.

In *Ayurveda* the best treatment for this condition involves correction of *Agni*, *aampachana* (digestion of *ama*) and *medanashana* (reduction of fat) which causes breaking of *samprapti* (Pathogenesis). Hence to manage this condition the selected drugs should be of *deepana* (appetizer), *pachana* (digestive), *lekhana* (scraping), *medohar*



(causing fat reduction) and *strotoshodhaka* (channel cleansing) properties<sup>[6]</sup>. *Kutaki* (*Picrorhiza kurroa* Royle ex. Benth) can be used in such conditions due to its *lekhana* and *medohar* properties<sup>[7]</sup>. Various animal research studies conducted on *Kutaki* proved its antihyperlipidemic and hepatoprotective property<sup>[8]</sup>. In this study *Kutaki* was selected as a single drug to treat a case of dyslipidemia after taking his consent.

#### CASE REPORT:

A 55 years old male working in a private institute came to *Kayachikitsa* OPD of Mahatma Gandhi Ayurveda College Hospital & Research Centre, Salod (H) Wardha with Chief complaints of weight gain, heaviness in the body, and lethargy from 6 months.

**History of present illness:** Patient was alright before 6 months, and then he gradually started gaining weight with feeling of heaviness and lethargy. He gave history of 7 kg weight gain with no any change in dietary habits or lifestyle.

**Past History:** There was no any past history of Diabetes mellitus, Hypertension, Hypothyroidism and Asthma.

**Family History:** Not significant

**Personal history** revealed that he was taking morning breakfast and meal twice a day. He was taking mixed diet. He was not doing any type of exercise and had not indulged in any bad habits like smoking, tobacco or alcohol. He had adequate sleep.

**Drug History**-Not significant

**Clinical Examination:** General examination of the patient showed that his weight was 78 kg, height 161 cm, body mass index (BMI) 30.1 kg/m<sup>2</sup> (class I obesity), blood pressure 130/80 mm of Hg and pulse rate was 76/min. His vital parameters were within normal limit. His *Prakriti* (body constitution) was *Kapha Vataja* with *Sama Agni* (normal digestive fire), *Madhyama Satva* (moderate mental strength) and *Krur Koshtha* (constipation). His physical and systemic examination was within normal limits.

#### INVESTIGATIONS DONE –

##### 1. Lipid profile-

-Serum Total Cholesterol -253 mg/dl

-Serum Low Density Lipoprotein (L.D.L) -166 mg/dl.

-Triglycerides-233 mg/dl

-High Density lipoprotein (H.D.L) -40 mg/dl

-VLDL (Very Low Density Lipoprotein)-47 mg/dl

2.Fasting Blood Sugar level-114 mg/dl

3.LFT- Liver function test-

-AST-24

-ALT-28

4.KFT- Kidney function test

-S.Creatinin-0.98

-S.urea-23

**Diagnosis**-According to National Cholesterol Education Program Adult Treatment Panel 3, following range of values have been taken for diagnosis of dyslipidemia<sup>[9]</sup>.

- Serum cholesterol >200 mg/dl
- Serum triglyceride >150 mg/dl
- S.L.D.L. >130 mg/dl
- Serum Very low-density lipoprotein >40 mg/dl
- Serum high-density lipoprotein <40 mg/dl.

From above values he was diagnosed having dyslipidemia

Table no. 1 Treatment Given:

| Name of drug         | Dose               | Anupana | Time of administration                                      | Duration | Follow up                             |
|----------------------|--------------------|---------|-------------------------------------------------------------|----------|---------------------------------------|
| <i>Kutaki tablet</i> | 500 mg twice a day | Water   | Morning and evening at empty stomach before meals (8am-8pm) | 60 days  | Every 15 days to check drug adherence |

**OBSERVATIONS AND RESULTS-**

Assessment of the patient was done before the commencement of treatment on day 0 and after completion of treatment on day 60.

Table no. 2 Assessment of Bodyweight and BMI before and after Treatment

| SN | Assessment parameters | Before Treatment (12.9.2019) | After Treatment (11.11.2019) |
|----|-----------------------|------------------------------|------------------------------|
| 1  | Bodyweight            | 78kg                         | 75kg                         |
| 2  | BMI                   | 30.1 kg/m <sup>2</sup>       | 28.9 kg/m <sup>2</sup>       |

Table no. 3 Assessment of investigations done before and after Treatment

| SN | Name of Investigation | Before Treatment (12.9.2019) | After Treatment (11.11.2019) |
|----|-----------------------|------------------------------|------------------------------|
| 1  | Total cholesterol     | 253 mg/dl                    | 194 mg/dl                    |
| 2  | Triglycerides         | 233 mg/dl                    | 180 mg/dl                    |
| 3  | HDL                   | 40 mg/dl                     | 46 mg/dl                     |
| 4  | LDL                   | 166 mg/dl                    | 112 mg/dl                    |
| 5  | VLDL                  | 47 mg/dl                     | 36 mg/dl                     |
| 6  | FBS                   | 114mg%                       | 101mg%                       |
| 7  | AST                   | 24 I.U./L                    | 22 I.U./L                    |
| 8  | ALT                   | 28 I.U./L                    | 21 I.U./L                    |
| 9  | S. Creatinine         | 0.98 mg%                     | 0.82 mg%                     |
| 10 | S. Urea               | 23 mg%                       | 21 mg%                       |

After completion of treatment as shown in Table no. 1, results were assessed which showed a significant reduction in lipid profile parameters (serum cholesterol, low-density lipoprotein, and triglyceride), body weight, and BMI. Reduction in body weight and BMI has been shown in Table 2 and reduction in lipid parameters have been shown in Table 3. After completion of the treatment, the patient felt a lightness in the Body. Results showed that there were no significant changes in serum ALT, AST, urea, and creatinine after completion of treatment as compared to baseline levels [Table 2]. This implies the safety of the drug. During treatment, the patient was advised to follow his routine daily lifestyle as it is.

**DISCUSSION-**

Treatment of *Medoroga* includes *Nidan Parivarjana* (avoidance of etiological factors) *Shodhana Chikitsa* (Purification measures) and *Shamana* (Internal medicine). In *Shaman Chikitsa* drugs having *deepana* (appetizer), *pachana* (digestive), and *lekhana* (scraping) properties are used which causes *agnidipana* (appetite stimulation) and *amapachana* (digestion of undigested/partially food).

Acharya Charak included *Kutaki* (*Picrorhiza kurroa* Royle ex. Benth) in *Lekhaniya Gana* (Class of drugs causing scraping action). In *Samhita*, *Kutaki* is described as having *Tikta Rasa* (bitter taste), *Ushna Virya* (hot potency), *Agnideepan*, *Pachana*, and *Lekhana* properties and it is mainly used in all types of liver disorders like Jaundice and blood disorders<sup>[10]</sup>. In *Dhanvantari nighantu*, *Amaghi* is used as a synonym of *Kutaki* as it helps in removing *Ama* and thereby cures diseases. It has stimulating and strengthening effects on the liver.

#### Probable mode of action of *Kutaki*-

*Kaphamedahar* property of *Kutaki* helps in alleviating increased *Kapha* and *Meda*. *Agnideepan* property of *Kutaki* corrects *Mandagni*, *amapachana* property helps to remove *Ama* and improves liver function which leads to breaking *Samprapti* (pathogenesis). *Lekhana* property helps in scraping action thereby aids in removing accumulated *Meda*. *Kutaki* has a direct effect on the functioning of the liver. Once the functioning of the liver is corrected, the synthesis of cholesterol may be checked and excretion of cholesterol may be increased by stimulating bile production and secretion.

*P. kurroa* possesses choleric activity. It contains iridoid glycosides (including picroside I, II, III, pikuroside, kutkoside, and 6-feruloyl catalpol), cucurbitacin glycosides, androsin, apocynin, and other organic acids such as vanillic and cinnamic acids<sup>[11]</sup>. Based on these properties, one may anticipate its pharmacodynamic activity on lipids specifically related to lipid disorders<sup>[12]</sup>. Picroside I have earlier been shown to be active in several models of liver toxicity<sup>[13]</sup>. A research study conducted in mice given a high-fat diet, 50-200mg/kg of *Picrorhiza kurroa* daily for 12 weeks appears to be able to normalize most parameters of lipid metabolism (triglycerides, cholesterol, LDL-C) although without apparent influence on HDL-C; these changes were thought to be secondary to aiding the liver<sup>[14]</sup> and has been seen elsewhere with lipid alterations induced by PX-407<sup>[15]</sup>.

It has hepatoprotective, anti cholestatic, antioxidant, antidiabetic, and immune- modulating properties. The hepatoprotective action of *Kutaki* may be attributed to its free radical scavenging activity. Additionally, it has been shown to stimulate liver regeneration in rats, probably by increasing nucleic acid and protein synthesis. In rats infected with malaria, *Picrorhiza* restored depleted glutathione levels, thereby enhancing detoxification and antioxidation, thereby maintaining a normal oxidation-reduction balance (Chander et al., 1992)<sup>[16]</sup>.

#### CONCLUSION-

*Kutaki* is effective and safe in normalizing lipid profile, reduction of weight; BMI, in case of dyslipidemia.

**Recommendations-** It is recommended that comparative the study should be carried out on large number of patients with dyslipidemia to prove safety and efficacy of *Kutaki*.

**Financial support and sponsorship-** Nil.

**Conflicts of interest-** There are no conflicts of interest.

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**AN EVOLUTIONARY STUDY OF GEOSPATIAL DATA AND TECHNOLOGIES WITH OPEN SOURCE SOFTWARE FOR WEB MAPPING**

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**ABSTRACT**

*The previous decade has seen a consistent development of open source programming use in industry and the scholarly world, prompting a mind boggling environment of projects. Web and accordingly topographical data frameworks have become noticeable advancements, generally embraced in assorted spaces. Inside this unique situation, we built up an open source web stage for interoperable GIS-services. To execute this design, 14 undertakings were chosen what's more, investigated, including the customer side libraries and the worker side parts. Albeit different reviews have been directed around there, little criticism has been officially gotten from the clients and engineers concerning their assessment of these devices. A poll was intended to acquire reactions from the important online networks about a given arrangement of qualities. This article depicts the advancements and reports the consequences of the overview, giving direct data about open source web and geospatial devices.*

*Keywords: FOSS , GIS-Services , Spatial RDBMS , Web mapping.*

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**1- INTRODUCTION**

The creation and use of free and open source programming (FOSS) has developed impressively over the previous decade, for the most part because of its improved quality and financial factors (Deshpande and Riehle, 2008). FOSS joins the idea of free programming and open source programming. Free programming identifies with the client's opportunity to run, duplicate, convey, study, change and improve the product (Stallman, 2009). Open source programming is by and large dispersed under licenses affirmed by the open source activity (OSI). Inside the open source biological system, web innovations have arisen as one of the predominant spaces. This has happened because of the coming of the Internet 2.0 in the most recent decade, which required free, interoperable, standard-agreeable programming segments. Accordingly, a few open source projects tested business contenders and arrived at a significant client base.

In equal, work area based topographical data frameworks (GIS) have effectively converged with Web 2.0 advancements bringing about web planning, which has gotten an omnipresent component of online administrations. The accessibility of open topographical datasets from sources, for example, Open-Street-Map has fuelled the advancement of an enormous number and assortment of open source web planning projects, contributing an option to grounded business administrations like Google Guides. Inside this specific situation, the open-geospatial consortium (OGC) has proposed principles for geological information and encouraged the plan of interoperable open source GIS devices. With such a plenitude of various innovations accessible, it is hard for an engineer to gauge the benefits of each approach. In spite of the fact that there is an assortment of hypothetical work here, the speed of improvement has made a hole in the information with respect to the functional parts of creating open source electronic geospatial information conveyance administrations.

The objective of this article is to depict the chosen projects and examine the aftereffects of the online study, giving the peruses a sign of the attributes of these open source instruments. The outcomes feature the qualities and shortcomings of the ventures being considered and will fill in as a helpful manual for the designers in arrangement how this geospatial open source nature is advancing and moreover help them in deciding which open source innovations to utilize. Thus, engineers at this point don't need to depend exclusively on the data given by the sites of such open source projects, which of course can be one-sided and self-advancing.

**2- RELATED WORK**

Lately, there has been a developing interest in the various parts of the open source wonder. This interest isn't limited to the customary software engineering disciplines, for example, programming, yet additionally accepts human-PC association. Nichols and Twidale (2003) have led a subjective examination on the attributes of open source projects regarding their ease of use. A study about ease of use by Andreasen et al. (2006) examines practices and assessments among supporters through on the web polls, while an exact examination caught the convenience factors in open source projects from the givers' point of view (Raza and Capretz, 2010). Given the irregular cosmetics of the open source creation framework, comprising of paid what's more, chipped in commitments, financial experts are keen on arrangement and demonstrating its highlights. Deshpande and Riehle (2008) distinguish a remarkable development in the number of open source projects since 2000. Bitzer et

al. (2007) have examined the intentions driving the supporters of commit time and assets towards open source advancement, while Bonaccorsi and Rossi (2003) have researched the conversation of open source advancements. As the wide-spread reception of open source GIS advances proceeds, interest in understanding and ordering their highlights has expanded. An overall audit of free and open source advances for geomatics is offered by Sanz-Salinas and Montesinos-Lajara (2009), in which the connections between projects are featured. Other examines center exclusively around open source work area apparatuses as far as functionalities (Sherman, 2008; Steiniger and Bocher, 2009), while Steiniger and Roughage (2009) give a similar examination between open source and business work area GIS bundles.

**3- TECHNOLOGY REVIEW**

During the execution of the design portrayed by McArdle et al. (2010), a scope of advances were inspected and classified into seven regions as follows: web GUI libraries, AJAX libraries, web planning workers, web application structures, object-social planning, spatial libraries, spatial DBMS. Two activities for every one of the seven classes were recognized as appropriate for building up a web planning design what's more, these were concentrated further. In complete 14 tasks, OpenLayers, Ext JS, Model, MooTools, GeoServer, MapServer, GeoTools, Java Geography Suite (JTS), Ruby on Rails, Vessels, Sleep, Rest Spatial, PostGIS, MySQL, were inspected and remembered for the review portrayed in this article. The activities are not in direct rivalry, as they are frequently between subordinate. While in a few circumstances, an innovation can be a clone of another (e.g., Ruby on Rails and Chalice), in different cases it tends to be a more specific spatial augmentation of another (e.g., Sleep also, Sleep Spatial). Different activities which seem comparable may indeed be answerable for diverse utilitarian territories as are not rivaling one another (e.g., OpenLayers and Ext JS). This overview doesn't endeavor to cover all the open source projects at present dynamic in the geospatial zone however centers around the particular area of web planning. The online networks related with these tasks are perhaps the most intriguing angles of the open source programming projects.

A comparison of open source geospatial technologies for web mapping.

| <i>Project</i>    | <i>Owner</i>                                                | <i>Year</i> | <i>License</i>     | <i># users</i> | <i>Website and users</i>                                                                                          |
|-------------------|-------------------------------------------------------------|-------------|--------------------|----------------|-------------------------------------------------------------------------------------------------------------------|
| OpenLayers        | (MetaCarta until 2007) Open Source Geospatial Foundation    | 2006        | BSD-like           | 1,450          | <a href="http://openlayers.org">http://openlayers.org</a><br>MetaCarta                                            |
| Ext JS            | Ext                                                         | 2006        | GNU GPL/Commercial | 127,000        | <a href="http://www.extjs.com">http://www.extjs.com</a><br>Adobe, Amazon.com, Microsoft, Sony                     |
| Prototype JS      | The Prototype Core Team, 37 Signals                         | 2006        | MIT                | 3,200          | <a href="http://www.prototypejs.org">http://www.prototypejs.org</a><br>Apple, CNN.com, Nasa ,Twitter              |
| MooTools          | The MooTools Dev. team                                      | 2005        | MIT                | 2,500          | <a href="http://mootools.net">http://mootools.net</a><br>Jeep, Ferrari                                            |
| MapServer         | University of Minnesota                                     | 1996        | X/MIT              | 1,880          | <a href="http://mapserver.org">http://mapserver.org</a><br>Camptocamp, WebMapIt, Syncera IT Solutions             |
| GeoServer         | Lime Group, The Open Planning Project, Refractions Research | 2001        | GNU GPL            | -              | <a href="http://geoserver.org">http://geoserver.org</a><br>Alkante, Cramptocamp, Landgate                         |
| GeoTools          | Open Geospatial Consortium                                  | 1996        | GNU LGPL           | 1,059          | <a href="http://www.geotools.org">http://www.geotools.org</a><br>Vision of Britain                                |
| JTS               | Martin Davis                                                | 2000        | GNU LGPL           | -              | <a href="http://www.vividsolutions.com/jts">http://www.vividsolutions.com/jts</a><br>GeoConnections               |
| Ruby on Rails     | David Heinemeier Hansson, 37 Signals                        | 2004        | MIT                | 20,000         | <a href="http://rubyonrails.org">http://rubyonrails.org</a><br>Basecamp, Twitter, Yellow Pages                    |
| Grails            | SpringSource (WMWare)                                       | 2006        | Apache v2.0        | 4,600          | <a href="http://grails.org">http://grails.org</a> Sky.com<br>Wired.com                                            |
| Hibernate         | Red Hat                                                     | 2001        | GNU LGPL           | 57,000         | <a href="http://www.hibernate.org">http://www.hibernate.org</a><br>UnionBank, Warner Music Group                  |
| Hibernate Spatial | GeoVise                                                     | 2003        | GNU LGPL           | 100            | <a href="http://www.hibernatespatial.org">http://www.hibernatespatial.org</a><br>N.A.                             |
| PostGIS           | Refractions Research                                        | 2001        | GNU GPL            | 1,790          | <a href="http://postgis.refractions.net">http://postgis.refractions.net</a><br>GlobeXplorer, Institut Gographique |
| MySQL             | Sun Microsystems                                            | 1994        | GNU GPL            | -              | <a href="http://www.mysql.com">http://www.mysql.com</a><br>Twitter, LinkedIn, United Nations FAO                  |

**Table 1** -Projects overview including project owner, year of foundation, estimate of number of users and contributors.

**3.1 Web GUI libraries-** Because of the dissemination of AJAX-arranged web innovations, web GIS has encountered exceptional development over the previous decade. Notable administrations, for example, Google Guides and Virtual Earth give designers ground-breaking and free web instruments. Albeit these

Items are famous, they are completely constrained by organizations that can choose to change or on the other hand cease them self-assertively.

Besides, there is no reasonable partition between the perception instruments and information, the two are blended in a consistent way thus the GUI can't be redone. Despite what might be expected, open source planning libraries offer feasible options to assemble amazing intelligent web maps, permitting the designer to pick the information sources furthermore, designs. In this study, OpenLayers, a famous open source web planning project, also, Ext JS, a library to construct complex Web UIs are surveyed.

Open Layers is a JavaScript library for showing spatial information in internet browsers, without worker side conditions. Open Layers executes a JavaScript Programming interface for building rich electronic geographic applications, establishing the principle open source option to the same business instruments.

**3.2 AJAX libraries:-** Prior to the appearance of AJAX, collaboration with pages was a simultaneous pattern of demand/reaction between the customer and the worker. AJAX, which means no concurrent JavaScript + XML, is definitely not a particular innovation however a methodology that can be executed with different advancements, whose name and general standards were characterized in an original article by Garrett (2005). Such a methodology presented an intermediated layer between customer and worker, allowing the customer to demand information for a particular subsection of the substance, adding no concurrent calls between the nuclear simultaneous calls. Albeit the thought was first introduced in 1992, it was not until Google delivered Gmail and Google Guides in the center of the most recent decade that AJAX went standard. This methodology received in Google Guides opened a few prospects to the web GIS field, which on account of AJAX has developed extensively.

**3.3 Web mapping servers :-** Web planning workers go about as a structure to distribute a GIS application on the web. For the most part, these workers incorporate usefulness to inquiry spatial DBMS, projection uphold, combination with other geographic libraries just as vector and raster uphold. Additionally, interoperable web guidelines have been created by the OGC on the side of web planning, including WMS, WFS, web inclusion administration (WCS), geology markup language (GML) and styled layer descriptor (SLD). WMS and WFS are generally utilized administrations to demand maps and get data about the geographic highlights. These OGC guidelines have permitted various activities to be distributed online since the start of the FOSS development (Sanz-Salinas and Montesinos-Lajara, 2009). MapServer and GeoServer have been remembered for this overview. MapServer, depicted by Kropla (2005), is a broadly utilized open source web planning project for creating intelligent and interoperable web GIS applications. Completely consistent with different OGC principles, for example, WMS, WFS, WCS and SLD, MapServer upholds a broad assortment of vector and raster designs. MapServer runs as a typical passage interface (CGI) application with Apache and Microsoft web workers. MapServer has solid cartographic help and dynamic abilities. A guide record characterizes styles and symbology that are utilized to deliver a completely altered guide.

**3.4 Spatial libraries:-** Spatial libraries give spatial programming segments which can be abused in work area also, web GIS applications. There are a few open source spatial libraries accessible on the web. an open source cartographic projection library is one such model that is broadly utilized by numerous customer and worker side GIS applications, including MapServer .Different models, for example, math motor open source (GEOS) characterize the topological predicates and activities needed to deliver a guide. As indicated by Câmara et al. (2009), the notoriety of these libraries is because of their quality and security. This study covers GeoTools and the JTS. GeoTools is an open source Java library that gives progressed GIS functionalities. It underpins vector and raster geospatial information designs, DBMS access and delivering of complex guides. Being probably the most seasoned task of Open Geospatial Establishment, it is completely agreeable with OGC particulars including GML, WMS, WFS, lattice inclusion, facilitate change and SLD. The JTS, portrayed in Segment 3.4, can be utilized in combination with GeoTools as a math model for vector highlights. This library can be utilized in customer and worker side geospatial applications. It is at present utilized by GeoServer) for a scope of geographic errands. Turton (2008) gives a set of experiences and an outline of GeoTools. JTS is a generally utilized open source Java library for taking care of 2D mathematical activities. It adjusts to the calculation model and Programming interface characterized in the straightforward highlights particular (SFS) proposed by OGC. JTS gives admittance to straightforward capacities, for example, buffering, overlays (convergence, association and contrast) just as further developed functionalities like spatial calculations and construction uphold (spatial ordering, planar chart structure, calculation disentanglement, Delaunay triangulation and exactness decrease). This library is utilized in a scope of open source geospatial projects including GeoTools, PostGIS, GeoServer and Rest Spatial.

**3.5 Web application frameworks---**As a feature of the Internet 2.0 progress, portrayed by O'Reilly (2005), programming applications have been moving to the Internet. Growing ground-breaking web applications has become a conspicuous action in the product business during the previous decade, as of late arriving at the GIS

field. From a computer programming point of view, the Light-footed techniques furthermore, rehearses reviewed by Martin (2003) underline variation to these evolving conditions, adaptability, effortless, convenience and client focused plan. Lite advancement standards have roused the plan of various effective open source projects that have demonstrated to be especially successful in a particularly impermanent and serious setting. For this review, two driving systems for web advancement, Ruby on Rails what's more, Chalice, have been assessed. Ruby on Rails is a structure for a fast web application improvement dependent on the model-see regulator worldview. The undertaking additionally authorizes plan standards, for example, show over design and don't rehash yourself (DRY), bringing down monotonous activities in the improvement cycle, driving the designer's consideration regarding the business rationale past the stage subtleties. The structure models the whole application, from the pages down to the fundamental social data set, implementing an unbending construction. The primary language utilized in the system is the unique language Ruby, made by Yukihiro Matsumoto mixing portions of Perl, Smalltalk, Eiffel, Ada and Drawl. Ruby's punctuation is expected to plan straightforwardly characteristic language and will in general be compact and without laces. Among the bundles that form the structure, Active Record gives an object-social planning framework for data set admittance, while ActiveRecord encourages the making of web administrations. Ruby on Rails has no local spatial help, in spite of the fact that it is conceivable to plan spatial information physically to a spatially-empowered data set, for example, MySQL. Thomas and Hansson (2009) have incorporated a definitive and broad guide for utilizing Ruby on Rails.

**3.6 Object-relational mapping**--Regularly, designers use data sets to store and keep up constant items. Notwithstanding, for this methodology to be effective, thought of how items are planned to the social information base administration framework (RDBMS) should be thought of. Information bases are normally intended to store information, objects are characteristically more mind boggling, comprising of information joined with state and conduct thus can't be put away straightforwardly in the information base. One of the forces of the article arranged worldview is the legacy model which offers the chance for code reuse. This contrasts from RDBMS whose basic role is to eliminate excess among put away information instead of model true substances and conduct. Inside GIS applications, taking care of the planning between the article situated worldview what's more, the social model is critical because of the complex spatial articles which require effective capacity in information bases. A few systems have been created to handle this planning by giving an interface to help designers, concealing low-level execution subtleties. In this study, Rest and its spatial augmentation, Rest Spatial, are explored.

**3.7 Spatial DBMS**--A spatial DBMS offers spatial information types in its information model and inquiry language, gives spatial ordering and calculations for spatial inquiries (Shekhar and Chawla, 2003). Prophet Spatial, PostGIS and MySQL are a portion of the well known Spatial DBMS bundles in this space. Progression and mindfulness in geospatial advancements has offered ascend to normalization and accordingly most Spatial DBMS adjust to the OGC SFS. This standard is broadly trailed by practically all SQL data sets and gives an approach to get to what's more, store geographic information types alongside related capacities and information tasks. In this review, PostGIS and MySQL are analyzed.

PostGIS is a spatial augmentation of the PostgreSQL information base administration framework and is a notable open source project for putting away and questioning geological substances. PostGIS is broadly upheld by countless restrictive and open source web planning workers. It is completely consistent with OGC principles, for example, SFS for SQL. Aside from the fundamental spatial help, PostGIS likewise has geography, information approval, organize change and Programming interface functionalities. As the task keeps on developing, extra highlights for raster uphold, directing, three dimensional surfaces, bends and splines have been proposed. Obe and Hsu (2009) give the most legitimate reference manual for PostGIS. MySQL is a broadly utilized open source RDBMS, which, since variant 4.1, incorporates uphold for spatial expansions utilizing an extra calculation segment for the capacity and investigation of geographic highlights. These highlights could be any element having mutiple measurement and related locational data. MySQL completely actualizes the SFS and upholds R-tree ordering to accelerate information base activities. It works on different stages and establishes a critical part of the open source Light system (Linux, Apache, MySQL, PHP/Perl/Python), subsequently making this a famous open source project. Widenius et al. (2002) offer a reference manual for MySQL.

#### 4 - ONLINE SURVEYS

Direct information with respect to open source projects was gotten from dynamic Engineers through online surveys .Given the idea of open source online networks, such reviews are an especially appropriate method of getting access to the local area individuals. For this reason, we have planned an unknown poll with 13 inquiries,



three of which cover the respondent (commitment, connection and level of ability), while ten are identified with the qualities of the undertaking being broke down (expectation to learn and adapt, solidness, execution, adaptability, interoperability, extendibility, guidelines, documentation, local area backing, and recurrence of updates). The full poll is duplicated in Index. Each question on the product is estimated on a five-point discrete visual simple scale, 1 being the base score and 5 the most extreme. It is significant not to drive the responder to offer a response when it isn't important or intriguing to them, so each answer incorporates a 'no answer' choice. To amplify the measure of reactions, every poll was intended to be finished in less than 120 seconds. Every survey centers on a particular venture, posing similar inquiries for all the projects, which permits the reactions to be thought about in a quantitative manner. A web home page, introducing a short depiction of the overview to people in general and connecting the 14 polls, was made and distributed online. This page has been dispersed through a few channels with a challenge to take the polls for the advances that the responder has utilized straightforwardly. The people group individuals are urged to take the review absolutely to add to scholarly research with no financial motivating force. The declaration was posted on the authority gatherings and mailing arrangements of each task.

## 6 CONCLUSIONS

This article gives an investigation of 14 open source projects nearby web and GIS Innovations. This exploration was completed with regards to the improvement of a web stage for open GIServices .In our past work, we centered on the usefulness and design of the stage. In actuality, in this article we present a nitty gritty overview of the open source GIS scene, zeroing in on 14 agent web advancements. This investigation comprises of two sections. First and foremost, general parts of each undertaking were analyzed through a writing audit, which uncovered the absence of extensive overviews in the field of open source web GIS innovations. An overall outline of the ventures is introduced, summing up their motivation, highlights and online local area size. Furthermore, an online poll was conceived and distributed to gather the conclusions from the significant online networks of clients and engineers. Each task was evaluated on ten measures identified with their useful use for programming improvement and criticism was gotten from 301 responders. From the general scores got across all the tasks, it is conceivable to derive a higher fulfillment for the consistence towards open principles and programming security than for the task documentation and the expectation to learn and adapt. A visual portrayal of the scores for each task permits the peruse to look at their qualities for use in various application spaces. As the utilization of open source geo-spatial innovations builds, these outcomes are material to a wide scope of spaces where intelligent guides are required. Numerous customary online administrations are presently being enlarged with spatial parts.

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A NEW ANTHRAQUINONE FROM THE ROOTS OF *CASSIA ALATA*Anup S. Balte<sup>1\*</sup>, Praveen Kumar Goyal<sup>2</sup>, K. M. Sharma<sup>2</sup> and R. R. Aggarwal<sup>3</sup><sup>1</sup>\*Research Scholar, School of Science, Career Point University, Kota, Rajasthan<sup>2</sup>School of Science, Career Point University, Kota, Rajasthan<sup>3</sup>Department of R.S. & B.K., Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur, Rajasthan

## ABSTRACT

A novel anthraquinone 1,5-Dihydroxy - 7-hydroxymethyl-3-methylanthraquinone having 1,5-dihydroxy system is being reported for the first time and was identified by its IR and <sup>1</sup>H NMR spectral studies.

Keywords *Cassia alata*, Anthraquinone, 1,5-Dihydroxy - 7-hydroxymethyl-3-methylanthraquinone

## INTRODUCTION

*Cassia alata* is a largely spreading shrub flowering in rainy season, introduced from West Indies and grown for ornamental as well as medicinal value. The plant is reported to possess anti-inflammatory, hydragogue, sudorific and diuretic properties and is used in snake bite. A decoction of leaves and flowers is widely employed as a remedy for ringworm and other skin diseases like herpes, blotch, eczema and mycosis. The dried leaves are used for treating syphilis, gonorrhoea and leprosy, they are employed as an abortifacient or to hasten delivery. The leaves are insecticidal, anthelmintic and piscicidal also. A decoction of the leaves and flowers is also useful in bronchitis, asthma and stomatitis. A strong decoction of the root is diuretic, it is given in rheumatism and used against tympanitis. The leaves and roots are purgative.<sup>1,2</sup> *C. alata* revealed the presence of anthraquinones as the most common constituent both in free form as well as their glycosides along with sterols, fatty acids, polyalcohols and galactomannans from its fruits<sup>4</sup>, leaves<sup>5-10</sup>, seeds<sup>11-14</sup>, stem<sup>15-19</sup> and roots<sup>20,21</sup>. Leaf extract of *C. alata* reduced blood sugar in streptozotocin induced hyperglycaemic animals. It also showed anti-inflammatory<sup>22</sup>, analgesic<sup>23</sup> and antimutagenic activities and caused immediate decrease in motor activity, enophthalmus hyperemia, micturition and diarrhoea<sup>24</sup>. Organic extracts of leaves, and stem bark exhibited antibacterial<sup>25</sup> and antifungal<sup>26,27</sup> activity especially against dermatophytic fungi<sup>28,29</sup>. The pet. ether extract of aerial parts showed larvicidal activity<sup>30</sup>.

## RESULT AND DISCUSSION

Compound 1 (Fig 1) was isolated as yellow powder, after crystallization with benzene methanol mixture, m.p. 245-48°C. The mass spectral studies and its elemental analysis indicated its molecular formula to C<sub>16</sub>H<sub>12</sub>O<sub>5</sub>. The colour reactions with methanolic NaOH and magnesium acetate were indicative of its anthraquinone nature. Appearance of violet colour with neutral FeCl<sub>3</sub> solution indicated the presence of phenolic group which was placed at □-position to the C=O group as it gave a green colour with ethanolic CuSO<sub>4</sub><sup>255</sup>. Further, it gave violet colour with conc. H<sub>2</sub>SO<sub>4</sub> which was indicative of 1,5-dihydroxy system in the molecule<sup>257</sup>.

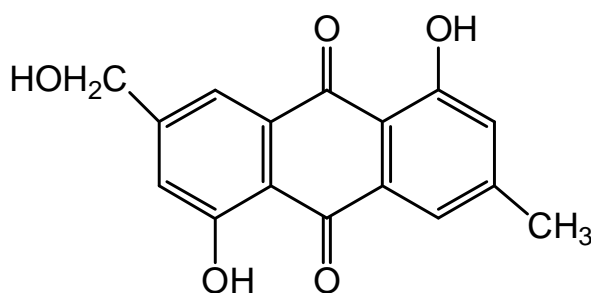


Figure 1

In the IR spectrum, a broad peak appeared at 3300 cm<sup>-1</sup> indicating the presence the hydroxyl group/s. Further, the peak at 1200 and 1050 cm<sup>-1</sup> (C-O stretching) indicated that there were phenolic as well as primary alcoholic groups. A peak at 1630 cm<sup>-1</sup> for chelated C=O stretching confirmed the presence of 1,5-dihydroxy system<sup>258</sup>.

In the NMR spectrum, two doublets at δ 6.58 and 7.68 appeared for H-6, and H-8 respectively. The singlets at δ 7.06 and δ 7.53 could be attributed to the protons on C-2 and C-4 respectively. A singlet at δ 2.43 showed the presence of methyl group at C-3 and a broad singlet at δ 4.65 appeared due to the methylene protons of hydroxy-methyl group. In the aromatic ring the characteristic downfield signals for the chelated hydroxy group at δ 12.16 and 12.09.

**EXPERIMENTAL****General details:**

Melting points were determined in glass capillary tubes in an electrothermal melting point apparatus. All solvents used were of analytical grade. The column and thin layer chromatography were conducted on silica gel (60-120 mesh). Spots on TLC plates were visualized in UV light, by spraying with 2% ceric ammonium sulphate in 2N H<sub>2</sub>SO<sub>4</sub>. The infrared spectra were recorded as KBr pellets on Perkin-Elmer 557 model spectrometer and A400S, Shimadzu, FT-IR spectrometer. <sup>1</sup>H NMR spectra were recorded on Bruker DRX 200 FT NMR and Jeol Al 500 MHz instruments using CDCl<sub>3</sub> as solvents and TMS as an internal reference. EIMS spectra was recorded on a Hitachi model RMU 6E and Jeol D-300 mass spectrometer.

**Plant source:**

The roots of *C. alata* Linn. were collected from Jhotwara in north-west Jaipur in the rainy season and identified in the Department of Botany, University of Herbarium Sheet Rajasthan, Jaipur (No. RUBL 19903).

**Extraction and isolation:**

Air-dried and coarsely powdered roots were extracted exhaustively with ethanol (95%) on a steam bath for 8 hrs thrice. The extract was concentrated under reduced pressure whereby a dark brown solid was obtained. The ethanolic extract was re-extracted with ethyl acetate which on concentration afforded dark brown solids. This solid was chromatographed over a column of silica gel. Elution was carried out with solvents of increasing polarity, viz., pet. ether, benzene, ethyl acetate and methanol. The fractions from benzene were collected and after repeated crystallization from benzene methanol to afford compound 1 as yellow powder, m.p. 245-48 °C.

|                                             |                                                                                                                                             |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elemental analysis</i>                   | <i>Found value , C, 67.60; H, 4.22%</i><br><i>Calculated value C<sub>16</sub>H<sub>12</sub>O<sub>5</sub>, C, 66.65; H, 4.23%</i>            |
| <i>IR (ν<sub>max</sub>) cm<sup>-1</sup></i> | <i>(KBr) 3300 (O-H), 2940, 1630, 1590, 1470, 1400, 1260, 1230, 1200, 1050, 860 and 760.</i>                                                 |
| <i><sup>1</sup>H NMR [300 MHz, □ (ppm)]</i> | <i>(CDCl<sub>3</sub>) 12.16, 12.09 (2×OH, s), 7.53 (1H, s), 7.18 (1H, d), 7.06 (1H, s), 6.58 (1H, s), 4.65 (2H, b, s) and 2.43 (3H, s).</i> |

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## AUTOMATIC SOLAR POWERED GRASS CUTTER

Karthikeyan R<sup>1</sup>, Vignesh P<sup>2</sup>, Kishore B<sup>3</sup>, SuryaPrakash S<sup>4</sup> and Sathya R<sup>5</sup>B.E Student<sup>1,2,3,4</sup> and B.E Assistant Professor<sup>5</sup>, Electronics and Communication Engineering, Rajalakshmi Engineering College, Chennai**ABSTRACT**

Lawn maintenance provides aesthetic pleasure to people. The operation of the lawn mower is very difficult. Gardeners with petrol-driven lawnmowers could be exposing themselves to alarming amounts of cancer causing chemicals. The mowers also produced more than one pound of carbon monoxide and several grams each of methane, hydrocarbons, nitrogen oxides and smoke particles. The Automated solar grass cutter is a fully automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass cutting without the need of any skill set for driving the vehicle. The vehicle comprises of a solar panel to charge the battery so that there is no need of charging it externally. The grass cutter and vehicle motors are interfaced to a microcontroller that controls the working of all the motors. It is also interfaced to an ultrasonic sensor for object detection. The microcontroller moves the vehicle motors in forward direction in case no obstacle is detected. On obstacle detection the ultrasonic sensor monitors it and the microcontroller thus stops the grass cutter motor to avoid any damage to the object/human/animal which is present on the way. Microcontroller turns the vehicle as long as it gets a clear path and then moves the grass cutter in forward direction again. It operates with the help of solar power. Because of this, no pollution is caused. The sound produced by the cutter is very low so, it can be used in silence zone areas such as hospitals, educational institutions. Smartphone can be used as the remote controller. After developing an established prototype, the design analysis is carried out to be validate with the theoretical values to ensure that the prototype can be safely used. The Smart Solar Grass Cutter can operate more than two hours when the used battery is fully charged. Based upon the results, the Smart Solar Grass Cutter is reliable with high efficiency of the system compared to the previous studies. Therefore, it can be concluded that the prototype is reliable and environmentally friendly.

The main advantage of our project is to reduce the space, cost, battery and man power required.

**Keywords:** Battery, Micro Controller, Obstacle Detection, Solar Power, Ultrasonic Sensor.

**INTRODUCTION**

Pollution is one of the major issues for the whole world. Pollution is man-made and can be seen in our homes. In case, if we use gas powered lawn movers, due to emission of gases. It can also lead to a concern of pollution, also the cost of the fuel is increasing rapidly which makes difficult to use them in those machines. Hence we move on to an alternative source of energy called renewable energy sources. Renewable energy is useful energy that is collected from renewable resources. Renewable resources are naturally replenished on a human timescale, including carbon neutral sources like sunlight, wind, rain, tides, waves, and geothermal heat. Hence a solar powered grass cutter is introduced to help eradicate the pollution. Solar powered grass cutter can be described as the application of solar energy to power an electric motor which rotates a blades and moves accordingly to cut the grass. It uses the photovoltaic panel to generate the energy needed to power the mower. The use of ultrasonic sensors helps it to avoid any damage onto the obstacles on the way.

The first lawn mower was invented by Edwin Budding in 1830 in Thrupp, just outside Stroud, in Gloucestershire, England. Budding's mower was designed primarily to cut the grass on sports grounds and extensive gardens, as a superior alternative to the scythe, and was granted a British patent on August 31, 1830. [1]in 1995, the first fully solar powered robotic mower became available. The mower can find its charging station via radio frequency emissions, by following a boundary wire, or by following an optional guide wire. This can eliminate wear patterns in the lawn caused by the mower only being able to follow one wire back to the station. A robotic lawn mower is an autonomous robot used to cut lawn grass. A typical robotic lawn mower requires the user to set up a border wire around the lawn that defines the area to be mowed. The robot uses this wire to locate the boundary of the area to be trimmed and in some cases to locate a recharging dock. Robotic mowers are capable of maintaining up to 20,000 m<sup>2</sup> (220,000 sqft) of grass. Automated solar grass cutter are increasingly sophisticated, are self-docking and some contain rain sensors if necessary, nearly eliminating human interaction. Robotic lawn mowers represented the second largest category of domestic robots used by

the end of 200Possibly the first commercial robotic lawn mower was the Mow Bot, introduced and patented in 1969 and already showing many features of today's most popular products. In 2012, the growth of robotic lawn mower sales was 15 times that of the traditional styles. With the emergence of smart phones some robotic mowers have integrated features within custom apps to adjust settings or scheduled mowing times and frequency, as well as manually control the mower with a digital joystick

### **LITERATURE SURVEY**

[1]Husqvarna, a Swedish manufacturer, this year is also introducing its automated grass cutter to the U. S. market (it's been sold in Europe for about three years). It works much the same as the Robomow with a boundary wire implanted at the border of your lawn. The Husqvarna model, however, takes care of itself whereas the robotic mow has to be taken out and set up and watched by the owner, the Husqvarna Automated grass cutter lives outside, mows when it's programmed to mow and automatically returns to its base for recharging. The Husqvarna model is also significantly lighter than the Robotic mow (15 pounds vs. the Robotic mow's 42 pounds). According to Husqvarna, this not only makes it safer, but it leaves no tracks on the lawn. This complete freedom from even the thought of mowing, however, does have its price -- \$1,995 plus \$200 to \$300 for installation. It's available in limited quantities this year from select dealers. The company also plans next year to release a solar-powered model to the U.S. market. Husqvarna Auto Mower and Solar Mower work independently. A boundary loop wire holds the automated grass cutter to the lawn and a search loop ensures that it returns to the docking station for battery recharging. The solar Powered version does not need a charging station and will be in production next year. Both mowers share similar features, the only difference is the power source. Almost noise less and environmentally friendly. The boundary loop wire (red) defines the Auto Mower's cutting area whilst the search loop wire (yellow) directs the mower to the charging station. The boundary loop is also laid out around trees and surfaces of the lawn which will not be cut. The lawn mower changes direction if it touches garden furniture, a tree or other solid objects, yet is able to cut under bushes and hedgerows. You can program the cutting height between 30 and 95 mm to achieve a lawn just the way you want it. Asha N. et al. proposed a programmable robot that is able to work either autonomously or wirelessly using an Android Smart phone via Bluetooth from a safe distance.[2]. The grass cutter can cut the grass according to preset shapes while the blade was able to be adjusted to maintain the different length of the grass. The robot is a dual powered with a Hybrid Solar panel and Lithium Ion rechargeable battery. This programmable robot is used to decorate the lawn and encourage the implementation of the renewable energy resources. Ulhe P.P. et al. [3]Fabricated and modified the solar grass cutter that can be used to cut the different grasses with different applications. A remote-control unit was added to help the unskilled persons to operate it. The used battery in the designed grass cutter can be charged by using solar panels regardless of the operating conditions. An AC charging system and spiral cutting blades were used to increase the cutting efficiency.

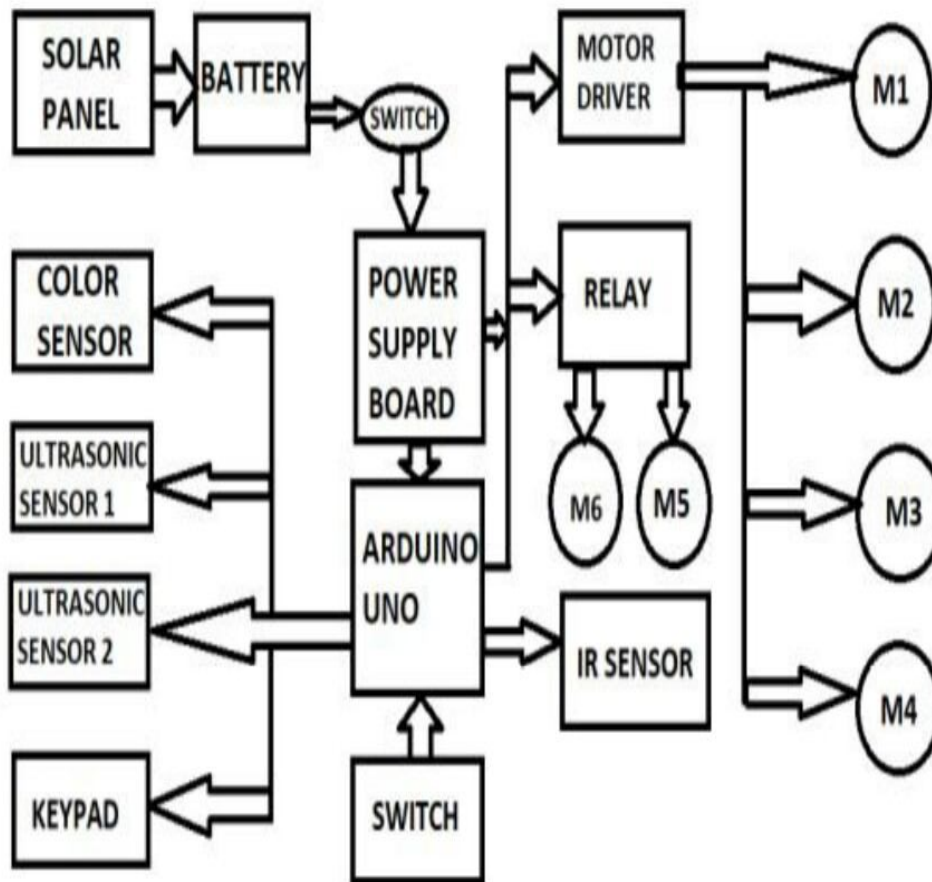
### **EXISTING SYSTEM**

Maintenance plans / costs can be higher than electric models. Due to their heavier weight they can be harder to move around corners and require more strength to push around the whole lawn area. Petrol mowers are a good deal noisier than other types of mower.

In electric tyre vehicles which uses the electric cord can be unsafe and we must install a safety switch. Extension cord may be needed to mow whole garden. The fuel equipped vehicles becomes costly as the fuel price increases rapidly. It also causes pollution by emitting smoke in some cases and noise pollution , on the other hand.

The conventional grass cutters have been widely used recently by workers in the gardening and agricultural industries. However, the manual handled grass cutters are consuming a lot of energy and producing air pollution which can directly affect the workers' health. The conventional grass cutters are also creating a high level of noise and vibration which can cause serious health issues such as grip strength, decreased hand sensation and dexterity, finger blanching or 'white fingers' and carpal tunnel. The lawn mowers may be frustrating to use.

Traditional design of lawn mowers had motored powered engines which required regular maintenance such as engine oil and greasing. They also created a lot of noise pollution and air pollution. In the cold and harsh environment the fossil fuel powered motors tend to freeze and not run. These problems are solved by using electric motors.

**BLOCK DIAGRAM****FUTURE SCOPE**

We completed our project successfully with the available sources. But the results and modifications are not up to the expectations. This can be further improved by incorporating the following modifications to obtain better results. The mechanism which we used ie scotch yoke mechanism does not given excepted efficiency. This efficiency can be increased by using some other mechanism. and speed of motor is reduce because we have used heavy material and this material can be replaced by using light weight material .and design of blades should be done based on types of grass is used to cut. The project which we have done surly reaches the average families because the grass can be trimmed with minimum cost and with minimum time .Finally this project may give an inspiration to the people who can modify and can obtain better results. Along with this hardware setup , some of the future technologies like machine learning, robotic process automation and pega tools can be added making it an intelligent equipment to be used. In this case, there is no need of any human intervention or control over the vehicle and it becomes autonomous. We can also integrate other useful functions like irrigation system, pesticide sprayer and also even alphabet printing can be used. There are widely many applications requiring the above mentioned systems which can be integrated making it a multi- purpose robotic vehicle. To allow for greater flexibility in the design, a custom built platform will be used. Much experience has already been gained with the other sensors working on the first two generations of autonomous lawn mowers. This is the key system that will enable the mower to recognize objects, avoid them, and can move also in a pattern.

**CONCLUSION**

Our project entitled Manufacturing of solar powered grass cutter is successfully completed and the results obtained are satisfactory. It will be easier for the people who are going to take the project for the further modifications. This project is more suitable for a common man as it is having much more advantages i.e, no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components and this can be operated by using solar energy. This will give much more physical exercise to the people and can be easily handled. This system is having facility of charging the batteries while the solar powered grass cutter is in motion. So it is much more suitable for grass cutting also. The same thing can be operated in night time also, as there is a facility to charge these batteries in day light.



A Smart waste management system is a step forward to make the manual collection and detection of wastes automated in nature. The developed system integrated by using the smart Vehicle System and the Smart Monitoring and controlling, in which it would pioneer work for solid waste collection, monitoring and management processes. The currently employing method in which concerned municipal employee has to look for the filled waste bins manually across different spots in an area/street for checking regularly whether the waste bin is filled or not, which is complex and time consuming process. This automation of waste also reduces the human effort and consequently the cost of the whole process. Robot model is used for carrying and unloading the solid wastes in dustbin by using DC motor. This Method is most effective in large corporation areas. This method can be implemented practically. In future, some additional features will add to this project to crush and recycling plastics and other materials automatically.

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**METABOLITE PROFILING OF PLANT GROWTH PROMOTING AND ANTAGONISTIC STREPTOMYCES SP. UT6A57 EFFECTIVE AGAINST RALSTONIA SOLANACEARUM****Manigundan Kaari, Jerrine Joseph\*, Radhakrishnan Manikkam, Ayswarya Sreenivasan and Gopikrishnan Venugopal**

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**ABSTRACT**

This study aimed to evaluate the plant growth promoting and antagonistic potential of *Streptomyces* strain UT6A57 against *Ralstonia solanacearum* and metabolite profiling by gas chromatography–mass spectrometry. The strain UT6A57 was found to exhibit in-vitro production of siderophore, ammonia, amylase and cellulase enzymes. In-vitro antagonistic activity of the strain UT6A57 was also found to inhibit *R. solanacearum* with 21mm zone of inhibition in diameter. Metabolite profile of the extracellular extract prepared from the strain UT6A57 was studied through GC-MS analysis. The presence of 21 compounds in the extract produced in which most of the compounds were found to be the derivatives of aromatic compounds. In particular, hexadecanoic acid ( $C_{16}H_{32}O_2$ ), *i*-propyl 12-methyltetradecanoate ( $C_{18}H_{36}O_2$ ), 2,5-piperazinedione, 3,6-bis(2-methylpropyl) ( $C_{12}H_{22}N_2O_2$ ), cyclo(L-prolyl-L-valine) ( $C_{10}H_{16}N_2O_2$ ), pyrrolo[1,2-*a*]pyrazine-1,4-dione, hexahydro ( $C_7H_{10}N_2O_2$ ) and gamma-sitosterol ( $C_{29}H_{50}O$ ) were found in high quantity which may be responsible for the antagonistic activity of the strain UT6A57. Findings of the present study proved that *Streptomyces* strain UT6A57 will be a promising candidate to develop as biocontrol agent against *R. solanacearum* since it has potential in vitro plant growth promoting and antagonistic activities.

Keywords: PGP, gas chromatography–mass spectrometry, *Ralstonia solanacearum*, *Streptomyces*

**INTRODUCTION**

Loss in solanaceous vegetable crop remains unavoidable due to bacterial wilt phytopathogen *Ralstonia solanacearum*. This disease is responsible for an estimated 10-30% yield loss every year (Elsayed et al., 2020). Chemical fertilizers have been used extensively to control this pathogen. However, in treated goods, these chemicals can lead to toxic residues. Owing to their slow biodegradation, these chemical fertilizers can also make pollution to the environment and can cause resistance of this pathogen. For the prevention and management of this pathogen, the use of microorganisms and their metabolites is a promising and environmentally sustainable option when compared to the use of chemical fertilizers (Zhang et al., 2018).

Actinobacteria are found widely in the plant rhizosphere and produce various agroactive compounds (Liu et al., 2019; Nafis et al., 2019). Due to its excellent antimicrobial ability and soil-dominant saprophytic nature, this bacterial group has gained a lot of interest as plant growth promoters in recent years. Actinobacteria can colonize plant root systems aggressively, destroy a broad variety of biopolymers by secreting multiple hydrolytic enzymes and tolerate aggressive environments by producing spores (Djebaili et al., 2020; Lee et al., 2021). *Streptomyces* is well known and most dominant genus under the phylum actinobacteria, have tremendous biocontrol activity against a variety of phytopathogens (Evangelista-Martínez et al., 2020). *Streptomyces* have long been treated merely as free-living soil occupants, but the significance of their diverse relationships with plants and other species has recently been revealed (Olanrewaju and Babalola et al., 2020).

The main objectives of the present study includes; (i) To screen the *Streptomyces* strain UT6A57 for plant growth and enzymatic activity such as production of IAA, ammonia, siderophore, cellulase, amylase and protease activity. (ii) To screen the *Streptomyces* strain UT6A57 for in-vitro antagonistic activity against *R. solanacearum*. (iii) To analysis the antagonistic metabolites from *Streptomyces* strain UT6A57 using GC-MS analysis.

**METHODS AND MATERIALS*****Streptomyces* strain UT6A57**

The strain *Streptomyces* UT6A57 was previously isolated from tomato rhizosphere soil collected from Udthagamandalam (lat. 11°48'N; long. 76°77'E), The Nilgiris, Tamilnadu, India through standard spread plate method using starch casein agar medium (Manigundan et al., 2020). The strain UT6A57 used for the present study was preserved in 20% glycerol broth as well as n ISP2 agar slants in the Actinobacterial Research lab, Centre for Drug Discovery and Development, Sathyabama Institute of Science and Technology, Chennai, Tamilnadu and India.

**Taxonomy of *Streptomyces* strain UT6A57**

The cultural, microscopic and molecular identification of *Streptomyces* UT6A57 was characterized by standard protocol (Shirling and Gottlieb, 1966). The different growth pattern was studied in ISP1 - ISP7 medium. The results were noted after incubation at 28°C for 7-14 days. The micromorphology was examined using laboratory simple microscopy.

The genomic DNA was extracted using solute ready genomic DNA kit (Himedia). The primer pairs: 27F 5'AGAGTTTGATCMTGGCTCAG3' (forward) and 1492R 5'TACGGYTACCTTGTTACGACTT3' (reverse) were used to amplify the genomic DNA and sequencing was done at Eurofins Genomics India Pvt. Ltd., Bangalore. The phylogenetic neighbors and calculation of pair wise 16SrRNA gene sequence similarities were achieved using the MEGA version 6 and BLAST analysis (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>). The obtained 16SrRNA sequence was deposited to NCBI-GenBank.

**In-vitro screening of *Streptomyces* UT6A57 for PGP and enzyme production**

The production of IAA and ammonia by the *Streptomyces* strain UT6A57 was estimated spectrophotometrically using Salkowski and Nessler's reagent respectively (Gordon and Weber, 1951; Cappucino and Sherman, 1992). The production of siderophore was evaluated on chrome azurol agar (CAS) plates (Alexander and Zuberer, 1991).

Amylase and protease activity of *Streptomyces* was screened by inoculating them on starch agar and skim milk agar, respectively (Hankin and Anagnostakis, 1975). The cellulolytic activity was screened on mineral salt agar containing carboxy methyl cellulose (CMC) as sole carbon source (Gupta et al., 2012).

**In-vitro screening of *Streptomyces* UT6A57 against *R. solanacearum***

Briefly, the *Streptomyces* strain UT6A57 inoculated into ISP2 agar medium and incubated at 28°C for 7 days. The bacterial phytopathogen *R. solanacearum* used in this study was inoculated into nutrient broth and incubated at 37°C for 24 hrs. The phytopathogen *R. solanacearum* ( $10^7$  CFU/ml) was spread on Mueller Hinton Agar (MHA) plates and a 6 mm diameter agar plugs were taken from *Streptomyces* plate using sterile cork borer. Then the agar plugs were aseptically placed over the pathogen inoculated MHA plates and incubated at 28°C for 24 hrs. The pathogenic bacterial growth suppression was measured and expressed as zone of inhibition diameter in millimeter.

**Production and metabolite profiling of *Streptomyces* UT6A57 using GC-MS**

*Streptomyces* strain UT6A57 was inoculated into 50 ml of ISP2 broth and incubated in a rotary shaker at 28°C with 120 rpm speed for 72 hrs to prepare the seed culture. For the production of antibacterial secondary metabolites, 500 ml of Soybean fermentation medium (soluble starch (47 g/l), yeast extract (3 g/l), soybean meal (22 g/l),  $(\text{NH}_4)_2\text{SO}_4$  (2.7 g/l), NaCl (2.7 g/l),  $\text{CaCO}_3$  (2.7 g/l)) was used. The production medium was inoculated with 5% (v/v) seed culture and incubated in rotary shaker at 28°C with 120 rpm speed for 96 hrs. Later the supernatant was collected by centrifugation at 10,000 rpm for 10 min and extracted twice using ethyl acetate. The equal volume of solvent (v/v) was added to the supernatant and vigorously shaken for 15 min and incubated overnight. The solvent phase containing secondary metabolites were collected using separating funnel and concentrated by rotary evaporator.

The crude ethyl acetate extract of *Streptomyces* UT6A57 was further subjected to gas chromatography–mass spectrometer (GC-MS) analysis (Agilent Technologies 6890–5973 N) with capillary column TG-5 ms Phenyl Methyl Siloxane (30 m × 250 μm × 0.25 μm) system. Mass detector used in split mode. Helium gas with flow rate of 1.0 ml/min was used as a carrier. Injector was operated at 230°C and oven temperature for initial setup was 60°C for 2 min, ramp 10/min to 280°C for 8 min.

**RESULTS AND DISCUSSIONS*****Streptomyces* strain UT6A57**

On ISP2 agar medium, the strain UT6A57 produced powdery colonies with white color reproductive mycelium. The micro-morphological observation of seven days old culture grown on ISP2 agar showed the presence of abundant aerial and substrate mycelium. This strain UT6A57 also produced good growth in tryptone yeast extract agar (ISP1), yeast extract malt extract agar (ISP2), oat meal agar (ISP3) and inorganic salts - starch agar (ISP4) medium and moderate growth in glycerol asparagine agar (ISP5), peptone yeast extract iron agar (ISP6) and tyrosine agar (ISP7) medium. Also D-glucose, sucrose and asparagines were influenced the good growth of UT6A57. These cultural and microscopic features indicated that the strain UT6A57 belong to the genus *Streptomyces*.

The 16S rRNA gene sequence of strain UT6A57 was compared to the similar sequences of *Streptomyces* already deposited in NCBI GenBank database, using BLASTn. The strain displayed 1464 nucleotide length and more than 99% similarity with *S. spiralis* and *S. fumigatiscleroticus*. 16S rRNA gene sequence of the strain UT6A57 was deposited in NCBI-GenBank under accession number MW468094. The *Streptomyces* strain UT6A57 was grouped with other known *Streptomyces* species by UPGMA clustering shown in figure 1.

### **In-vitro PGP and antagonistic activity**

The production of ammonia is an indirect plant growth promotion factor and may play a major role in the suppression of phytopathogens (Minaxi et al., 2012). The development of yellow to brown color is confirmed the production of ammonia in the strain UT6A57 with the amount of  $43.2 \pm 1.2$  mg/ml but unable to produce IAA. This present finding was supported by similar results by Passari et al., 2017 who stated that the strain *Streptomyces* sp. showed ammonia production of 82.3 mg/ml. Similarly, *Streptomyces* strains isolated from tomato rhizosphere soil samples showed positive production of ammonia which can increase the plant growth and also influenced the virulence factor of opportunistic phytopathogens (Anwar et al., 2016).

Cellulase and amylase production not only assists in the decomposition of organic matter and the promotion of plant growth, but also plays a vital role in disease suppression by inhibiting soil-borne pathogens (Kavamura et al., 2013). In our study the strain UT6A57 was able to produce siderophore, amylase and cellulase enzyme in plate assay (figure 2). Passari et al., 2017 reported that *Streptomyces* strains showed broad range of siderophore production and enzymes like amylase and cellulase in *in-vitro* assay. Our finding is also correlated with Shrivastava et al. 2016 who stated that *Streptomyces* sp. K20 showed the production of ammonia, siderophore and amylase.

*Streptomyces* are well known as important biological resources for their biologically active secondary metabolites, which play important roles in protecting plants against various phytopathogens (Ueno et al., 2016). In our present study the strain UT6A57 showed the antagonistic activity against *R. solanacearum* with the zone of inhibition 21mm in diameter (figure 3). This finding was exactly supported by similar results by Zhao et al., 2019 who stated that the strain *Streptomyces* sp. NEAU-SSA 1<sup>T</sup> showed antagonistic activity against *R. solanacearum* with inhibitory zone diameters of 23 mm.

### **GC-MS analysis**

GC-MS is well known analytical techniques for the analysis of microbial secondary metabolites (Tan et al., 2015). It is also play a significant role in natural product discovery, including bioactive compounds derived from *Streptomyces* (Ara et al., 2014; Jog et al., 2014). In this present study GC-MS analysis of ethyl acetate extract of *Streptomyces* sp. UT6A57 confirmed the presence of various compounds with different retention times as illustrated in Figure 4. The identified compounds and their retention time, molecular mass, peak area (%), molecular formula, and their potential activities are shown in Table1. Totally 21 compounds were identified and most of the compounds were found to be the derivatives of aromatic compounds. Hexadecanoic acid (C<sub>16</sub>H<sub>32</sub>O<sub>2</sub>), i-Propyl 12-methyltetradecanoate (C<sub>18</sub>H<sub>36</sub>O<sub>2</sub>), 2,5-Piperazinedione, 3,6-bis(2-methylpropyl) (C<sub>12</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub>), Cyclo(L-prolyl-L-valine) (C<sub>10</sub>H<sub>16</sub>N<sub>2</sub>O<sub>2</sub>), Pyrrolo[1,2-a]pyrazine-1,4-dione, hexahydro (C<sub>7</sub>H<sub>10</sub>N<sub>2</sub>O<sub>2</sub>) and Gamma-Sitosterol (C<sub>29</sub>H<sub>50</sub>O) were found as antagonistic properties possessing compounds in this study with highest peak number (Table 1; Figure 4). Among them, the most prevailing major compounds were Hexadecanoic acid (peak area: 15.34%), i-Propyl 12-methyltetradecanoate (peak area: 14.64%) and Piperazinedione, 3,6-bis(2-methylpropyl) (peak area: 5.85%). Similarly Krishnan et al., 2014 purified 1, 2-benzene dicarboxylic acid from *Streptomyces* showed cytotoxic activity. Shoge et al., 2016 reported that 1, 2-benzene dicarboxylic acid showed antimicrobial activity against various pathogens. Sanjenbam and Kannabiran, 2016 reported that pyrrolo[1,2-a]pyrazine-1,4-dione,hexahydro-3-(phenylmethyl) is well know antifungal compound which is isolated from *Streptomyces* sp. showed cytotoxic activity. Also Kiran et al., 2018 isolated pyrrolo[1,2-a]pyrazine-1,4-dione,hexahydro-3-(phenylmethyl) from *Bacillus* showed strong antimicrobial activity against multi-drug resistant *Staphylococcus aureus*. The same compound isolated from novel strain *S. smangrovisoli* showed antioxidant activity. Alshaibani et al., 2017 isolated diketopiperazine (DKP) compound such as Cyclo(L-prolyl-L-valine) from *Streptomyces* showed antimicrobial and cytotoxic activity in broad range. Previous reports by Abu-Lafi et al., 2019; Agoramoorthy et al., 2007; Altaee et al., 2016; Arora et al., 2017; Gherraf et al., 2017; Kumar et al., 2010; Kumari et al., 2019; Lalitha et al., 2015 and Raman et al., 2012 showed the importance of GC-MS characterization for common effect of bioactive compounds identification. Thus, the present study also revealed that those twenty one compounds identified through GC-MS could be the key contributing factors to the antagonistic potential of *Streptomyces* strain UT6A57.

## CONCLUSION

Thus, *Streptomyces* strain UT6A57 can be utilized as a potential resource as biocontrol agent against *R. solanacearum* in future.

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## Conflicts of interest

Authors do not have any conflict of interest.

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## FIGURES

Figure 1. Neighbor-joining phylogenetic tree based on 16SrRNA gene sequence comparing *Streptomyces* sp. UT6A57 to other *Streptomyces* species collected from NCBI-BLAST. The numbers on the branches indicate the percentage bootstrap values of 1000 replicates; only values >50% are indicated.

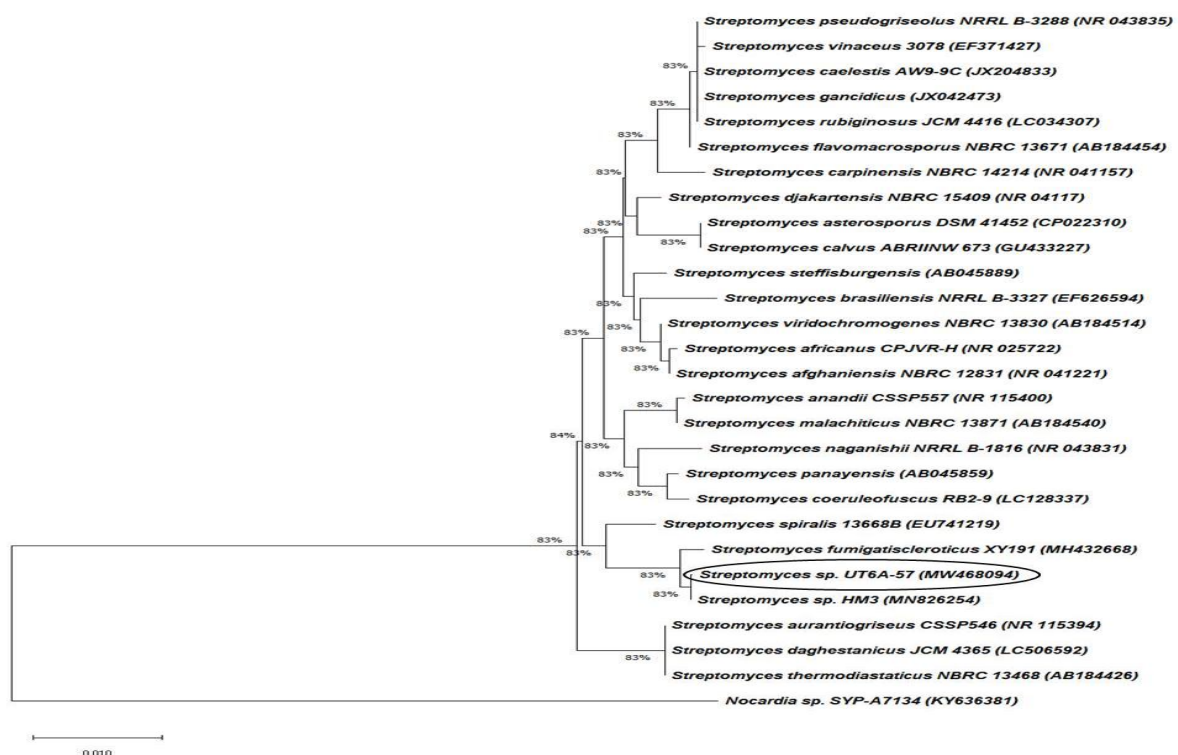


Figure 2. *In-vitro* PGP and enzymatic activities of *Streptomyces* strain UT6A57 (a) ammonia production, (b) siderophore, (c) cellulose and (d) amylase.

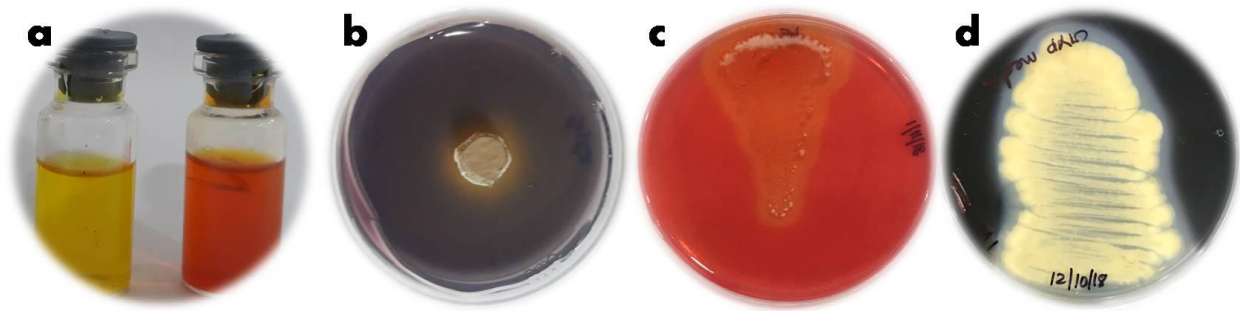


Figure 3. *In-vitro* antagonistic activity of *Streptomyces* strain UT6A57 against *R. solanacearum*.



Figure 4. GC-MS chromatogram of ethyl acetate extracts of *Streptomyces* strain UT6A57.

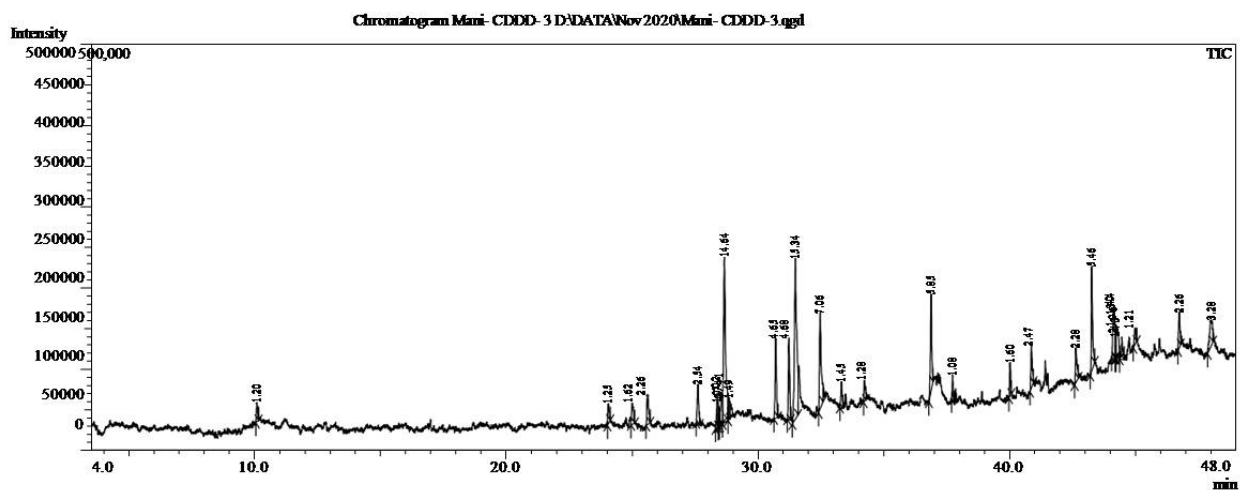


Table 1. GC-MS metabolite profiling from the crude extract of *Streptomyces* strain UT6A57.

| S. No | Name                                            | R. Time | Molecular mass | Area% | Molecular Formula                                             | Activity                             | References                                  |
|-------|-------------------------------------------------|---------|----------------|-------|---------------------------------------------------------------|--------------------------------------|---------------------------------------------|
| 1     | 1,2-Benzenedicarboxylic acid                    | 10.098  | 166.13         | 1.2   | C <sub>8</sub> H <sub>6</sub> O <sub>4</sub>                  | Cytotoxicity, Antimicrobial activity | Kannabiran et al., 2014; Shoge et al., 2016 |
| 2     | 3-methyl-1,4-diazabicyclo[4.3.0]nonan-2,5-dione | 24.083  | 210.23         | 1.25  | C <sub>10</sub> H <sub>14</sub> N <sub>2</sub> O <sub>3</sub> | No activity reported                 | -                                           |
| 3     | 5-Azacytosine                                   | 27.639  | 112.09         | 2.54  | C <sub>3</sub> H <sub>4</sub> N <sub>4</sub> O                | Antiproliferative                    | Guo et al., 2008                            |
| 4     | Pentadecanoic acid                              | 28.414  | 242.40         | 2.02  | C <sub>15</sub> H <sub>30</sub> O <sub>2</sub>                | Antimicrobial, antifungal            | Chandrasekaran et al., 2011                 |
| 5     | Stannane, hydroxytriphenyl-                     | 28.455  | 367.03         | 1.07  | C <sub>18</sub> H <sub>16</sub> OSn                           | No activity reported                 | -                                           |



|    |                                                                                                   |        |        |       |                                                               |                                                                                                                                                                     |                                                                      |
|----|---------------------------------------------------------------------------------------------------|--------|--------|-------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 6  | i-Propyl methyltetradecanoate                                                                     | 28.691 | 284.50 | 14.64 | C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>                | No activity reported                                                                                                                                                | -                                                                    |
| 7  | erythro-9,10-Dibromopentacosane                                                                   | 28.89  | 510.50 | 1.49  | C <sub>25</sub> H <sub>50</sub> Br <sub>2</sub>               | No activity reported                                                                                                                                                | -                                                                    |
| 8  | Pyrrolo[1,2-a]pyrazine-1,4-dione, hexahydro                                                       | 30.739 | 154.17 | 4.65  | C <sub>7</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub>  | Hemolytic activity, Genotoxicity assay, Cytotoxicity assay; Antimicrobial; Antioxidant                                                                              | Sanjenbam and Kannabiran, 2016; Kiran et al., 2018; Ser et al., 2015 |
| 9  | Cyclo(L-prolyl-L-valine)                                                                          | 31.263 | 196.25 | 4.68  | C <sub>10</sub> H <sub>16</sub> N <sub>2</sub> O <sub>2</sub> | Biofilm formation; Antimicrobial, Cytotoxic Activity                                                                                                                | Wang et al., 2016; Alshaibani et al., 2017                           |
| 10 | Hexadecanoic acid                                                                                 | 31.509 | 256.42 | 15.34 | C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>                | Anti-inflammatory, Antioxidant, hypocholesterolemicnematicide, pesticide, anti androgenic flavor, hemolytic, 5-Alpha reductase inhibitor, potent mosquito larvicide | Aparna et al., 2012; Rahuman et al., 2000; Kumar et al., 2010        |
| 11 | 1-Nonadecene                                                                                      | 33.351 | 266.50 | 1.45  | C <sub>19</sub> H <sub>38</sub>                               | Antimicrobial activity; Antifungal;                                                                                                                                 | Gherra et al., 2017; Kumari et al., 2019                             |
| 12 | Heptadecanoic acid                                                                                | 34.264 | 270.50 | 1.28  | C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>                | Antibacterial and antifungal                                                                                                                                        | Agoramoorthy et al., 2007                                            |
| 13 | 2,5-Piperazinedione, 3,6-bis(2-methylpropyl)                                                      | 36.914 | 226.32 | 5.85  | C <sub>12</sub> H <sub>22</sub> N <sub>2</sub> O <sub>2</sub> | Antimicrobial                                                                                                                                                       | Altaee et al., 2016; Raut and Hamde, 2018                            |
| 15 | Ergotaman-3',6',18-trione, 9,10-dihydro-12'-hydroxy-2',5'-bis(1-methylethyl)-, (5'alpha,10alpha)- | 40.902 | 563.70 | 2.47  | C <sub>31</sub> H <sub>41</sub> N <sub>5</sub> O <sub>5</sub> | No activity reported                                                                                                                                                | -                                                                    |
| 16 | Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester                                         | 42.674 | 330.50 | 2.28  | C <sub>19</sub> H <sub>38</sub> O <sub>4</sub>                | Hemolytic, pesticide, flavour, antioxidant; HypocholesterolemicNematicide, Lubricant, Antiandrogenic                                                                | Tyagi and Agarwal, 2017; Lalitha S et al.2015                        |
| 17 | 1,3-cyclohexadecanedione, 6-nit                                                                   | 44.162 | 80.13  | 4.04  | C <sub>6</sub> H <sub>8</sub>                                 | No activity reported                                                                                                                                                | -                                                                    |
| 18 | Gona-1,3,5(10)-trien-17-one, 3-methoxy-, (1                                                       | 44.24  | 270.40 | 1.13  | C <sub>18</sub> H <sub>22</sub> O <sub>2</sub>                | No activity reported                                                                                                                                                | -                                                                    |
| 19 | Octadecanoic acid, 2,3-dihydroxypropyl ester                                                      | 44.338 | 442.60 | 2.96  | C <sub>25</sub> H <sub>46</sub> O <sub>6</sub>                | Anticancer, antimicrobial; anti-inflammatory                                                                                                                        | Arora et al., 2017; Idan et al., 2015                                |
| 20 | 2- Bromopropionic acid, tetradecyl ester                                                          | 44.505 | 349.30 | 1.43  | C <sub>17</sub> H <sub>33</sub> BrO <sub>2</sub>              | No activity reported                                                                                                                                                | -                                                                    |
| 21 | Gamma-Sitosterol                                                                                  | 48.054 | 414.70 | 3.28  | C <sub>29</sub> H <sub>50</sub> O                             | Antibacterial and Antifungal, Antioxidant; Anti-diabetic, Anti-angeogenic, Anticancer, anti-inflammatory, antidiarrhoeal and antiviral                              | Abu-Laf et al., 2019; Raman et al., 2012                             |

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**STRENGTH PROPERTIES OF HIGH PERFORMANCE GEOPOLYMER CONCRETE USING SILICA FUME AND CERAMIC WASTE**

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**ABSTRACT**

*The Ceramic waste from ceramic and construction industries is a major contribute to construction demolition waste (CDW), representing a serious environmental, technical, and economical problem of nowadays' society. The main focus of this experimental investigation is to study the strength of geopolymer concrete with ceramic waste as coarse aggregate. Silica fume is one of the most recent pozzolanic materials used in concrete. The rapid increase in the use of silica fume is attributed to its positive effect on the mechanical properties of cementitious composites. Plasticizers are usually used to make concrete fluid and workable. This research is an attempt to achieve high performance with 60MPa in geopolymer concrete with additives such as ceramic waste aggregates, silica fume and super plasticizer in different material proportions. In this work, 10%,20%,30%,40% and 50% of ceramic waste is replaced with coarse aggregates. Also, constant volume of silica fume with 15% and polycarboxyl based superplasticizer of 0.8% by weight of fly ash is utilized. Oven curing is applied with 60°C under three days rest period. 12M of NaOH is used. The strength related properties like compressive, flexural and split tensile tests are conducted to find out optimum usage of ceramic waste coarse aggregates to achieve high performance in geopolymer concrete.*

*Keywords: CC-Conventional Concrete, CW-Ceramic Waste, GPC-Geopolymer Concrete, PM-Pozzolanic Materials, RP-Rest Period, SF-Silica Fume, SP-Superplasticizer.*

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**1. INTRODUCTION**

High-performance concretes are made with carefully selected high-quality ingredients and optimized mixture designs; these are batched, mixed, placed, compacted and cured to the highest industry standards. HPC is not one product but includes a range of materials with special properties beyond conventional concrete and routine construction methods at that time. It only can be made by appropriate materials, suitable mix design and properly mixed, transported, placed, consolidated and cured, so that the resulting concrete will give excellent performance in the structure in which it will be placed, in the environment to which it will be exposed, and with loads to which it will be subjected to during its design life. Presently, the primary characteristics of HPC can be summarized as easy placement, high early age strength, toughness, superior long-term mechanical properties, and prolonged service life in severe environment. Of course, some HPC applied in special fields and occasions possess some other characteristics of HPC will change with time.

Natural resources are depleting worldwide while at the same time the generated waste from the industry are increasing substantially, the sustainable development for construction involves the use of nonconventional and innovative materials, and recycling of waste materials in order to compensate the lack of natural resources and to find alternative ways conserving the environment. Advancements in technology get better not only human comforts but also harm the environment. Use of construction waste as aggregate in construction industry has become popular and safe now. At present construction industry is in need of finding cost effective material to enhance the strength of concrete.

A ceramic is an inorganic, nonmetallic solid prepared by the action of heat and subsequent cooling. In ceramic industries, a significant part of the losses in the manufacturing of ceramic elements is not returned to the production process. If the concrete industry fails to utilize substitute aggregates in the future, around 8 to 12 billion tones of natural aggregates will be addicted. Since aggregates occupies around 50-80% of concrete volume. Ceramic wastes can be separated in two categories in accordance with the source of raw materials. The first one are all fired wastes generated by the structural ceramic factories that use only red pastes to manufacture their products, such as brick, blocks and roof tiles. The second one is all fired waste produced in stoneware ceramic such as wall, floor tiles and sanitary ware. These producers use red and white pastes; nevertheless, the usage of white paste is more frequent and much higher in volume.

Use of silica fume in concrete has been increasing rapidly, it has been used either as a partial replacement for cement or as an additive when special properties are desired. Though added strength and low permeability are the two reasons that silica fume is added to concrete, there are other properties that are favorably affected by the addition of silica fume, including modulus of elasticity, drying shrinkage, bonding, and resistance to reinforcing steel corrosion and sodium sulphate attack due to low permeability to water and chloride ions.

**2. MATERIAL PROPERTIES**

**2.1 Flyash**

For the present investigation fly ash using was conformation to ASTM class F and specific gravity of 2.87 and fineness of 290m<sup>2</sup>/kg is used.

**2.2 Silica Fume**

Specific gravity of silica fume is 2.2. The chemical composition of silica fume is shown below.

**Table -1: Chemical Composition of Silica Fume**

| Constituents                   | Quantity (%) |
|--------------------------------|--------------|
| SiO <sub>2</sub>               | 91.03        |
| Al <sub>2</sub> O <sub>3</sub> | 0.39         |
| Fe <sub>2</sub> O <sub>3</sub> | 2.11         |
| CaO                            | 1.5          |
| Loss of Ignition               | 4.05         |

**2.3 Fine Aggregate**

Specific gravity of fine aggregate used is 2.6 and dry rodded bulk density of fine aggregate is 1726kg/m<sup>3</sup>.

**2.4 Coarse aggregate**

As per, BIS : 383-1970 crushed granite coarse aggregate provides better interlocking and hence higher strength than rounded gravel aggregate. Blue granite crushed stone aggregates of 12.5 mm maximum size and of typical particle shape “average and cubic” were used as the coarse aggregate for this present investigation. Specific gravity of coarse aggregate is 2.7. Bulk density is 1674kg/m<sup>3</sup>.

**2.5 Ceramic waste coarse aggregate**

For this present investigation, broken glazed stone ware pipes having thickness of 12.5mm obtained from Shelters Construction Pvt Ltd., Nallampalayam site, trichy were used as coarse aggregates with different percentages as replacement of conventional coarse aggregates.

**Table -2: Properties of ceramic waste aggregates**

| Properties       | Test Results          |
|------------------|-----------------------|
| Specific Gravity | 2.52                  |
| Bulk Density     | 1482kg/m <sup>3</sup> |
| Water Absorption | 1.01%                 |
| Impact Value     | 11.45%                |

**2.6 Alkaline Activator Solution**

This solution is the combination of sodium hydroxide and sodium silicate. In this work, Sodium hydroxide with specific gravity 1.16 in pellets form is used. Sodium silicate of specific gravity is 1.57 and weight ratio of SiO<sub>2</sub> to NaOH is 3. Also the chemical composition of different constituents are Na<sub>2</sub>O-14.7%, SiO<sub>2</sub>-29.4%, water-55.90%.

**3. MIX DESIGN**

Parameters used for Mix Design of M60.

Molarity of Sodium hydroxide - 12M

Ratio of Sodium Hydroxide to Sodium Silicate -0.75

Ratio of Fly ash to Sodium Silicate Solution – 2.5

**Table -3: Mix Proportion of Various Ingredients**

| Flyash (kg/m <sup>3</sup> ) | Fine Aggregate (kg/m <sup>3</sup> ) | Coarse Aggregate (kg/m <sup>3</sup> ) | Ceramic Waste Aggregate (kg/m <sup>3</sup> ) | Super plasticizer (kg/m <sup>3</sup> ) |
|-----------------------------|-------------------------------------|---------------------------------------|----------------------------------------------|----------------------------------------|
| 555.58                      | 592.8                               | 1138.32                               | 936.82                                       | 4.445                                  |

|   |      |      |      |                          |
|---|------|------|------|--------------------------|
| 1 | 1.07 | 2.05 | 1.68 | 0.8% by weight of cement |
|---|------|------|------|--------------------------|

Sodium Hydroxide - 27.5kg/m<sup>3</sup>

Sodium Silicate – 206.25kg/m<sup>3</sup>

Water – 53.69kg/m<sup>3</sup>

**4. METHODOLOGY**

**4.1 COMPRESSIVE STRENGTH TEST**

All the cubes were tested under drying condition, after drying the surface of the specimens containing no moisture in it. For each mix proportion three cubes were tested at 7 days and 28 days. Using compression testing machine of 2000kN capacity as per IS: 516-1959 code. The tests were carried out at a uniform rate stress level with the specimen properly placed and centered in the testing machine. Load was applied gradually with the help of hydraulic pumps until dial gauge reading just get reverses its direction of motion. The reverse of needle indicates the total failure load of specimen. The dial gauge reading is noted at the instant of failure, which is ultimate load of specimen. From that the compressive strength of particular mix cube calculated by dividing the cross sectional area of cube specimen from ultimate load will give a compressive strength at failure load.

**4.2 SPLIT TENSILE STRENGTH TEST**

This is an indirect test method to determine the tensile strength of concrete of test specimen of cylinders. Split tensile strength were carried out at the age of 28 days for the cylinder specimen of size 100mm diameter and 150mm length, using compression testing machine of 2000kN capacity as per IS 516-1959. The split tensile strength of specimen were calculated from the following relationship. Fig.1 represents the compressive strength and split tensile strength test of specimens.

$$F_t = 2P/\pi DL$$

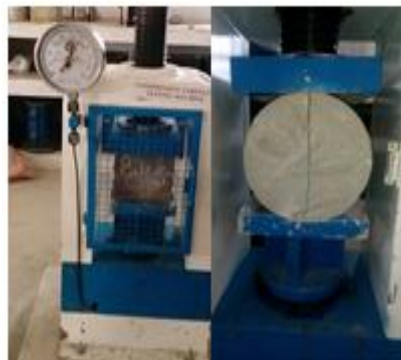
Where,

F<sub>t</sub> – Split tensile strength of concrete in Mpa

P - Failure load in kN

D – Diameter of cylinder (100mm)

L – Length of cylinder (150mm)



**5. RESULTS AND DISCUSSION**

From Table-4 results it was very clear that compared to conventional concrete the strength of geopolymer concrete is high. By replacing ceramic waste aggregates as coarse aggregates in addition of silica fume the performance of geopolymer concrete increases in higher percentage. Up to replacement of 30% of ceramic waste aggregates the high performance in geopolymer concrete is achieved. Whereas, replacement of 40% and 50% ceramic waste aggregates perform less compared to conventional concrete. Addition of superplasticizer and 15% of silica fume are the most important key elements in increasing the strength. Also three days rest period and oven curing at 60°C for 48 hrs are the prime factors in enhancing high performance in geopolymer concrete. Fig-2 represents the failure pattern of cube specimens. Split tensile strength also results the same as compressive strength. Table-5 shows the split tensile strength of specimens at 7 days and 28 days. It also clear that these parameters enhance earlier strength in geopolymer concrete. Addition of silica fume with 15% and replacement of ceramic waste up to 30% shows better improvement in split tensile strength of specimens. Chart-1 and Chart-2 shows the compressive and split tensile strength of specimens respectively.



Fig-2: Shows the failure pattern of cube specimens.

Table -4: Compressive Strength of Cube Specimens

| Mix ID | Compressive Strength @7 Days | Compressive Strength @28Days |
|--------|------------------------------|------------------------------|
| CC     | 42.00                        | 62.50                        |
| CWA1   | 44.83                        | 65.50                        |
| CWA2   | 47.60                        | 66.00                        |
| CWA3   | 40.83                        | 62.17                        |
| CWA4   | 40.00                        | 59.00                        |
| CWA5   | 37.17                        | 52.17                        |

Table -5: Split Tensile Strength of Specimens

| Mix ID | Split Tensile Strength @7 Days | Split Tensile Strength @28Days |
|--------|--------------------------------|--------------------------------|
| CC     | 2.01                           | 4.45                           |
| CWA1   | 2.15                           | 4.74                           |
| CWA2   | 2.67                           | 5.16                           |
| CWA3   | 1.95                           | 4.31                           |
| CWA4   | 1.87                           | 4.29                           |
| CWA5   | 1.76                           | 4.10                           |

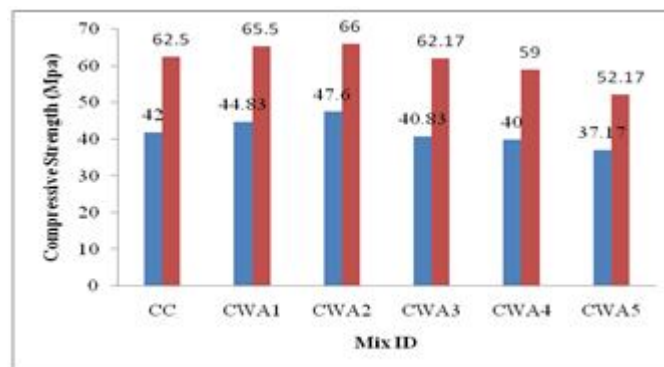


Chart-1: Compressive Strength of Specimens

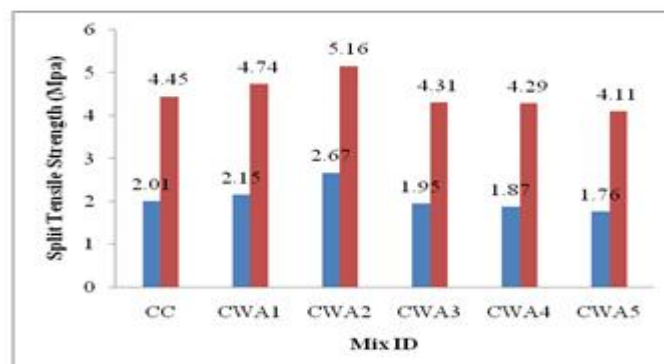


Chart-2: Split Tensile Strength of Specimens

**6. CONCLUSIONS**

- Addition of 15% of silica fume in geopolymer concrete enhance the strength to reach its high performance.
- Replacement of ceramic waste aggregates up to 30% with normal coarse aggregates helps to attain maximum compressive and split tensile strength.
- Replacement of 40% and 50% ceramic waste aggregates fails to attain its target strength.
- Rest period of three days assist the specimens to improve its strength.
- Oven curing with 60°C at 48hrs increase the strength of geopolymer concrete.
- Addition of 0.8% of superplasticizer by weight of cement (Conplast SP430) helps to bind all the ingredients into homogeneous mix.

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**HEALTH TOURISM, ITS DEVELOPMENT AND CURRENT TRENDS IN INDIA**

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**ABSTRACT**

*Travelling for wellness and health is one of the most important tourist patterns of economic generated by the industry, tourist and health sector. Health tourism is a wider term to travel which focuses on medical treatments. It covers a wide concept and wide field of health orientation tourism ranging from preventive and health conductive forms of travel. Health care is an act where people from all around the world and are traveling from one country to another to gain medical, surgical and dental care. People travel from one place to another because they need cheaper rates or treatments rates such as Ayurveda or Yoga therapies which are not available in own country. Health tourism is a fast growing tourism industry with multi Billion dollars all around the world. It entails trade and services of two important industries which are medicine and tourism. It has earning huge sum of foreign exchange. In India there is a lot of opportunity to develop medical tourism and capture a big share of industry. But on the other hand there are lot of challenges which India is facing in developing health tourism. India has been a pioneer in healthcare tourism due to modern medical technology and low prices. Healthy people traveling to other cities to maintain their psychological and physical health through receiving certain services. The present paper indicates the discussion of health tourism, its development and current trends in India.*

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**1). INTRODUCTION**

Tourism is one of the fastest growing industry in world. In 2nd half of the 20th century Tourism industry has evolved into global business contributing around 9% of world GDP and 8% of world employment. With the advent of globalization and the growing culture of consumerism, people start to travel globally so as to make use of a wide variety of alternatives that bring them personal satisfaction and which promote healthy living.

They are conscious in maintaining a healthy body, mind and soul. Currently millions of people are travelling to tourist destinations seeking healthcare. Healthcare tourists are those people who cross international borders for the exclusive purpose of obtaining healthcare services. Healthcare tourism has increased in part because of rising health-care costs in developed countries, cross-border medical training and widespread air travel. The Healthcare tourism industry has been growing worldwide. It involves about 50 countries in all continents and many Asian countries like India, Singapore and Thailand are clearly in the lead. These three Asian countries, which combined comprised about 90% of the Healthcare tourism market share in Asia.

**HEALTH TOURISM**

Health is the synergy between hospitals and the Tourism industry. Healthcare tourism can be broadly defined as provision of cost-effective private medical care in collaboration with the tourism industry for patients needing surgical and other forms of specialized treatment. This process is being facilitated by the corporate sector involved in medical care as well as the tourism industry- both private and public.

**ACC TO "WEIERMAIR K AND MATHIES C":** Health Tourism means Traveling across international borders to obtain health care services.

**ACC. TO "DR. PREM JAGYASI":** Healthcare Tourism is often interchanged with the terms "Medical Travel", "Medical Tourism" "Health Travel" and "Global Healthcare". Although each term has a specific meaning, they all fall into the description of individuals travelling abroad for any type of medical, quasi-medical or health treatment. It also describes the growing global industry of healthcare professionals, clinics and hospitals who are marketing themselves to overseas patients.

**HISTORY OF HEALTHCARE TOURISM**

The concept of Healthcare tourism is not a new one. It dates back thousands of year old when Greek pilgrims traveled from all over the Mediterranean to sanctuary of the healing god Asklepios at Epidauria. Spa towns and sanitariums may be considered an early form of healthcare tourism. For example, in eighteenth century in England, patients visited spas because they were places with supposedly health-giving mineral waters, treating diseases like liver disorders, skin problems etc. Since 19th century when there were no restrictions on travel in Europe people visited neighboring countries in order to improve their health. In 20th century, however health tourism expand to a

much larger level and countries like Thailand, India, Argentina, Cuba, China and others become the most popular destination for health care.

**2). HEALTHCARE TOURISM IN INDIA**

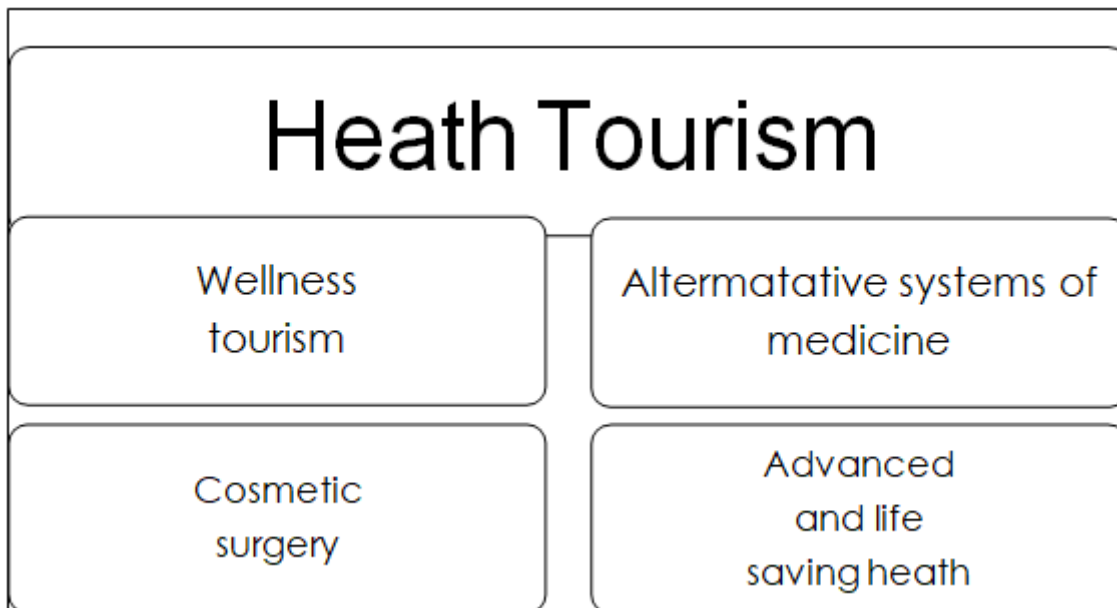
Healthcare tourism is an age-old concept that has gained popularity in the recent times. The history of healthcare tourism in India is very old. With the popularity of Yoga and Ayurveda, around 5000 years ago constant streams of medical travelers and spiritual students flocked to India to seek the benefits of the alternative healing methods.

Today, many people travel great distances to exotic locations for health care facilities in faraway countries, in search of medical treatment and health care. Due to various positive impacts of healthcare tourism, many developing countries are emerging as hot healthcare tourism destinations. India is a huge magnet for attracting foreign patient for medical treatment.

**HEALTH TOURISM STRUCTURE IN INDIA**

Nowadays healthcare tourism in India includes advanced and life savings health care services like open transplants, cardio vascular surgery, eye treatment , dental treatment, knee/hip different cosmetic surgeries and alternate systems of medicine. Some other aspect like leisure, medical traveling/wellness tourism may be included on such medical travel trips. India provides a variety of medical services to overseas patients.

**FIGURE 1: THE HEALTH CARE TOURISM STRUCTURE IN INDIA**



**TABLE 1: CLASSIFICATION OF THE SERVICES SPECTRUM OF HEALTHCARE TOURISM IN INDIA VIS-À-VIS ITS COMPETITIVE COUNTRIES**

|                         | <b>Wellesstourism</b>                                        | <b>Alternativesystems of medicine</b>                                      | <b>Cosmeticsurgery</b>                                                              | <b>Advanced andlife savings healthcare</b>                                                          |
|-------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Services offered</b> | Spas, Stress relief, rejuvenation centres                    | Yoga, Ayurvedics, Siddha treatment for diseases e.g. Arthritis, Rheumatism | Dental Care, Plastic Surgery , Breast enhancement, Tummy reduction , Skin Treatment | Open transplants, cardio vascular surgery, Eye treatment , Hip Replacement , In vitro fertilization |
| <b>Profit Margin</b>    | Low                                                          | Low                                                                        | Medium                                                                              | High                                                                                                |
| <b>Key Competitors</b>  | Thailand , SouthAfrica --                                    | --                                                                         | South Africa , Cuba , Thailand                                                      | Singapore , Jordan, Thailandand Malaysia                                                            |
| <b>India’s Strength</b> | Low –Thailand has captured a significant share of the market | High-Kerala is popular for thisservice                                     | Low –South Africa and Thailand leads in plastic surgery                             | High-India has strong image onmedical tourism                                                       |



**WHY INDIA**

India has a very old civilization of more than 5000 years and is known for its cultural and religious diversities with diverse geographical landmarks. The traditional arts and crafts add to its appeal to attract tourists. In India guest are treated as god so is the case with tourist. In India, the indigenous or traditional health care practices like Ayurveda, Siddha, Unani, Naturopathy, and Yoga provide uniqueness. And it attracts patients from all over the world. From the customer's perspective, i.e. the medical tourist's perspective, the key drivers which motivate a patient to travel to India for medical purpose are:

- Availability Of Hospitals With International Accreditations.
- Low Cost Of Treatment Provided In Comparable To Any Other Destination In Developed Countries.
- English Speaking Doctors And Other Staff.
- Flight Connectivity Is Good.
- Possibility Of On Line Diagnosis Especially For Post Care And Future Consultations.
- Large Pool Of Doctors (Over 650,000)
- Nurses & Paramedics – Highly Skilled Experts With Good Communication Skills.
- Strong Pharma Sector And Gaining Worldwide Recognition.
- Yoga & Ayurveda As Alternative Treatments. (In Case Of Minor Ailments)
- Availability Of Major Tourist Destinations Like Goa, Agra Jaipur, Kerala Etc. (This Serves As An Additional Incentive To The Medical Tourist).

**3) DEVELOPMENT OF HEALTH TOURISM IN INDIA**

- **INCREASED DEMAND FOR WELLNESS TOURISM AND ALTERNATIVE CURES:** due to fast-paced lifestyle now in developed countries there is increase in the demand of alternative healthcare practices. India is the hub of some of the unique alternative healthcare practices like yoga, Ayurveda, homoeopathy, naturopathy etc. these alternative provide motivation to foreigner to visit India.
- **REDUCED COST OF INTERNATIONAL TRAVEL AND TOURISM:** India have all the facilities in bulk which are required by the tourists. There are a growing number of convenient, inexpensive non-stop or one-stop flights to India. All this results in low cost of tour packages to India, which directly attract people from around the world.
- **AVAILABILITY OF ALTERNATIVE HEALTHCARE PRACTICES:** the availability of alternative healthcare practices such as Yoga, Meditation, Ayurveda, Allopathy, and other systems of medicines are increasingly becoming popular among foreign patients as non-surgical treatment for various ailments. Kerala for Ayurveda and Kairali Massage, Uttarakhand for yoga and meditation, Goa for holistic living, Rajasthan for spas and heritage living, are some of the world-renowned places in India for alternative medicine. These practices are the main ancestral assets which provide a big opportunity to the country to develop healthcare tourism in India and to earn a big amount of foreign exchange from the developed countries.
- **HIGHER COST OF MEDICAL TREATMENT IN DEVELOPED WORLD:** the cost of healthcare treatment in developed countries is 60-80% higher. India is the cheapest of any of the world healthcare tourism destinations, while being equal or better than other major destinations in terms of quality of staff, equipment and healthcare procedures. Foreigners are increasingly flocking to India because it offers quality treatment at a fifth of the cost abroad. In India, complicated surgical procedures are being done at 1/10th the cost as compare with the procedures in the developed countries.
- **LONG WAITING TIME FOR TREATMENT IN DEVELOPED COUNTRIES:** long waiting time for treatment in developed countries is one of the main motivator for the foreign patients to visit other countries to get treated. In countries like UK for a surgery a patient have to wait for 10 to 12 month. But on the other hand in developing countries like India, Thailand etc. there is not any waiting time. Patient can get treated whenever he wishes.
- **GROWING PRIVATIZATION AND INVESTMENT OPPORTUNITIES (FDI) IN TOURISM AND HEALTHCARE SECTOR IN INDIAN ECONOMY:** In recent years Increased participation of private sector result that Indian hospitals invested heavily in infrastructure, equipment's to make it globally

competitive particularly eyeing Indian elite class and foreign patients.

- **FLUENT ENGLISH SPEAKING HOSPITAL STAFF:** English is widely spoken and understood in India, which is one of the main advantage because it attract many Englishspeaking patient from different countries. Whereas countries like Thailand, China etc are lacking this quality.
- **DESTINATION WITH INCREDIBLE ATTRACTION:** India is the world's most popular and exciting destination for tourism. The country is well known for its rich and diversified culture, history, heritage, people & lifestyle, fairs and festivals, food, wildlife, deserts, beaches as well as snow covered peaks of Himalayas.

#### 4). CHALLENGES TO HEALTHCARE TOURISM IN INDIA

- **STRONG COMPETITION FROM COUNTRIES:** no doubt India have lot of opportunities to develop healthcare tourism but even then India have to face cut-throat competition from countries (Thailand, Malaysia, Singapore, Philippines etc.) that actively promote healthcare tourism.
- **LACK OF INTERNATIONAL ACCREDITATION:** one of the main challenge in front of Indian healthcare industry is that most of the hospitals of India are not accredited by any international accreditation agency like JCI, ISO, NABH etc. Either these hospitals are not fulfilling the norms of these agency or they are not serious for getting accreditation from international agency
- **LACK OF INSTITUTIONAL TIE-UPS BETWEEN DIFFERENT PLAYERS OF INDUSTRY:** lack of coordination and tie-ups between different players (hospitals, insurance companies and travel companies) of industry is also one of the main problem for Indian healthcare tourism industry. This coordination is must require to develop this industry in India.
- **UNAVAILABILITY OF PROPER SAFETY & SECURITY FACILITIES:** when a person travel out of his familiar place he always expect proper safety and security measures at the destination. Whereas India is lacking in providing proper safety and security. To satisfy this safety and security need to the tourist is one of the biggest challenges for the Indian tourism industry.
- **POOR INFRASTRUCTURE AS WELL AS INFORMATION & COMMUNICATION FACILITIES:** India is one of the developing country so till date its infrastructure and communication system is not fully develop. It is nowhere stand parallel to the developed countries. Special Issue ISSN:2278-4853 Vol. 4, Issue 3, March 2015 Impact Factor: SJIF 2013=4.708 TRANS Asian Research Journals <http://www.tarj.in> 44
- **POSSIBILITY OF SPREAD OF SERIOUS DISEASES FROM FOREIGN PATIENTS:** one of the main drawbacks of developing healthcare tourism is that there is risk of spreading of serious diseases to the locals from the foreign patients. To reduce this risk is a great challenge against the industry.
- **NO STRONG GOVERNMENT SUPPORT:** The government can play a vital role to upgrade the healthcare tourism sector. But the industry is always treated like stepson by government which results that now industry is facing the following problems which are caused by the governments. They are: (a) no regulations, (ii) taxation anomalies, (c) bureaucratic roadblocks, (d) no works on land reforms, (e) lack of long-term investor friendly policies and (f) instability with respect to terrorism and communal tensions.
- **LACK OF PROPER INSURANCE POLICIES FOR THIS SECTOR:** On the part of insurance and allied services, the healthcare tourism industry in India is also facing some key bottlenecks. They are: (a) inadequate insurance cover, (b) underdeveloped insurance market in India, (c) insurance frauds and (d) overseas companies refusing reimbursement.

#### 5) CURRENT TRENDS OF HEALTH TOURISM IN INDIA

##### 1. The Growth of Private Health Cities

Foreign investment has grown significantly. This paved the way for private health cities to emerge. Patients from different countries are becoming attracted to multi-specialty hospitals. These hospitals offer both health and hospitality.

##### 2. Asian Expansion

Medical tourists bound for Asia are expected to increase in number because Asian countries provide high standards of hospitality and care. Plus, they are always updating to the latest technology. And don't forget that medical care is a lot cheaper in Asia than other regions.

### 3. Cultivation of Skilled Medical Tourism Professionals

The growth of the industry calls for a surge of qualified health care personnel. This includes doctors, surgeons, translators, physiotherapists, and other facilitators. Medical schools and training centers are also expected to rise with the need as these professionals learn specialized procedures that are favored by medical tourists. These are rhinoplasty, angioplasty, and breast augmentation among others.

### 4. Establishment of New Destinations

Several countries that are currently known for catering to medical tourists will have new contenders in the future. The UAE, Greece, and Taiwan have shown promising growth over the past years in part due to their breathtaking landscapes that patients look forward to during their visit.

Medical tourism has indeed changed the future of the healthcare industry. It has expanded so much and is continually evolving all throughout the globe. The previously set standards are set to be surpassed in the coming years as more people will expect for more advancement, quality service, as well as lowering of the costs.

### 6). SUGGESTIONS

**The following suggestions lay down the future path for India in order for developing India as a unique destination for healthcare tourism.**

- **ROLE OF GOVERNMENT:** The role of Indian Government for success in healthcare tourism is two-fold: a) Acting as a Regulator to institute a uniform grading and accreditation system for hospitals to build consumers trust. b) Acting as a Facilitator for encouraging private investment in healthcare infrastructure and policy making for improving healthcare tourism.
- **MEDICAL VISAS:** A simplified systems of getting medical visas should be developed in order to make travel across borders easier. Visas can be extended depending on the condition of the patients. A visa on arrival scheme for the tourists from selected countries should be instituted which allows foreign nationals to stay in India for healthcare reasons. There is a need to simplify and speed up these procedures to make India a more attractive healthcare tourism destination.
- **SETTING UP NATIONAL LEVEL BODIES:** To market India's specialized healthcare products in the world and also address the various issues confronting the corporate healthcare sector, leading private hospitals across the country should plan to set up a national-level body with the objective to promote India as hot healthcare tourism destinations.
- **PROMOTING INTER-SECTORAL COORDINATION:** The government bodies like NAHT (National Association of Health Tourism) should take up the responsibility of coordinating the activities of various players – Hospital, Tourism Department, Transport Operators, Hotel Associations, Escorts personnel etc.
- **STANDARDIZATION OF SERVICES:** there is need to enhanced the image of India for that concerned authorities should also focus on establishing price parity for similar kinds of treatments in various hospitals and ensure the hospitals follow to high hygiene and quality standards. It is felt that not only the private hospitals but the country to stands to benefit from this by earning foreign currency.
- **JOINT VENTURES / ALLIANCES:** To face increasing competition in healthcare tourism sector, Indian hospitals should tie-up with foreign institutions for assured supply of medical tourists. Specifically they should tie-ups with hospitals and insurance providers. For example Mohali's Fortis Hospital has entered into a mutual referral arrangement with the Partners Healthcare System, which has hospitals like Brigham Women's Hospital and Massachusetts Hospital in Boston under its umbrella, to bring patients from the US (Kohli 2002). The Apollo group has also tied up with hospitals in Mauritius, Tanzania, Bangladesh and Yemen.
- **PUBLICITY OF THE HEALTHCARE PRODUCT:** Production of publicity material such as websites, popular magazines, tourist guide books, business magazines and journals on tourism is needed and should be circulated in target markets.
- **SUPPORT THE PUBLIC-PRIVATE PARTNERSHIP:** to accelerate the growth of healthcare tourism in India there is need to support public – private partnership so that difference financial and policy related hurdles can be solved timely.



## Health Tourism

### 7). CONCLUSION

India has enormous potential to emerge as one of the world's best Healthcare tourism destinations. Its splendid tourism attractions and unique healthcare practices like Ayurveda, Spa, Yoga, Meditation, Siddha, Naturopathy etc. have the ability to lure more and more tourists from around the world. In addition to traditional healthcare practices, the emergence of accredited multi-specialty hospitals will undoubtedly boost healthcare tourism in India. As long as differences in medical techniques and costs exist among countries, healthcare tourism should continue to develop and evolve India as sought after destination.

Now there is only need that legal, regulation, and ethical issues are being addressed and resolved by governments and healthcare institutions. Government of India, ministry of tourism should set up a department for Marketing India as healthcare destination.

The private sector should also be motivated to invest in this sector so that world class hygienic infrastructure should be developed.

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## ENVIRONMENTAL IMPACT ASSESSMENT OF WASTEWATER TREATMENT SYSTEMS: STATE OF THE ART

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### ABSTRACT

*Discharge of untreated water is common practice in many countries, especially in the Indian context, where major downsides are rapidly growing population and wastewater generation. Environmental impact assessment plays a significant role within the field of wastewater treatment however; its application is still in process. This paper aims to review articles dealing with methodologies for analysing environmental, economic, and social impacts of wastewater treatment plants (WWTP) and the comparative assessment of centralized and decentralized wastewater treatment systems. Besides, in most of the urban areas, the selection of the treatment system is a major concern. Thus, the need for stricter adherence to sustainability indicators to help decision-makers for selecting the appropriate wastewater treatment system is highlighted in the current study.*

*Keywords: Environmental impact assessment, Life cycle assessment, Sustainability indicators.*

### 1. INTRODUCTION

The potential environmental impact of wastewater treatment plants can be identified by several environmental analysis tools such as Environmental Impact Assessment (EIA), Material Flow Analysis (MFA), Life Cycle Assessment (LCA), and Strategic Environmental Assessment (SEA). To assist in making the design and construction of the most suitable sewage treatment plants, utilization of environmental impact assessment techniques would be helpful. In general, environmental effects are measured by defining and assessing the resources and materials used and waste emitted to the atmosphere during the life cycle. The construction phase of the wastewater treatment plant consumes a lot of resources and energy, whereas energy and chemicals consumed during the operation phase are responsible for emissions to air, soil, water that can pollute the environment. In many countries, LCA has been widely used to analyse the waste management systems. Usually, decentralized wastewater treatment systems involve more awareness and participation from local users than the centralized approach of wastewater treatment. Also, decision-related to the implementation of a decentralized treatment solution is usually conducted at the local level, whereby local stakeholders are more proactive when considering these systems.

### 2. LITERATURE REVIEW

Over the past decade, comprehensive studies were performed worldwide, which address the impact assessments of WWTPs on the environment using the LCA method. On the whole, several studies addressed mainly industrial wastewater treatment plants, the municipal water, and wastewater treatment plants (Tillman et al., 1998; F. J.; Machado et al., 2007; Glick et al., 2012). In relation to local environmental conditions, the lack of data on cost optimization in developing countries may result in an inappropriate selection of WWT systems (Poch et al., 2004). The crucial components of selecting the appropriate wastewater treatment systems are performance, reliability, sludge disposal, land requisites, and cost associated with infrastructure and operation (Walid and Rosenwinkel, 2005).

LCA was introduced in 1990 since then worldwide many researcher have performed studies associated with life cycle assessment of wastewater treatment system, but LCA-driven studies in the Indian context, are very few (Kalbar et al. 2012, 2013, 2014; Kamble et al. 2017; Raghuvanshi et al. 2017; Singh & Kazmi 2017; Singh et al. 2018; Kamble et al. 2019; Dewalkar & Shastri 2020).

With an increasing interest in the use of LCA in WWT system by researchers and decision-makers, it is essential to examine what has been done and identify the complexities for the near future. Table 1 and Table 2 shows the review of 25 studies using a range of databases including functional unit, phases included and impact methodology related to WWT system assessment.

**Table 1. Published LCAs applied within waste management system**

| Sr. no. | References              | Country | Functional unit | Impact methodology | Phases included          |
|---------|-------------------------|---------|-----------------|--------------------|--------------------------|
| 1       | Emmerson et al., (1995) | UK      | 1000 p.e, 15 ys | Inventory only     | Const, O&M, End of life. |
| 2       | Tillman et al. (1998)   | Sweden  | 1 p.e. per yr   | Not specified      | Const, O&M.              |

|                                                                                                      |                                 |         |                               |                                                                     |                             |
|------------------------------------------------------------------------------------------------------|---------------------------------|---------|-------------------------------|---------------------------------------------------------------------|-----------------------------|
| 3                                                                                                    | Lundin et al. (2000)            | Sweden  | 1 p.e per y                   | Not specified                                                       | Const, O&M.                 |
| 4                                                                                                    | Dixon et al. (2003)             | UK      | 1 p.e                         | Not specified                                                       | Const, O&M.                 |
| 5                                                                                                    | Hospido et al. (2004)           | Spain   | 1 m <sup>3</sup> per d        | CML                                                                 | O&M.                        |
| 6                                                                                                    | Machado et al. (2007)           | Germany | 1 p.e.                        | CML                                                                 | Const, O&M,<br>End of life. |
| 7                                                                                                    | L. Bravo and I. Ferrer (2011)   | Spain   | 50,000 p.e, 20 yrs            | CML                                                                 | Const, O&M,<br>End of life. |
| 8                                                                                                    | K. Lopsik (2013)                | Estonia | 1 p.e.                        | Impact 2002+,<br>ReCiPe                                             | Const, O&M.                 |
| 9                                                                                                    | Risch et al. (2014)             | Egypt   | 1 p.e.                        | Recipe                                                              | Const, O&M,<br>End of life. |
| 10                                                                                                   | Greg McNamara (2016)            | Ireland | 1 p.e.                        | CML                                                                 | Const, O&M.                 |
| 11                                                                                                   | G. De Feo et al. (2016)         | Italy   | 5, 10, 20 and 30 p.e. per yr. | ReCiPe 2008 (H/H), Ecological Footprint and IPCC 2007 GWP 100 years | Const, O&M,<br>End of life. |
| 12                                                                                                   | Wenhua Piao & Ye-jin Kim (2016) | Korea   | 1 m <sup>3</sup>              | CML                                                                 | Const, O&M,<br>End of life. |
| 13                                                                                                   | M. Garfi et al. (2017)          | Spain   | 1 m <sup>3</sup>              | ReCiPe midpoint                                                     | Const, O&M.                 |
| 14                                                                                                   | M.Tabesh et al. (2019)          | Iran    | 1 p.e.                        | Eco-Indicator 99                                                    | Const, O&M,<br>End of life. |
| 15                                                                                                   | Y. Kobayashi et al. (2020)      | Canada  | 1 p.e.                        | TRACI 2.1                                                           | Const, O&M,<br>End of life. |
| Note: Const: Construction phase, O&M: Operation and maintenance phase, End of life: Demolition phase |                                 |         |                               |                                                                     |                             |

**Table 2. Published LCAs in Indian context applied within waste management system**

| Sr. no.                                                                                              | References                | Country | Functional unit               | Impact methodology | Phases included            |
|------------------------------------------------------------------------------------------------------|---------------------------|---------|-------------------------------|--------------------|----------------------------|
| 1                                                                                                    | Kalbar et al. (2012)      | India   | 1 p.e. per yr                 | CML                | Const, O&M                 |
| 2                                                                                                    | Kalbar et al. (2013)      | India   | 1 p.e. per yr                 | CML                | O&M                        |
| 3                                                                                                    | Kalbar et al. (2014)      | India   | 1 p.e. per yr                 | CML                | O&M                        |
| 4                                                                                                    | Singh P. et al. (2016)    | India   | 1 m <sup>3</sup>              | IPCC, CED          | Const, O&M                 |
| 5                                                                                                    | Kamble et al. (2017)      | India   | 1 m <sup>3</sup>              | CML                | Const, O&M,<br>End of life |
| 6                                                                                                    | Raghuvanshi et al. (2017) | India   | 1,500 m <sup>3</sup> /d 50 yr | ReCiPe             | O&M                        |
| 7                                                                                                    | Singh N. et al. (2017)    | India   | 1 m <sup>3</sup>              | CML                | Const, O&M                 |
| 8                                                                                                    | Kamble et al. (2019)      | India   | 1 m <sup>3</sup>              | CML                | O&M                        |
| 9                                                                                                    | Singh et al. (2019)       | India   | 1 m <sup>3</sup>              | CML                | O&M                        |
| 10                                                                                                   | Dewalkar & Shastri (2020) | India   | 1 m <sup>3</sup>              | Impact 2002+       | Const, O&M                 |
| Note: Const: Construction phase, O&M: Operation and maintenance phase, End of life: Demolition phase |                           |         |                               |                    |                            |

Studies addressing impact assessment of decentralised WWT systems are relatively uncommon but in recent years these have become more frequent (Machado et al., 2007; Gardels, 2011; Glick and Guggemos, 2013; K. R. Piratla et. Al., 2015). Several researches report the cost-effectiveness of a decentralised system than a centralised WWT system for specifically small countries (Butler R. and MacCormick T, 1996). A shift towards the treating domestic wastewater with decentralisation occurs due to a rise in water scarcity and the constantly growing urbanisation worldwide. (Lam et al., 2015; Larson and Gujar, 2013). About 80-90 percent of the cost of the centralised WWT system is associated with the transport of waste from the source to the treatment facility, while 10-20 percent of the cost is mainly associated with the treatment process (Goodland and Filler, 1996). K. R. Patel (2015) examines an increase in supply reliability when conventional water supply

schemes are accompanied by on-site greywater reuse. By performing comparative reliability analysis between decentralized and centralized WWT systems, the research yielded 5.83% total reliability enhancement.

The construction phase has a substantial contribution in the environmental impact of natural wastewater treatment systems (Machado, et. al, 2007; Pillay et al., 2002). In comparison, the contribution of the mechanised WWTP construction process was found to be almost 1% of the overall life cycle impact across all the impact categories (eutrophication potential, human health, and terrestrial eco-toxicity) and thus can be further neglected in the analysis. Also, the environmental impact of end-of-life phase contribution is typically lower as compared to the overall environmental impact of the wastewater treatment plant (Emmersion et al., 1995; Tillman et al., 1998; Lundin et al., 2000; Karrman and Jonsson, 2008; Machado et al, 2007). Karrman and Jonsson (2008) reported that global warming potential is mainly influenced by coal incineration for electricity production. Sludge and effluent disposal containing heavy metals contributes to the impact indicators like terrestrial and aquatic ecotoxicity and human toxicity (Kalbar et al., 2012). Singh et al. (2017) develop an evaluation methodology and framework for data collection. Assessment of decentralized WWTPs across India has been done which helps in assessing emerging market technologies related with the existing one. In several kinds of research, the economic viability of WWTPs has been carried out with cost-benefit analysis (CBA) (Lund 1992; Tung1992; Godfrey et al., 2009). Sustainable development can often be presented as social, environmental, and economical.

LCA studies performed earlier have considered many software like SimaPro, Umberto, GaBi, Easewaste, Wisard, Eco-guide etc. These LCA programs have their own advantages and disadvantages. After reviewing several literatures focused on commercial software usage for analysing waste management system, it is worth mentioning that SimaPro has widely used software (Figure 1)

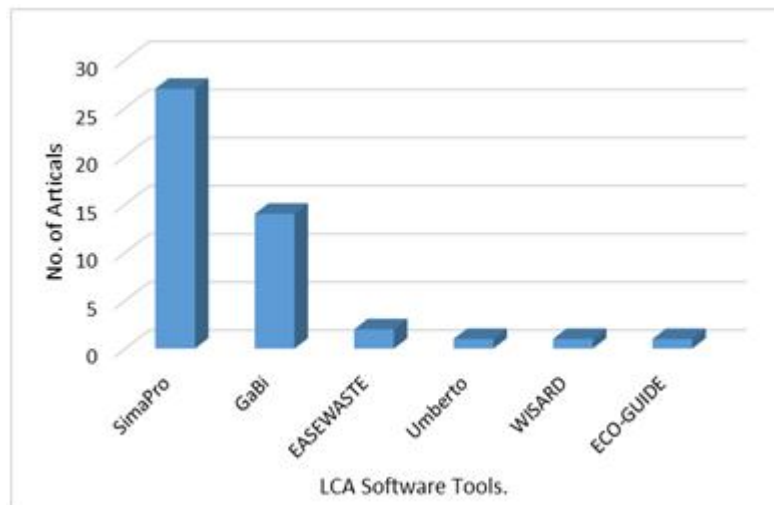


Figure 1. Review of use of LCA software for assessment of waste management systems.

### 3. SUSTAINABILITY INDICATORS

#### 3.1. Environmental sustainability

Environmental sustainability concerns the ability to protect human ways of life. The latter depends primarily on the ethical basis: to what degree policies should be anthropocentric and to what degree nature has endogenous characteristics (Balkema et al., 2002). It is also used to compare the degree of recycling and re-use from the operational phase of treatment plant (such as agricultural spreading with enrichment of nutrients and organic material), and non-renewable energy protection (such as biogas production).

#### 3.2. Economic sustainability

The principle of the economic approach consists of all the resources associated with the treatment facility. In addition, it can also be coupled with social and environmental values. However, economic analysis mostly includes financial cost i.e. capital costs and operating costs, and benefits achieved as sustainability indicators (Balkema et al., 2002). The type of effluent to be treated and the utilization of the treatment process has a major contribution to the operation and maintenance expense.

#### 3.3. Social sustainability

The main purpose of social sustainability is to build the environment both socially and naturally sustainable. Generally, qualitative and quantitative methods are used for assessing social sustainability. Qualitative social



sustainability works on indicators such as worker stress, work satisfaction, and attitudes to achieving sustainability (Stavroula et al., 2004; Palme et al., 2005). Whereas, quantitative sustainability associated with the indicators like social capital (in terms of customer value, efficiency); social equity (in terms of fees, local affairs, autonomy, social compatibility); and social peace (in terms of responsiveness, environmental awareness, work involvement) (Tamara Popovic et al., 2014).

**4. Life Cycle Assessment**

LCA phases have been specified in the ISO 14040:1997 standard and are depicted schematically in Figure 1. In precise, The ISO 14041:1997 standard, ISO 14042:1997, and ISO 14043:1997 standard explicitly consists of the concept of a goal, scope, and inventory analysis; environmental impact assessment; interpretation, describing the methodology behind LCA studies, respectively. Environmental Protection Agency (1993) defines the LCA as an assessment of the potential environmental impact associated with a particular activity from the preliminary procurement of the raw materials from the earth to the point of return to the earth of all residuals. A life-cycle practices the “cradle-to-grave” and cradle-to-gate” approach for product process or activity. Cradle-to-grave describes the use of resources, the input of materials, and the waste produced from raw material acquisition to their final disposal. The four main stages of ISO LCA are described in the next section.

**4.1. Goal and Scope definition**

The first stage of ISO LCA defines the purpose of the study and decision process to which it makes available environmental decision supports. The goal should be well defined and relatively close to the decisions to be made. Some essential questions should be answered during the process of goal and scope definition, such as why is the study conducted? Why there is a necessity of LCA? Who is the study's pilot target audience? (Ahmed M. T., 2010).

**4.2. Inventory Analysis**

During the inventory analysis phase, the LCA model is constructed rendering to specifications govern as per goal and scope definition. Inventory analysis enumerates resources and energy consumption, and environmental emission, which is allied with all the processes in the system. The inventory table shows the outcomes of an inventory analysis that plays the main role of generating lists related with the quantified inputs and output scenario as per specified functional units (Guinee J. et al., 2002).

**4.3. Impact Assessment**

The impact assessment phase comprises an evaluation of the impact on the environment that the system has exerted (Baumann and Tilman, 2014). It has four assessment steps: 1. Classification and description of impact indicators. 2. characterisation. 3. Normalisation, 4. Weighting.

**4.4. Interpretation**

Interpretation is the final important stage, which demonstrates conclusions drawn from the acquired results and the crucial sources of impact also solutions available for their mitigation (Ahmed M. T., 2010). In order to make conclusions and propose suggestions, the results from inventory analysis are evaluated (Baumann & Tilman, 2014).

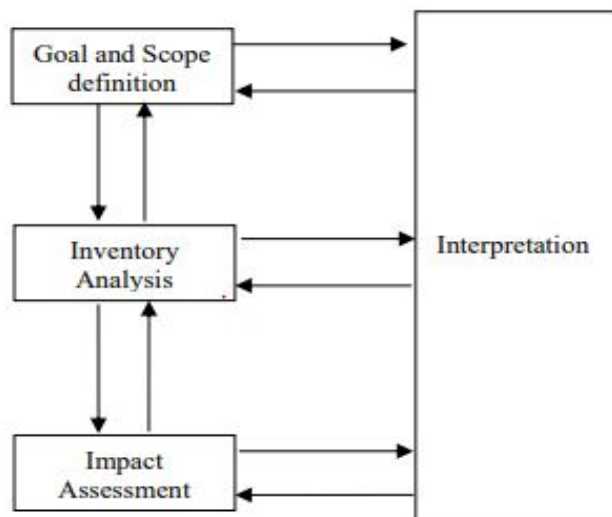


Figure 2. Phases of LCA (ISO 14040, 1997)

## 5. CONCLUSION

Life cycle assessment methodology can very well be structured with sustainability indicators such as environmental, social, and economical, which helps in not only assessing wastewater treatment systems but also selecting an appropriate system. Goal and scope definition, inventory analysis, and optimization are the phases associated with LCA methodology. The numerous literature in the field of LCA of WWTP has revealed the variability observed in the case of system boundaries, functional unit, implementation of assessment method, and the procedure adopted for interpreting the outcomes within the limitations of the ISO specifications. A centralized and decentralized selection of the wastewater treatment system is an important parameter in order to reduce environmental impacts. The performance characteristics and environmental impacts of centralized and decentralized WWT systems vary in many ways such as high-energy consumption, use of construction material with high-embodied energy, land occupation. If one of the core functions of the WWT process is to reduce the adverse impacts on the environment, then they should be built to serve the purpose. The current study reviews sustainability parameters, which acquire vital importance in the decision-making process. LCA plays important role in supporting the decision-making process and helps in simplifying complex problems. Although generic LCA software mostly comprises extensive databases but are not always necessarily relevant to waste management system and not entirely adequate for national or regional contexts. As far as the Indian LCA database is concerned, some literature reflects the need for the development of specific and exhaustive life cycle inventories.

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## EFFECT OF FOLIAR NUTRITION ON YIELD AND ECONOMICS OF RICE

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## ABSTRACT

A field experiment was conducted at Anbil dharmalingam Agricultural college and Research Institute, Trichy during Rabi season of 2020 on rice to access the productivity enhancement through foliar nutrition. The experiment was conducted in RBD with three replications with 8 treatments viz., T<sub>1</sub> - No spray(control), T<sub>2</sub> - Inorganic (1%Urea + 2%MAP + 1%KCL), T<sub>3</sub> - PPFM @ 500 ml/ha, T<sub>4</sub> - Brasinosteroid @ 0.5 ppm, T<sub>5</sub> - T<sub>2</sub>+T<sub>3</sub>, T<sub>6</sub> - T<sub>2</sub>+T<sub>4</sub>, T<sub>7</sub> - T<sub>3</sub>+T<sub>4</sub>, T<sub>8</sub> - All (T<sub>2</sub>+T<sub>3</sub>+T<sub>4</sub>). Foliar nutrition given at panicle initiation and 15 days later. Various yield attribute were recorded at harvest stage. The results revealed that foliar spray of nutrient combination T<sub>8</sub> significantly recorded more no. of grains/panicle(145), Filled grains(138nos). Thus, foliar spray of T<sub>8</sub> [Inorganic(1%Urea+2% DAP+1%KCL) + PPFM@ 500ml/ha+Brassinosteroid@0.5ppm] at panicle initiation and 15 days after 1<sup>st</sup> spray could be recommended as economically viable and best nutrient management strategy under sodic soil during rabi season.

Keywords: Rice, Productivity, foliar nutrition, Yield, BCR

## INTRODUCTION

Rice (*Oryza sativa* L.) is an important cereal crop of India and belongs to the family gramineae, It is the staple food for two thirds of the world's population. Rice is grown under many different conditions. Rice is the only cereal crop that can grow in standing water. 57% of rice is grown on irrigated land, 25% on rain fed lowland, 10% on the uplands, 6% in deep water and 2% in tidal wetlands of the world. In India, rice is cultivated on an area of about 44.21 million hectares. India, area under the sodic soil condition is 37.8 lakh ha. In Tamil Nadu, 3.5 lakh ha of area is under sodic soil. The sodic soils are characterized by a disproportionately high concentration of Na in their cation exchange complex, contains more than 15% exchangeable sodium percentage and having high pH (>8.5) due to the presence of high concentrations of sodium carbonate. Foliar nutrition is recognized as an important method of fertilization, since foliar nutrients usually penetrate the leaf cuticle and enters the cell facilitating easy and rapid utilization of nutrients. nutrients availability to plants is very less in soil application. In this circumstances application of nutrients through foliar spray may be beneficial to rice.

Keeping these in view, a field experiment was conducted during Rabi season of 2020 with the following objectives:

- To study the impact of Foliar nutrition in rice on growth and yield
- To find out suitable Foliar nutrition based on economics
- To select suitable combination of foliar nutrition

## MATERIALS AND METHODS

A field experiment was conducted at Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Tiruchirapalli during Rabi season of 2019-2020 to study the effect of foliar nutrition on rice growth, yield and economics under sodic soil. Soil of the experimental field was alkaline in reaction (pH - 8.8), clay and moderately drained. The initial soil status was low in available nitrogen(229kg/ha) medium in available phosphorus (14.5 kg/ha) and medium in available potassium (168 kg/ha). Medium duration rice variety TRY 3 was grown.

Experiment was laid out in randomized block design with three replications. Treatments consists of foliar application of T<sub>1</sub> - No spray(control), T<sub>2</sub> - Inorganic (1%Urea + 2%MAP + 1%KCL), T<sub>3</sub> - PPFM @ 500 ml/ha, T<sub>4</sub> - Brasinosteroid @ 0.5 ppm, T<sub>5</sub> - T<sub>2</sub>+T<sub>3</sub>, T<sub>6</sub> - T<sub>2</sub>+T<sub>4</sub>, T<sub>7</sub> - T<sub>3</sub>+T<sub>4</sub>, T<sub>8</sub> - All (T<sub>2</sub>+T<sub>3</sub>+T<sub>4</sub>). Foliar spray given at panicle initiation and 15 days later. Biometric observations on growth parameters, yield attributes and yield were recorded. Economics were worked out based on the input cost, labour wages and produce price based on the market value prevailed. The data on various characters studied were analyzed statistically as per the procedures suggested by Gomez and Gomez (1984)

No. of panicles per square meter at harvest was counted by using a quadrat of 50 X 50 cm at three places at random in each plot and total number of panicles per square meter were computed. Five panicles were sampled

randomly at maturity stage from each plot and their length was measured and averaged values were recorded in cm. After taking weight selected five panicles were threshed and number of filled grains was counted and there after the mean number of grains per panicle were computed .A composite sample of grains was collected from the produce of each plot after drying and cleaning. Thousand grains were counted from the sample and their weight was recorded in gram. Threshing was done plot-wise manually. The thrashed grains were sun dried to bring the moisture content at a standard level of 14 per cent and cleaned thoroughly before taking the final weight in kg per plot, qha-1. which in largely computed as The straw yield was computed by deducting the grain yield from the total biomass from each plot qha-1 and expressed in The recovery of grains in total dry matter of crop was considered as harvest index.

## RESULTS AND DISCUSSION `

The results (Table1) revealed that the yield attributes are significantly higher No. of .grains/panicle (145), filled grains(138nos),high fertility %(97)under foliar spray of nutrient combination T<sub>8</sub>. However, it was comparable with foliar spray of T<sub>7</sub> (T<sub>3</sub>+T<sub>4</sub>). Such Increase in yield attributes might be due to altered physiological and reproductive growth of the crop induced by foliar spray of nutrient combination T<sub>8</sub> through enhanced activities of enzymes and photosynthetic efficiency. Lower level of no of grains/panicle (118),filled grains(138) and fertility %(93) are observed under control.

Nutrient combination (T<sub>8</sub>) significantly recoded the highest grain yield of rice and this greater grain yield might be due to absorption of nutrient at peak time with optimum rate at critical stages of rice as a result maximum mobilization of photosynthates from source to sink and ultimately yield contributing characters like, filled grain/panicle, test weight and improved grain yield.

Similarly T<sub>8</sub> recorded the highest BC ratio of 2.48 compared other treatments

**Table 1.Effect of foliar spray of nutrients on yield attributes, yield and economics of rice**

| Treatment      | Productive tillers/m <sup>2</sup> | No of grains/panicle | Panicles length(cm) | Grain yield (kg ha <sup>-1</sup> ) | Benefit Cost Ratio |
|----------------|-----------------------------------|----------------------|---------------------|------------------------------------|--------------------|
| T <sub>1</sub> | 179                               | 118                  | 15.24               | 4033                               | 1.56               |
| T <sub>2</sub> | 183                               | 121                  | 15.32               | 4466                               | 1.96               |
| T <sub>3</sub> | 210                               | 134                  | 15.16               | 4266                               | 2.21               |
| T <sub>4</sub> | 218                               | 143                  | 16.25               | 4672                               | 1.71               |
| T <sub>5</sub> | 216                               | 135                  | 16.47               | 4066                               | 1.59               |
| T <sub>6</sub> | 232                               | 137                  | 17.28               | 4500                               | 1.69               |
| T <sub>7</sub> | 250                               | 139                  | 17.46               | 5028                               | 2.23               |
| T <sub>8</sub> | <b>261</b>                        | <b>145</b>           | <b>17.89</b>        | <b>5433</b>                        | <b>2.48</b>        |

## CONCLUSION

From this study it is concluded that foliar spray of T<sub>8</sub> [Inorganic(1%Urea+2% DAP+1%KCL) + PPFM@ 500ml/ha+Brassinosteroid@0.5ppm] at panicle initiation and 15 days after 1<sup>st</sup> spray could be recommended as economically viable and best nutrient management to enhance the productivity of rice under sodic soil.

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**DEVELOPMENT OF NUTRITION BARS FROM SOUTH INDIAN TRADITIONAL RICE VARIETIES**

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**ABSTRACT**

*The main goal was to introduce traditional ingredients into our diet, through snacks or use the traditional rice as a substitute for the main ingredient in different products. A preliminary survey was conducted to find a product that people will be interested to consume with alternate ingredients than the ingredients usually used in the preparation of the product. From the list of traditional rice varieties, it was narrowed down to five traditional rices based on their benefits and their glycemic index. The preparation of nutrition bars were standardized by the preparation methods, ingredients used, texture and shape of the product were optimized. The texture, flavour, and shape of the nutrition bar was standardized with the help of primary and secondary sensory analysis. This sensory analysis form uses five hedonic scale as the measurement. A single product is finalized based on the results from the primary and secondary sensory analysis.*

*Keywords: Hedonic scale, Nutrition bar, Preliminary survey, Sensory analysis, Traditional rice.*

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**INTRODUCTION:**

(Pravin Kumar, Binodh, Saravanan, Senthil, & Senthil Kumar, 2019) Rice is a staple food in Asian countries and in India rice is in their meal at least once a day. Traditional rice varieties were lost during the green revolution. Which lead to the production of high yield rice varieties which needs less water to cultivate, when compared to the traditional rice varieties. The idea was to include traditional rice back into the daily use, since the high yield varieties cause many diseases and increase the blood glucose level. These are the different types of rice varieties that are cultivated in India like basmati, brown rice, white, red, etc. Most of the rices were unpolished but after the green revolution the high yielding rice varieties were mostly white rice and polished. They started polishing the rice to get a better appearance and better colour of the rice.

Rice is a main ingredient in a lot of traditional snacks that are made in the south Indian household for centuries. The pericarp is rich in protein and vitamin B which gets removed during the polishing and milling process of the grains, which leads to the deficiency of thiamin(vitamin B1) or Beri-beri. And to bring back the traditional rice varieties of daily diet. So we have taken traditional rice to create a new product, Kuzhiadichan, Kalanamak, Seraga samba, Neelam samba, Kullakar, Karupu kavuni, Sivapu kavuni, Karungkuruvai, Mappilai samba, Annamazhagi, Karuthakar, Kattuyanam, Kodai samba, Perunkar, Kudaivazhai. These are some, South Indian traditional rice varieties contains medicinal properties and health benefits.

(CIKS Report et al., 2014)(Res, 2010)

- Annamazhagi: It helps in curing the fever and reduce the body heat
- Kalanamak: It helps in reducing skin diseases and blood pressure, and it has been said that it is consumed by the Buddhist monk.
- Kodai samba: helps in curing vatha related disease based on the ayurvedic studies.
- Gundu samba:used to treat indigestion and treat skin diseases.
- Kattuyanam: it is useful in diabetes
- Karuthakar: the regular consumption of rice helps in controlling diabetes and a cure for piles.

**Preliminary survey**

The preliminary survey is done to find out the product preferred by the consumers, so the survey is taken between the targeted consumers between the age group of 20-30 years. Based on the results of the preliminary survey the desired product is prepared.

The targeted people are selected randomly to respond to the survey, to avoid biased and discussed answers they subjects are separated from forming a group and respond them to the survey, which helps in the selection of the product and whether they would prefer eating traditional foods or an alternate the traditional rice varieties to make them ready to eat food. The survey is calculated and recorded then the pie chart is used to represent the results, for each question, there is a separate pie chart made. These pie chart helps to find which ready to product is preferred by the consumers.

The list of products that was used in Pizza, burger, nutrition bars, cookies, pasta, noodles. Based on the survey results the preferred product was a nutrition bar. So the selected rice varieties are used to create a nutrition bar.

## METHODS AND MATERIALS

Traditional rice varieties that was selected to make nutrition bars are listed below:

(CIKS Report et al., 2014)(Kalaivani, Arulmozhi, & Bakiyalakshmi, 2018)(Krishnanunni, Senthilvel, Ramaiah, & Anbarasu, 2015)(MALINI. S, HESWARI, YA, & REDDY, 2018)(Rajendran, Sivakumar, Marichamy, Sundararajan, & Ramalingam, 2018)(Keerthivarman, Hepziba, Ramalingam, Hepziba, & Gnanamalar, 2019)

(Krishnanunni et al., 2015)(Rimal Isaac, Nair, Varghese, & Chavali, 2012)(Arisi, Manovina, Thamarai, & Gousika, 2019)

**Kuzhiadichan:** It contains Galactagogues, which is good for lactating mothers.

**Kullakar:** It acts as an antimicrobial due to the presence of 3-cyclohexane-1-methanol and  $\alpha$ ,  $\alpha$ ,4-trimethyl acetate. It contains 3-hydroxy-4-methoxy benzoic acid which is used as the precursor for the synthesis of morphine. It has fatty acid esters and fatty acids such as dodecanoic acid, ethyl ester(lauric acid ester), and octadecanoic ester which increases low-density lipoprotein (LDL) cholesterol in the human body. Likewise, it Contains 2,6,10-cycloundecatrien-1-one,2,6,9,9-tetramethyl-(E, E, E)a sequiterene used as a tumour suppressor. Not only that, but it has 3-hydroxyl-4-methoxy benzoic acid and 5-hydroxymethyl furfural causing the specific aroma and antimicrobial activity.

**Mappilai Samba:** It is a good source of phenolic compounds. It has good flavonoid content, the property which can be used in the treatment of cancer, coronary heart disease, gastrointestinal ulcers, and rheumatic disease. It contains high thiamine content.

**Karungkuruvai:** It has poly sterols such as sitosterol, stigma sterol, campesterol, cycloartenol. It contains esters of stearic acid. Volatile 2H-1,4-Benzodiazepine-2-one,7-chloro-1,3-dihydro-5-phenyl-1-(trimethylsilyl)-in siloxane derivative form is also found. The presence of anxiolytic anticonvulsant, sedative, hypnotic, and muscle relaxant molecule 1,4- Benzodiazepine-2-one.

It has good antioxidant capacity. It contains a high amount of crude fiber and carbohydrates. Furthermore, it has high vitamin E content. It has anthocyanin content and rich in protein.

**Karupu Kavuni/Karung Kavuni:** It is a good source of vitamin B12. It enhances blood circulation and strengthens the body. It has a high glycemic that reduces the accumulation of hepatic fat and helps in the recovery of liver damage. Likewise, it cures gastritis and peptic ulcer. It is considered as the best anti-arthritis and antidiabetic. It also reduces the levels of total soluble sugar, low-fat content, increased protein content, high levels of phenolic acid, flavonoids, carotenoids, and minerals like iron, manganese, zinc, copper, sodium, potassium, magnesium. Not only that, but it also contains a high level of polyphenols, it is because of the colour of the pericarp of the grain karupu kavuni is dark. It is rich in antioxidants. South Indian Traditional Rice Varieties used to make the Nutrition Bars.(CIKS Report et al., 2014)

**Table 1:shows the nutrients contents of the traditional rice varieties of comparison to white ponni.**

| Nutrients              | White ponni | Karung kruvai | Mappilai samba | Kullarkar | Kovuni |
|------------------------|-------------|---------------|----------------|-----------|--------|
| Energy (kcal/100g)     | 351.32      | 358.56        | 358.52         | 354.92    | 354.48 |
| Carbohydrates (g/100g) | 77.85       | 77.85         | 80.28          | 78.04     | 78.33  |
| Protein (g/100g)       | 9.06        | 9.45          | 7.18           | 9.32      | 8.49   |
| Fat (g/100g)           | 0.92        | 1.04          | 1.0            | 0.72      | 0.8    |
| Crude fiber (g/100g)   | 1.48        | 1.49          | 7.07           | 1.37      | 1.48   |
| Calcium (mg/100g)      | 80.63       | 77.09         | 50.82          | 52.54     | 78.8   |
| Iron(mg/100g)          | 4.25        | 19.63         | 5.47           | 5.62      | 4.51   |
| Potassium (mg/100g)    | 94.23       | 83.8          | 90.39          | 88.77     | 88.78  |
| Sodium                 | BLD         | BLD           | BLD            | BLD       | BLD    |

| (mg/100g)               | (DL:10) | (DL:10) | (DL:10) | (DL:10) | (DL:10) |
|-------------------------|---------|---------|---------|---------|---------|
| Phosphorus<br>(mg/100g) | 264.04  | 350.59  | 310.92  | 303.03  | 253.49  |
| Glycemic index          | 75.02   | 53.81   | 68.84   | 52.25   | 52.36   |

**FLAVOURING AGENTS USED:****Cinnamon:** (*Cinnamomum zeylanium*):

Cinnamon have been used in the culinary practice in India for centuries. It grows as a shrub or small tree from the family Lauraceae. The outer bark, inner bark, leaves have medicinal qualities, which can be used in the treatment for the stomach ache, diarrhoea, bronchitis, cough, respiratory ailments. Not only that but also used to cure loss of appetite, dyspepsia, gastritis, blood circulation, and inflammatory diseases.

It is used for invigorating tonic, cold, nausea, vomiting, flatulence asthma, paralysis, toothache, bad breath, bloating stomach, stomach upset, gastric ulcers, hypertension. It is used as an anti-microbial, it cures bacterial and fungal infections on the skin and also acts as an anti-clotting agent. Cinnamon odour boosts brain function. (Ribeiro-Santos et al., 2017)(Gruenwald, Freder, & Armbruester, 2010)(Balasubramanian et al., 2016)(Singletary, 2008)

Folklore:(ref: spices board of India)

Cinnamon is one of the first spices used in the 15th century, Romans believed cinnamons fragrance are sacred and burned it at funerals. It is originated from the central hills of Sri Lanka. In India, it is grown in one or two locations in Kerala.

**Cardamom:** (*Elettaria cardamomum*):

(M. M. Rahman et al., 2017)(Sengottuvelu, 2011)

Cardamom is known as the “Queen of spices”, which is used to treat depression, heart disorders, diarrhoea and to help with vomiting and nausea. It can also be used as antibacterial, antimicrobial, and antioxidant. They also have efficient skin permeation enhancers for some drugs and used as a digestive aid, helps in the reduction of fat according to the ayurvedic studies. Cardamom is useful in the treatment for constipation, colic, epilepsy, headache.

Folklore:Cardamom has been used in India from 3000 BC, and mentions the usage of cardamom in their wedding ceremonies. Both Greeks and Romans mixed cardamom with wax and filled them inside shells to use it as perfume which they wore in their hair or the clothes.

**Cumin:** (*Cuminum cyminum*):

(Srinivasan, 2018)(El-Ghorab, Nauman, Anjum, Hussain, & Nadeem, 2010)

Cumin is a herb from the family Apiaceae which is mostly used in traditional medicine and considered very good for digestion. It is used for the treatment of flatulence, diarrhoea, and used to treat wounds. Other benefits: Antidiabetic, Neuroprotective, Antioxidant, Anti-inflammatory, cardioprotective, chemopreventive. Bioactive compounds: Terpenes, Phenols, Flavonoids. Cumin seeds effects on digestion.

Animal studies: The effects of cumin seed on digestive enzymes in rat pancreas and intestinal mucosa have been studied and the cumin lowers the activity of pancreatic lipase, pancreatic trypsin, chymotrypsin. Small intestine: There was high maltase activity seen in animals that was fed with higher cumin, but there was no effect on lactose and sucrose was unaffected.

Folklore: People believed that a happy life, was awaited by the bride and groom who carried cumin seed throughout the wedding ceremony.

**Ghee:**

(B. & K.D., 2017)(Kumar A, Tripathi S, Hans N, Pattnaik H, 2018)(Sserunjogi, Abrahamsen, & Narvhus, 1998)(Ganguli & Jain, 1973)(Karandikar, Bansude, & Angadi, 2016)

Ghee is used in south Indian daily cooking and ayurvedic medicine. It is obtained from the clarification of milk fat at high temperature, Ghee contains the fat-soluble vitamins (A, D, E, K) and essential fatty acids like linolenic acid and arachidonic acid. Ghee is also capable of increasing the mental power, physical appearance, and it helps in curing the ulcer and eye diseases. The ghee used in the project is from cow's milk because it has better flavour and aroma compared to the buffalo's milk which also lacks carotenoids.

Ghee has short-chain fatty acids that are responsible for their role in better digestion and anti-cancerous property. It contains chemical properties like complex lipids of glycerin and free fatty acids, phospholipids, sterols, esters, fat-soluble vitamins, carbonyls, hydrocarbons, carotenoids, small amounts of charred casein and some traces of calcium, phosphorous, iron. It has 98% of glycerol constituents and 2%-5% of sterols. Ghee is used in the nutrition bars to get a softer texture and good aroma.

**Butter:**

(Kwak, Ganesan, & Mijan, 2013)(Karandikar et al., 2016)

The milk fat components are highly concentrated in ghee which is followed by the butter. Some beneficial components are generated during the process of fermentation, nutritive compounds such as Milk fat globule membrane(MFGM), Conjugated linolenic acid (CLA), and fatty acids.MFGM also contains many bioactive compounds, phospholipids compounds that play a vital role in cell proliferation, apoptosis, signal transduction, blood coagulation, and neuronal signalling in the human body.MFGM sphingolipids also show antibacterial and cholesterol-lowering activities in the human body, Antimicrobial activity on certain pathogens like *Listeria mono cytogenes*, and regulation of the immune system.CLA enhances the quality of butter during storage, some fatty acids add a certain specific flavour to butter, such as butyric acid and anti-cancerous properties.

The probiotic microorganisms which are present in the butter exert their helpful properties through supplementing metabolites and directly providing live cells. The components found in MFGM, CLA, SCFAS aids in the prevention of various diseases such as osteoporosis, cancer, atherosclerosis, and other degenerative disorders in humans, and it also as nutrients like peptides, lipids, minerals, and vitamins.

**Coconut Oil:**

(Kappally, Shirwaikar, & Shirwaikar, 2015)(Vala & Kapadiya, 2015)(da Silva Lima & Block, 2019)

Coconut oil has a lot of health benefits which include skincare, haircare, stress relief, immunomodulatory effects, diabetes, and some studies say that coconut oil helps in weight loss, cardiovascular diseases and recently in Alzheimer's disease. Coconut oil consists of high saturated fatty acid. But there is a misconception about coconut oil that it is not good for health due to the presence of large number of saturated fats. There is lauric acid(50%) which helps in the prevention of various heart diseases, high cholesterol levels, and blood pressure. It also contains short and medium-chain fatty acids which help to reduce the excessive weight. It is also good for digestion, healing, and infections.

The medium-chain triglycerides and fatty acids help in the prevention of liver diseases by converting those substances into energy when they reach the liver, so it also helps in the prevention of accumulation of fat. It helps in the prevention of kidney and gallbladder diseases and kidney stones. Coconut oil is also considered as anti-inflammatory and antimicrobial and very good for skin and hair. It is largely used in the state of Kerala in the southern part of India, and it is used in their day-to-day life cooking practices. Coconut oil is used in the project to get a better texture of the nutrition bars and add more nutritive value to the bar and coconut oil's unique aroma and flavour.

The usage of ghee/butter/coconut oil is based on the preference of the consumer, it's based on which texture is preferred by the consumers compared to a softening agent that it can be either ghee/butter/coconut oil and the flavour of each softening ingredient used in the nutrition bar.

**Jaggery:**

(Singh, 2013)(Xiao, Liao, & Guo, 2017)

(In 100g of jaggery):It contains Provitamins: vitamin B1, vitamin B2,vitaminB5, vitamin B6, vitamin C, vitamin D2, vitamin E, vitamin PP, Proteins, Water, Calories. Carbohydrates: Sucrose, Fructose, Glucose. Minerals: Calcium, Magnesium, Phosphorous, Sodium, Iron, Manganese, Zinc, Chloride, Copper. Magnesium: It helps in strengthening our nervous system, It also helps in the relaxation of our muscles, It helps in relieving from fatigue and takes care of our blood vessels. Selenium: It acts as an antioxidant property to scavenge free radicals from our body. Potassium and low sodium: It helps in maintaining the acid balance in the body cells and also battle acids, acetone and helps in controlling our blood pressure. So, it is healthier to use jaggery as a sweetener agent which is a natural and organic sweetener compared to the refined sugars used in the ready to eat food varieties. Which reduces the risk caused due to refined sugars.

**STANDARDIZATION:** The shape and texture is standardized based on the texture of the product

Method one: Texture was very hard, so it was difficult to shape the nutrition bars and hard to bite into the bar.

Method two: Texture was too soft, so the bar did not stay in shape.

Method three: Texture was firm, so it was easy to cut into pieces

Method four: In this method the texture was optimized and was easy to cut them into a small bar-shaped nutrition bars.

From the above mentioned ingredients and the different methods used to prepare the bars, from that various combinations of the product was prepared. Sensory analysis is used to find the one final product from the different combinations.

### **SENSORY ANALYSIS FOR PREPARED NUTRITION BARS:**

(Srebernich, Gonçalves, Ormenese, & Ruffi, 2016)(Agbaje, Hassan, Arifin, & Rahman, 2014)

Sensory analysis is a technique or a discipline which is used to find the product based on the consumer preference by giving Then the sample of the product to the targeted consumers, the results of the sensory analysis help in the standardization of the product on the different aspects and which helps in better marketing of the product for the commercial purposes.

Sensory analysis of nutrition bars:

The sensory analysis is started by getting consent from the subjects whether they are interested in taking part in the sensory analysis and ready to taste the nutrition bars and check if they are allergic to any of the food products. The subjects were separated from forming a group so that they can not discuss the answers because if they discuss the answers it leads to inaccuracy of the answers which leads to inaccuracy for results which affects the final product, then the product is given to the subject without revealing the flavours and ingredients because when they come to know they might be biased with the answers, so the ingredients or flavour used in the product is not revealed to the subject before or during the sensory analysis test.

**Hedonic scale:** It is a method that is used in the measurement of food preference, in primary sensory analysis five hedonic scales are used. It is a five-degree scale from one to five that is dislike extremely to like extremely.

(1-dislike extremely, 2- dislike, 3- neutral, 4- like, 5- like extremely)

This hedonic scale is used only in the primary sensory analysis, the secondary sensory analysis uses nine hedonic scale for more accuracy to narrow down the final product.

(1-Like extremely, 2- Like very much, 3- Like moderately, 4- Like slightly,5- Neither like nor dislike, 6- Dislike slightly, 7-Dislike moderately, 8- Dislike very much, 9- Dislike extremely)

There are two phases of sensory analysis that takes place in the project of making nutrition bars, the first is the primary sensory analysis which targets only a small group of people to check whether they like the nutrition bars texture, colour or which flavour is liked better than the others and to help in standardization of the product which narrows it down to two or more preferred products and these products undergoes the secondary sensory analysis which helps is to find the one or two final products which is preferred by the consumer.

### **RESULTS AND DISCUSSION:**

#### **Primary Sensory Analysis:**

Primary sensory analysis:This primary sensory analysis helps in the standardization of the nutrition bars. The preferred flavour of the bar, the shape of the nutrition bars, Whether they prefer using ghee or butter or coconut oil. It also helps in narrowing it down to fewer products for secondary sensory analysis. All of these aspects are selected based on consumer preference.

The number of respondents: 20,Gender: Male/Female, Age: 20 -30 years

This primary sensory analysis is the first step of the sensory analysis which is done in a small group of people. Subjects who take part in the sensory analysis are random by the targeted age group, they seated

separately from one another to avoid disused answers which will cause issues inaccuracy in the results. After they are seated separately the subjects are given the different combinations of the product is marked as A, B, C, D. Which is given one by one to the subject for a tasting of a nutrition bar, and their results were marked on the primary sensory survey form. These answers are then recorded and marked in the bar graph to represent the results of the primary sensory analysis, which helps in narrowing it down to two or more consumer-preferred products.

Primary sensory analysis results:

The list of questions in the sensory form:

Colour: C was strongly liked, A was liked.

Texture: B was strongly liked, A and C was liked.

Taste: B was strongly liked, C and A was liked.

Aroma: C was strongly liked, B and D was liked.

Mouth feel: B and C was strongly liked, D was liked

Flavour: A and B was strongly liked, D was liked.

Overall: C was strongly liked, B was liked.

Based on the above results three products were selected to the secondary sensory analysis from the four products.

**Secondary sensory analysis:** (Zealand, 2009) It is the same as the primary sensory analysis, we ask the consent from the subject and ask about the allergies, these should be different subjects from the primary sensory analysis and separate them before giving the product or tasting. But this time nine

hedonic scale is used in the secondary sensory analysis. This analysis helps in narrowing it down to one or two product. Nine hedonic scale is one as dislike extremely and nine as like extremely(1- like extremely, 2- like very much, 3- like moderately, 4- like slightly, 5- neither like nor dislike,6- dislike slightly, 7- dislike moderately, 8-dislike very much,9-dislike extremely). Number of respondents: 50, Gender: Male/Female, Age: 20- 30 years.

The following products name A, B, C in the secondary sensory from renamed in the graph. A - 111, B -222,C-333. In each graph the overall mean and the standard deviation is calculated for each characteristic of the nutrition bars. These are the different factors that helped in selecting, a single product from the three product.

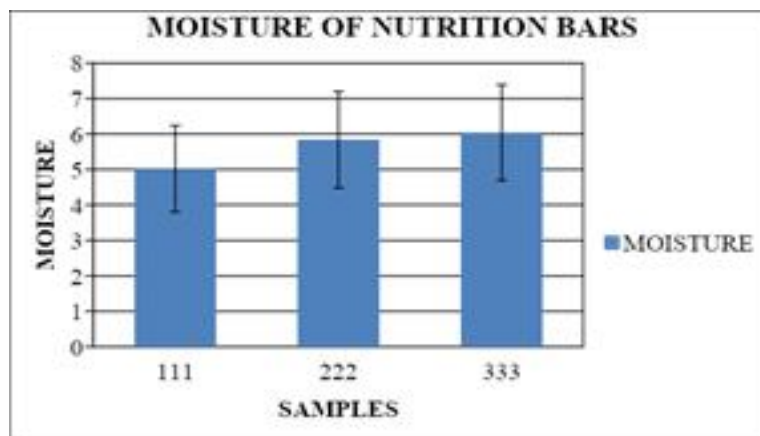


Fig: 1

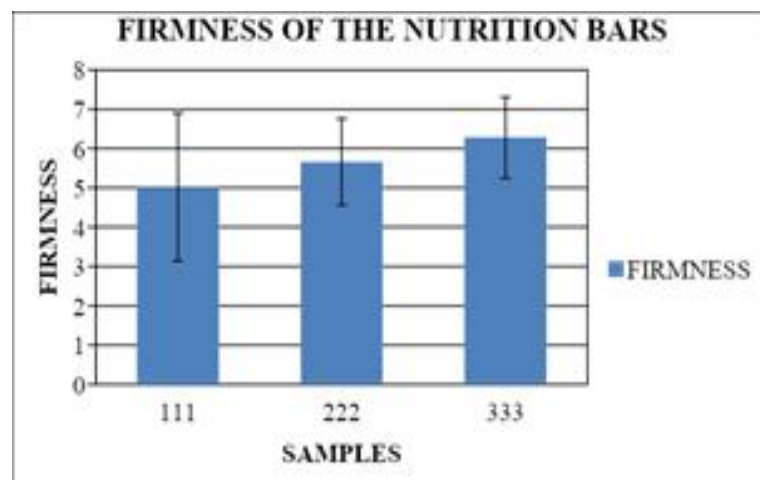


Fig: 2

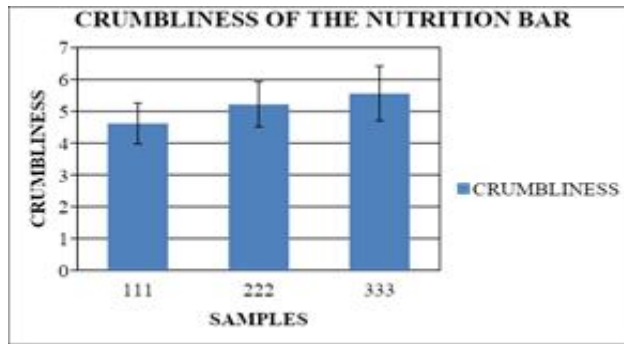


Fig: 3

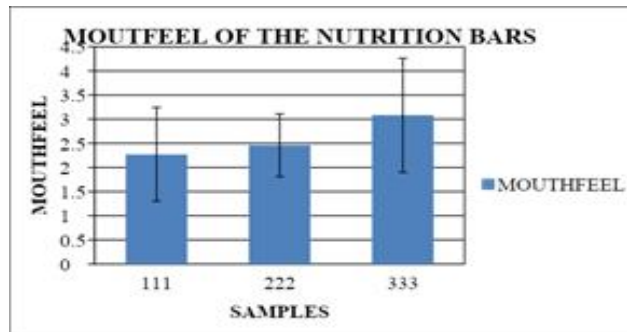


Fig: 4

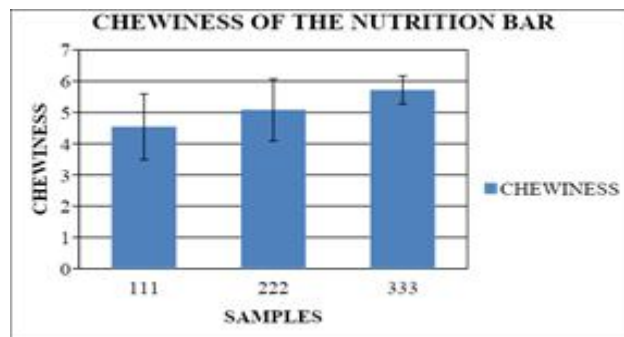


Fig: 5

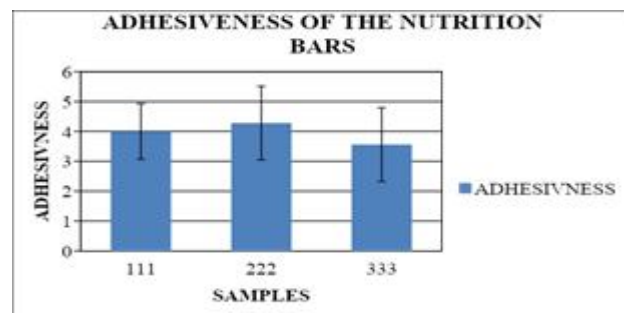


Fig: 6

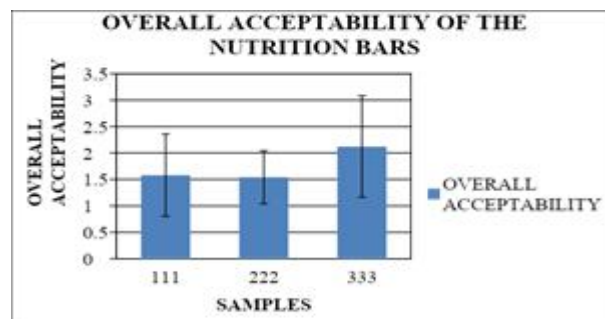
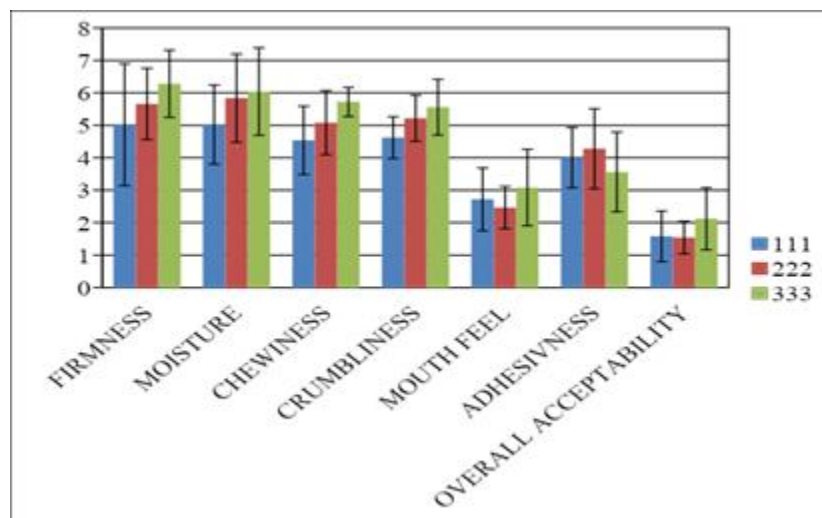


Fig: 7



**Fig: 8**

Based on the mean overall acceptability as shown in the graph, the product 333 is highly preferred by the consumers.

### SUMMARY AND CONCLUSION:

Based on the preliminary survey helped to identify which ready to eat product is preferred by the consumers, and whether they liked to eat ready to eat food with traditional ingredients. Based on the survey the consumers liked to eat ready to eat traditional foods and the most preferred product by the consumers was nutrition bars under the category of trending ready to eat foods. So the south Indian traditional rice varieties are selected based on their health and medical benefits, glycemic index. The other ingredients like flavouring agent and ghee/butter/coconut oil was used in the preparation of nutrition bar were selected based on their benefits and the standardized by the primary and secondary sensory analysis based on the preference of the consumer. Jaggery which is the natural sweetener and cumin, cinnamon, cardamom are natural flavouring agents was used to avoid the artificial flavours and sweeteners.

The sensory analysis is the process used to identify the final product. This sensory analysis is of two sections primary sensory analysis and secondary sensory analysis which uses the five and nine hedonic scale as measurement. The final product which was finalized by the responses of the secondary sensory analysis is sample 333, As shown in the fig:8 the mean deviation of all the factors and overall Acceptability clearly shows the final product as 333. This final product can be further analysed for their nutrition content and shelf-life studies.

**Limitation of the study:** Nutritional analysis and proximate analysis was not done due to the pandemic situation.

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**PHYTOCHEMICAL & PHARMACOLOGICAL EVALUATION OF DIFFERENT FRACTION OF CAESALPINIA BONDUCELLA**

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**ABSTRACT**

*In recent years, plant-based therapeutics have been used for the prevention and management of cancer. Caesalpinia bonducella has been shown by in vitro anticancer assay that the fractions of ethanolic extract of C. bonducella seeds possess anticancer activity. The plant Caesalpinia bonducella has been used in different system of traditional medication for the treatment of diseases and ailments of human beings. The phytochemical screening of seeds of Caesalpinia bonducella revealed the presence of bioactive compounds such as Triterpenoids, Flavonoids, glycosides, saponins, tannins, alkaloids and amino acids. To explore anti colorectal cancer, and immunomodulator activities of Caesalpinia Bonducella seed extract by utilizing in-vitro models. Hydroalcoholic extract of Caesalpinia Bonducella seeds was prepared and arranged in the different concentrations to study the immunomodulatory activity by different methods and anti colorectal cancer activity also. Total five extracts were prepared and screened for In vitro immunomodulatory potential employing Nitroblue Tetrazolium Reduction test (NBT). Results showed a significant difference in the immunomodulatory activities according to the seed Caesalpinia Bonducella. Among all tested extracts, the hydroalcoholic seed extract showed the maximum potential for NBT. The results of this study demonstrate the immunostimulatory effect of Caesalpinia Bonducella in a concentration-dependent manner. The results suggest the seeds could be applied as an immunomodulator & anti colorectal cancer activity for their studies.*

*Keywords: Anti colorectal cancer, Caesalpinia bonducella, Immunomodulatory activity, NBT-(Nitroblue Tetrazolium Reduction test)*

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**INTRODUCTION**

Colorectal cancer (CRC) is the third most common cancer and the second leading cause of mortality among cancers in the United States. In India, it is the second most common cancer after breast cancer. Many overlapping etiologies have been linked to the incidence of this cancer, such as hereditary, genetic and more recently, immunologic. The theory about cancer immune surveillance, which sets that malignant cells are recognized as foreign and then eliminated by immune system, Immune evasion plays an important role in immunologic mechanisms of development and progression of cancer. Regulatory T Lymphocytes are one of many major players in tumor evasive mechanisms [1,2].

Ancient usage of medicinal plants in treating immunological disorders have made the plants to be the promising source of immunomodulators, which are the substances either it can stimulate or suppress any of the immune system components [3].

*Caesalpinia Bonducella* is a well-known kind of herb that has been used in traditional medicine for thousands of years. The extrusion of raw materials from it could treat various diseases such as anti diabetic, anti filarial, anti pyretic, anti spermatogenic, anti malarial, etc. The purpose of this study is to investigate antitumor and immune boosting effects of extruded in NBT screening assay and human colon carcinoma cell line respectively. After authentication, the seed was dried in shade for 2-3 days then pulverized in a blender, sieved and use for further studies [4-6].

**MATERIALS AND METHODS**

**COLLECTION AND AUTHENTICATION OF CAESALPINIA BONDUCELLA SEED:** Mature seeds of *C. bonducella* were collected from nearby cantonment territory of Tiruchengode, Namakkal district, cleaned and dried at room temperature in shade, away from direct sunlight. Identification of the plant was done by Dr. C. Ravindersingh, Ph.D. authenticated plant by comparing morphological features.

**DRYING AND SIZE REDUCTION OF PLANT:** The seeds of *C. bonducella* were cleaned to evacuate the adhered foreign material and homogenized to powder and stored.

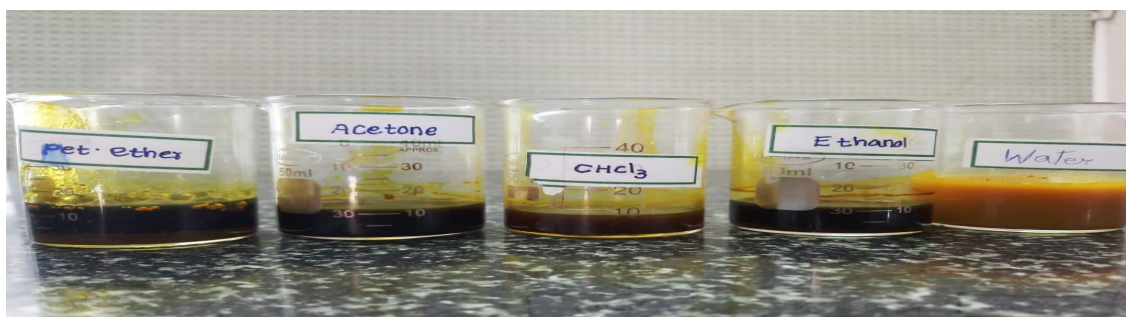
**CHEMICALS AND SOLVENTS:** All the chemicals utilized were of analytical grade and were obtained from lab and also from vendors. Nitroblue tetrazolium (Lobachemie pvt. limited) Giemsa stain (Quali -Tech) was purchased from commercial sources [7,8].

**EXTRACTION BY SOXHLET APPARATUS**

The seeds of *C. bonducella* were procured, dried in the shade and subsequently powdered in a homogenizer. The powdered seeds were used for extraction. Powder drug was passed through 120 meshes to remove the fine powder. Coarse powder material (500g) was employed for successive extraction with petroleum ether and 70% ethanol in water in Soxhlet apparatus. Crude extract obtained was vacuum dried to get solvent-free dry extract. All fractions, including the aqueous fraction, were concentrated under reduced pressure using a rotary evaporator and dried in vacuum and subjected to Phytochemical screening. Pet-ether, ethanol, acetone, chloroform, water extracts of seeds were subjected to preliminary Phytochemical screening for the detection of various class of Phytochemical analysis [9,10].



Fig: 3. Extraction of *Caesalpinia bonducella* seeds with ethanol by Soxhlet apparatus [11].



Different fraction of ethanolic extract of *Caesalpinia bonducella* seed [12].

- a) Petroleum ether b) Acetone c) Chloroform d) Ethanol e) Water

**IN-VITRO IMMUNOMODULATORY ACTIVITY**

Immunomodulatory activity of the test plant extracts was determined using various *In-vitro* methods such as nitroblue tetrazolium reduction assay using rat leucocytes (neutrophil). [13,14]

**NITROBLUE TETRAZOLIUM ASSAY****REAGENTS AND PREPARATION**

- ✓ Rat Whole blood
- ✓ Hank's Balanced salt solution
- ✓ 0.3% Nitroblue tetrazolium solution
- ✓ Giemsa stain
- ✓ *E.coli*

**METHODS:**

One part of 0.3% NBT solution was prepared in 0.35% sucrose solution was used fresh. 100 micro litres of whole blood and 100 microliters of Hank's balanced salt solution (HBBS), were added to each eppendroff tube and mixed well. The stock solution of hydroalcoholic extract and its fraction of seeds of *Caesalpinia bonducella* in different concentration of 1,000 microgram/ml, 500 microgram/ml, 250 microgram/ml, 125 microgram/ml, 62.5 microgram/ml were added individually to tubes containing suspension of blood cells and 50 microliters of NBT solution in another tube 50 microliters of *E.coli* endotoxin was added to 50 microlitre NBT solution and suspension of blood cells, which served as positive control (standard). A normal control was maintained in another tube with only suspension of blood cells and NBT solution. All tubes are incubated at 37° c for 20 minutes and were gently shaken at room temperature for 20 minutes. A smear of fluid from each tube was taken on microscope slide, air dried, fixed in ethanol for 2 min, stained with Giemsa stain for 15 min, rinsed with

distilled water, dried, were observed under microscope. Neutrophils were counted and % of NBT Positive cells containing blue deposit was determined. [15]

### ANTI COLONCANCER ACTIVITY

#### CYTOTOXICITY ASSAYS

Cytotoxicity was estimated using the tetrazolium LDH cytotoxicity assay (Roche Diagnostics, Germany) and spectrophotometric measurement of dye absorbance obtained at 492/650 nm in an ELISA reader (Decker and Lohmann-Matthes, 1988). Cell suspension treated with 100  $\mu$ l Triton X-100 were used as 'high' controls, while the untreated cultures were used as 'low' control. Cytotoxicity was estimated, at 48h, from the absorbance values using the following [16,17].

Equation:

Cytotoxicity (%)

$$= \frac{A_{\text{exp value}} - A_{\text{untreated control}}}{A_{\text{triton control}} - A_{\text{untreated control}}} \times 100$$

### RESULT AND DISCUSSION

Phytochemical evaluation with different solvent fraction of *Caesalpinia bonducella* ethanolic seed extract [18, 19].

Alkaloidal test- Dragendroff's test has shown that; the ethanol has high intensity of colour observed in the ethanolic fraction.

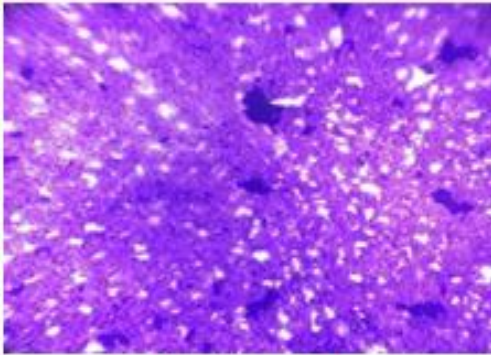
Carbohydrates- Molisch's test has shows that the water has high intensity of colour observed and also the Fehling's test has to shows that the petroleum ether and ethanol has high intensity of colour observed in the ethanolic fraction.[20]

In the immunomodulatory activity shows that the alkaloids, carbohydrates, flavonoids, saponin are the constituents used in the petroleum ether as immunomodulation action [21-25]

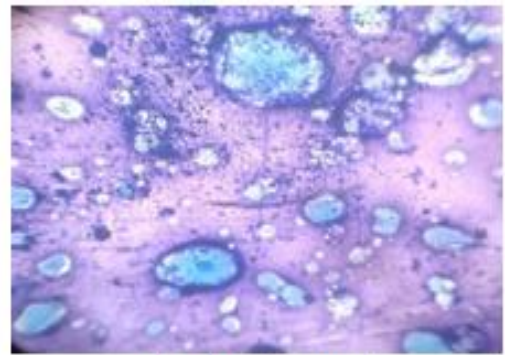
#### Percentage of reduced neutrophils after treatment with extract and fractions of CB by NBT test.

| Fraction             | Concentration( $\mu$ g/ml) |                  |                  |                  |                  |
|----------------------|----------------------------|------------------|------------------|------------------|------------------|
|                      | 1000                       | 500              | 250              | 125              | 62.5             |
| Blood without E.coli | 25.77 $\pm$ 1.60           | 24.09 $\pm$ 0.59 | 25.18 $\pm$ 1.14 | 24.65 $\pm$ 0.55 | 25 $\pm$ 0.54    |
| Blood with E.coli    | 90.12 $\pm$ 1.54           | 89.43 $\pm$ 1.33 | 88.66 $\pm$ 0.99 | 88 $\pm$ 1.10    | 87.54 $\pm$ 0.34 |
| Petroleum ether(CB1) | 89.55 $\pm$ 0.33           | 85.5 $\pm$ 2.85  | 82.7 $\pm$ 70.88 | 65 $\pm$ 1.00    | 35.00 $\pm$ 0.88 |
| Acetone(CB2)         | 82.54 $\pm$ 0.66           | 80.00 $\pm$ 0.77 | 77.53 $\pm$ 0.44 | 44.00 $\pm$ 0.57 | 28.66 $\pm$ 2.84 |
| Chloroform(CB3)      | 67.09 $\pm$ 0.67           | 65.14 $\pm$ 0.33 | 60.09 $\pm$ 0.40 | 42.11 $\pm$ 0.54 | 25.1 $\pm$ 0.87  |
| Ethanol(CB4)         | 45.00 $\pm$ 0.57           | 40.66 $\pm$ 0.88 | 26.01 $\pm$ 0.34 | 24.20 $\pm$ 0.32 | 20.00 $\pm$ 0.75 |
| Water(CB5)           | 20.33 $\pm$ 0.33           | 20.20 $\pm$ 0.59 | 19.33 $\pm$ 0.67 | 18.12 $\pm$ 0.00 | 16.65 $\pm$ 0.33 |

The data are expressed as mean percentage reduced neutrophils $\pm$ SEM. Blood with E.coli (positive control), Blood without E.coli (normal control); CB; *Caesalpinia bonducella*.

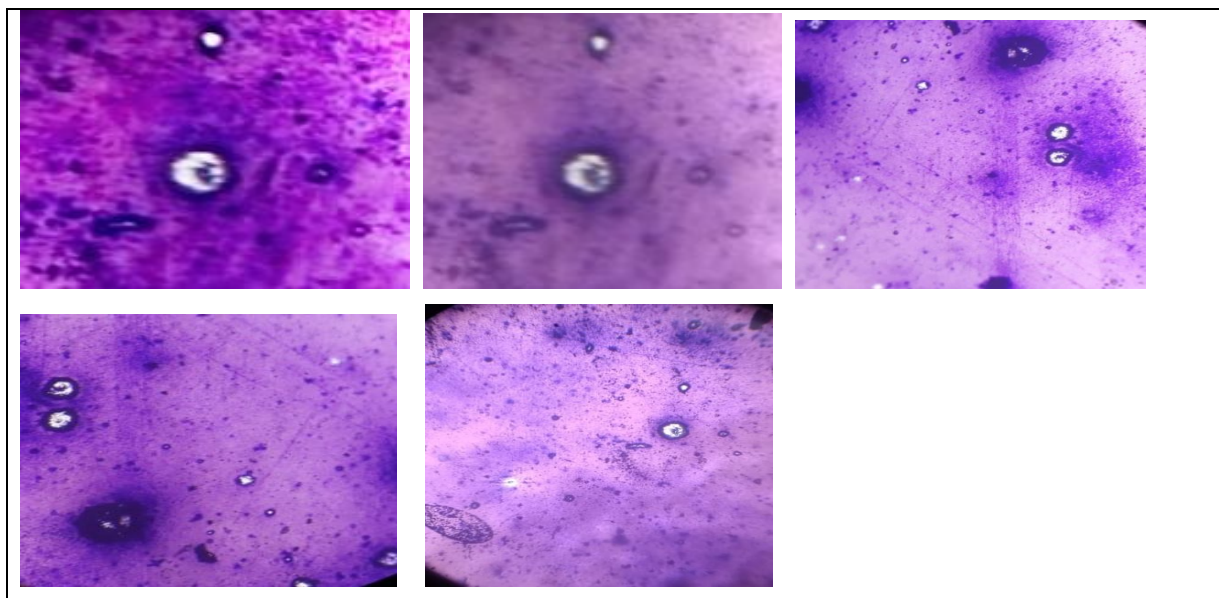


Blood without *E.Coli*

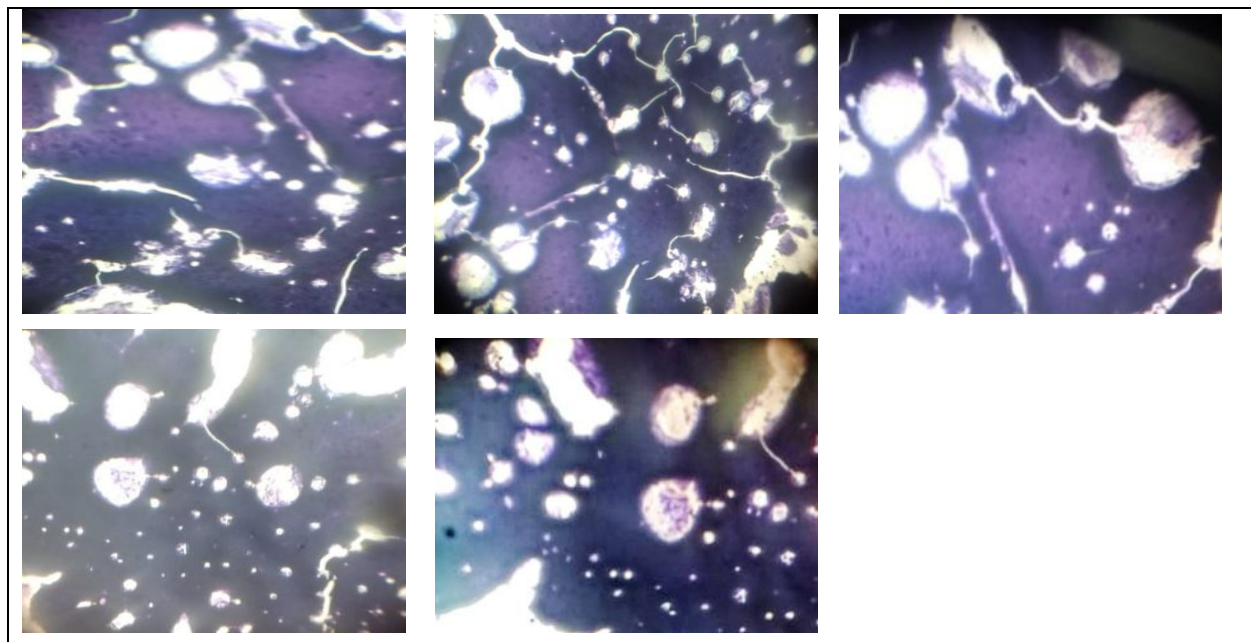


Blood with *E.Coli*

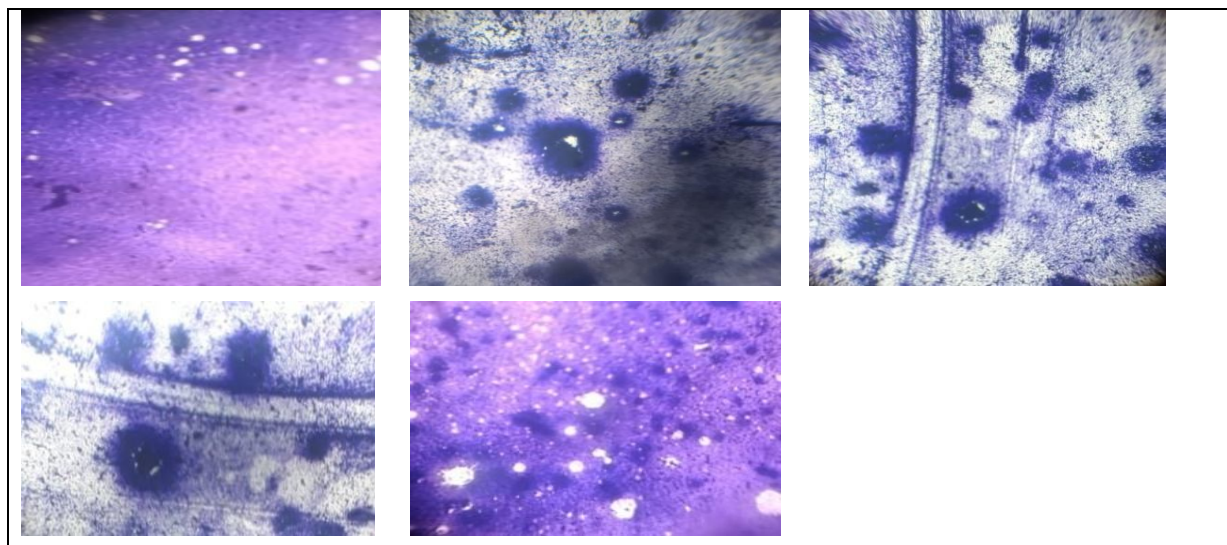
**IMMUNOMODULATORY EFFECT OF DIFFERENT SOLVENT FRACTION OF CAESALPINIA BONDUCELLA ETHANOLIC SEED EXTRACT**



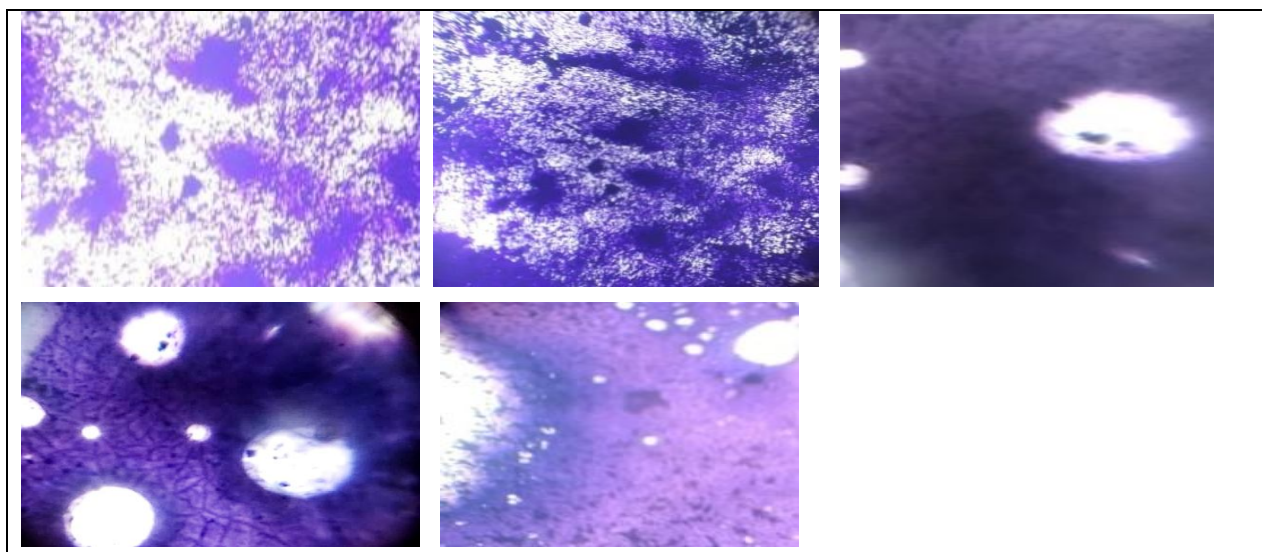
**Nirtoblue tetrazolium reduction screening of Petroleum ether fraction of caesalpinia *bonducella* ethanolic seed extract**



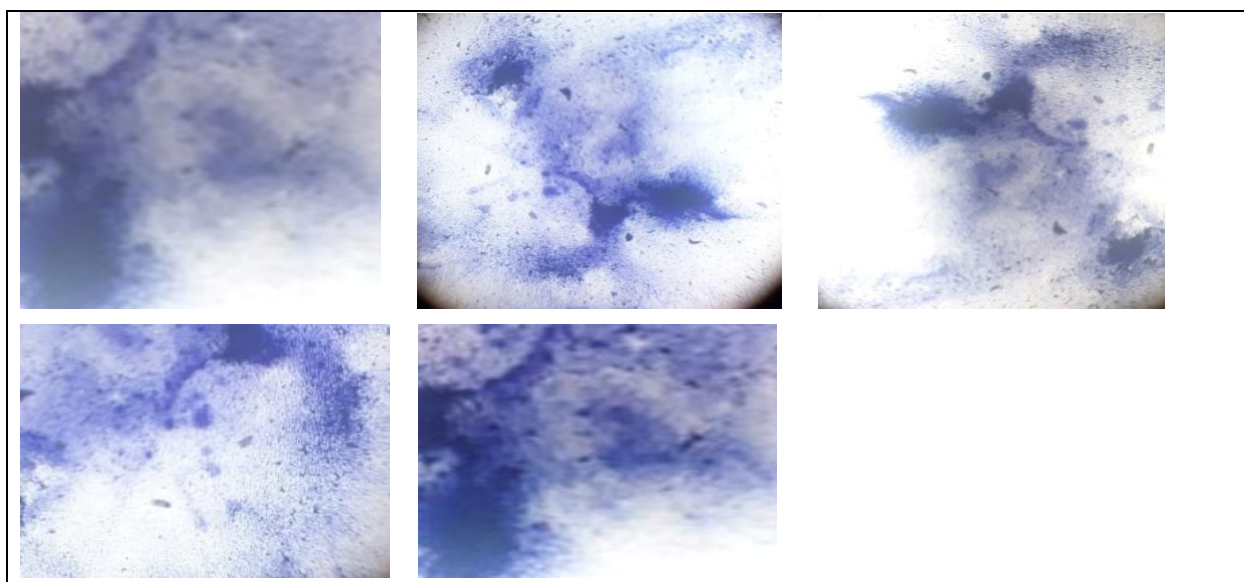
**Nirtoblue tetrazolium reduction screening of Acetone fraction of caesalpinia *bonducella* ethanolic seed extract**



Nirtoblue tetrazolium reduction screening of Chloroform fraction of caesalpinia *bonducella* ethanolic seed extract



Nirtoblue tetrazolium reduction screening of Ethanol fraction of caesalpinia *bonducella* ethanolic seed extract



Nirtoblue tetrazolium reduction screening of Water fraction of caesalpinia *bonducella* ethanolic seed extract

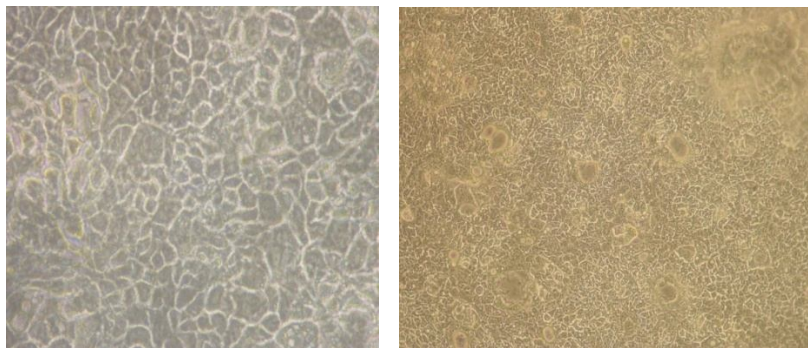
The result are showed that the petroleum ether (CB1) fraction showed very highly significant result at all concentration The pet.ether extract of *Caesalpinia bonducella seeds* has stimulated the neutrophils to phagocytic activity to the extent of 89.55% at concentration 1000( $\mu\text{g/ml}$ ) and 85.5% at concentration 500( $\mu\text{g/ml}$ ), 82.7% at concentration 250 ( $\mu\text{g/ml}$ ), 65.10% at concentration of 125( $\mu\text{g/ml}$ ),35.00% at concentration of 62.5( $\mu\text{g/ml}$ ) very significantly.

The results are showed that Acetone (CB2) fraction showed 82.54% at concentration of 1000( $\mu\text{g/ml}$ ) and 80.00% at concentration of 500( $\mu\text{g/ml}$ ), 77.53% at concentration of 250 ( $\mu\text{g/ml}$ ), 44.00%, at 28.66% concentration of 125( $\mu\text{g/ml}$ ), 28.66% at concentration of 62.5( $\mu\text{g/ml}$ ).

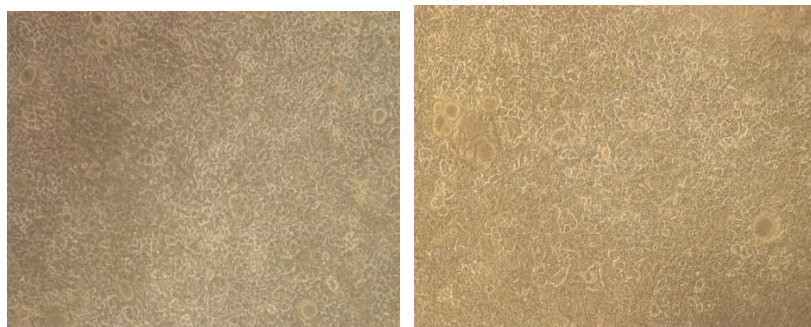
The results are showed that chloroform (CB3) fraction showed significant resultsto the extent 67.09% at concentration 1000( $\mu\text{g/ml}$ ) and 65.14% at concentration of 500( $\mu\text{g/ml}$ ), 60.09% at concentration 250 ( $\mu\text{g/ml}$ ), 42.11% at concentration 125( $\mu\text{g/ml}$ ), 25.10% at concentration 62.5( $\mu\text{g/ml}$ ).

The results are showed that ethanol (CB4) fraction has stimulated the neutrophils to phagocytic activity to the extent of to the extent of 45.00% at concentration of 1000( $\mu\text{g/ml}$ ) and 40.66% at concentration of 500( $\mu\text{g/ml}$ ), 26.01% at concentration of 250 ( $\mu\text{g/ml}$ ), 24.20% at concentration of 125( $\mu\text{g/ml}$ ), 20.00%.

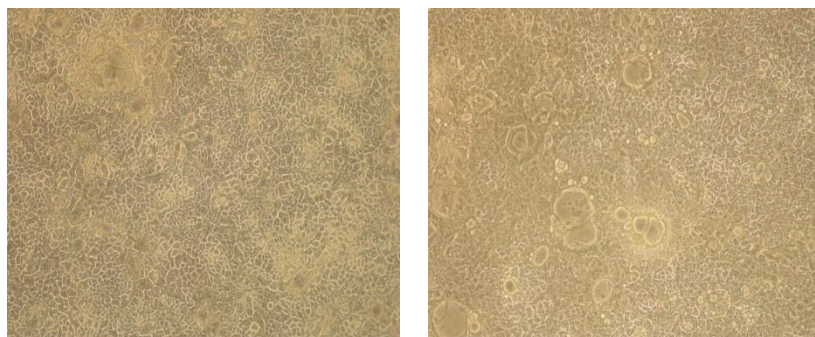
The results are showed that water (CB5) fraction does not show significant activity.



**Cohesiveness of un exposed HT-29 cell line Cohesiveness of HT-29 cell -exposed to 1000  $\mu\text{g/ml}$**



**Cohesiveness of HT-29 cell line-at 500  $\mu\text{g/ml}$  Cohesiveness of HT-29 cell line at 250 $\mu\text{g/ml}$**



**Cohesiveness of HT-29 cell line exposed to 125  $\mu\text{g/ml}$**

**Cohesiveness of HT-29 cell line-exposed to 62.5  $\mu\text{g/ml}$**

**The effect of different concentration of pet ether fraction of *caesalpinia bonducella* on the growth of human colon cancer cell line (HT-29)**



The number of viable cells has been measured by indirect colorimetric assay. The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay has been adapted to measure the growth modulation of cells using HT-29 cell line. HT-29 cells were treated with petroleum ether different concentration (1000 µg/ml to 62.5 µg/ml) of *Caesalpinia bonducella* for 48 hrs. They showed strong anti proliferative activity against HT-29 cells ( $IC_{50}=30.67\pm 0.6\%$ ). Numerous studies have been proposed the inhibitory effect of on various cell lines with it shows 34.80% of inhibitory activity at 125 µg/ml concentration (Nada N. Alshawiet *et al.*, 2012). It indicates that has more potent anti proliferative effect with less concentration compared with p. It shows the effect of different concentration of on the growth of human colon cancer cell line.

### CONCLUSION

From the results obtained in this study, concluded that petroleum ether fraction of *Caesalpinia Bonducella* seed ethanolic extract has potent anti cancerous activity as well Immunostimulant effect, that was confirmed by in vitro cell colon cancer cell (HT-29) line study and NBT screening assay. The proposed mechanism is the *Caesalpinia Bonducella* seed will suppress cancer cell growth by boosting of immune system.

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**CREDIT CARD FRAUD PREDICTION USING MACHINE LEARNING MODELS**

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**ABSTRACT**

*The World is rapidly moving towards a cashless economy. The Cashless economy has many benefits as the completely digitalized system will solve the problem of tax evasion, money laundering. Cashless transactions are easy to track and will allow financial authorities to properly analyze the market. Among these benefits, millions of credit card users fall victim to fraud resulting in financial loss. Security measures must be in place to protect users from credit card frauds. In this paper, machine learning models are developed to detect credit card fraud. Before training the model the dataset is preprocessed to handle data imbalance. The credit card fraud dataset is highly imbalanced data. The imbalance is due to the rarity of different classes in the dataset. Such a dataset needs to be preprocessed before it is used for training a machine learning model. In this paper, the model is trained to differentiate between authorized and fraud transactions with an accuracy of 96.45%.*

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**I. INTRODUCTION**

Credit card fraud can be defined as the unauthorized transaction for purchasing items by using credit card or credit card information. Fraudsters can use illegally obtained information (Identity theft), credit card number, password, one time passwords to get access to credit card accounts. Credit card theft can be done by fraudsters by staling credit cards, account impersonation, using lost and found cards, creating a duplicate credit card, stealing information from your laptop, malicious application, falling prey to specialized techniques like phishing and so on. Stopping credit card fraud is an important issue that needs to be addressed. Credit card companies can use intelligent machine learning algorithms to detect fraud transactions with high precision so that their customers are not cheated. The machine learning model needs to be trained. Count of fraud transactions is very few among a large number of authorized transactions. Data to be used for training is likely to be highly imbalanced. If the dataset is dominated by one or more classes, the trained model will be biased and will wrongly classify most points to the majority class. Such a dataset needs to be re-sampled. This paper presents the use of Logistic regression, Support Vector Machine and an artificial neural network that can work like a human brain when trained properly with the desired accuracy.

**II. LITERATURE REVIEW**

Carcillo et al. (2019) [1] presented a paper he explored the idea of combining supervised and unsupervised algorithms to improve the accuracy of credit card fraud detection. Carcillo proposed an extension of the best of both the world's principles. Lebichot et al. (2019) [2] proposed a transfer learning method to train a deep learning model. Data patterns reorganized from a similar e-commerce transaction classification model are used for detecting fraud transactions and studied domain adoption strategies.

Saraswathi et al. (2019) [3] proposed the use of Artificial Neural Network and self-organizing maps for predicting fraudulent transactions. Carcillo et al. (2018) [4] presented a scalable real-time fraud finder. The proposed framework is tested on big data and proved to be efficient and accurate.

Wang et al. (2019) [5] designed a Support Vector Machine based machine learning model. The skewed dataset is fine-tuned by using K-means clustering analysis and the proposed model gave 97.5% precision. Comparative study between Support Vector Machine (SVM), AdaBoost-SVM, K-means-AdaBoost-SVM was conducted by the authors. K-means-AdaBoost-SVM gave the best accuracy among them.

Dal et al. (2018) [6] analyzed a huge amount of credit card transactions and designed a learning algorithm for the Fraud Detection System that was able to handle class imbalance and concept drift effectively. The authors analyzed 75 million transactions in 3 years. Dal et al. (2015) [7] carried out experiments to understand how under-sampling a class adversely affects the machine learning model. Bias due to the undersampling impacts the classification accuracy of the machine learning model. Darwish, S. M. (2020) [9] proposed the fusion of k-means and artificial bee colony algorithm to design a two-level credit card fraud detection model. The author used an e-commerce transaction dataset. Total of 1027 transactions dataset was used in the study. The author compared the proposed two-level credit card fraud detection model with GA & KNN and KNN. The proposed model proved to be more accurate and consumed less time for training the model.

Kim et al. (2019) [10] compared hybrid ensemble and deep learning models and tested the models on the dataset obtained from their partner credit card company of South Korea. The deep learning model showed a +3.8%

improvement when compared to the other model. They used the dataset with 5709 fraud transactions in a total of 11025756 transactions.

**III. PROPOSED METHODOLOGY**

In this section, we will describe the dataset used in the experiments and three different machine learning classifiers to be applied namely Artificial Neural Network, Support Vector Machine and Logistic regression. Steps in creating a classifier are the collection of the dataset, pre-processing the dataset (remove outliers, handling null values, normalizing the dataset, sampling, etc), training the designed model and testing the designed model.

**a) Dataset**

Credit Card Fraud Detection dataset used in this paper was collected during a joint collaboration of the Worldline and the Machine learning group of Université Libre de Bruxelles. Dataset has transaction detail of European credit cardholders in Sep 2013. Dataset has details about the 284,807 transactions. Data is highly skewed consisting of 492 fraud transactions and a total of 284807 transactions. Dataset consists of 28 numerical features that are transformed using Principal Component Analysis along with two nontransformed features ‘Time’ and ‘Amount’. Thus dataset has 30 features. Due to privacy concerns, the metadata about the features is not provided. The ‘Amount’ feature is transformed using the StandardScaler method of sklearn library [14]. The ‘Time’ feature specifies the number of seconds elapsed between this transaction and the first transaction and is used for chronological ordering. ‘Time’ feature is not considered for training the model. The feature ‘class’ is the target class and can have two values 0 or 1, where 0 means non fraud and 1 means fraud transaction.

Data preprocessing is done to under-sample the majority class (non fraud transactions) by randomly picking the samples. RandomUnderSampler python class with random\_state = 0, sampling\_strategy = 1.0 options is used in this paper for under sampling the majority class [15]. A total of 984 transactions are selected with 492 fraud and 492 non fraud transactions.

**b) Artificial Neural Network**

ANN mimics the behavior of the human brain to solve complex data-driven problems. ANN consists of a pool of simple processing units which communicate by sending the signal to each other over a large number of weighted connections. Neural networks are made up of layers of neurons. These neurons are the core processing units of the network. Three types of layers are distinguished as

- 1) Input Layer: It is the first layer of the ANN model. The input layer receives the input
- 2) Output layer: It is the final layer of The ANN model. This layer projects the final output.
- 3) Hidden Layer: Between input and output layers there are hidden layers that perform most of the computations.

Neurons of one layer are connected with neurons of other layers through channels. Weight is the numerical value that is assigned to each of these channels. Inputs are multiplied to their corresponding weights and their sum is passed as input to the neurons in the hidden layer. Each neuron has a numerical value called bias which is then added to the input sum. The result is then passed through the threshold function also called an activation function [13]. The result of the threshold function then decides that a particular neuron will get activated or not. The activated neurons then transmit the data as input to the next layer over the channels. In this manner, the data is propagated through the network called forward propagation. The values propagate until it reaches the output layer. In the output layer, the neuron with the highest value activates and determines the output. During the training, the predicted value is compared with the actual output to calculate the error. The error information is transmitted backward to adjust the weights also called backpropagation [8]. This process continues for multiple inputs to obtain the desired accuracy.

**c) Logistic regression**

Logistic regression is a statistical technique used to predict the probability of binary response based on one or more independent variables [12]. It means that, given certain factors, logistic regression is used to predict an outcome that has two values such as 0 or 1, pass or fails, yes or no, etc. In logistic regression, the probabilities are estimated using a sigmoid function. The sigmoid function is given by equation

$$\sigma(x) = \frac{1}{1+e^{-x}} \text{----- (1)}$$

$$x = w_0z_0 + w_1z_1 + w_2z_2 + \dots + w_nz_n \text{----- (2)}$$

Where  $z_i$  is the input data and  $w_i$  are the regression coefficients of the model calculated by maximum likelihood estimation.

**d) Support Vector Machine (SVM)**

SVM is a mathematically complex and computationally expensive supervised machine learning algorithm [11]. SVM algorithm takes data points as input and outputs a hyperplane that best separates the classes. In other words, SVM outputs the hyperplane whose distance to the nearest element of each class is largest. SVM classifier can be classified as linear and nonlinear.

**IV. Results and Discussions**

In this paper prediction will be made by using Artificial Neural Network, Logistic Regression and SVM machine learning models. Initially, data is split into 80% training and 20% test data. In the end, the model results for 80-20, 70-30 and 60-40 are shown in a table.

**a) ANN**

An artificial neural network with three layers is designed. Input and hidden layers using activation function 'relu' and the output layer with a sigmoid activation function. The sigmoid function is also called the logistic activation function as the function outputs a value between 0 and 1. IF the final layer neuron's output is larger than or equal to 0.5, it outputs 1 otherwise the output is 0. ANN model layers use regularizers to apply penalties on layer parameters during optimization. Model is compiled with following settings optimizer = 'adam', loss = 'binary\_crossentropy'. Model is trained with batch size = 40, epochs=100.

**Training–Progress Graphs of the Designed ANN Model**

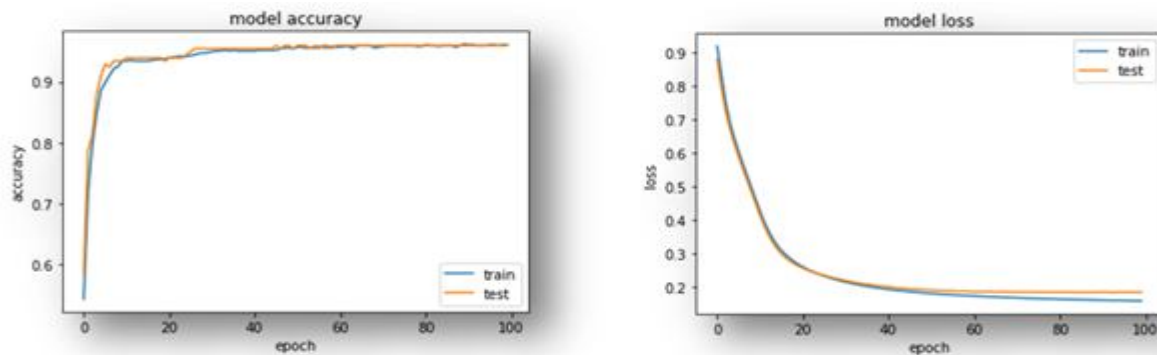


Fig. 1 Graphs depicting training and validation accuracy curves.

Graphs in the Fig. 1 depict that with each epoch training and testing accuracy increases and training and validation loss decreases. During the last 20 epochs model, testing accuracy and testing loss remained constant. ANN model achieved a training accuracy of 96.06% and a validation accuracy of 95.94%. Fig2. displays the confusion matrix for the model where TN = True Negative, TP = True Positive, FN = False Negative, FP = False Positive. True positives (TP) are the diagonal values in the confusion matrix.

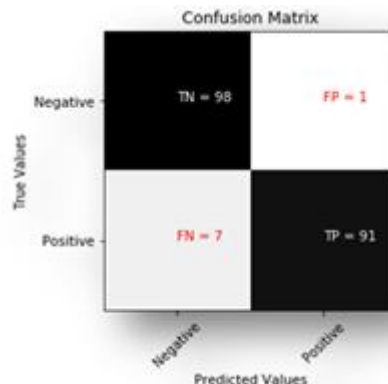


Fig2. Confusion matrix ANN model

$$\text{Accuracy} = (TN+TP)/(TN+TP+FP+FN) = 189/197=95.94$$

Precision is the measure of the accuracy of the predictions of a specific class and is given by  $TP/(TP+FP)$ . For positive class precision=91/98= 92.85% and F1 Score: 0.94736

```

precision recall f1-score support

 0 0.92 0.98 0.95 99
 1 0.98 0.92 0.95 98

 accuracy 0.95 197
 macro avg 0.95 197
 weighted avg 0.95 197

```

Fig. 4 Logistic regression classification report

```

CPU times: user 1min 57s, sys: 9.29 ms, total: 1min 57s
Wall time: 1min 57s
{'C': 100, 'gamma': 0.001, 'kernel': 'linear'}

```

Fig. 5 Best Fit parameters of SVM

LogisticRegression with penalty = 'l2' and max\_iter = 500 is trained. The trained model gave 94.92% accuracy. The classification accuracy report is shown in Fig. 4

Exhaustive search over specified parameter values for an SVM classifier is carried out to find the best possible value of c, gamma, and kernel. C, gamma and kernel are the hyperparameters that must fit to optimize the SVM performance.

Grid search results for hyperparameters are shown in Fig. 5

The classification accuracy report of SVM is shown in Fig. 6. SVM achieves an accuracy of 94%.

```

precision recall f1-score support

 0 0.92 0.96 0.94 98
 1 0.96 0.92 0.94 99

 accuracy 0.94 197
 macro avg 0.94 197
 weighted avg 0.94 197

```

Fig. 6 SVM classification report

Table 1 displaying the test accuracy of an artificial neural network, Logistic regression, and SVM. ANN is providing the best accuracy.

| Train-Test Split (percentage) | ANN   | Logistic Regression | SVM  |
|-------------------------------|-------|---------------------|------|
| 80-20 Accuracy                | 95.94 | 94.92               | 94   |
| 70-30 Accuracy                | 92.95 | 92.56               | 90.8 |
| 60-40 Accuracy                | 91.6  | 91.1                | 90.1 |

Table 1 Accuracy at different test train split

**V. CONCLUSION AND FUTURE WORK**

The paper investigated the credit card fraud prediction dataset. Dataset obtained was highly imbalanced due to the rarity of different classes. Predictions of fraud and non fraud transactions were made using Artificial Neural Network, Logistic Regression and Support Vector Machine. ANN is providing results with high accuracy.

A real-time credit card fraud detection system that checks every transaction before any purchase is made needs to be developed. Accurate real-time fraud detection systems will help in developing the confidence of customers in digital payments.

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**WASTE MANAGEMENT SYSTEM IN INDORE CITY**

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**ABSTRACT**

*India faces major environmental challenges connected with waste generation and not enough waste collection, transport, treatment and dumping. Current systems in India cannot cope with the volumes of waste generated by an increasing urban population, and these impacts on the environment and public health. Indore today generates over 1,115 MT of garbage a day and all of it is collected from the source whether it is a household or commercial establishment. The door-to-door service was started in January 2016 as a pilot projects in two of the 84 wards in the city. It took approximately a year to achieve 100 % door-to-door garbage compilation. Indore through its praiseworthy joint efforts has achieved separation of waste at source at 100% of its household's and commercial units. Citizens of Indore played a momentous role in making the city neat and clean. The cleanliness circumstances of Indore was changed by improved habits of its people. Within a span of one year the Municipal Corporation successfully sensitized citizens for segregation at source and not throwing away garbage in open areas. The Swachhata story of Indore is truthfully transformation throughout community contribution.*

*Keywords: Indore; Swachh Bharat; Waste Collection; Garbage*

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**INTRODUCTION**

The fast industrialization and population detonation in India has led to the migration of people from villages to cities, generating thousands of tons of Municipal solid waste (MSW) per day. The quantity of municipal solid waste is expected to augment significantly in the near prospect as the country strives to accomplish industrialized nation status by 2020. Poor collection and inadequate transportation are responsible for waste accumulation municipal solid in every corner and corner. The management of the MSW is in a critical phase, due to the lack of sufficient facilities to process and dispose of the largest quantity of MSW generated every day in metropolitan cities. In general, municipal solid waste is eliminated in low areas with no precautions or operational controls. As a result, MSWM is one of the major environmental problems in the megacities of India. It covers activities related to the manufacture, storage, collection, transport and transport, treatment and disposal of solid waste. Though, in most cities, the MSWM system includes only four activities, i.e. production, collection, transport and waste disposal. The supervision of municipal solid waste requires sufficient infrastructure, maintenance and updating for all activities. This is flattering increasingly expensive and multifaceted due to the continued and unplanned enlargement of town centers. The difficulties in providing the preferred level of public service in urban centers are often attributed to the poor financial circumstances of municipal governments. According to the 2011 census, the population of the city of Indore was about 2.17 million, which represents an augment of nearly 47 % since the last census of 2001. The rapid population enlargement, the industrialization, urbanization and financial growth of the city generates thousands of tons of municipal solid waste per day. Poor collection and insufficient transportation are accountable for the accumulation of MSW in every nook and cranny. As additional land is needed for the final disposal of this solid waste, the problems associated with disposal have turn out to be a big confront. The management of the MSW is going from side to side a critical phase, due to the lack of adequate facilities to process and eliminate the large quantity of MSW that is generated daily. Typically, in Indore, MSWs are placed in an open area without taking the necessary precautions and quantifiable controls, which is why it has become the main cause of environmental pollution and human health. Solid waste management activities related to the production, storage, collection, transfer and transport, treatment and disposal of solid waste. But in Indore, MSWM only has four activities: waste generation, collection, transport and disposal. The solid management of solid waste requires sufficient infrastructure, preservation and updating for all activities. The management of MSW covers the planning, engineering, organization, management, financial and legal aspects of the activities related to the production, storage, collection, transport, processing and elimination of waste.

**METHODS OF WASTE COLLECTION****Door to door collection**

Indore has been separated into 19 zones and 85 wards. Every ward has on an regular 6,000 households and 600 marketable establishments (part of 88 notified commercial areas). In Indore, waste is generated from a variety of sources including households, commercial areas and other institutions like RWAs, hospitals, hotels among others. The households or housing complexes are enclosed by the door to door collection system whilst the semi



bulk and bulk generators are covered by the bulk collection arrangement. Indore ensures the 100 % coverage of wards throughout its door to door collection system.

Earlier, household waste collection system previous to 2016 was not so good. Solid waste management was carried out in three stages as explained below.



Fig. 1 Door to door waste collecting van

**1) Primary collection:** Household waste was collected in some locations by municipality workers and in others throughout private arrangement by housing colonies.

Private waste collectors were called “Jagirdars”. They had extremely poor service quality levels and often dumped the compost in open government land/ empty plots leading to health hazards for citizens. In general, the waste collected was put in dustbins along main streets. The city had 1380 dustbins with some of them in very poor shape. These dustbins would often run over creating a hideous look around the city. Stray animals (cows, pigs and dogs) would nourish on this compost. Some of these animals (cows and pigs) were looked after by the Jagirdars who could get supplementary income by milking the cows or selling the animals for meat. They had a vested attention in not keeping the localities spotless so that the animals could feed on them and decrease their preservation cost on these animals.

**2) Secondary collection:** From the central dustbins, waste was detached by a private contractor A2Z transportation limited and enthused to open removal ground in to Devguradia. A2Z was facing a severe financial disaster foremost to severely exaggerated secondary waste transportation



Fig. 2 Door to door waste collection system

Their financial woes were reflected in the deprived preservation of vehicles managed by them and unequal service foremost to accumulation and overflowing of dustbins.

The amalgamation of poor collection and transportation of household waste lent a filthy look to the city. In addition open defecation was widespread in slum areas as the municipality had not provided sufficient public toilets for such people to use. Even with the city areas, cleanliness of public toilets was indecent leading to open defecation by other citizens as well.

The Mayor expressed her concern regarding cleanliness to the commissioner and apprehensions about continuing with A2Z which led to a execution of the contract in August 2015, few months after Mr. Manish Singh joined as Municipal Commissioner of Indore.

### **Implementation of D2D collection system**

In order to accomplishment successful door to door collection system, a recognition study had to be carried out which helped to shape out the quantity of waste generated at each ward and the population of each ward. On that basis, a comprehensive route plan was prepared to cover all wards. Based on the route plan, a detailed vehicle and staff deployment plan was implemented in order to meet the waste collection demand of each ward. The door to door collection is done through the use of partitioned vehicles. There are three disconnect collection bins for wet, dry and household hazardous waste in each tipper. These tippers carry the waste from households to the move station, from where the waste is transported to the trenching ground in hook loaders. All vehicles used in the collection and transportation system are monitored by a GPS enabled tracking system. The GPS system is constantly monitored by the monitoring cell. Any route deviations by exacting drivers are penalized and multiple deviations are also grounds for termination.

### **Characteristics of waste**

The wet waste from the domestic generators is collected through the Door to Door Collection System. The door to door collection system has been deployed by IMC to collect the waste from domestic generators and commercial areas in Indore. The waste is collected through partitioned vehicles known as 'Tippers' and transported to the Garbage Transfer Stations for secondary collection.

The wet waste from semi bulk generators generating 25 to 100 kg of waste is collected throughout the Bulk Collection System. The bulk collection vehicles consist of a dumper which is used to collect wet waste and a compactor which is used to collect dry waste. These vehicles move in pairs as per a predefined deployment plan. These vehicles on completing their collection way transport the waste straight to the central processing plant.

The bulk generators generating more than 50 kg of waste are comes under the category of bulk garbage generators. As per the GOI guidelines, it is mandatory for these generators to process their wet waste on site. Therefore wet waste is not collected from these generators.

The wet waste collected by the door to door collection vehicles is transported by the tippers to one of the eight transfer stations. At the GTS, the tippers unload the wet waste into devoted compactors which compress and load the wet waste on dedicated hook loaders. The details of all the incoming waste collection vehicles are logged in the log books at the GTS. The bulk collection vehicles do not travel to the GTS but straight to the processing plant after completing their individual collection routes.



Fig. 3 Wet waste disposal system in land area

The Weighment Bridge facility is recognized at the central processing plant. This is the first point of interaction for all the vehicles incoming at the plant. This is a computerized facility where the weight of all the wet waste that is being collected by the door to door collection and the bulk collection system is brought to be weighed before it can move to the processing plant.

The wet waste is processed in two ways i.e. Central Processing Plant & at Decentralized Waste Processing Units. All the wet waste of the bulk generators (50 kg and above) is processed at their premises, so this waste is not processed at the central processing plant. The wet waste from the GTS (D2D Collection) and semi bulk collection (25 to 100 kg) is transported to the central wet waste processing plant, where it is processed into compost.

**Dry Waste:** Dry Waste is defined as the “waste other than bio-degradable waste and inert street sweepings and includes recyclable and non-recyclable waste, combustible waste and sanitary napkin and diapers, etc.” The Domestic Hazardous Waste consists of material as sanitary pads, lead acid batteries, etc. This waste is collected in a separate bin which is attached at the back of the waste collection vehicle.

### **Garbage Transfer Station**

Indore is one of the economically developed cities of Madhya Pradesh and is the financial capital of the state. Indore is the 9<sup>th</sup> largest city in India with population of around 25 lakhs. The city has been divided into 85 Wards and 19 Zones as the operational area for Solid Waste Management (SWM). In Indore, waste is collected in segregated way i.e. the waste is segregated at basis by the generators. The total waste generation in Indore is 1115 MTPD. Out of the total waste 58.25 % is the wet or organic waste, 41.75 % is dry waste and 0.5 % is household harmful and sanitary waste. The total wet waste generation is 650 MTPD (Approximately) and dry waste generation is 465 MTPD (Approximately).

The collected waste is transported by the Tri-portioned compost tippers deployed in all 85 wards to the designated Garbage transfer station (GTS). Previously, the waste was being transported to the centralized processing plant which is around 20-23 kms from the city. To strengthen and reduce the cost of the Secondary Collection and Transportation System, IMC has constructed eight ultra-modern transfer stations of three types of models such as Ramp based static GTS, portable Compactors based GTS and semi portable Compactors based GTS installed by Hyva and TPS at different locations mentioned below within the city

- Star Square
- Kabithkedi
- F-sector, Sanwer Road
- Sangam Nagar
- Sirpur, Dhar Road
- Lalbagh
- Crystal IT Park
- Rajshahi, DakkanwalaKua

## **PROCESS OF WASTE MANAGEMENT**

### **Incineration**

Incineration is a waste treatment process that involves the burning of organic matter present in the MSW. Ashes and combustion gases are the byproducts of this process. Incineration is valuable for dangerous waste, pathogens, toxins and waste produced by hospitals. It also reduces waste from 80 to 85 % by weight and from 90 to 96 % by volume. This is done in a computer called an incinerator. Incineration can produce 2/3 MWh of electricity per ton of MSW. This is a bad choice because the waste consists mostly of high organic matter (40-60 %) and high inert content (30- 50 %), as well as low heat content (800-1100 kcal / kg) and high moisture content (40-60 %) in MSW and high plant installation and operation costs.

### **Composting**

Composting is an organic material that has been broken down and recycled as a fertilizer and soil amendment. The composting process simply requires that the pile of wet organic matter be known as green waste and that the material decomposes into humus after a period of a few weeks or months. Compost is rich in nutrients. It is used in gardens, land spacing, horticulture and agriculture. Compost itself is beneficial to the soil in a number of ways, including as a soil conditioner, fertilizer, addition of humus or humic acid, and as a natural soil pesticide.

**Landfill**

Landfill is the oldest and most common method of treating solid waste. This is done on a particular site or land called a dump. The waste is poured into the soil by weight in a uniform manner. After the spill, the debris is covered with a layer of soil after each day. It does not require any infrastructure or equipment, so it is the most economical process of waste management. Methane produced from waste, which is a greenhouse gas, is a major threat to the environment and is highly flammable and explosive. It is the disposal of waste that cannot be reused, recycled or recovered, in or on land. The aim is to avoid contact between the waste and the surrounding environment, especially groundwater.

**Recycling**

Recycling is a process of converting waste into new products. Recycling is the key element of modern waste reduction and is the third component of the waste hierarchy. Recyclable materials include many types of glass, paper, metal, plastic, electronics and textiles. Recycling is a key element of modern waste reduction.

**CONCLUSION**

The paper presentation indicates the appropriate management and processing of Indore's MSW. The determination and type of MSW and the treatment with the individual method is the most excellent way to manage the MSW, so it does not create pollution and compensation our society. Indore Municipal Corporation (IMC) generally uses landfill and composting methods for the treatment of MSW. IMC can also use different treatments such as gasification technology for MSW treatment because it is a renewable energy source for energy production. As the population grows speedily as urbanization accelerates, the generation of MSW also increases, this document will help MSWM authorities progress the city.

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**STATISTICAL ANALYSIS OF THE EXPERIMENTAL DATA ON THE CONTENT OF HEAVY METALS IN SOD-PODZOLIC SOILS, DEPENDING ON THE INTRODUCTION OF SEWAGE SLUDGE UNDER ENERGY WILLOW**

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Formulation of the problem. The amount of municipal sewage and sewage sludge is constantly growing against the background of exacerbation of problems associated with their rational use, cost-effective and environmentally friendly use as fertilizers. The content of heavy metals is one of the key criteria for environmental assessment of sewage sludge of various origins as a fertilizer, given the concentration of hazardous elements in particular cadmium and lead.

This limits its widespread use for fertilizing crops in the agricultural sector [7, 10 - 12]. Therefore, it is now important to use sewage sludge for energy crops, which will help Ukraine out of the environmental and energy crisis [11]. Today, due to the cultivation of energy willow with the introduction of sewage sludge, two problems are solved - increasing biomass production and increasing the share of renewable energy production, and on the other hand - safe disposal of sewage sludge [7, 10, 12].

However, the proposed methods of utilization of sewage sludge as fertilizer during the cultivation of energy crops to obtain biomass require a comprehensive analysis of the reliability and environmental safety of their introduction into the soil, including the use of mathematical statistics.

Analysis of recent research and publications. One way out of the energy and environmental situation is to grow fast-growing energy plantations. Salix willow is widely used in energy forestry, which usually grows up to 5 - 6 m in height, has a large number of shoots and accumulates a large amount of vegetative mass in a relatively short period [7].

The dense and very deep root system of willow intensively absorbs nutrients and heavy metals that may be contained in sewage sludge [7, 10]. Cod (chips) of energy willow are not significantly different from other types of wood chips, but may contain more bark and moisture. Thus, compared to wood chips, the fuel may contain relatively more nitrogen and cadmium. Under ideal conditions, during combustion, most of the nitrogen will be released in the form of N<sub>2</sub>, and heavy metals remain in the ash [7, 9].

To assess the impact on the ecosystem of heavy metals in the agrocenosis, especially during the introduction of sewage sludge, several approaches can be used: determine the impact of heavy metals on the content of gross forms in the sludge and soil [5 - 7, 12]. Cadmium compounds deserve special attention, as this element belongs to the first class of environmental hazards. From the biogeochemical standpoint of Heavy Metals, even at relatively low absolute concentrations have a toxic effect on living organisms.

Therefore, there is an urgent need for statistical processing of heavy metal content in the soil depending on the fertilizer.

Setting objectives. The aim of our research is to determine, process and model experimental data on the content of cadmium and lead in the soil under the influence of the use of sewage sludge on sod-podzolic soils for the cultivation of energy crops.

Виклад основного матеріалу. Експериментальна плантація верби енергетичної була створена в другій декаді березня 2012 року на колекційно-дослідному полі Івано-Франківського коледжу ЛНАУ розшифрувати в Передкарпатті Івано-Франківської області. У 2015 році після збору біомаси верби енергетичної повторно вносили добрива у ґрунт за відповідною схемою варіантів.

Схема садіння 0,33 м X 0,70 м. Варіанти дослідів: 1. контроль - без добрив; 2. – N<sub>100</sub>P<sub>100</sub>K<sub>100</sub>; 3. ОСВ - 40 т/га; 4. ОСВ - 60 т/га; 5. ОСВ - 80 т/га; 6. Компост ОСВ + тирса (3:1) – 60 т/га; 7. Компост ОСВ + солома (3:1) – 20 т/га; 8. Компост ОСВ + солома (3:1) – 40 т/га; 9. Компост ОСВ + солома (3:1) - 60 т/га; 10. Компост ОСВ + солома (3:1) + цементний пил 10 % - 40 т/га.

**Presenting main material.** The experimental energy willow plantation was created in the second decade of March 2012 on the collection and research field of Ivano-Frankivsk College of LNAU to decipher in the

Precarpathians of Ivano-Frankivsk region. In 2015, after the collection of energy willow biomass, fertilizers were re-applied to the soil according to the appropriate scheme of options.

Planting scheme 0.33 m X 0.70 m. Experiment options: 1. control - without fertilizers; 2. -  $N_{100}P_{100}K_{100}$ ; 3. SS - 40 t/ha; 4. SS - 60 t/ha; 5. SS - 80 t/ha; 6. Compost SS + sawdust (3: 1) - 60 t/ha; 7. Compost SS + straw (3: 1) - 20 t/ha; 8. Compost SS + straw (3: 1) - 40 t/ha; 9. Compost SS + straw (3: 1) - 60 t/ha; 10. Compost SS + straw (3: 1) + cement dust 10% - 40 t/ha.

Sewage sludge from sludge maps of Ivano-Frankivsk vodoekotechprom was used for experiments. The selected samples were analyzed in the laboratory of the Ivano-Frankivsk branch of the State Institution "Institute of Soil Protection" according to generally accepted methods.

Soil preparation for willow planting included plowing to a depth of 20-25 cm, and two weeks after plowing - loosening the soil and applying sewage sludge and compost on their basis according to the scheme of the field experiment to earn a disc harrow to a depth of 15 - 20 cm

1.5 - 2 weeks after planting the plants in the soil, the first sprouts appear from the buds and the intensive growth of vegetative shoots begins. Already at the first stages of their regrowth we noticed positive growth trends in the variants where composts of sewage sludge with straw were applied at the rate of 40 - 60 t / ha.

After 60 days, we took soil samples from each variant at a depth of 0 - 20 cm, conducted agrochemical studies of the soil. We also performed analyzes to determine the gross and mobile forms of some heavy metals and compared them with the maximum allowable concentrations of these elements in the soil [7, 12] (Table 1).

Table 1.

Dynamics of the content of gross and mobile forms of some heavy metals in sod-podzolic soil under the influence of repeated application of sewage sludge and compost on its basis under energy willow, 2016 -2020

| A variant of the experiment                                | Gross forms, mg/kg of soil |      |       |       | Mobile forms, mg/kg of soil |      |      |      |
|------------------------------------------------------------|----------------------------|------|-------|-------|-----------------------------|------|------|------|
|                                                            | Pb                         | Cd   | Ni    | Co    | Pb                          | Cd   | Ni   | Co   |
| 1 control - without fertilizers                            | 11,93                      | 0,52 | 16,51 | 11,41 | 1,15                        | 0,09 | 1,05 | 1,05 |
| 2. $N_{100}P_{100}K_{100}$ ;                               | 11,90                      | 0,82 | 17,21 | 11,81 | 1,35                        | 0,13 | 1,23 | 1,30 |
| 3. SS - 40 t/ha                                            | 12,56                      | 0,78 | 18,78 | 11,78 | 1,17                        | 0,10 | 1,12 | 1,25 |
| 4. SS - 60 t/ha                                            | 12,67                      | 0,67 | 18,97 | 12,06 | 1,22                        | 0,12 | 1,17 | 1,33 |
| 5. SS - 80 t/ha                                            | 13,72                      | 0,65 | 19,56 | 12,45 | 1,30                        | 0,12 | 1,12 | 1,47 |
| 6. Compost SS + sawdust (3: 1) - 60 t/ha                   | 14,20                      | 0,73 | 20,0  | 13,3  | 1,75                        | 0,10 | 1,34 | 1,55 |
| 7. Compost SS + straw (3: 1) - 20 t/ha                     | 13,97                      | 0,69 | 20,89 | 13,56 | 1,57                        | 0,14 | 1,40 | 1,49 |
| 8. Compost SS + straw (3: 1) - 40 t/ha                     | 14,54                      | 0,78 | 21,67 | 13,45 | 1,50                        | 0,12 | 1,38 | 1,56 |
| 9. Compost SS + straw (3: 1) - 60 t/ha                     | 15,64                      | 0,73 | 21,56 | 13,67 | 1,48                        | 0,14 | 1,29 | 1,80 |
| 10. Compost SS + straw (3: 1) + cement dust 10% - 40 t/ha. | 15,76                      | 1,06 | 26,01 | 14,31 | 1,55                        | 0,15 | 0,91 | 1,78 |

Relatively low concentrations of heavy metals in the studied sewage sludge did not lead to an increase in the maximum allowable concentrations of them in the soil after its introduction in different doses. However, the cadmium content in the soil was twice as high as in the unfertilized version. According to our results, the content of cadmium in gross form is from 0.52 mg/kg in the control variant to 3.0 mg/kg in the 10 variant. In the mobile form, the cadmium content varies significantly from the control option to option 7 increases, then decreases.

Statistical evaluation of the obtained results of heavy metals in the soil is subject to the normal distribution law [7 - 9, 12].

For the analysis and conclusions we used the results of the study of Pb in gross and mobile form on sod - podzolic soils, after the introduction of sewage sludge; the number of study options was  $N = 10$  (to calculate the correlation coefficient and its estimates  $N = 10$ ).

The following statistical characteristics were calculated for [1 – 3, 7 – 9, 10, 11, ]

1) arithmetic mean ( $\bar{x}$ ):

$$\bar{x} = \frac{\sum_{i=1}^N x_i}{N}; \quad (1)$$

2) variance ( $S^2$ ):

$$S^2 = \frac{\sum_{i=1}^N (x_i - \bar{x})^2}{N-1}; \quad (2)$$

3) standard deviation ( $S$ ):

$$S = \sqrt{S^2}; \quad (3)$$

4) coefficient of variation ( $\gamma$ ):

$$\gamma = \frac{S}{\bar{x}}; \quad (4)$$

5) an indicator of the degree of aggregation of estimates in the distribution ( $E$ ):

$$E = \frac{S^2}{\bar{x}}; \quad (5)$$

6) initial moments ( $h$ ) 1, 2, 3, 4 - orders:

$$h_k = \frac{1}{N} \sum_{i=1}^N x_i^k; \quad (6)$$

7) central moments ( $m$ ) 1, 2, 3, 4 :

$$m_k = \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^k, \quad (7)$$

where  $k$  is the order of the moment;

8) coefficient of asymmetry of the distribution of estimates ( $as$ ), standard deviation ( $S_{as}$ ) and its triple value ( $3S_{as}$ ):

$$as = \frac{m_3}{m_2^{3/2}}; S_{as} = \sqrt{\frac{6(N-1)}{(N+1)(N+3)}}; \quad (8)$$

9) the coefficient of excess of the study distribution ( $ex$ ), standard deviation ( $S_{ex}$ ) and its quadruple value ( $5S_{ex}$ ):

$$ex = \frac{m_4}{m_2^2} - 3; S_{ex} = \sqrt{\frac{24(N-2)(N-3)N}{(N-1)^2(N+3)(N+5)}}; \quad (9)$$

10) the calculated value ( $N\omega^2$ ) of the criterion  $\omega^2$  and the maximum significance level ( $\alpha_{max}$ ), which corresponds to  $(N\omega^2)_p$   $p$  and the degree of compliance of the research results with the normal law of Gauss  $\xi_j(\omega^2)_\alpha$  for significance levels  $\alpha$ :

$$\left(N\omega^2\right)_p = \frac{1}{12N} + \sum_{i=1}^N [P(x_i) - w(x_i)]^2, \tag{10}$$

where  $p(x_i) = 0,5 + \Phi(z_i)$  – theoretical probability of hitting a random variable  $X(Z)$  on the  $i$ -th place of the variation series;

$z_i = \frac{x_i - \bar{x}}{S}$ ;  $w(x_i) = \frac{i - 0,5}{N}$  – empirical distribution function (accumulated frequency - the frequency of hitting  $chi$  at the  $i$ -place in the variation series).

$$\Phi(z_i) = \frac{1}{\sqrt{2\pi}} \int_0^z \left(-\frac{z^2}{2}\right) dz - \text{Laplace function [1, 2, 9]} \tag{11}$$

За нерівністю  $\left(N\omega^2\right)_p \leq Z_\alpha(\alpha)$  [8, 9] determined the level of significance of the acceptance of the hypothesis of the subordination of empirical data to the normal Gaussian distribution law.

- calculated the correlation coefficient ( $r$ ) between the results of (gross) and (moving) forms:

$$r = \frac{\sum_{i=1}^N (x_{ki} y_{mi}) - N\bar{x}_k \bar{y}_m}{\sqrt{\left[\sum_{i=1}^N (x_{ki}^2) - N\bar{x}_k^2\right] \left[\sum_{i=1}^N (y_{mi}^2) - N\bar{y}_m^2\right]}} \tag{12}$$

and proved its significance by the critical value ( $r_{cr}$ ), for two levels of significance  $\alpha=0,05$  and  $\alpha=0,01$ , while estimating the degrees of linearity

Reliability (confidence interval)  $p=1-\alpha$  and accuracy (confidence interval) of results.

Mathematical expectation  $a_i$  for  $\bar{x}_i$ .

• **Pb mobile forms:**

$$\alpha=0,05 \quad p(1,29 < a_x < 1,517) = 0,95; \tag{13}$$

$$\alpha=0,01 \quad p(1,23 < a_x < 1,5778) = 0,99;$$

$$\alpha=0,1 \quad p(1,324 < a_x < 1,484) = 0,90; \tag{14}$$

$$\alpha=0,005 \quad p(1,204 < a_x < 1,604) = 0,995.$$

• **Pb gross forms:**

$$\alpha=0,05 \quad p(12,877 < a_x < 14,5) = 0,95; \tag{15}$$

$$\alpha=0,01 \quad p(12,439 < a_x < 14,93) = 0,99;$$

$$\alpha=0,1 \quad p(13,079 < a_x < 14,30) = 0,90; \tag{16}$$

$$\alpha=0,005 \quad p(12,259 < a_x < 15,119) = 0,995.$$

**Table 2.**

**Comparative mathematical analysis of the results of gross and mobile forms of Pb on sod-podzolic soils of Precarpathia after re-introduction of sewage sludge**

| Function     | gross forms | Mobile forms |
|--------------|-------------|--------------|
| N            | 10          | 10           |
| $\bar{x}$    | 13,689      | 1,404        |
| $S^2$        | 1,98        | 0,0381       |
| S            | 1,4         | 0,195        |
| $\gamma, \%$ | 10,2        | 13,92        |
| E            | 0,1446      | 0,027        |
| $h_1$        | 13,689      | 1,404        |
| $h_2$        | 166,76      | 4,99         |



|                                 |                |                                |
|---------------------------------|----------------|--------------------------------|
| h <sub>3</sub>                  | 2638,46        | 2,844                          |
| h <sub>4</sub>                  | 3 7136,573     | 4,298                          |
| m <sub>1</sub>                  | 0              | 0                              |
| m <sub>2</sub>                  | -20,62872      | 0,018                          |
| m <sub>3</sub>                  | 920,46         | 2,769                          |
| m <sub>4</sub>                  | 69615,08       | 0,208                          |
| as                              | 9,82           | 1153,75                        |
| Sas                             | 0,61           | 0,61                           |
| 3Sas                            | 1,83           | 1,81                           |
| ex                              | 160,59         | 647                            |
| Sex                             | 0,92           | 0,92                           |
| 5Sex                            | 4,6            | 4,6                            |
| (Nω <sup>2</sup> ) <sub>p</sub> | <b>0,03694</b> | <b>0,03694</b>                 |
| <b>Correlation coefficient</b>  |                | <b>r<sub>p</sub> 0,7005973</b> |

General variance σ<sub>i</sub><sup>2</sup> is estimated S<sub>i</sub><sup>2</sup>

- **Pb** Mobile forms:

за χ<sup>2</sup>: α=0,01 p [0,0145 < σ<sub>x</sub><sup>2</sup> < 0,1982] = 0,95; (17)

- **Pb** gross forms:

за χ<sup>2</sup> α=0,01 p [0,755 < σ<sub>x</sub><sup>2</sup> < 10,300] = 0,99; ; (18)

**Table 3.**

**Comparative mathematical analysis of the results of gross and mobile forms of Cd on sod-podzolic soils of Prykarpattia after re-introduction of sewage sludge**

| Функція                         | gross forms  | Mobile forms                |
|---------------------------------|--------------|-----------------------------|
| N                               | 10           | 10                          |
| $\bar{x}$                       | 0,743        | 0,181                       |
| S <sup>2</sup>                  | 0,019        | 0,3018                      |
| S                               | 0,14         | 0,549                       |
| γ, %                            | 18,8         | 30,3                        |
| E                               | 0,025        | 1,66                        |
| h <sub>1</sub>                  | 0,743        | 0,181                       |
| h <sub>2</sub>                  | 0,5667       | 0,060                       |
| h <sub>3</sub>                  | 0,4478       | 0,03573                     |
| h <sub>4</sub>                  | 0,3689       | 0,02418                     |
| m <sub>1</sub>                  | 0            | 0                           |
| m <sub>2</sub>                  | 0,0146       | 0,02805                     |
| m <sub>3</sub>                  | 0,0048       | 0,01455                     |
| m <sub>4</sub>                  | 0,0049       | 0,12955                     |
| as                              | 2,82         | 3,163                       |
| Sas                             | 0,61         | 0,61                        |
| 3Sas                            | 1,83         | 1,83                        |
| ex                              | 20,3         | 161,82                      |
| Sex                             | 0,92         | 0,92                        |
| 5Sex                            | 4,6          | 4,6                         |
| (Nω <sup>2</sup> ) <sub>p</sub> | <b>0,074</b> | <b>0,7449</b>               |
| <b>Correlation coefficient</b>  |              | <b>r<sub>p</sub>=0,1827</b> |

- Mobile forms:

α=0,05 p (-0,137 < a<sub>x</sub> < 0,499) = 0,95; } (19)

α=0,01 p (-0,309 < a<sub>x</sub> < 0,671) = 0,99; }

α=0,1 p (-0,059 < a<sub>x</sub> < 0,421) = 0,90; } (20)

$\alpha=0,005$  p  $(-0,365 < a_x < 0,727) = 0,995$ .

- **Cd** gross forms:

$\alpha=0,05$  p  $(0,663 < a_x < 0,823) = 0,95$ ; } (21)

$\alpha=0,01$  p  $(0,618 < a_x < 0,868) = 0,99$ ; }

$\alpha=0,1$  p  $(0,727 < a_x < 0,804) = 0,90$ ; } (22)

$\alpha=0,005$  p  $(0,6 < a_x < 6,886) = 0,995$ . }

**General variance  $\sigma_i^2$  is estimated  $S_i^2$ .**

- **Cd** Mobile forms:

3a  $\chi^2$ :  $\alpha=0,01$  p  $[0,115 < \sigma_x^2 < 1,57] = 0,99$ ; (23)

- **Cd** gross forms:

3a  $\chi^2$   $\alpha=0,01$  p  $[0,0072 < \sigma_x^2 < 0,0988] = 0,99$

**CONCLUSIONS**

Testing the hypothesis about the conformity of the results of the analysis by criterion  $N\omega^2$  showed that  $(N\omega^2)_p=0,03694$  (c),  $(N\omega^2)_p=0,03694$  (p). This corresponds to the significance levels  $\alpha>0,4$  (B) and  $\alpha>0,4$  (p), respectively, and allows us to conclude that the results obtained during the field experiment are correct.

The study of the subordination of the results of the analysis of the Pb gross form in this case  $|ex| < S_{ex}$ , the test of the hypothesis that the results of the analysis of the correspondence to the normal distribution law by the criterion  $N\omega^2$  showed that  $(N\omega^2)_p=0,074$  (c),  $(N\omega^2)_p=0,74$  (p). This corresponds to the significance levels  $\alpha>0,003$  ( $\kappa$ ) and  $\alpha>0,01$  (m), respectively, and allows us to conclude that the linear law of distribution of the analysis result does not contradict the results obtained during the experiment.

The results allow us to construct confidence intervals for the mathematical expectation  $a_x$ , the general variance  $\sigma^2$ , the general coefficient of variation  $v$  and the critical value of the correlation coefficient to test hypotheses about the statistical equality of general variances and mathematical expectations, the significance of correlation coefficients

With the introduction of compost based on sewage sludge with various organic materials (sawdust and straw), the content of cadmium and lead in the soil is significantly reduced, which allows the use of compost without environmental risks to the environment. According to the results of research, the highest content of cadmium and lead was compost, made on the basis of sewage sludge and sawdust (3: 1).

Therefore, according to our calculations, the use of sewage sludge should be used as a fertilizer for energy crops, as statistical analysis showed that the linear distribution law of the analysis result confirms the results obtained during the experiment.

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## EXISTENCE OF FIXED-POINT THEOREM IN SPACES

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## ABSTARCT

*Fixed point hypothesis is a very powerful apparatus in Mathematical investigation. Its assumes a fundamental part in use of numerous parts of Mathematics. Finding a fixed purpose of contractive mappings turns into the focal point of solid examination action. There are numerous scientists who have worked in fixed point hypothesis of contractive mappings (see for example,1,2). In2 Police Mathematician Banach demonstrated a vital outcome with respect to a constriction planning, known as the Banach withdrawal rule.*

## INTRODUCTION

In5, Bakhtin presented the idea of a b-metric space as a speculation of a measurement space and demonstrated the compression planning hypothesis in a b-metric space. He demonstrated the compression planning guideline in b-metric space that summed up the renowned Banach constriction standard in measurement spaces.

To conquer the issue of quantifiable capacities as for a measure and their assembly, Czerwik6 needs an expansion of metric space. Utilizing this thought, he introduced a speculation of prestigious Banach fixed point hypothesis in the b-metric spaces sees for (7,8,9). Numerous creators have considered the expansion of fixed point hypothesis in b-metric spaces.

In 2007, Huang and Zhang10 summing up the thought of a measurement space by supplanting the arrangement of genuine number by requested normed spaces, characterized a cone metric space and made some fixed statement hypotheses of contractive mappings characterized on these spaces. In 2008, Rezapour and Hambarani11 excluded the suspicion of ordinariness in cone metric space, which is an achievement in creating fixed point hypothesis in cone metric spaces.

Hence, a few creators have summed up the aftereffects of Haung and Zhang10 and acquired fixed focuses and basic fixed purposes of mappings fulfilling contractive sort condition on a typical cone metric spaces.

As of late, in 2011, Hussein and Shah12 presented the idea of cone b-metric spaces as a speculation of b-metric spaces and cone metric spaces. They set up some topological properties in such spaces and improved some new outcomes about KKM mappings in the setting of a cone b-metric space. In 2013, Shi and Xu13, Proved basic fixed point hypotheses for two feebly viable self-mappings in cone b-metric spaces. In14, H. Huang and S. Xu. Introduced some new models in cone b-metric spaces and made some fixed statement hypotheses of contractive mappings without the presumption of ordinariness in cone b-metric spaces. In15, Reny George and Brian Fisher, acquired a typical fixed point hypothesis of Taskovic type for three mappings in non-ordinary cone b-metric spaces, which will expand and sum up ongoing consequences of Huang and Xu14, George and Khan16, Rao et al.17, George et al.18 and furthermore many existing outcomes in measurement spaces, b-metric spaces and cone b-metric spaces. Cone b-metric spaces assume a valuable part in fixed point hypothesis. In 2014, Tiwari, S.K. et al.19, summed up and made regular fixed statement hypotheses for self planning fulfilling an overall contractive condition on complete cone b-metric spaces of the results15. Kumar, P. et al.20, Expand hypothesis 1 of the results14 and made basic fixed statement hypotheses in cone b-metric spaces. In continuation, Tiwari, S.K., et al.21, summed up fixed point hypothesis of cone b-metric spaces.

Indeed there exist mappings with normal fixed focuses which are constriction mappings in a cone b-metric space yet are not compression mappings when characterized in a cone metric space. The motivation behind this paper is to sum up and expand fixed point hypothesis of summed up withdrawal planning in cone b-metric space. Our outcomes expand and improve the consequences of 3 and 4.

Leave  $X$  alone a nonempty set .A planning  $T:X \rightarrow X$  is called self guide of  $X$ . In the event that there is a component  $x \in X$  with the end goal that  $T(x) = x$ , at that point  $x$  is known as a fixed purpose of oneself guide  $T$  of  $X$ . An outcome giving a bunch of conditions on  $T$  and  $X$  under which  $T$  has a fixed point is known as a fixed point hypothesis. We note that fixed point issues and root discovering issues  $Tx = 0$  are same. Presently, the inquiry emerge what kind of issues have the fixed point. The fixed point issues can be explained as the accompanying:

- (I) What capacities/maps have a fixed point?
- (ii) How would we decide the fixed point?

(iii) Is the fixed point one of a kind?

Fixed point hypotheses have huge application in Science and Engineering can be decreased to fixed point issues. A large portion of the hypotheses guarantee the presence of arrangements differential conditions, Integral conditions or other administrator conditions. They are likewise utilized in new zones of arithmetic applications like Mathematical Economics, Game Theory, Fluid stream, Eigen esteem Problems, Random differential conditions etc.

The fixed point hypothesis is the significant piece of practical investigation. It has created as co-arrangements of the endeavors to sum up the aftereffect of traditional examination, algebras and math. It gives an integral asset to find answers for issues happening in unadulterated, applied and sociologies for designing, medication, agrobusinesses, financial aspects, bio-financial matters and space science and so on

The deliberation of this old style hypothesis is the spearheading work of the incredible clean mathematician Stefan Banach Published in 1922 which gives a helpful technique to the fixed purposes of a guide.

The Banach fixed point hypothesis expresses that "a withdrawal planning on a total measurement space has an interesting fixed point." The detailing of this specific outcome is known as Banach fixed point hypothesis or Banach compression rule. Numerous mathematicians have expanded and summed up crafted by Banach in various ways. Hence, the exquisite Banachs fixed point hypothesis addresses:

- a) The issue on the presence of a one of a kind answer for a condition,
- b) Gives a commonsense strategy to acquire estimated arrangements and
- c) Gives a gauge of such arrangements.

This method have been applied in such different field as science, science, financial aspects, designing, game hypothesis, physical science, software engineering and innovation, practical condition, Mathematical physical science, numerical science, numerical science, control framework hypothesis, improvement hypothesis and numerous different territories.

Fixed point hypothesis is separated into three significant territories:

- Metric fixed point hypothesis;
- Topological fixed point hypothesis;
- Discrete fixed point hypothesis
- Verifiably limit line between the traditional and significant outcomes in these zones is:
- Brower's fixed point hypothesis;
- Banach fixed point hypothesis;
- Tarski's fixed point hypothesis.

Be that as it may, on authentic perspective, the significant traditional outcome in fixed point hypothesis is because of L.E.J. Brouwer given in 1912, which expresses that "a persistent map on a shut unit ball in  $R^n$  has a fixed point" An expansion of this outcome is the Schauder's fixed point hypothesis of 1930 which expresses that "a ceaseless guide on a raised reduced subspace of a Banach space has a fixed point"

Presently we have contemplated distinctive kind of room, for example, follows:-

**(a). metric space**, we mean

Let  $X$  is non-empty set. A metric on  $X$  is a real function " $d$ " of ordered pair of elements of  $X$ , which satisfies the following three conditions:

1. and  $d(x, y) = 0 \Leftrightarrow x = y$ .
2.  $d(x, y) \leq d(x, z) + d(z, y)$  (the triangle inequalities)

A metric space consists of two objects: a non empty set  $X$  and a metric " $d$ " on  $X$ . The elements of  $X$  are called the points of the metric space  $(X, d)$ . There are many kinds of metric spaces, some of which play very significant roles in geometry and analysis.

**(b). b-Metric space:**

Let  $X$  be a set and let  $s \geq 1$  be a given real number. A function  $d : X \times X \rightarrow R_+$  is said to be a b-metric if and only if for all  $x, y, z \in X$  the following conditions are satisfied:

- 1.
- 2.
- 3.

The pair  $(X, d)$  is called b-metric space.

Example:-

The space  $l_p (0 < p < 1)$

$$l_p = \left\{ (x_n) \subset R : \sum_{n=1}^{\infty} |x_n|^p < \infty \right\}$$

Together with the function  $d : l_p \times l_p \rightarrow R$ ,

$$d(x, y) = \left( \sum_{n=1}^{\infty} |x_n - y_n|^p \right)^{1/p},$$

Where  $x = (x_n), y = (y_n) \in l_p$  is a b-metric space.

**(c). Cone Metric Spaces:**

Let  $X$  be a non empty set. Suppose the mapping  $d : X \times X \rightarrow E$  satisfies ( $E$  is always be a real Banach space).

- 1.
- 2.
- 3.

Then  $d$  is called cone metric on  $X$ , and  $(X, d)$  is called cone metric space.

**Example:-** Let  $E = R^2, P = \{(x, y) \in E : x, y \geq 0\} \subset R^2, X = R$  and  $d : X \times X \rightarrow E$  such that

$d(x, y) = (|x - y|, \alpha |x - y|)$  where  $\alpha \geq 0$  is a constant. Then  $(X, d)$  is a Cone metric space.

**(d). Cone b-Metric spaces**

Let  $X$  be a non – empty set. Suppose the mapping  $d : X \times X \rightarrow E$  satisfies the

following condition:

- (i)  $\theta < d(x, y)$  for all  $x, y \in X$  with  $x \neq y$  and  $d(x, y) = 0$  if and only if  $x = y$ ;
- (ii)  $d(x, y) = d(y, x)$  for all  $x, y \in X$ ;
- (iii)  $d(x, y) \leq s [d(x, z) + d(z, y)]$  for all  $x, y, z \in X$ .

Then  $d$  is called a cone b- metric on  $X$ , and the pair  $(X, d)$  is called a cone b- metric space.

**(e). Generalize Cone b-Metric spaces**

Let  $X$  be a non – empty set,  $E$  be Areal Banach space,  $P$  be a solid cone in  $E$ ,  $\leq$  be a partial ordering with respect to  $P$  and  $s \geq 1$  be a real number. Suppose the mapping  $d : X \times X \rightarrow E$  be such that for all  $x, y \in X$  and for all distinct points  $w, z \in X$  (distinct from  $x$  and  $y$ ):

- (i)  $\theta < d(x, y)$  for all  $x, y \in X$  with  $x \neq y$  and  $d(x, y) = 0$  if and only if  $x = y$ ;
- (ii)  $d(x, y) = d(y, x)$  for all  $x, y \in X$ ;
- (iii)  $d(x, y) \leq s [d(x, w) + d(w, z) + d(z, y)]$  for all  $x, y, w, z \in X$ .

Then  $d$  is called a generalized cone b- metric on  $X$ , and the pair  $(X, d)$  is called a generalized cone b- metric space.

**1.2 Contraction mapping:-** A self- map  $f$  defined on a metric space  $(X, d)$  is called a contraction mapping if for some  $0 < k < 1$ ,

$$d(f(x), f(y)) \leq k d(x, y), \text{ for all } x, y \in X.$$

A mapping  $f : X \rightarrow X$  is said to a **non-expansive** mapping if

$$d(f(x), f(y)) \leq d(x, y), \text{ for all } x, y \in X. \text{ or}$$

It is remarked here that non-expansive mappings are more general than contractive mappings

## REVIEW OF LITERATURE

The result about the existence of fixed point is the Banach's fixed point theorem, sometimes called the contraction mapping theorem. It was first stated and proved by Banach in (1922). During the last few years many branches of science have benefitted from the theory and many generalizations are emerging from it contractive maps see for instance (1922). After this provital result, many authors have studied various extensions and generalizations of Banch's theorems by considering contractive mappings on several directions.

Bakhtin (1989) introduced b-metric spaces as generalization of metric spaces. He proved the contraction mapping principle in b- metric spaces that generalized the famous Banach contraction principle in metric spaces. Since then several papers deal with fixed point operator in b-metric spaces see for instance [(1993), (1997), (1998), (2009),(2010), (2011),(2012),(2013),(2014), (2015), (2016)].

Recently, the concept of cone metric space is introduced and some fixed point theorems for contractive mapping in a cone metric space were established by Huang and Zhang(2007). Indeed the authors there replace the real numbers by ordering a Banach space to define cone metric space. They prove some fixed theorems for contractive mapping by using normality of the cone. However in (2008), this theorem was proved without normality cone metric space.

Some definitions and topological concept generalized by Turkoglu and Abuloha in (2010) and they proved that every cone metric space is a topological space. . Later, many authors generalized and studied fixed and common fixed point results in cone metric spaces for normal and non normal cone

Quiet recently, Husain and shah (2011) introduced cone b- metric spaces as generalization of b- metric spaces and cone metric spaces. They established some topological properties in such spaces and improved some recent results about KKM mappings in the setting of cone b- metric spaces.

In sequel, Huping Huang and Shaoyuan Xu (2013) presented some new example in cone b- metric spaces, then obtained some fixed point theorems of contractive mapping without the assumption of normality in cone b- metric spaces. In the same year, George and Fisher ,B.(2013), proved and generalized common fixed point theorem of Taskovic type for three mappings  $f : X \rightarrow X$  and  $S, T : X^k \rightarrow X$  in cone b- metric space. Tiwari, S.K.et al.(2014) generalized and proved common fixed point theorems satisfying contractive type conditions in complete cone b- metric spaces. Sushanta, K.M. and R. Maitra(2014), proved coincidence and common fixed point results for mappings satisfying some expansive type contraction in the setting of a cone b-metric space. In 2015, Saluja, G.S, proved some fixed point theorems of contractive type conditions in cone b-metric spaces. Also Saluja,G.S.(2017), established some fixed point results in cone b- metric space satisfying generalized contraction involving rational expressions. Adamu, T.(2018), studied the existence and uniqueness of coincidence points and common fixed points of a class of almost contraction maps in cone b- metric spaces.

## OBJECTIVE

The following objectives of our research work are:

1. To explore the pure and applied part of functional analysis.
2. To apply the functional analysis technique in certain developed spaces, mappings and Iterative sequences.
3. To improve and generalize the existing results of contractive Mappings in various types of spaces such as metric space, b- metric spaces, cone metric spaces , cone b-metric spaces, Generalized cone b- metric spaces etc.

**PLAN OF RESEARCH PROPOSED WORK:**

1. We shall try to get some sufficient conditions for the existence of common fixed point Of self mappings in b- metric spaces.
2. We shall try to improve and generalize the results in cone b- metric spaces and Common fixed point Results for mappings satisfying rational type contractive Condition.
3. We shall try to improve and extend common fixed point results for contractive mappings in cone b-metric spaces.
4. We shall try to improve and extend common fixed point results for expansive type mappings in cone b- metric space
5. We shall study the results of fixed point theorems results on, metric spaces, b- metric spaces, cone metric spaces, cone b- metric space, Generalized cone b- metric spaces.

**CONCLUSION/RESULTS/ EXPECTED OUT COMES OF RESEARCH WORK.**

The proposed research work will be useful for generalizing and extending the results in b- metric spaces, cone b- cone metric spaces and generalized cone b- metric spaces this sort of research work will give new direction in mathematical studies.

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**AN EPQ DESIGN WITH IMPERFECT MANUFACTURING SYSTEM AND TWO BACKORDERS COST**

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**ABSTRACT**

*This paper develops an economic production quantity (EPQ) design with two backorders cost and imperfect production processes, in which the setup cost and manufacturing quality are functions of capital expenditure. The mathematical model is derived to investigate the effects of an imperfect production process on the optimal production cycle time when capital investment strategies in setup reduction and manufacturing quality improvement are adopted. An efficient procedure is developed to find the optimal production run length, setup cost, manufacturing quality and backorders level considering both linear and fixed backorder costs. Additionally, this paper presents a review of the different optimization methods utilized in inventory theory. Finally, numerical example is provided to illustrate the theoretical results.*

*Keywords: Production and inventory control; Economic production quantity; Backorders; Production cycle; Imperfect production process; Investment strategy.*

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**1. INTRODUCTION**

Generally, the classical EPQ (economic production quantity) design consider the production of perfect quality items. The economic production quantity (EPQ) model has been widely used in practice because of its simplicity. In the past several decades, numerous research efforts have been undertaken to extend the basic EPQ model by relaxing various assumptions so that the model confirms more closely to real-world situations. The classical EPQ model assumes that the production facility is failure free and all the items produced are of perfect quality, and that quality level is fixed at an optimal level. However, in real production environment, it can often be observed that the product quality is not always perfect and usually depends on the state of the production process. In addition, there are defective items being produced due to imperfect production processes. The defective items must be rejected, repaired and reworked, and thus substantial costs incur. Hence, the inventory policy determined by the conventional model might be in appropriate.

**2. LITERATURE REVIEW**

To study the effects of imperfect quality to lot sizes, several authors have developed various models involving the quality-related issues. L.E. Crdenas-Barrn (2009) developed an EPQ type inventory model with planned back orders for determining the economic production quantity for a single product, which is manufactured in a single-stage manufacturing system that generates imperfect quality products, and all these defective products are reworked in the same cycle. An alternative method (i.e. arithmetic geometric mean inequality) for deriving EOQ/EPQ models when back orders were allowed by L.E. Crdenas-Barrn (2010). The optimization of the EOQ/EPQ models with/without back orders through different optimization approaches were the most frequently encountered by L.E. Crdenas-Barrn (2011). K.-J. Chung, L.E. Crdenas-Barrn (2012) discussed a complete and analytic solution procedure to the EOQ/EPQ inventory models with linear and fixed backorder costs to locate and ensure the optimal solutions. Mokhtari (2018) combined both EPQ and EOQ in a single model; at the end of each production run in a cycle (the number of production runs is a decision variable), a single batch from a supplier is received and added to the inventory. Muhammad Al-Salamah (2019) developed EPQ models for the imperfect manufacturing process and a flexible rework. Shortages are back ordered and defective items are reworked at the same cycle. S. Ganesan et al. (2020) considered a model that a process warm-up production run, hybrid maintenance schedule, anticipated shortages during the maintenance period, and rework of imperfect items. The EPQ proposed in the literatures are not always a good substitute for the cost minimization. Hence, their solution procedures may be inappropriately to find the optimal lot sizes and the investments optimally for setup reduction and quality improvement when based on the actual cost function of inventory systems. Based on the above arguments, the purpose of this paper here is to develop a cost minimization design with capital investments to explicitly obtain the optimal lot sizing and investments in setup cost reduction and manufacturing quality improvement.

Section 3 describes the notations and assumptions that are used throughout this study. In section 4, we derive an analytical model and develop a solution procedure to find the optimal decisions with proposed model.

Numerical example is provided to illustrate the results in section 5. Finally, we present the conclusions of the EPQ design with imperfect manufacturing system and two backorders cost in this research.

**NOTATIONS AND ASSUMPTIONS**

*Notations*

**D** - the demand rate in units per unit time

**P** - the production rate in units per unit time ( $P > D$ )

**T** - the cycle time for each production cycle

**C** - the purchase cost per unit

$C_1$  - the holding cost per unit per unit time  $g$  - the rework cost per defective item

$\lambda$  - the rate of shift, during a production run the manufacturing system may shift from an in-control state to an out-of-control state.

$\alpha_0$  - the original percentage of defective items produced when the process is in the out-of-control state prior to investment.

$\alpha$  - the percentage of defective items produced on production run when the process is in the out-of-control state.

$A_0$  - the original setup cost for each production run

**A** - the setup cost on production run

$\varphi_A$  - the capital investment in setup cost reduction

$\varphi_\alpha$  - the capital investment in manufacturing quality improvement reduction

**i** - the cost of capital per dollar per year

$\bar{\pi}$  per unit backorder cost per time unit(linear)

$\pi$  - per unit backorder cost(fixed) **B** - backorders level.

**TC** - the total cost per unit time

$TC_1$  - the total cost per unit time of the traditional model

$TC_2$  - the total cost per unit time of the proposed model

*Assumptions*

1. The product is manufactured with a finite production rate and  $P > D$ .
2. The planning horizon is infinite
3. Shortages are allowed and complete backlogging
4. The relationship between setup cost reduction and capital investment can be described by the logarithmic investment cost function. That is setup cost  $A$  and the capital investment in setup cost reduction  $\varphi_A$  can be stated as

$$\varphi_A = a \ln \left( \frac{A_0}{A} \right), \text{ for } 0 < A \leq A_0 \tag{1}$$

5. Similarly the relationship between manufacturing quality  $\alpha$ , and capital investment in manufacturing quality improvement  $\varphi_\alpha$  is described by

$$\varphi_\alpha = b \ln \left( \frac{\alpha_0}{\alpha} \right), \text{ for } 0 < \alpha \leq \alpha_0 \tag{2}$$

where  $\frac{1}{a}$  and  $\frac{1}{b}$  are the fractions of the reduction in  $A$  and per dollar increase in investment.

6. **The elapsed time until the manufacturing system shifts, X, is assumed to be exponential distributed with a mean of 1/λ.**
7. Once the production process shifts to an out-of-control state, the shift cannot be detected until the end of the production cycle, and the process continues production, and a fixed proportion of the produced items are defective.
8. All defective items produced are detected after the production cycle is over, and rework cost for defective items will be incurred.
9. **The process is brought back to the in-control state with each setup.**
10. At the start of each production cycle, the production process is always in an in-control state and perfect items are produced.
11. During a production run, the production process may shift from an in-control state to an out-of-control state.

**3. MATHEMATICAL FORMULATION**

*Traditional Model*

An EPQ model determines an approximated optimal production run length in deteriorating manufacturing systems with fixed setup cost and quality. Now, consider the total cost function per unit time for the traditional EPQ model with backorders given by

$TC_1 =$  setup cost + holding cost + rework cost + linear back order cost + fixed back order cost + unit product cost

$$TC_1(T, B) = \frac{A_0 D}{PT} + \frac{C_1 PT \left(1 - \frac{D}{P}\right)}{2} + g \alpha_0 D \left[1 + \frac{1}{\lambda T} (e^{-\lambda T} - 1)\right] + B^2 \left[ \frac{C_1 + \bar{\pi}}{2PT \left(1 - \frac{D}{P}\right)} \right] + B \left[ \frac{\pi D - C_1 PT}{PT} \right] + CD \tag{3}$$

Maclaurin approximation is used to transform Eq.(1) into

$$TC_1(T, B) = \frac{A_0 D}{PT} + \frac{C_1 PT \left(1 - \frac{D}{P}\right)}{2} + \frac{g \alpha_0 D \lambda T}{2} + B^2 \left[ \frac{C_1 + \bar{\pi}}{2PT \left(1 - \frac{D}{P}\right)} \right] + B \left[ \frac{\pi D - C_1 PT}{PT} \right] + CD \tag{4}$$

Also, for a fixed T, Eq. (4) is a parabola with regards to variable B. Therefore, the optimal backorders level is

$$B = - \frac{\frac{\pi D - C_1 PT}{PT}}{2 \left[ \frac{C_1 + \bar{\pi}}{2PT \left(1 - \frac{D}{P}\right)} \right]} = \left( \frac{C_1 PT - \pi D}{C_1 + \bar{\pi}} \right) \left( 1 - \frac{D}{P} \right)$$

Equivalently, Eq. (4) can be expressed as

$$TC_1(T, B) = \frac{A_0 D}{PT} + \frac{C_1 PT \left(1 - \frac{D}{P}\right)}{2} + \frac{g \alpha_0 D \lambda T}{2} - \frac{(\pi D)^2 \left(1 - \frac{D}{P}\right)}{2PT (C_1 + \bar{\pi})} + \frac{\pi D C_1 \left(1 - \frac{D}{P}\right)}{C_1 + \bar{\pi}} - \frac{C_1^2 PT \left(1 - \frac{D}{P}\right)}{2 (C_1 + \bar{\pi})} + CD \tag{5}$$

Taking the first and second derivatives of TC(T) with respect to T gives

$$\frac{\partial TC_1}{\partial T} = - \frac{A_0 D}{PT^2} + \frac{C_1 P \left(1 - \frac{D}{P}\right)}{2} + \frac{g \alpha_0 D \lambda}{2} + \frac{(\pi D)^2 \left(1 - \frac{D}{P}\right)}{2PT^2 (C_1 + \bar{\pi})} - \frac{C_1^2 P \left(1 - \frac{D}{P}\right)}{2 (C_1 + \bar{\pi})}$$

$$T^* = \sqrt{\frac{A_0 DP (C_1 + \bar{\pi}) - (\pi D)^2 (P - D)}{P^2 [(C_1 + \bar{\pi}) [C_1 (P - D) + g \alpha_0 D \lambda] - C_1^2 (P - D) ]}} \tag{6}$$

$$\frac{\partial^2 TC_1}{\partial T^2} = \frac{2A_0 D}{PT^3} - \frac{(\pi D)^2 \left(1 - \frac{D}{P}\right)}{2PT^3 (C_1 + \bar{\pi})} > 0 \text{ only if } A_0 > \frac{\pi^2 D \left(1 - \frac{D}{P}\right)}{4 (C_1 + \bar{\pi})}$$

**Proposed Model**

However, when the setup cost and quality level are no longer considered to be fixed parameters but decision variables, the control of setup cost and quality level are accomplished by varying the capital investments allocated to reduce the setup cost and improve the quality level. In addition, as it takes investment to reduce setup cost and manufacturing quality improvement, we should include an amortized investment cost in the proposed model. Therefore, the total cost per unit time of the system,  $TC_2(T, A, \alpha)$ , is composed of Eq.(3) and the amortized total capital cost,  $i(\varphi_A + \varphi_\alpha)$  which shows the economic consequences of the investment per unit time, as follows:

$$TC_2(T, A, \alpha) = \frac{AD}{PT} + \frac{C_1 PT \left(1 - \frac{D}{P}\right)}{2} + g \alpha D \left[1 + \frac{1}{\lambda T} (e^{-\lambda T} - 1)\right] - \frac{(\pi D)^2 \left(1 - \frac{D}{P}\right)}{2PT (C_1 + \bar{\pi})} + \frac{\pi D C_1 \left(1 - \frac{D}{P}\right)}{C_1 + \bar{\pi}} - \frac{C_1^2 PT \left(1 - \frac{D}{P}\right)}{2 (C_1 + \bar{\pi})} + CD + i [\varphi_A(A) + \varphi_\alpha(\alpha)]$$

$$TC_2(T, A, \alpha) = \frac{AD}{PT} + \frac{C_1 PT \left(1 - \frac{D}{P}\right)}{2} + g \alpha D \left[1 + \frac{1}{\lambda T} (e^{-\lambda T} - 1)\right] - \frac{(\pi D)^2 \left(1 - \frac{D}{P}\right)}{2PT (C_1 + \bar{\pi})} + \frac{\pi D C_1 \left(1 - \frac{D}{P}\right)}{C_1 + \bar{\pi}} - \frac{C_1^2 PT \left(1 - \frac{D}{P}\right)}{2 (C_1 + \bar{\pi})} + CD + i \left[ a \ln \left(\frac{A_0}{A}\right) + b \ln \left(\frac{\alpha_0}{\alpha}\right) \right]$$

(7)

Notice that the  $TC_2$  in Eq.(7) is convex in  $A$  and  $\alpha$  and its Hessian is positive definite. Thus, to yield the optimal setup cost and manufacturing quality, the partial derivatives of the  $TC_2(T, A, \alpha)$  with respect to  $A$  and  $\alpha$  can be evaluated as

$$\frac{\partial TC_2(T, A, \alpha)}{\partial A} = -\frac{D}{PT} - \frac{ia}{A}$$

Hence, the optimal setup cost can found as  $A^*(T) = \frac{iaPT}{D}$  (8)

$$\frac{\partial TC_2(T, A, \alpha)}{\partial \alpha} = gD \left[1 + \frac{(e^{-\lambda T} - 1)}{\lambda T}\right] - \frac{ib}{\alpha} = 0$$

Hence, the manufacturing quality can found as  $\alpha^*(T) = \frac{ib}{gD \left[1 + \frac{(e^{-\lambda T} - 1)}{\lambda T}\right]}$  (9)

Substituting Eqs. (8) and (9) into Eq. (7) gives the following expression of the corresponding total annual

$$TC_2(T, A, \alpha) = ia + \frac{C_1 PT \left(1 - \frac{D}{P}\right)}{2} - \frac{(\pi D)^2 \left(1 - \frac{D}{P}\right)}{2PT(C_1 + \pi)} + \frac{\pi D C_1 \left(1 - \frac{D}{P}\right)}{C_1 + \pi}$$

cost TC:

$$-\frac{C_1^2 PT \left(1 - \frac{D}{P}\right)}{2(C_1 + \pi)} + CD + ib + ia \ln\left(\frac{A_0 D}{iaPT}\right) + ib \ln\left(\frac{\alpha_0 g D \left[1 + \frac{(e^{-\lambda T} - 1)}{\lambda T}\right]}{ib}\right) \quad (10)$$

$$\varphi_A(T^*) = a \ln\left(\frac{A_0 D}{iaPT^*}\right); \quad \varphi_\alpha(T^*) = b \ln\left(\frac{\alpha_0 g D \left[1 + \frac{(e^{-\lambda T} - 1)}{\lambda T}\right]}{ib}\right)$$

From the above procedure, when  $A^* = A_0$  and  $\alpha^* = \alpha_0$ , the model reduced to the traditional EPQ model.

**5. NUMERICAL EXAMPLE**

Let us consider an inventory system with the following data:  $P = 500$  units/year,  $D = 400$  units/year,  $A_0 = \$100$ ,  $\pi_0 = 2$ ;  $\alpha_0 = 0.08$ ,  $g = \$60$ ,  $C_1 = \$8$ , and we solve the cases when  $\lambda = 0.5, 0.4, 0.3, 0.2, 0.1, 0.09, 0.08, 0.07, 0.06$  and  $0.05$ . Besides, we take  $i = 0.2$ ,  $a = 1450$ ,  $\bar{\pi} = 2$ ,  $\pi = 2$  and  $b = 30$ . Applying the proposed algorithm, the optimal solutions are summarized in Table 1. Furthermore, to see the effects of investments in setup cost reduction and quality improvement, we list the results of traditional model, and proposed model, respectively, in the same table.

| $\lambda$ | $A^*$ | $\varphi_A(T^*)$ | $\alpha$ | $\varphi_\alpha(T^*)$ | Proposed Model |      | Traditional model |      |
|-----------|-------|------------------|----------|-----------------------|----------------|------|-------------------|------|
| 0.50      | 61.93 | 695              | 0.0060   | 77.6032               | 0.1708         | 2517 | 0.4990            | 4187 |
| 0.40      | 71.82 | 480              | 0.0065   | 75.4119               | 0.1981         | 2486 | 0.4888            | 4181 |
| 0.3       | 76.76 | 384              | 0.0080   | 68.9333               | 0.2117         | 2471 | 0.4702            | 4176 |
| 0.2       | 79.23 | 338              | 0.0116   | 57.9163               | 0.2186         | 2462 | 0.4535            | 4173 |
| 0.1       | 80.47 | 315              | 0.0227   | 37.8000               | 0.2220         | 2455 | 0.4385            | 4169 |
| 0.09      | 81.08 | 304              | 0.0250   | 34.8893               | 0.2237         | 2452 | 0.4249            | 4166 |
| 0.08      | 81.39 | 299              | 0.0280   | 31.4914               | 0.2245         | 2451 | 0.4125            | 4163 |
| 0.07      | 81.55 | 296              | 0.0319   | 27.5645               | 0.2250         | 2450 | 0.4011            | 4160 |
| 0.06      | 81.62 | 294              | 0.0372   | 22.9907               | 0.2252         | 2449 | 0.3906            | 4158 |
| 0.05      | 81.66 | 294              | 0.0446   | 17.5576               | 0.2253         | 2447 | 0.3809            | 4155 |

**CONCLUSION**

Compared to the results of traditional model with fixed setup cost and manufacturing quality, with the proposed model. Therefore, this article assumes that the relationship between setup cost reduction (or manufacturing quality improvement) and capital investments can be described by the logarithmic investment function. The proposed model can be considered as an extension of the previous inventory models by investigating the advantages of capital investments in quality improvement and reducing setup costs. A simple and accurate procedure is presented to locate the optimal production run length, and then to find the optimal setup cost and optimal manufacturing quality simultaneously. The results are compared with no investment option solution as traditional model. Finally, a numerical example is given to illustrate the results obtained by adopting capital investments. This type of model has not been considered yet. As expected, our proposed model resulted in smaller production lot sizes and better product quality. We have shown that investment in setup reduction leads to a reduction in  $T^*$  and to a reduced lot size, whereas investment in manufacturing quality improvement leads to an increase in  $T^*$  and to an increase of lot size. Since a reduction or an increase in  $T^*$ , will affect the setup

operations, it would be very important to investigate the optimal allocation of investments between both options. We examined the tradeoffs and optimally allocate the investments for setup cost reduction and manufacturing quality improvement.

The optimal production run length depends on how costly it is to make setup cost reduction and how costly it is to make manufacturing quality improvement. Finally, the numerical example is given to explain the solution and to demonstrate the advantage of implementing the capital investment strategies.

The contribution of this paper helps to business decision makers for choosing an optimal level of production, service and inventory management policy under many variations. A significant cost savings is achieved through the reduction of these controllable parameters. As expected, our proposed model resulted in smaller production lot sizes and better product quality. In the future study, it may be extended to multiple items with partial backlogging. Another possible extension of this study may consider the assumption of variable deterioration rate. Also, we could extend the deterministic model into a stochastic model.

**APPENDIX A**

We want to prove the Hessian Matrix of  $TC_2(A, \alpha)$  at point  $(A^*, \alpha^*)$  is positive definite. We first obtain the Hessian Matrix as follows:

$$H = \begin{bmatrix} \frac{\partial^2 TC_2}{\partial A^2} & \frac{\partial^2 TC_2}{\partial A \partial \alpha} \\ \frac{\partial^2 TC_2}{\partial \alpha \partial A} & \frac{\partial^2 TC_2}{\partial \alpha^2} \end{bmatrix}$$

where  $TC_2(.) \equiv TC_2(A, \alpha)$

$$\frac{\partial^2 TC_2}{\partial A^2} = \frac{ia}{A^2} > 0; \quad \frac{\partial^2 TC_2}{\partial \alpha^2} = \frac{ib}{\alpha^2} > 0; \quad \frac{\partial^2 TC_2}{\partial A \partial \alpha} = 0; \quad \frac{\partial^2 TC_2}{\partial \alpha \partial A} = 0$$

Then we proceed by evaluating the principal minor determinants of Hat point  $(A^*, \alpha^*)$ . The first principal minor determinant of H is

$$|H_{11}| = \frac{ia}{A^2} > 0$$

The second principal minor determinant of H is

$$|H_{22}| = \frac{i^2 ab}{A^2 \alpha^2} > 0$$

Therefore, the Hessian Matrix H is positive definite at point  $(A^*, \alpha^*)$ . The proof is completed.

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**FUZZY PARAMETRIC INVENTORY MODEL FOR ECONOMIC PRODUCTION CYCLE WITH IMPERFECT PRODUCTION PROCESS**

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**ABSTRACT**

*This paper focuses on an economic production cycle model with imperfect production process costs in fuzzy environment. In many factual situations, the goal and constraint function of the decision-makers are approximately in nature. Therefore the coefficients, indices, goal function and constraint are assessed in fuzzy environment. In this paper the crisp model transformed to parametric fuzzy model is established by geometric programming technique. In parametric fuzzy model, the nearest interval approximation method transfers triangular fuzzy number to an interval number, and then the interval number transfers to a parametric interval-valued functional form. Geometric programming technique is used to find the solution of the parametric fuzzy model. The proposed model can help decision-makers to get the optimal outcomes according to their expectation. Finally, a numerical example and graphical representations are provided to demonstrate the theoretical outcomes.*

*Keywords: geometric programming, minimum total annual cost, optimal production cycle, parametric fuzzy model, triangular fuzzy number.*

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**1. INTRODUCTION**

The problem of optimal production cycle and minimum total annual cost in inventory management has been common in operation management research. In this paper, we study a decision-maker to obtain profit maximizing inventory model where the imperfect production process cost in fuzzy environment.

The novelty of fuzzy sets initially introduced by Zadeh (1965) was used to describe imprecise or unspecified in nature which resulted in variety of uses in several disciplines. Zimmermann (1983) extended the fuzziness in the extent of operational research. Managing inventory is important for the easy functioning of several organization. Duffin (1962) developed price minimization problems in geometric programming. Kochenberger (1971) solved non-linear problem using Geometric programming. The benefits of applying geometric programming in factual situations were deliberated by Beightler (1976). Mandal and Roy (2006) dealt Multi-item classical inventory models model with L-R fuzzy number. Islam and Mandal (2016) developed an economic order quantity model in fuzzy environment that was solved by parametric geometric programming. Mandal and Islam (2016) offered fuzzy unconstrained problems solved by geometric programming, modified geometric programming with negative or positive integral degree of difficulty. Islam and Mandal (2019) discussed parametric geometric programming approach in fuzzy environment. Rosenblatt and Lee (1986) assumed that the elapsed time until the production process shift is exponentially distributed and derived an approximated optimal production run length. Hou (2007) planned the effects of an imperfect production method on the optimal production run interval when principal investment in process quality development is approved.

In this paper, we first consider the crisp inventory model. Thereafter we transform it into a fuzzy inventory model. A numerical example and graphical representation are given to illustrate the results obtained by the fuzzy parametric geometric programming technique.

**2. NOTATIONS AND ASSUMPTIONS**

To improve the proposed model, we acquire the following notations and assumptions which are identical to those used in (Hou, 2007). Besides, additional notations and assumptions will be specified out when mandatory.

**2.1. Notations:**

- $D$  demand rate in units per unit time,  
 $P$  production rate in units per unit time  $P > D$ ,  
 $T$  cycle time for each production lot,

- $t$  actual production cycle,
- $t^*$  optimal production cycle,
- $t_0$  original optimal production run length with no capital investments in setup cost reduction and process quality improvement,
- $K_0$  original setup cost for each production run,
- $K$  setup cost for each production run,
- $H$  holding cost per unit per unit time ,
- $S$  rework cost for a defective item,
- $\alpha_0$  original percentage of defective items produced when the process is in the “out-of- control” state prior to investment.

**2.2. Assumptions:**

To develop the model, we adopt the following assumptions in (Hou, 2007).

1. At the start of each production cycle, the production process is always in an in-control state and perfect items are produced.
2. During a production run, the production process may shift from an in-control state to an out-of-control state.
3. The elapsed time until the production process shifts,  $X$  is assumed to be exponential distributed with a mean of  $\frac{1}{\lambda}$ .
4. Once the production process shifts to an out-of-control state, the shift cannot be detected until the end of the production cycle, and the process continues production, and a fixed proportion of the produced items are defective.
5. All defective items produced are detected after the production cycle is over, and rework cost for defective items will be incurred.
6. The process is brought back to the in-control state with each setup.

**3. PRELIMINARIES**

**3.1 Fuzzy Number:** A real fuzzy number  $\tilde{A}$  described as a fuzzy subset on the real line  $R$  whose membership function  $\mu_{\tilde{A}}(x)$  has the following characteristics with  $-\infty < a_1 < a_2 < a_3 < \infty$

$$\mu_{\tilde{A}}(x) = \begin{cases} \mu_{\tilde{A}}^L(x), & \text{if } a_1 \leq x \leq a_2, \\ \mu_{\tilde{A}}^R(x), & \text{if } a_2 \leq x \leq a_3, \\ 0, & \text{otherwise,} \end{cases}$$

where  $\mu_{\tilde{A}}^L(x) : [a_1, a_2] \rightarrow [0, 1]$  is continuous and strictly increasing;  $\mu_{\tilde{A}}^R(x) : [a_2, a_3] \rightarrow [0, 1]$  is continuous and strictly decreasing.

**3.2  $\alpha$ -Level Set:** The  $\alpha$ -level of a fuzzy number  $\tilde{A}$  is defined as a crisp set  $A(\alpha) = [x : \mu_{\tilde{A}}(x) \geq \alpha, x \in X]$  where  $\alpha \in [0, 1]$ .  $A(\alpha)$  is a non-empty bounded closed interval contained in  $X$  and it is denoted by  $A(\alpha) = [A_L(\alpha), A_R(\alpha)]$ .  $A_L(\alpha)$  and  $A_R(\alpha)$  are the lower and upper bounds of the closed interval, respectively.

**Note:**  $\alpha_1$  level set of  $\tilde{A}$  is  $A(\alpha_1) = [A_L(\alpha_1), A_R(\alpha_1)]$  and that of  $\alpha_2$  level set is  $A(\alpha_2) = [A_L(\alpha_2), A_R(\alpha_2)]$ . If  $\alpha_2 \geq \alpha_1$  then  $A_L(\alpha_2) \geq A_L(\alpha_1)$  and  $A_R(\alpha_1) \geq A_R(\alpha_2)$ .

**3.3 Interval Number:** An interval number  $A$  is defined by an ordered pair of real numbers as follows  $A = [a_L, a_R] = \{x : a_L \leq x \leq a_R, x \in R\}$ , where  $a_L$  and  $a_R$  are the left and right bounds of interval  $A$ ,

respectively. The interval  $A$  is also defined by centre ( $a_c$ ) and half-width ( $a_w$ ) as  $A = [a_c - a_w, a_c + a_w] = \{x : a_c - a_w \leq x \leq a_c + a_w, x \in R\}$ , where  $a_c = \frac{a_R + a_L}{2}$  is the centre and  $a_w = \frac{a_R - a_L}{2}$  is the half-width of  $A$ .

**3.4 Nearest Interval Approximation:** Here we want to approximate a fuzzy number by a crisp model. Suppose  $\tilde{A}$  and  $\tilde{B}$  are two fuzzy numbers with  $\alpha$ -cuts being  $A = [A_L(\alpha), A_R(\alpha)]$  and  $B = [B_L(\alpha), B_R(\alpha)]$ , respectively. Then the distance between  $\tilde{A}$  and  $\tilde{B}$  is

$$d(\tilde{A}, \tilde{B}) = \sqrt{\int_0^1 (A_L(\alpha) - B_L(\alpha))^2 d\alpha + \int_0^1 (A_R(\alpha) - B_R(\alpha))^2 d\alpha}$$

Given a fuzzy number  $\tilde{A}$ . We have to find a closed interval  $C_d(\tilde{A})$ , which is closest to  $\tilde{A}$  with respect to some metric  $d$ . We can do it since each interval is also a fuzzy number with constant  $\alpha$ -cut for all  $\alpha \in [0, 1]$ . Hence  $(C_d(\tilde{A}))\alpha = [C_L, C_R]$ . Now we have to minimize

$$d(\tilde{A}, C_d(\tilde{A})) = \sqrt{\int_0^1 (A_L(\alpha) - C_L)^2 d\alpha + \int_0^1 (A_R(\alpha) - C_R)^2 d\alpha}$$

with respect to  $C_L$  and  $C_R$ .

In order to minimize  $d(\tilde{A}, C_d(\tilde{A}))$ , it is sufficient to minimize the function  $D(C_L, C_R) = d^2(\tilde{A}, C_d(\tilde{A}))$ . Differentiating  $D(C_L, C_R)$  partially with respect to  $C_L$  and  $C_R$ , we get

$$\frac{\partial D(C_L, C_R)}{\partial C_L} = -2 \int_0^1 (A_L(\alpha) - C_L) d\alpha + 2C_L \quad \text{and} \quad \frac{\partial D(C_L, C_R)}{\partial C_R} = -2 \int_0^1 (A_R(\alpha) - C_R) d\alpha + 2C_R$$

Solving  $\frac{\partial D(C_L, C_R)}{\partial C_L} = 0$  and  $\frac{\partial D(C_L, C_R)}{\partial C_R} = 0$ , we get  $C_L^* = \int_0^1 A_L(\alpha) d\alpha$  and  $C_R^* = \int_0^1 A_R(\alpha) d\alpha$ .

Again since  $\frac{\partial^2 D(C_L^*, C_R^*)}{\partial C_L^2} = 2 > 0$ ,  $\frac{\partial^2 D(C_L^*, C_R^*)}{\partial C_R^2} = 2 > 0$  and

$$H(C_L^*, C_R^*) = \frac{\partial^2 D(C_L^*, C_R^*)}{\partial C_L^2} \cdot \frac{\partial^2 D(C_L^*, C_R^*)}{\partial C_R^2} - \left( \frac{\partial^2 D(C_L^*, C_R^*)}{\partial C_L^* \partial C_R^*} \right)^2 = 4 > 0. \quad \text{So } D(C_L, C_R), \quad \text{i.e.}$$

$d(\tilde{A}, C_d(\tilde{A})) D(C_L^*, C_R^*)$  is global minimum. Therefore, the interval  $C_d(\tilde{A}) = [\int_0^1 (A_L(\alpha) d\alpha, \int_0^1 (A_R(\alpha) d\alpha)]$

is the nearest interval approximation of fuzzy number  $\tilde{A}$  with respect to the metric  $d$ .

Let  $\tilde{A} = (a_1, a_2, a_3)$  be a triangular fuzzy number. The  $\alpha$ -cut interval of  $\tilde{A}$  is defined as  $A_\alpha = [A_L(\alpha), A_R(\alpha)]$ , where  $A_L(\alpha) = a_1 + \alpha(a_2 - a_1)$  and  $A_R(\alpha) = a_3 + \alpha(a_3 - a_1)$ . By nearest interval

approximation method the lower limit of the interval is  $C_L = \int_0^1 A_L(\alpha) d\alpha = \int_0^1 [a_1 + \alpha(a_2 - a_1)] d\alpha = \frac{a_1 + a_2}{2}$  and

the upper limit of the interval is  $C_R = \int_0^1 A_R(\alpha) d\alpha = \int_0^1 [a_3 + \alpha(a_3 - a_1)] d\alpha = \frac{a_3 + a_2}{2}$ .

Therefore, the interval number corresponding  $\tilde{A}$  is  $[\frac{a_1 + a_2}{2}, \frac{a_3 + a_2}{2}] = [m, n]$ . In the centre and half-width form the interval number of  $\tilde{A}$  is defined as  $\langle \frac{1}{4}(a_1 + 2a_2 + a_3), \frac{1}{4}(a_1 - a_3) \rangle$ .

**3.5 Parametric Interval-Valued Function:** Let  $[m, n]$  be an interval, where  $m > 0, n > 0$ . From analytical geometry point of view, any real number can be represented on a line. Similarly, we can express an interval by a function. The parametric interval-valued function for the interval  $[m, n]$  can be taken as  $g(d) = m^{1-d}n^d$  for  $d \in [0, 1]$  which is a strictly monotone, continuous function and its inverse exists. Let  $\psi$  be the inverse of  $g(d)$ , then  $\delta = \frac{\log \psi - \log m}{\log n - \log m}$ .

**4. MATHEMATICAL MODEL**

The inventory specific of the inventory model for products with imperfect production and optimal production cycle, where  $T$  cycle time for each production lot and  $t$  is the actual production cycle. The cost of producing a defective item could include the costs of rework, it is assumed that the percentage of defectives  $\alpha_0$  is constant throughout the duration when the production process is in the "out-of-control" state. The total annual cost  $\pi(t)$  is established as  $\pi(t) = \text{setup cost} + \text{holding cost} + \text{rework cost}$ . The objective is to determine the optimal production cycle that will minimize the total annual costs.

**4.1 Crisp Inventory Model with Geometric Programming:**

The crisp total annual cost, which is composed of setup cost, holding cost and rework cost, and is expressed by

$$\pi(t) = \frac{K_0 D}{Pt} + \left( \frac{(HP - HD + s\alpha_0 \lambda D)t}{2} \right) \tag{1}$$

The primal solution of equation (1) is given by

$$\text{Min } \pi(t) = \frac{K_0 D}{Pt} + \left( \frac{(HP - HD + s\alpha_0 \lambda D)t}{2} \right) \tag{2}$$

subject to  $t \geq 0$ .

The below dual problem is taken as equation (2)

$$\text{Max } d(\beta) = \left( \frac{K_0 D}{P\beta_1} \right)^{\beta_1} \left( \frac{(HP - HD + s\alpha_0 \lambda D)}{2\beta_2} \right)^{\beta_2} \tag{3}$$

Therefore the normality condition is

$$\beta_1 + \beta_2 = 1 \tag{4}$$

and, the orthogonally condition is

$$-\beta_1 + \beta_2 = 0 \tag{5}$$

equations (4) and (5) include a system of two linearly independent equations in two unknowns. Thus, values for the dual variables can be uniquely calculated by simply solving this two-by-two system of equations. The simultaneous solution is  $\beta_1 = \frac{1}{2}$  and  $\beta_2 = \frac{1}{2}$ .

The degree of difficulty is 0, since two equations in two unknowns constitute a unique solution. Further substituting  $\beta_1$  and  $\beta_2$  in equation (3), the dual function transforms into,

$$d(\beta) = \left( \frac{K_0 D}{P \left( \frac{1}{2} \right)} \right)^{\left( \frac{1}{2} \right)} \left( \frac{(HP - HD + s\alpha_0 \lambda D)}{2 \left( \frac{1}{2} \right)} \right)^{\left( \frac{1}{2} \right)} \tag{6}$$

which implies that,

$$\text{Min } \pi(t) = d^*(\beta) = \sqrt{\frac{(2K_0 D)(HP - HD + s\alpha_0 \lambda D)}{P}} \tag{7}$$

From the relation among primal-dual variables, we acquire

$$\frac{K_0 D}{Pt} = \beta_1^* d^*(\beta) \tag{8}$$

substitute  $d^*(\beta)$  and  $\beta_1 = \frac{1}{2}$  in equation (8), we have

$$\frac{K_0 D}{Pt} = \left( \frac{1}{2} \right) \sqrt{\frac{(2K_0 D)(HP - HD + s\alpha_0 \lambda D)}{P}}$$

$$\text{and we get } t = \sqrt{\frac{2K_0 D}{P(HP - HD + s\alpha_0 \lambda D)}} \tag{9}$$

Here, we consider

$$\pi(t)^* = \text{Min } \pi(t) = \sqrt{\frac{(2K_0 D)(HP - HD + s\alpha_0 \lambda D)}{P}} \tag{10}$$

$$t_c^* = t = \sqrt{\frac{2M_0 D}{R(HR - HD + C_r \zeta_0 \lambda D)}} \tag{11}$$

The minimum total annual cost  $\pi(t)^*$  and the optimal production cycle  $t_c^*$  are solutions of crisp inventory model.

**5. METHODOLOGY**

**5.1 Geometric Programming with Fuzzy Coefficient:**

Primal fuzzy coefficient geometric programming problem is of the form

$$\text{Min } \hat{g}_0(x) = \hat{a} \prod_{k=1}^{T_0} \hat{C}_{0k}^{\%} \prod_{j=1}^{\infty} x_j^{a_{0kj}} \tag{12} \text{ subject to } x_j > 0,$$

here  $a_{0kj}$  are real numbers and coefficients  $\hat{C}_{0k}^{\%}$  are fuzzy triangular numbers, as  $\tilde{C}_{0k} = (C_{0k}^1, C_{0k}^2, C_{0k}^3)$ . Using nearest interval approximation method, we transform all triangular fuzzy number into interval number  $[C_{0k}^L, C_{0k}^U]$ . The geometric programming problem with imprecise parameters is of the following form

$$\text{Min } \hat{g}_0(x) = \hat{a} \prod_{k=1}^{T_0} \hat{C}_{0k} \prod_{j=1}^{\infty} x_j^{a_{0kj}} \tag{13} \text{ subject to } x_j > 0,$$

where  $\hat{C}_{0k}$  denotes the interval counterparts  $\hat{C}_{0k} \in [C_{0k}^L, C_{0k}^U]$ ,  $C_{0k}^L > 0, C_{0k}^U > 0$  for all  $i$  and  $k$ . Using parametric interval-valued functional form, the problem in equation (13) reduces to

$$\text{Min } g_0(x, d) = \hat{a} \prod_{k=1}^{T_0} (C_{0k}^L)^{1-d} (C_{0k}^U)^d \prod_{j=1}^{\infty} x_j^{a_{0kj}} \tag{14}$$

subject to  $x_j > 0$ , for  $j = 1, 2, 3, \dots, m$ .

This is a parametric geometric programming problem. The corresponding dual form of equation (14) is

$$\text{Max } d(\beta, \delta) = \prod_{k=0}^{T_0} \left( \frac{(C_{0k}^L)^{1-\delta} (C_{0k}^U)^\delta}{\beta_{0k}} \right)^{\beta_{0k}} \tag{15}$$

$$\text{subject to } \sum_{k=1}^{T_0} \beta_{0k} = 1, \text{ (Normality condition)} \tag{16}$$

$$\sum_{k=1}^{T_0} a_{kj} \beta_{0k} = 0, \text{ (orthogonality conditions)} \tag{17}$$

$$\beta_k > 0, k = 1, 2, \dots, T_r. \text{ (positivity condition)}$$

Case-1: For  $T_0 \geq M + 1$ , the dual program presents a system of linear equations for the dual variables, where the number of linear equations is either less than or equal to dual variables. More or unique solution exists for the dual vectors.

Case-2: For  $T_0 < M + 1$ , the dual program presents a system of linear equations for the dual variables, where the number of linear equations is greater than the number of dual variables. In this case generally no solution vectors exist for the dual variables. However one can get an approximate solution vector for the system using either the Latest Square (SQ) or Max-Min (MN) method.

These are applied to solve such a system of linear equations. Once optimal dual variable vector  $\beta^*$  are known, the corresponding values of the primal variable vector  $x$  is found from the following relations:

$$C_k \prod_{j=1}^m x_j^{*a_{kj}} = \beta_k^* d^*(\beta^*, \delta), k = 1, 2, 3, \dots, T_0. \tag{18}$$

**5.2 Solution Procedure for Fuzzy Inventory Model by Geometric Programming Technique:**

In this paper, we use triangular fuzzy number and nearest interval approximation method to defuzzify the total annual cost. When the inventory model is nonlinear we use the Geometric programming to determine fuzzy optimal production cycle for better accuracy of fuzzy minimization of total annual cost. When  $\tilde{K}_0 = (K_{01}, K_{02}, K_{03})$ ,  $\tilde{D} = (D_1, D_2, D_3)$ ,  $\tilde{P} = (P_1, P_2, P_3)$ ,  $\tilde{s} = (s_1, s_2, s_3)$ ,  $\tilde{H} = (H_1, H_2, H_3)$  and  $\tilde{\alpha}_0 = (\alpha_{01}, \alpha_{02}, \alpha_{03})$  are triangular fuzzy number. Then the fuzzy total annual cost, which is composed of fuzzy setup cost, fuzzy holding cost and fuzzy rework cost, is expressed by

$$\text{Min } \tilde{\pi}(t) = \frac{\tilde{K}_0 \tilde{D}}{\tilde{P}t} + \left( \frac{(\tilde{H}\tilde{P} - \tilde{H}\tilde{D} + \tilde{s}\tilde{\alpha}_0 \lambda \tilde{D})t}{2} \right) \tag{19}$$

subject to  $t \geq 0$ .

Using nearest interval approximation method, the interval number corresponding triangular number  $\tilde{K}_0 = (K_{01}, K_{02}, K_{03})$  is  $[\frac{K_{01} + K_{02}}{2}, \frac{K_{03} + K_{02}}{2}] = [K_{0L}, K_{0U}]$ . Similarly interval number corresponding

$$\tilde{D}, \tilde{P}, \tilde{s}, \tilde{H} \quad \text{and} \quad \tilde{\alpha}_0 \quad \text{are} \quad [\frac{D_1 + D_2}{2}, \frac{D_3 + D_2}{2}] = [D_L, D_U], \quad [\frac{P_1 + P_2}{2}, \frac{P_3 + P_2}{2}] = [P_L, P_U],$$

$$[\frac{s_1 + s_2}{2}, \frac{s_3 + s_2}{2}] = [s_L, s_U], \quad [\frac{H_1 + H_2}{2}, \frac{H_3 + H_2}{2}] = [H_L, H_U] \quad \text{and} \quad [\frac{\alpha_{01} + \alpha_{02}}{2}, \frac{\alpha_{03} + \alpha_{02}}{2}] = [\alpha_{0L}, \alpha_{0U}]$$

respectively. The fuzzy total annual cost equation (19) reduces to

$$\text{Min } \tilde{\pi}(t) = \frac{[K_{0L}, K_{0U}][D_L, D_U]}{[P_L, P_U]t} + \left( \frac{([H_L, H_U][P_L, P_U] - [H_L, H_U][D_L, D_U] + [s_L, s_U]) + [\alpha_{0L}, \alpha_{0U}]\lambda[D_L, D_U]t}{2} \right) \quad (20)$$

subject to  $t \geq 0$ , which is equivalent to

$$\text{Min } \hat{\pi}(t) = \frac{\hat{K}_0 \hat{D}}{\hat{P}t} + \left( \frac{(\hat{H}\hat{P} - \hat{H}\hat{D} + \hat{s}\hat{\alpha}_0\lambda\hat{D})t}{2} \right) \quad (21)$$

subject to  $t \geq 0$ , where  $\hat{K}_0 \in [K_{0L}, K_{0U}]$ ,  $\hat{D} \in [D_L, D_U]$ ,  $\hat{P} \in [P_L, P_U]$ ,  $\hat{s} \in [s_L, s_U]$ ,  $\hat{H} \in [H_L, H_U]$  and  $\hat{\alpha}_0 \in [\alpha_{0L}, \alpha_{0U}]$ . Using parametric interval-valued function, the fuzzy total annual cost equation (21) reduces to a parametric programming by replacing  $\hat{K}_0 = K_{0L}^{1-\delta} K_{0U}^\delta$ ,  $\hat{D} = D_L^{1-\delta} D_U^\delta$ ,  $\hat{P} = P_L^{1-\delta} P_U^\delta$ ,  $\hat{s} = s_L^{1-\delta} s_U^\delta$ ,  $\hat{H} = H_L^{1-\delta} H_U^\delta$  and  $\hat{\alpha}_0 = \alpha_{0L}^{1-\delta} \alpha_{0U}^\delta$  where  $\delta \in [0, 1]$ . The fuzzy total annual cost equation (21) reduces

form as follows 
$$\text{Min } \tilde{\pi}(t) = \frac{[K_{0L}^{1-\delta} K_{0U}^\delta][D_L^{1-\delta} D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]t} + \left( \frac{([H_L^{1-\delta} H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta} H_U^\delta][D_L^{1-\delta} D_U^\delta]) + [s_L^{1-\delta} s_U^\delta][\alpha_{0L}^{1-\delta} \alpha_{0U}^\delta]\lambda[D_L^{1-\delta} D_U^\delta]t}{2} \right)$$

subject to  $t \geq 0$ . The corresponding dual form of equation (22) is given by

$$\text{Max } d(\beta, \delta) = \left( \frac{[K_{0L}^{1-\delta} K_{0U}^\delta][D_L^{1-\delta} D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]t\beta_1} \right)^{\beta_1} \left( \frac{([H_L^{1-\delta} H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta} H_U^\delta][D_L^{1-\delta} D_U^\delta]) + [s_L^{1-\delta} s_U^\delta][\alpha_{0L}^{1-\delta} \alpha_{0U}^\delta]\lambda[D_L^{1-\delta} D_U^\delta]t}{2\beta_2} \right)^{\beta_2} \quad (23)$$

subject to  $t \geq 0$ .

Therefore the normality condition is

$$\beta_1 + \beta_2 = 1 \quad (24)$$

and, the orthogonally condition is

$$-\beta_1 + \beta_2 = 0 \quad (25)$$

equations (24) and (25) include a system of two linearly independent equations in two unknowns. Thus, values for the dual variables can be uniquely calculated by simply solving this two-by-two system of equations. The simultaneous solution is  $\beta_1 = \frac{1}{2}$  and  $\beta_2 = \frac{1}{2}$ .

The degree of difficulty is 0, since two equations in two unknowns constitute a unique solution. Further substituting  $\beta_1$  and  $\beta_2$  in equation (23), the dual function transforms into,

$$d^*(\beta, \delta) = \left( \frac{[K_{0L}^{1-\delta} K_{0U}^\delta][D_L^{1-\delta} D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]t(\frac{1}{2})} \right)^{\frac{1}{2}} \left( \frac{([H_L^{1-\delta} H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta} H_U^\delta][D_L^{1-\delta} D_U^\delta]) + [s_L^{1-\delta} s_U^\delta][\alpha_{0L}^{1-\delta} \alpha_{0U}^\delta]\lambda[D_L^{1-\delta} D_U^\delta]t}{2(\frac{1}{2})} \right)^{\frac{1}{2}} \quad (26)$$

which implies that,

$$Min \tilde{\pi}(t) = d^*(\beta, \delta) = \sqrt{\frac{(2[K_{0L}^{1-\delta}K_{0U}^\delta][D_L^{1-\delta}D_U^\delta])([H_L^{1-\delta}H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta}H_U^\delta][D_L^{1-\delta}D_U^\delta]) + [s_L^{1-\delta}s_U^\delta][\alpha_{0L}^{1-\delta}\alpha_{0U}^\delta]\lambda[D_L^{1-\delta}D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]}}. \quad (27)$$

From the relation among primal-dual variables, we obtain

$$\frac{[K_{0L}^{1-\delta}K_{0U}^\delta][D_L^{1-\delta}D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]t} = \beta_1^* d^*(\beta, \delta). \quad (28) \text{ Substitute}$$

$d^*(\beta)$  and  $\beta_1 = \frac{1}{2}$  in equation (28) we get

$$t = \sqrt{\frac{2[K_{0L}^{1-\delta}K_{0U}^\delta][D_L^{1-\delta}D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]([H_L^{1-\delta}H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta}H_U^\delta][D_L^{1-\delta}D_U^\delta]) + [s_L^{1-\delta}s_U^\delta][\alpha_{0L}^{1-\delta}\alpha_{0U}^\delta]\lambda[D_L^{1-\delta}D_U^\delta]}}. \quad (29)$$

Here, we consider

$$\tilde{\pi}(t)^* = Min \tilde{\pi}(t) = \sqrt{\frac{(2[K_{0L}^{1-\delta}K_{0U}^\delta][D_L^{1-\delta}D_U^\delta])([H_L^{1-\delta}H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta}H_U^\delta][D_L^{1-\delta}D_U^\delta]) + [s_L^{1-\delta}s_U^\delta][\alpha_{0L}^{1-\delta}\alpha_{0U}^\delta]\lambda[D_L^{1-\delta}D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]}}. \quad (30)$$

$$t^* = t = \sqrt{\frac{2[K_{0L}^{1-\delta}K_{0U}^\delta][D_L^{1-\delta}D_U^\delta]}{[P_L^{1-\delta}, P_U^\delta]([H_L^{1-\delta}H_U^\delta][P_L^{1-\delta}, P_U^\delta] - [H_L^{1-\delta}H_U^\delta][D_L^{1-\delta}D_U^\delta]) + [s_L^{1-\delta}s_U^\delta][\alpha_{0L}^{1-\delta}\alpha_{0U}^\delta]\lambda[D_L^{1-\delta}D_U^\delta]}}. \quad (31)$$

The fuzzy minimum total annual cost is  $\tilde{\pi}(t)^*$  and the optimal production cycle  $t^*$  are solutions of fuzzy inventory model.

**6. NUMERICAL EXAMPLE**

In this section, a numerical example and graphical representations are given to validate the above solution procedure.

**EXAMPLE**

The numerical example given below is for demonstrative and comparative purposes. Let us consider an inventory system with the following data:  $P = 1500$  units/year,  $D = 1000$  units/year,  $K_0 = \$50$ ,  $\alpha_0 = 0.08$ ,  $s = \$40$ ,  $= \$8$ , and  $\lambda = 0.05$ . Applying the proposed model, the optimal solutions are summarized in Table 1. To demonstrate the solution procedure for crisp model, let us deliberate the system with the data used in (Hou, 2007). Using equations (10) and (11), we get the minimum total annual cost is  $\pi(t)^*$  and optimal production cycle  $t_c^*$ .

When the input data of inventory model is taken as triangular fuzzy number i.e.,  $\tilde{D} = (900, 1000, 1100)$ ,  $\tilde{P} = (1400, 1500, 1600)$ ,  $\tilde{K}_0 = (40, 50, 60)$ ,  $\tilde{\alpha}_0 = (0.06, 0.08, 0.1)$ ,  $\tilde{s} = (30, 40, 50)$  and  $\tilde{H} = (6, 8, 10)$ . Using nearest interval approximation method, we get the corresponding interval number and interval-valued function that is

$$\begin{aligned} \tilde{D} \approx [950, 1050] &\Rightarrow \tilde{D} = (950)^{1-\delta} (1050)^\delta \in [950, 1050], \\ \tilde{P} \approx [1450, 1550] &\Rightarrow \tilde{P} = (1450)^{1-\delta} (1550)^\delta \in [1450, 1550], \tilde{K}_0 \approx [45, 55] \Rightarrow \tilde{K}_0 = (45)^{1-\delta} (55)^\delta \in [45, 55], \\ \tilde{\alpha}_0 \approx [0.07, 0.09] &\Rightarrow \tilde{\alpha}_0 = (0.07)^{1-\delta} (0.09)^\delta \in [0.07, 0.09], \tilde{s} \approx [35, 45] \Rightarrow \tilde{s} = (35)^{1-\delta} (45)^\delta \in [35, 45] \text{ and} \\ \tilde{H} \approx [7, 9] &\Rightarrow \tilde{H} = (7)^{1-\delta} (9)^\delta \in [7, 9], \text{ where } \delta \in [0, 1]. \end{aligned}$$

Using the equations (30) and (31), we get fuzzy minimum annual total cost and optimal production cycle of the fuzzy inventory model by interval-valued parametric geometric programming.



Table 1: Optimal solution for crisp and fuzzy model

| Optimal solution for crisp model |            | Optimal solution for fuzzy model |        |                    |
|----------------------------------|------------|----------------------------------|--------|--------------------|
| $t_c^*$                          | $\pi^*(t)$ | $\delta$                         | $t^*$  | $\tilde{\pi}(t)^*$ |
| 0.1266                           | 526.6245   | 0                                | 0.1277 | 461.7807           |
|                                  |            | 0.1                              | 0.1257 | 475.3540           |
|                                  |            | 0.2                              | 0.1238 | 489.2704           |
|                                  |            | 0.3                              | 0.1219 | 503.5384           |
|                                  |            | 0.4                              | 0.1201 | 518.1669           |
|                                  |            | 0.5                              | 0.1183 | 533.1650           |
|                                  |            | 0.6                              | 0.1165 | 548.5419           |
|                                  |            | 0.7                              | 0.1148 | 564.3072           |
|                                  |            | 0.8                              | 0.1131 | 580.4704           |
|                                  |            | 0.9                              | 0.1114 | 597.0417           |
|                                  |            | 1                                | 0.1098 | 614.0312           |

In Table 1, we observed that the optimal production cycle  $t_c^* = 0.1266$  and total annual cost  $\pi^*(t) = \$526.6245$  for crisp model. Next we consider the fuzzy model, the fuzzy optimal production cycle  $t^*$  varies from 0.1098 to 0.1277 when the  $\delta$  increases and fuzzy total annual cost  $\tilde{\pi}(t)^*$  varies from \$461.7807 to \$526.6245 when the  $\delta$  increases.

For  $\delta = 0$ , the least bound of the interval value of the parameter is used to find the fuzzy total annual cost and optimal production cycle. For  $\delta = 1$ , the largest bound of interval value of the parameter is used for the fuzzy total annual cost and optimal production cycle. These results yield the lower and upper bounds of the optimal solution. The main advantage of the proposed technique is that one can get the intermediate optimal effect using proper value  $\delta$ .

Graphically represent the outcomes under different values of  $\delta$ . In Figure 1, we observed that the production cycle  $t^*$  decreases when the  $\delta$  increase and in Figure 2 fuzzy total annual cost  $\tilde{\pi}(t)^*$  increases when the  $\delta$  increase.

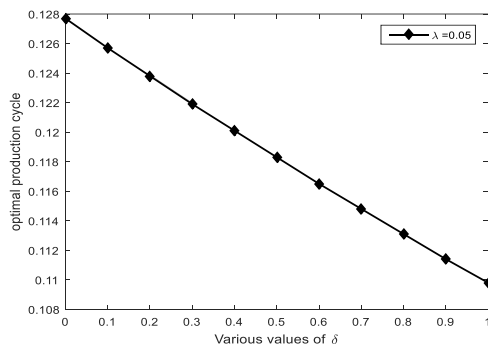


Figure 1: Graphical representation of optimal production cycle versus  $\delta$ .

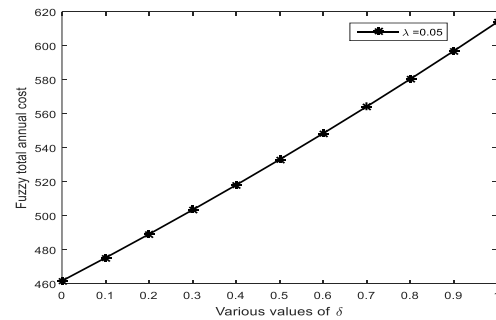


Figure 2: Graphical representation of fuzzy total annual cost versus  $\delta$ .

7. CONCLUSION

In this paper, we formulated an economic production cycle model with imperfect production process costs in a fuzzy environment. The proposed model was established in the crisp model is converted to fuzzy model then resolved by parametric geometric programming technique. This model can help decision-makers to obtain the optimal results according to their expectation. The numerical and graphical representation shows that if we control the parametric  $\delta$  effectively then we can acquire a significant amount of savings. For future study, the other type of membership functions such as parabolic fuzzy number, pentagonal fuzzy number, etc. can be examined to produce the membership function and then the model can be easily solved.

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**IMPACT OF LABOR ON THE ECONOMIC GROWTH OF VIETNAM:  
HISTORY, SITUATION AND PREDICTION**

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**ABSTRACT**

*This paper analyzes the effects of the fluctuation in labor force and labor productivity on Vietnam's economic growth. Using the neoclassical growth model with data from the General Statistics Office, the study shows that when the number of laborers increases by 1%, the economic growth rate will raise by 2.78%. Combined with predicted figures on changes in Vietnam's labor force in the period of 2009-2049, the results of the study reveal in order to maintain the current economic growth rate, labor productivity needs to increase to 106.2% in the period of 2029-2039 and 111.6% in the period of 2039-2049. Vietnam is losing the advantage of labor force so its long-term economic growth will depend mainly on labor productivity. Improving the quality of labor is the driving force for the economic growth. This depends on the combination of specific national policies and strategies, in which education and training policies are highlighted.*

*Keywords: Labor; Labor productivity; Economic growth.*

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**1. INTRODUCTION**

After many development stages of economic history, from the Classical Growth Theory (18th century) to the Endogenous Growth Model (late 20th century), the growth theories and models affirm the importance of labor - one of the basic inputs that determine economic growth in a country. The birth of the Neoclassical growth model (mid-20th century) is considered the first complete economic growth model, focusing on four variables namely Output (Y), Capital (K), Labor (L) and Technology (A) with a starting point from the Cobb-Douglas production function ( $Y = A.K^\alpha L^\beta$ ). From this basic equation, several economic studies have based on developing the model to calculate the contribution of the factors to the growth.

In Vietnam, after the reunification day, especially since the implementation of economic reform, the labor force has grown continuously in term of scale and proportion over the total population. The sharp increase in the labor force together with the policies of innovation, openness and development contributed significantly to the national economic growth over the past 30 years. Figures showed an impressive economic growth rate of Vietnam with an average of about 7% per year, including a great contribution of the labor force. Therefore, during this period, many studies proudly mentioned the huge advantage of Vietnam with "abundant labor force, cheap labor..." because it was one of the significant reasons to attract foreign investment, promote the development of processing and labor-intensive manufacturing industries. However, in recent years, fewer and fewer scientists use the term "advantage" when mentioning cheap labor in the nation. Instead, they express anxiety and concern because it is impossible for Vietnam's labor force to be permanently abundant, and, in addition, cheap is not considered an advantage but a big challenge on the way of integration and development. Vietnam is facing up with "middle income trap" and the risk of "getting old before getting rich" due to low labor skills and low labor productivity.

If the study simply bases on the perspective of labor force size, it can be seen that there has been drastic transformation in the process of population change in Vietnam over the past three decades, resulting in a raise in the labor force over the total population. Many studies point out that Vietnam has a period of "golden population structure" which lasts for more than 30 years (about 2009-2039), that is, during such period, the labor force accounts for a large proportion of the total population with "more than two working-age people bearing one dependent only". This is a great advantage for Vietnam if it can exploit this resource for economic growth and development. However, if the labor quality is not improved and labor capacity is not promoted better to create high productivity, the term "golden population structure" will be no longer accurate, but only "copper" or "iron", as once feared by some leading scientists. On the other hand, what will Vietnam's economic growth be like when the "golden population structure" period is over? In the long term, when there is no advantage in labor resources, how should the labor quality be improved so that the country can maintain the current economic growth rate? This paper studies the fluctuation of Vietnam's labor resources in relation to economic growth, and analyzes labor quantity, labor productivity and calculates the contribution of labor to economic growth in the past, at present and in the future (predicted data) to clarify these issues.

**2. RESEARCH METHOD AND ESTIMATION MODEL**

In the calculation models and expressions, this study assumes that all working-age people are engaged in

economic activities, so the Labor variable (L) is interpreted as a variable representing the population group in the working age (from 15 to 60 years old).

To estimate the impact of labor on economic growth through the number of laborers and labor productivity in Vietnam, the study bases on the theoretical framework of the neoclassical growth model with the starting point of the Cobb-Douglas production function:

$$Y = AK^\alpha L^\beta \quad (1)$$

In which, Y is output (real GDP), capital (K) and labor (L) are inputs. A is a parameter reflecting technology,  $\alpha$  and  $\beta$  are parameters reflecting the elasticity of output according to capital and labor respectively.

With P being the total population, equation (1) can be rewritten as follows:

$$Y = AK^\alpha P^\beta (L/P)^\beta \quad (2)$$

To clarify the relationship between the growth rate of the factors and the growth rate of GDP per capita, logarithms is made on two sides of equation (2) as follows:

$$\ln Y = \ln A + \alpha \ln K + \beta \ln P + \beta \ln(L/P) \quad (3)$$

The study uses the above-mentioned form of function to estimate the impact of factors on economic growth, in which the proportion of the working-age population (number of people aged 15 to 60 over the total population-aw) is used as variable representing the labor force to population ratio (L/P).

Then, the specific form of empirical production function to estimate will be:

$$\ln(Y) = a + b_1 \ln K + b_2 \ln P + b_3 \ln(L/P) + e \quad (4)$$

In which,  $a$  is a constant that reflects the change of the dependent variable not explained by the independent variables in the model; and the coefficients  $b_1$ ,  $b_2$ ,  $b_3$  respectively are elasticity coefficients of real GDP according to the independent variables in the model.

Besides, with  $y$  being real GDP per capita, simple mathematical transformation can be made to show labor productivity and labor force to population ratio for growth through following equation:

$$y = \frac{Y}{P} = \frac{Y}{L} \times \frac{L}{P} \quad (5)$$

Equation (5) shows the dependence of the economic growth rate on two components such as: labor productivity and labor force to population ratio. Thus, if labor productivity (Y/L) is constant, economic growth depends on the growth rate of the labor force to population ratio. This confirms that: in any country the bigger number of laborers in the total population is, the more per capita income gets. So,  $L/P$  is called the Economic support ratio that shows how many people of working age 'burden' the entire population economically.

From equation (5) logarithm is made on two sides, the equation showing the growth rate of the GDP per capita as follows:

$$g_Y = g_{Y/L} + g_L - g_P \quad (6)$$

Equation (6) shows that the economic growth rate is determined by the growth rate of labor productivity and the difference between the labor growth rate and the population growth rate. If  $g_L - g_P = 0$ : the labor growth rate is equal to the population growth rate, then economic growth depends on labor productivity only. On the other hand, if  $g_L - g_P < 0$ : the labor growth rate is slower than the population growth rate in general, then economic growth is constrained by the increase in the number of dependents (children and the elderly) in the total population.

The later part of the paper will present the results of estimating the impact of labor on Vietnam's economic growth through the correlation between labor growth rate and growth rate of GDP per capita. Nevertheless, equation (6) is used in combination with the data source of the Vietnam Population Census for the period 1979-2009 and the predicted data for the period 2009-2049 of the General Statistics Office to calculate the contribution of the labor productivity, labor ratio, and population in general to the growth of the economy.

### 3. LABOR FORCE AND LABOR PRODUCTIVITY IN VIETNAM: OPPORTUNITIES AND CHALLENGES FOR ECONOMIC GROWTH

#### 3.1. The labor force

The labor force of Vietnam has continuously increased since before 1979. This fact was an inevitable result of the "population explosion" phenomenon that began in the 1960s, derived from too high fertility and low death rates. According to the statistics, the average number of children per woman in period 1960-1969 was 6.6 and in 1969-1979 was 5.8 (Nguyen Dinh Cu, 2011). The number of newborns every year boosted so fast that as a result, after 15 years, the number of people entering the working age would increase accordingly. Hence, the average numbers of employees increased were 820,000/ year in the period 1979-1989, 980,000 / year in the period 1989-1999 and in the period 1999-2009 about 1.3 million laborers were added to the labor force in Vietnam every year in average. For the period 1979 – 2009 in general, the population raised by 1.6 times while the number of people of working age increased by 2.1 times, but in the period of 1999 – 2009 especially the growth rate of the working-age population doubled which of the general population.

As a result of the strict execution of fertility reduction in our country, there was an evident decline in the number of newborns every year. In the period of 1979-1989, the average number of children per woman decreased to 4.3. This figure decreased to 3.1 in the period of 1989-1999 and 2.18 only ten years later. This is the basic reason for the growth rate of the population and the working-age population to decline over the years although both have increased sharply in terms of size.

*Table 1: Labor and population changes in Vietnam, 1979-2049*

| No | Year                                    | 1979  | 1989  | 1999  | 2009  | 2019  | 2029   | 2039   | 2049   |
|----|-----------------------------------------|-------|-------|-------|-------|-------|--------|--------|--------|
| 1  | Population (P) (Mil people)             | 53,74 | 64,38 | 76,33 | 85,85 | 95,47 | 102,65 | 107,02 | 107,88 |
| 2  | Labor (L) (Mil people)                  | 27,13 | 34,51 | 44,56 | 56,70 | 62,84 | 65,45  | 65,76  | 61,89  |
| 3  | Proportion of labor in total population | 50,49 | 53,60 | 58,38 | 66,05 | 65,83 | 63,76  | 61,45  | 57,37  |
| 4  | Labor growth rate ( $g_L$ ) (%)         | -     | 2,40  | 2,56  | 2,41  | 1,03  | 0,41   | 0,05   | (0,61) |

*Source: Calculated from the 1979-2019 Population Census data and population forecast data of the General Statistics Office, 2020*

The data in Table 1 shows that, although the labor growth rate has decreased strongly over the years, the number of labourers will continue to increase until 2039 with a peak of 65.76 million, then the labor force size will decrease gradually and rapidly as the labor force reaches retirement age while its annual additional source declines greatly as a result of fertility reduction policy. With this fact, Vietnam will experience the "golden population structure" for about 30 years (2009-2039), characterized by the fact that the labor force accounts for a large proportion of the total population, about over 67%, that is, more than two people of working age bear a dependent (Bui Thi Minh Tiep, 2012). This abundant human resource is considered a national advantage, a great opportunity to distribute labor into sectors in the economy, reduce the burden of dependencies, increase savings, promote investment, stimulate production, consumption and promote Vietnam's economic growth.

#### 3.2. Labor productivity and labor quality

Though a young and abundant labor force is identified as a national advantage, in order to exploit this advantage, it is necessary to integrate two conditions in terms of labor force scale and labor quality. If the workers are well-trained and have good professional qualifications, Vietnam may become a production partner with developed countries in some key industries. The large and skilled labor force will help Vietnam penetrate faster and deeper into the regional and global economy. Furthermore, the raise in the quantity of employed labor force with higher and higher incomes will make a major contribution to the social security fund, contribute to the strong assurance of the pension financial system in the long term.

Our labor force, however, has low technical qualifications and lacks of skills. The proportions of labor with professional and technical qualifications in Vietnam were 22.8% in 2018, 15.5% in 2009 and 10% in 1999, showing a slow-moving improvement in the labor quality in comparison with the speed of economic growth and labor restructuring.

In 2018, there were more than 77% of untrained employed workers in the nation, in which the proportion of trained workers in urban and rural areas was significantly different. The country faces a great challenge in meeting the goal of sustainable development. In addition, trained workers are still poor in quality with proximately 40% of them with weak qualifications. Thousands of graduates from economics, business

administration, etc. every year are unable to find jobs due to unrealistic training, while businesses cannot recruit enough skilled workers. This situation is a consequence of inadequacies in the education system. The majority of Vietnamese technical employees working in high-tech enterprises usually only perform simple tasks such as operating simple machines, equipment and repairs, while complicated stages required high technical skills are mostly undertaken by foreign workers, which shows that Vietnamese workers are losing their advantages right at “home base” and, along with that, their income sources are also limited.

With low technical and professional qualifications, the limited amount of human capital accumulated in the labor force makes Vietnam's labor productivity not high. Vietnam's labor productivity in 2018 was estimated at VND 102.2 million / person, an increase of 5.93% compared to 2017 (Institute of Labor Science and Social Affairs, 2018). Labor productivity growth has recovered and increased rapidly in recent years, reaching an average of 4.77%/ year in the period of 2011-2018 (compared to 3.17%/ year in the 2007-2010 period). However, the Ministry of Labor, Invalids and Social Affairs assessed that Vietnam's labor productivity is still far behind many ASEAN countries. At 2010 comparative prices, in 2018 Vietnam's labor productivity was 1/30 times that of Singapore, 29% of Thailand's labor productivity, 13% of Malaysia's labor productivity, 44% of the Philippines' labor productivity. During the past 15 years, our country's productivity growth rate has always been lower than the economic growth rate. This shows the fact that Vietnam's economy is growing based on expanding production scale, using more labor rather than developing in depth, basing on labor productivity. Therefore, it is necessary to improve the quality of labor by increasing the number of trained workers, improving the quality of training, etc., which is an urgent work to improve labor productivity, thereby integrating with the increased work force during the "golden population structure" period to accelerate economic growth.

**4. IMPACT OF LABOR ON THE ECONOMIC GROWTH OF VIETNAM: HISTORY, SITUATION AND PREDICTION**

The study uses the ordinary least squares (OLS) method to estimate the production function (4) with the data source collected mainly from GSO Statistical Yearbook, including: collected population data by age group of 63 provinces/ cities in the 2007-2009 period and data on GDP, the ratio of investment to GDP by province in the 2007-2009 period. The estimation results are shown in the following table:

*Table 2: Results of estimating the impact of factors on Vietnam's economic growth*

| <b>ln_gdp</b> | <b>Coef.</b> | <b>Std. Err.</b> | <b>t</b> | <b>P&gt;t</b> | <b>[95% Conf.</b> | <b>Interval]</b> |
|---------------|--------------|------------------|----------|---------------|-------------------|------------------|
| <b>ln_k</b>   | 0,406        | 0,046            | 8,840    | 0,000         | 0,315             | 0,496            |
| <b>ln_p</b>   | -1,999       | 0,545            | -3,670   | 0,000         | -3,074            | -0,924           |
| <b>ln_aw</b>  | 2,782        | 0,532            | 5,230    | 0,000         | 1,733             | 3,832            |
| <b>_cons</b>  | 4,542        | 0,814            | 5,580    | 0,000         | 2,936             | 6,148            |

It is shown in the estimation results that the estimated coefficients in the model, which are actually nonzero, are at the rate of 5% statistically. R2 = 0.8273 indicates that the independent variables in the model explain 82.73% of the variation of the dependent variables.

The estimation results can be written in the form of the equation as follows:

$$Ln(GDP) = 4,542 + 0,406ln K - 1,999ln P + 2,782ln(aw) \quad (7)$$

The positive coefficient of the working-age population ratio variable (aw) is at the rate of 5% statistically, showing the positive role of labor supply to economic growth. In the context of other factors remaining unchanged, when the proportion of people in working age increases by 1%, the economic growth rate will increase by 2.78%.

The negative coefficient of LnP variable implies that the too fast population growth will negatively affect the economic growth. Provided that other factors remain constant, when the total population growth rate increases by 1%, the economic growth rate will decrease by 1.99%. The table of estimation results also shows that investment brings a positive impact on economic growth. Specifically, in the context of other factors unchanged, the 1% increase in rate of investment capital will increase GDP growth rate by 0.4%. From this result, it can be asserted that, when the labor force increases, saving will increase, which is an important indirect channel that has a positive impact on the economic growth.

On the other hand, in order to prove labor’s contribution to the economic growth expressed through two indicators: labor quantity and quality (productivity), the study uses equation (6) in combination with Data in

Table 1 for specific calculations for the period of 1989-2009 and forecasts for the period of 2009-2049 (assuming GDP stays at the average level of the period 1999-2009). Calculation results are shown in Table 3 below:

**Table 3: Contribution of factors to Vietnam's economic growth, 1989-2049**

| Period                              |           | 1979-1989 | 1989-1999 | 1999-2009 | 2009-2019 | 2019-2029 | 2029-2039 | 2039-2049 |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Average growth rate (%/ year)       | $g_L$     | 2,40      | 2,56      | 2,41      | 1,03      | 0,41      | 0,05      | -0,61     |
|                                     | $g_P$     | 1,81      | 1,7       | 1,18      | 1,06      | 0,73      | 0,42      | 0,08      |
|                                     | $g_{Y/L}$ | -         | 5,09      | 4,75      | 6,07      | 6,33      | 6,38      | 6,70      |
|                                     | $g_{Y/P}$ | -         | 5,95      | 5,98      | 6,10*     | 6,10*     | 6,10*     | 6,10*     |
| Contribution to economic growth (%) | $I$       | -         | 43,03     | 40,30     | 16,89     | 6,72      | 0,82      | -10,0     |
|                                     | $P$       | -         | -28,57    | -19,73    | -16,39    | -11,97    | -6,89     | -1,31     |
|                                     | $Y/L$     | -         | 85,55     | 79,43     | 100,50    | 103,77    | 104,59    | 109,84    |
|                                     | $Y/P$     | -         | 100       | 100       | 100       | 100       | 100       | 100       |

Source: Calculation from data in Table 1 and Vietnam's economic growth data in the period of 1990-2009 of General Statistics Office, 2010

(\*) the data assumes GDP remained at the level of the period 2008-2018 is 6.01% (GSO)

The calculation results in Table 3 show that:

Vietnam's labor growth rate has passed its peak period (2.56%/ year in the 1989-1999 period) and in the coming decades, the labor growth rate will continue to decrease. After 2039, Vietnam will have absolutely no advantage in terms of labor size with the contribution of labor size to economic growth after 2039 being negative. This confirms the role of labor quality to Vietnam's economic growth in the long term.

Abundant labor force contributed about 43% to Vietnam's economic growth in 1989-1999. However, if the whole population is considered a unity in which workers engage in economic activities and "burden" their dependents (the elderly and children), after deducting the portions for dependents, the remaining contribution to economic growth during this period is about 15% only. Similarly, the labor force contributed to Vietnam's economic growth in the periods of 1999-2009 and 2009-2019 were 40% and 17% respectively. However, after subtracting the "dependent burden", the contribution to economic growth in the period of 1999-2009 was 21% and at the end of the period of 2009-2019, as the labor force decreased sharply, together with the increase in dependent burden from the elderly, this contribution was zero. After 2019, Vietnam's economic growth will depend mainly on labor productivity.

Labor productivity contributed 85% to economic growth in 1989-1999 and this figure was 100% in 2019. After 2019, along with a decrease in the number of laborers, there will be a sharp increase in the number of dependents at old age in Vietnam due to population aging. At that time, to maintain the current economic growth rate, Vietnam's labor quality needs to be strongly improved; labor productivity needs to increase to 105% in the period of 2019-2029 and to 110% in the period 2039-2049. This fact raises the problem of improving the quality of human resources in Vietnam.

### 5. CONCLUSION AND RECOMMENDATIONS

In the cause of industrialization, modernization and international economic integration, an abundant human resource is national advantage of Vietnam. The number of laborers increased dramatically in the period of stable political status, economic reform and expansion of exchanges with the world economy, creating a new position and force for Vietnam to accelerate economic growth during the period of 1989 – 2009. The contribution of labor size to economic growth in this period was over 40%. In the next 30 years, the number of laborers in our nation will continue to rise, reaching at peak in 2039 with 65.76 million, a good opportunity for economic growth and national development. However, the number of laborers is only a necessary condition while improving the quality of human resources is the sufficient condition to best exploit the opportunities from labor for growth.

Vietnamese labor quality is currently the most important issue that requires regulation through specific policies and strategies. The quality of the available labor force does not meet production requirements, in which, labor productivity is low, workers are both physically and professionally weak and lack necessary skills. Without improving labor quality, Vietnam will not be able to sustain economic growth and will deal with lots of challenges such as unemployment; social evils, burden of "dependent population" ... and when this force joins

the elderly, the burden of retirement finance, medical expenses and social security issues will become serious. In the manufacturing sector alone, in order to maintain the growth rate as in the past time, labor productivity must increase by 105% - 110% (2019-2049) if other factors remain unchanged.

Human resource development is the driving force for economic growth, the most urgent issue of our country's goal of economic growth and development. Therefore, it is necessary to take the initiative and innovation in policies and actions, ensure abundant human resources, high quality and high employment growth rate to be able to continue to exploit the advantages of labor and increase competitiveness of the economy and promote integration and development. Education and training policies should give priority to vocational training and job creation for workers; strengthen professional training and skills for learners in order to increase labor productivity and link training with practical social needs. Attention should be also paid to labor - employment policies, production promotion and cooperation in developing science and technology, promotion of international cooperation on labor, etc, to gradually improve labor quality and ensure the quality of Vietnam's economic growth in the long term.

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**CONDITIONS OF APPLICABILITY OF THE STOREY SYSTEM FOR THE DEVELOPMENT OF URANIUM ORE DEPOSITS WITH FILTRATION INHOMOGENEITY**

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**ABSTRACT**

*One of the main structural features of the ore-bearing horizons of stratal hydrogenic uranium deposits mined by underground leaching, which significantly affects the efficiency of the leaching process, is their filtration heterogeneity in plan and section.*

*Taking into account the above, the thesis briefly presents the study results on the applicability of the multi-storey development system and its advantages, the regime of push-pull system and acidity of leaching solutions, as well as the technical and economic assessment of the operation of the multi-storey blocks.*

*Keywords: filtration heterogeneity, ore deposit, storey development system, uranium, underground leaching.*

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**INTRODUCTION**

Hydrogenic uranium deposits, ore deposits (their parts), mined by the underground leaching method, are characterized by a wide range of variability of natural geological and hydrogeological parameters and the conditions of their occurrence, which significantly affect the efficiency of their development. The main ones are:

- metal reserves (especially in permeable ores);
- shape and size of ore bodies;
- metal content in ore bodies;
- the nature of the distribution of uranium by lithological-filtration types of ore;
- the power of ore deposits;
- depth and conditions of ore occurrence;
- permeability of ores and host rocks, their ratio;
- groundwater level;
- the capacity of the ore-bearing horizon;
- the position of the ore in the ore-bearing horizon;
- granulometric, chemical, mineralogical composition of ores and bearing rocks;
- the contrast of the ore grades in the ore deposit;
- degree of ore oxidation (4 - 6 valence form of uranium).

The above list of geological and hydrogeological conditions does not exhaust the whole variety of conditions affecting underground leaching (IS).

All factors and their combinations can be conditionally divided into three groups:

1. Factors (values of factors), as well as their combinations, in which the IS process is most effective - factors favorable to the process.
2. Factors (their meanings), as well as combinations of the latter, at which the IS process is practically impossible - are inhibiting factors.
3. Factors (their values), as well as combinations of the latter, in which IS is possible, but associated with a deterioration of the technical and economic indicators of mining - factors that are not favorable to the process.

It should be borne in mind that this classification of factors affecting the IS process cannot be divorced from the type of development system used. [1].

The most important element of development systems is the production wells, which consists of a certain number of interacting technological wells.

### MAIN BODY

It is necessary for leaching processes that the solution comes into direct contact and reacts with uranium minerals. In other words, minerals containing uranium must be available for leaching, which is largely due to the ability of the mining mass to filter the leaching solution. The latter, in turn, depends on the effective porosity, i.e on the type, size and morphology of interconnected pores and cracks along which formation waters and process solutions move [2].

Anisotropy of the permeability of ores and ore-bearing sediments has a significant effect on the structure of the filtration flow, which is expressed in the fact that the permeability of loose sedimentary rocks is higher in layering than across the bedding (as a consequence of their general property - filtration heterogeneity). Anisotropy of permeability takes place not only in the section of the ore-bearing horizon, but also in plan, however, in plan it is manifested to a much lesser extent. At the same time, despite the fact that uranium mineralization, as a rule, is confined to the most filtering part of the section, the ore deposit itself is less permeable in comparison with the enclosing ore and rocks due to the fact that the ores of hydrogenous deposits are usually localized in interlayers enriched with «precipitators» of uranium (organic matter, sulfides, fine-grained sands, clay particles, etc.), reducing their permeability [3,4].

The main feature of the storey underground leaching system is the development of ore deposits through the storey filters of technological wells (pumping filters under the deposit, injection filters above it, or vice versa, with the installation of injection filters in a more permeable part of the ore-bearing section - oxidized sands enriched with 3-valent iron, which is a natural intensifier of the uranium leaching process). The system distinguishes three types of well development - storey with a single-row arrangement of wells, storey and two-storey with a checkerboard or rectangular arrangement of wells for the development of wide and double-winged ore deposits.

When using a storey development system, the duration and intensity of the development of storey blocks are determined not only by the natural parameters of the occurrence of ore deposits, but also, to a large extent, by the regime of injection and pumping and the acidity of the leaching solutions.

The theoretical foundations of the application of the storey water supply system, tested and confirmed by the practice of mining storey blocks and the results of analyses, presuppose constant hydrodynamic interaction of pumping and injection wells from the stage of reserves preparation (acidification) to their complete development. Therefore, it is recommended to develop storey blocks only in the mode of simultaneous pumping and pumping, observing the balance of solutions.

In figure 1, for storied blocks with different carbonate content of ores and host rocks, different modes of acidity of working solutions are recommended, especially at the initial stages of their development, with a general tendency of a systematic decrease in acid concentration as the level of uranium extraction increases.

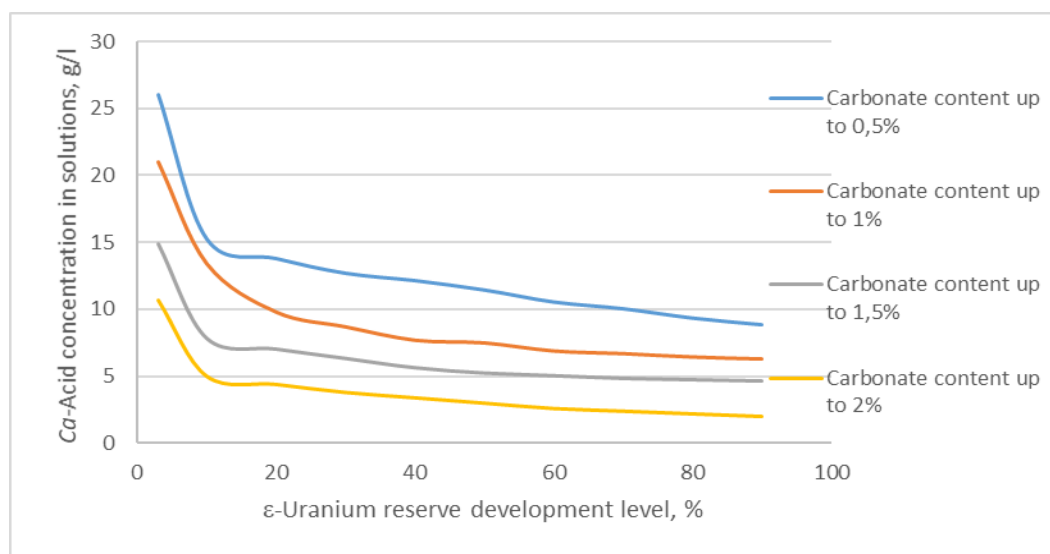


Figure 1. Modes of acidity of solutions depending on the degree of carbonate ores and the dynamics of mining reserves.

The advantages of the stacked system over other underground leaching systems are:

- more complete use of the flow of solutions, filtered between the injection and exhaust filters, for geotechnological development of the ore layer;
- more uniform distribution of filtration rates and flow rates in the hydrodynamic circuit of the supply air, also a more distinct character of this circuit;
- less dependence of the efficiency of the flow of solutions on such natural parameters as permeability, filtration inhomogeneity, anisotropy of ores and ores in interfering rocks, the total thickness of ores in the interfering horizon and the ratio  $m / Me$ .

The revealed features provide more intensive underground leaching (with lower solvent costs), despite the lower absolute values of the filtration rate of solutions.

Based on the results of the technical and economic assessment of the work of the underground leaching blocks, it was established;

- in comparison with a rectangular development system, the storey system is characterized by lower (by 12-15%) specific acid consumption for uranium mining, better (by 10-15%) by other basic geotechnological and underground leaching indicators. At the same time, the cost of uranium mining decreases by 10-15%;
- in comparison with the three-well version, the use of process wells equipped in a two-well version will reduce the cost of uranium mining in storey blocks by about 10-12%;
- observance of the optimal operating mode of storeyed underground leaching units (exclusion of the positive imbalance of solutions from the practice) will further reduce the specific consumption of acid for uranium mining by 10-15%.

The staged system, with its various variants, can be used to mine both wide and narrow (in plan) ore deposits with single-storied and multi-storied mineralization. It can be used for the development of individual isometric ore bodies of small size, the edge parts of ore deposits, "fitting" into which traditional opening schemes are often difficult, as well as areas of conjugation of production blocks of other well systems of underground leaching.

At the same time, the use of a stacked system with its vertical filtration of leaching solutions is not widespread; the main factors hindering the use of the system may be:

- localization of the ore body directly at one of the aquicludes limiting the ore-bearing horizon;
- significant filtration heterogeneity of ores and ore-bearing deposits, expressed by the presence in the section of numerous layers or layers ("layered cake"), sharply different in permeability;
- low thickness of the ore-bearing horizon;
- higher carbonate content of the above-ore or under-ore part of the section in relation to the ore part.

## **CONCLUSION**

Based on the foregoing, we can conclude that the efficiency of filtration of working solutions across the bedding of rocks (into the cross of the ore deposit), proven in the practice of mining operations, gives rise to a wider application of the storey development system at the underground leaching facilities of the Navoi Mining and Metallurgical Combine.

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## PROBLEMS OF EMULSIFYING CAPACITY OF MIXTURE IN URANIUM EXTRACTION AND THEIR SOLUTIONS

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### ABSTRACT

*Industrial practice of the extraction of uranium and other metals at hydrometallurgical production shows that in many cases the process becomes complicated because of increased **emulsifying capacity of mixture**. Increased **emulsifying capacity of mixture** leads to a decrease in the productivity of equipment, an increased consumption of extractants, diluent and other reagents.*

*Keywords: emulsifying, emulsifier, gelatin, silicic acid, uranium extraction.*

### INTRODUCTION

Dispersion (dispersed system) is a mixture of two substances, one of which (dispersed phase) is distributed in form of subdivided particles throughout another substance. Dispersed systems are divided into four groups: suspensions, emulsions, foams and aerosols.

An emulsion is a mixture of two or more liquids that are normally immiscible (unmixable or unblendable) owing to liquid-liquid phase separation. Emulsions are part of a more general class of two-phase systems of matter called colloids. Although the terms colloid and emulsion are sometimes used interchangeably, emulsion should be used when both phases, dispersed and continuous, are liquids. In an emulsion, one liquid (the dispersed phase) is dispersed in the other (the continuous phase).

Two liquids can form different types of emulsions. As an example, oil and water can form, first, an oil-in-water emulsion, in which the oil is the dispersed phase, and water is the continuous phase. Second, they can form a water-in-oil emulsion, in which water is the dispersed phase and oil is the continuous phase. Multiple emulsions are also possible, including a "water-in-oil-in-water" emulsion and an "oil-in-water-in-oil" emulsion [2].

### MANI BODY

Emulsification can be caused by several reasons, including the presence of organic emulsifiers, such as humic acids, various surface active substances, as well as inorganic substances - silicon and zirconium compounds. Presence of fine-dispersed solids that stabilize the emulsion plays an important role to form stable emulsions. Such solid particles can be not only ore material, but also hardly soluble salts of some extractants with metals, for example D2EHPA with scandium, zirconium and iron.

An emulsifier (also known as an "emulgent") is a substance that stabilizes an emulsion by increasing its kinetic stability. Emulsifiers are part of a broader group of compounds known as surfactants, or "surface active agents". Surfactants (emulsifiers) are compounds that are typically amphiphilic, meaning they have a polar or hydrophilic (i.e. water-soluble) part and a non-polar (i.e. hydrophobic or lipophilic) part. Because of this, emulsifiers tend to have more or less solubility either in water or in oil. Emulsifiers that are more soluble in water (and conversely, less soluble in oil) will generally form oil-in-water emulsions, while emulsifiers that are more soluble in oil will form water-in-oil emulsions.

One of the main reasons for emulsification of mixtures in the uranium extraction from sulfuric acid mixture is the presence of silicic acid, its high-polymer forms, contained in the mixture in the form of grossly aggregated colloidal particles.

The **emulsifying capacity of mixture** depends as on the amount of silicon as on forms of its presence in mixtures: monomeric ( $\alpha$  - form) and polymeric ( $\beta$  - and  $\gamma$  - forms). The table below shows data on the **emulsifying capacity of mixture** depending on the content of polymer silicon [1].

**Table 1: The emulsifying capacity of mixture depending on content of SiO<sub>2</sub>**

| Test | SiO <sub>2</sub> (general), g/l | SiO <sub>2</sub> ( $\alpha$ -form), g/l | SiO <sub>2</sub> (polymeric), g/l | Presence of an emulsion |
|------|---------------------------------|-----------------------------------------|-----------------------------------|-------------------------|
| 1    | 0,122                           | 0,101                                   | 0,022                             | No                      |
| 2    | 0,18                            | 0,06                                    | 0,133                             | Emulsion                |
| 3    | 0,139                           | 0,105                                   | 0,026                             | No                      |
| 4    | 0,215                           | 0,103                                   | 0,120                             | Emulsion                |

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|   |       |       |       |    |
|---|-------|-------|-------|----|
| 5 | 0,192 | 0,188 | 0     | No |
| 6 | 0,11  | 0,078 | 0,029 | No |

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Table above clearly shows that when the content of polymer silicon is higher than 100 mg/l, the formation of a stable emulsion is observed. This confirms the crucial role of polymer silicic acid in the emulsification process.

To reduce emulsify ability, it is reasonable to add poly alcohols (for example, propylene glycol), which migrate to the boundary of the phase section and form a protective layer around the droplets. Adding gelatin can prevent emulsifying capacity. When gelatin is used, polymerized silicon acid is coagulated. As a coagulant, Anthranilic acid ( $C_6H_4(NH_2)(CO_2H)$ ) can be utilized.

Emulsion formation is reduced after primarily adding kerosene to mixture at phase ratio O:A = 1:3. The polymer of silicic acid is floated by kerosene and a mixture that does not contain an emulsifier is sent to extraction. Kerosene can be used repeatedly to separate polymer silicon from mixture after regeneration of a silicon-containing kerosene emulsion with a 10% NaOH solution. Thorough preparation of mixture before extraction, separation from solid suspensions filtration, clarification or other methods reduce the likelihood of the formation of polymer chains by reducing the total amount of dissolved silicon in mixture and deposition of polymers on the filter material.

### CONCLUSION

These new economical and effective physicochemical methods of anti-emulsion cleaning will make it possible to reduce the cost of uranium products, improve their quality and production culture. In our opinion, this will be an important contribution to scientific and technological progress in the field of liquid uranium extraction.

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## MAGNETORHEOLOGICAL FLUID-A REVIEW

<sup>1</sup>Manpreet Singh, <sup>2</sup>Amrinder Singh Uppal and <sup>3</sup>Gaurav Kumar<sup>1,3</sup>Asistant Professor, Baba Farid College of Engineering and Technology, Bathinda, Punjab, India-151001,<sup>2</sup>Mechanical Engineer, Holland Grove Ct, Cypress Texas, USA-77433**ABSTRACT**

Magnetorheological fluids are a smart fluid, this fluid is combination of the suspension of fine, non-colloidal, low-coercivity ferromagnetic particles in a base or carrier fluid. These fluids are controllable fluid which control by the viscosity of the fluid, which have control by application of magnetic field. Application of magnetic field converts the liquid phase of the fluid into the semi solid, which generates the yield stress of the fluid. MR fluid fulfil the important performance criteria such as low initial viscosity, high shear upon the application of the magnetic field, low hysteresis, low power consumption, temperature stability, and fast response. The unique nature of MR fluids has made them suitable for semi-active energy-dissipating applications in particular. In this paper highlight the general principles of MR fluids, their rheology, and critical parameters are discussed and also the mechanisms governing the MR effect are characterized. For a more in-depth review of modelling efforts, compositions and the influence of critical parameters are also discussed in this work.

**Keywords:** - MR fluid, Materials, Rheological properties, Structure

**1. INTRODUCTION**

Particular magnetization model (de Vincente et al . [1-4]) is the most acceptable model for the magnetization of MR fluid. According to this model, the magnetization effect is produced due to the non-permeability of the two phases, two phases are liquid phase (carrier fluid) and solid phase (CI particles and abrasive particles) respectively. The particles assumed, when in off state, that the particles act as multi-domain magnets (Agrawal et al.)[6]. Basically, when applying the magnetic field, the MR fluid reacts to the polarization in the suspension particles (Jolly and Nakano[7], Jolly et al.[8]), this polarization creates the dipole moment in the particles, which helps to generate the chain structure of the particles in the direction of the magnetic field lines (Felt et al.)[9]. It defines that the off-state particles are multi domains; each domain has a randomly aligned fluid dipole moment. When the magnetic field is supplied all the particle sub-domains are aligned in one direction. The magnetic field sets the forces together between the two adjacent particles. The forces are attractive and repelling forces between the particles.

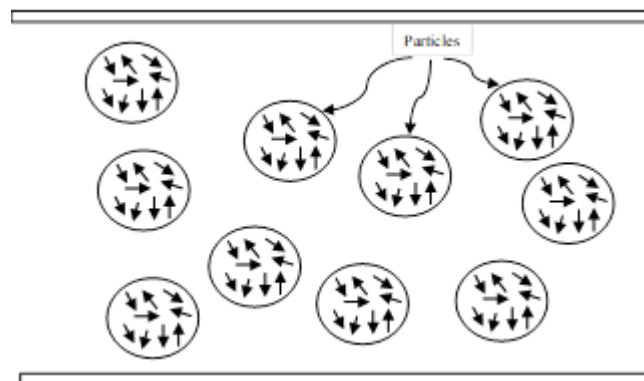


Fig.1 MR fluid particles at off state (Agrawal et al. 2001) (H=0)

These forces, which are defined by their direction of attractive forces in the magnetic field, are parallel to the magnetic field and otherwise the repulsive forces are perpendicular to the magnetic field. These forces help to form the chain as structure in the direction of the magnetic field lines. The aggregation helps to generate the structure of the columnar type parallel to the line of the magnetic field. The yield stress, which is dependent on the magnetic field, is produced when columnar type structures. Yield stress is the minimum stress that the external forces need to defeat to start fluid flow. The chain like structure yields the fluid stress mainly depends on the strength of the magnetic field and the pattern of the distribution of particles (Mohebi et al.)[10]. Monodisperse and bidisperse were used in two types of MR fluid. Various models are proposed for the prediction of chain formation and yield stress (Bossis and Lemaire[11]; Ginder et al.[12]; Kittipoomwong and Klingenberg[13]; Li and Peng[14]; Shulman et al.[15]).

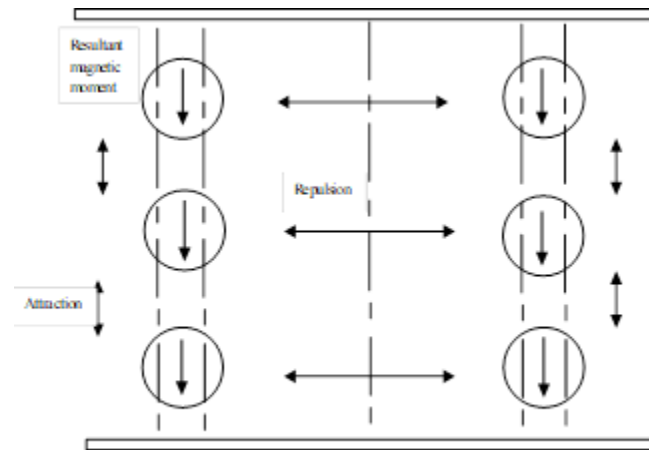


Fig.2 MR fluid particles at on state (Agraval et al. 2001) ( $H>0$ )

Also, they try to model the interaction of the magnetic dipoles between the particles in the fluid aggregation. First attempts to predict the micromechanical model of the MR fluid particles based on the diluted suspension statistical theory. The micromechanical model equation (1) as follows.

$$\tau = \mu \frac{d\mu}{dz} + vH^2 \phi \alpha^{-1} \frac{\kappa}{2} + k \tag{1}$$

Also, they try to model the interaction of the magnetic dipoles between the particles in the fluid aggregation. First attempts to predict the micromechanical model of the MR fluid particles based on the diluted suspension statistical theory. The micromechanical model equation (1) as follows. Where  $\tau$  - shear stress,  $\mu$  - viscosity,  $H$  - magnetic field strength,  $\phi$  - particle volume fraction,  $v$  - vacuum permeability,  $\kappa$  - susceptibility and  $\alpha$  is a constant.

Ginder et al. [12] investigated that the finite-element method's mathematical and methodical analysis of the magnetic flattened occurrence by income. Researchers recognized three systems: -a) low field of application b) medium field of application c) high field of application. The yield stress increases quadrate when the author uses low applied fields, meaning the yield stress is the square of magnetic field force. When using the applied medium fields then the rate of change in yield stress is reduced.

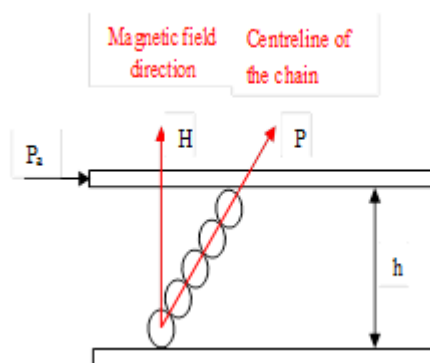


Fig. 3 Shear Yield Stress

The complete saturation magnetization is obtained in the third system, using the highly applied fields. Ly et al. [16] analyzed the chain formation system, using the fast multipole method, and simulated the process. Fluid is performed with the different iron content, and the time required to generate the aggregates is inversely proportional to the fraction of the iron volume. Si et al. [17] defined the characterization of the yield stress in terms of the strength of the magnetic field, iron particle size and iron particle volume fraction. The author gives the model in Fig.1, where  $h$  defines the height of the gap between the plates  $P_a$  is the force applied to the system's upper plate and held stationary at the bottom plate. Shear yield stress is taken has per unit area ( $\tau$ ).  $\tau = P_a \sin \theta$ , show in figure the angle between the centreline of the chain and the magnetic field direction is denoted by  $\theta$ .

## 2. MAGNETORHEOLOGICAL MATERIALS

MR fluid is particles which can be magnetised are suspended in the carrier fluid. There are many types of additives (Phule) used to improve yield stress, settling rate and reduce chemical reaction between the particles[18]. A simpler and quite effective MR fluid consists mainly of iron powder with a particle size of 10-30  $\mu\text{m}$  which disperses into the oil or water depending on the application using the surfactant which controls the irreversible aggregation. First, time the iron is used which is separate from the carbonyl iron precursors known as carbonyl iron [19-21]. Particulate carbonyl iron has high permeability which helps to produce highly permeable circuits. These powder particles are quite spherical and are also provided in a very small range, from 1-2 $\mu\text{m}$  to higher. CI particles have very good saturation of the magnetization ( $\mu\text{0Ms} = 2.1$  Tesla) and very low remanent magnetization. The efficacy of MR fluid is measured using yield stress which is studied by the volume fraction of the fluid. Researcher finds that shear stress is 30kpa for field of  $H = 4000$  Oersted at the volume fraction of 30 percent [22]. Another researcher studied that the shear stress value is 100kpa for 1 Tesla field at a volume fraction of 36 percent [23]. The magnetic induction  $B$  is given by:

$$B = \mu (M + H) \quad (2)$$

$$M = \chi H \quad (3)$$

Magnetic induction is indicated with the help of flux meter and also used a sensing coil method. These methods are safer and easy use with the comparison between the different fluids. It is not directly measurable to MR fluid magnetic field ( $H$ ) opposing internal fluid. The measurement is carried out with the help of a Hall gauge placed to the fluid to establish an air gap between them. To improve the aggregation state, surfactants are added into the fluid, or we can say that it helps to impose the non-zero gap between the chain particles. High density CI particles (7.87 g /  $\text{cm}^3$ ) have. Researcher studied taking the particle size of iron into the water is one micron and measuring the sedimentation speed of 5.4 cm/hr. The gel-type additive is used to prevent this sedimentation in the fluid. These additives of the type of gel are low in yield stress which controls the flow and helps to reduce particle sedimentation. A further problem more important than sedimentation is the corrosion of the CI particles to solve the sedimentation problem. This problem arises in the application of applied magnetic field in the permanent used damper[24]. The off state (zero fields) in this stage fluid thickened this happen by viscosity factor of 3 after a 600000 cycles. Because of this thickening, the removal of thin oxide fragments from the CI particles, which is the main cause of particle corrosion, is done.

The Lord Corporation is making new fluid particles to solve the problem of particle corrosion, which do not show any thickening even after the 2 million cycles. The higher saturation magnetization in CI particles at room temperature obtains 2.1 Tesla to strengthen the chain or strength of the MR fluid. Continuing to improve iron particle saturation magnetization is replaced by cobalt iron particles with higher saturation magnetization (2.45 Tesla at room temperature for about 50 percent Fe, 50 percent Cobalt). These particles provided the higher shear stress as compared to iron particles like 70kPa instead of 50kPa for  $H = 4000$  Oersted[22] due to higher saturation magnetization. Some researchers are working on the bidisperse which is essentially two particles of different sizes that are used in the MR fluid. The particles of small size fill the gap between the two larger particles this small improves the shear stress of the fluid. In another work researcher, compare the monodisperse and bidisperse, and compare the two fluids that behave differently with their shear forces and rheology.

## 3. COLLOIDAL MAGNETORHEOLOGICAL FLUIDS

The particle size is greater than 1 $\mu\text{m}$  when taken, which gives the higher fluid resistance. Shear stress helps to push the particles against each other and that will be proportional to the particle size square. Another advantage of the smaller particle is that it reduces sedimentation, fragmentation and also reduces the two abrasions. The important parameter is  $\lambda$ (define the dipolar attraction between the particles), which defines the two dipolar characteristics of the particles to define the cluster formation of the particles that help to improve the stress of the shear. The chain formation, which also affected by particle size and magnetic field value, is larger the value of the  $\lambda$ .

Kormann et al[20] studied the use of soft ferrites with an average diameter of approximately 30 nm and also select the 23% volume fraction applied to 0.2 Tesla magnetic fields resulting in a dynamic shear stress value of 2kpa. Even in zero magnetic field nano sized particles show aggregation formation. This is due to the natural set of permanent dipoles between the particles and the clusters that persist length (stiffness) relationship between the diameter of the particles and the orientation of the dipoles of the particles in the zero magnetic field. The dipoles orientation towards the next particle value is much larger than the particle diameters. Bossis et al. are studying the change in viscosity by changing the magnetic field and also finding out the attractive dipolar energy that helps to generate the cluster and clusters are attractive to each other in making a gel like structure.



This type of fluid used for the small yield stress value is the very small particles which have no sediment and are not abrasive. These nano-particles are presented with carbonyl iron recently[25]. These particles of carbonyl iron are produced by the decomposition process of chemical vapour deposition (CVD), with an average size of 26 nm. Experiment was conducted with the 16 percent volume fraction at that volume fraction a 7kpa average increase in yield stress occurred.

#### 4. STRUCTURE OF MAGNETORHEOLOGICAL FLUID

When the MR fluid is supplied with the magnetic field, the particles are aggregated and create a different type of structure, which depends on the volume fraction of the fluid as well as on the parameter  $\pi$  (defines the dipolar attraction between the particles). Colloidal range is also an important parameter which defines particle distribution into carrier fluid. Particulate distribution important for increases the fluid field. Field supply also affects the MR fluid structure, it gives the labyrinthine type structure when we supplied the field too quickly, and when we increase the field slowly gives well separated columns [26,27]. The labyrinthine structure of the fluid [28] will form a larger volume fraction (above 5 per cent). If the magnetic field increases the slow then we observe the transmitting light behaviour throughout the fluid. We observe that light transmission is less when the field is low because the particles are distributed in complex patterns that obstruct light scattering or light transmission[29]. The same behaviour was found in the ER fluids [30,31]. At the higher field values, transmitted light is easily transmitted because the particles form the chain structure at the higher field and these chains form the thick fibres together.

Therefore the transmitted light transmits without any obstruction between the thick fibres [31]. The formation of the chain is converted into the thick fibres. At the low volume fraction, those thick fibres are well separated. The main problem in the fluid is the structural equilibrium which is not improved by the field being supplied only slowly. This is dependent on the chain formation phase to thick fibre structure to solve this problem in order to improve the value of  $\lambda$ . Between the isotropic phase to the nematic phase and the columnar phase [31], the value of  $\lambda$  is. The transmitting light is also an aid in determining the measurement of the light's observation angle. The best method for accessing the chain length is the light beam plane which is perpendicular to the chains. Also the author finds out that the light dispersed in the plane perpendicular to the chains is proportional to the square of the chains length [32, 33].

#### 5. RHEOLOGICAL PROPERTIES OF MAGNETORHEOLOGICAL FLUIDS

When the on state of the magnetic field, viscosity is defined the magnetorheological effect of the MR fluid. The mmagnetorheological effect shows the stress on yield due to magnetic field application. Magnetic field also controls MR fluid rheology and chain formation. The magnetic field defines the polarity of the parts of iron [34]. When magnetic field is applied the particles induce the multi-dipoles and the chains are formed. Chains are the attraction of the adjacent particles between each other that are defined by the chain's shear rate and converted the liquid phase of the MR fluid into semi solid. In other words, the interactions between the particles help to induce particle alignment in the direction of the magnetic field being applied and form a columnar structure. The structure of the columnar type is reinforced by the magnetic field applied to overcome this mechanical energy is required [35]. When we apply the mechanical energy, the shear rate is reached at the extreme value and the chain type structure breaks down at that value, and the fluid flows. That extreme shear rate value is called the fluid's yield stress [36].

Yield stress is the maximum stress that can be applied before the continuous MRF flow which is a function of the fluid's magnetic field [34] and related to the enrichment of the fluid's viscoelasticity behaviour [37]. The yield stress in the MR fluid is an important factor in industrial applications, varying from 10 to 100 kPa in different magnetic field ranges [38]. Yield stress depends on the shape, size [39–40], volume fraction of the MR fluid particles and the distribution of particles also on the intensity of the applied magnetic field [36], particles between attraction and repulsion, and aggregation creation [41]. Designing MR fluid operated devices and finding out how to work out the relation between shear stress and shear rate [42]. In the off state of the magnetic field, MR fluid's behaviour is similar to that of the carrier fluid's behavioural model, apart from the fact that the iron particles are bit concentrated in the fluid[34]. Researchers have different equations, but one of the basic equations is the Bingham model with a description of the behaviour of the MR fluid [43], also explaining the applied flow curve (shear rate versus shear stress) of MR fluids.

As per the Bingham model, flow curve can be drawn from interpolation at zero shear rates for each yield stress value [44, 45]. Many researchers have used this model in recent years to validate MR fluid behaviour [35, 34, 46–50]. Claracq et al.[48] examined the rheological properties of the MR fluid and discussed shear stress and shear strain as well. Author concluded that the fluid's rheological properties follow plastic model Bingham. Other basic two parameter model defines rheological properties as Casson model [51]. Gabriel and Laun [52]

experimentally describe that the Casson model confirms greater accuracy in the experimental results and is thus a more appropriate model for the design of magnetorheological devices. One reason for this observation is that unlike the Bingham model, shear stress slope versus shear rate in the Casson model is a shear rate function; consequently, it reveals more consistency with the magnetorheological fluid experimental results. Herschel-Bulkley model is a three-parameter model that was developed to describe viscoplastic fluid flow curve and yield stress, and is more general compared to previous models [53]. Some research on magnetorheological fluid technology emphasises this model's better consistency with the behaviour of those fluids [52,54,55]. Other models, such as the power law model, have been proposed to explain the behaviour of non-Newtonian fluids not applied extensively to magnetorheological fluids [56].

## 6. CONCLUSIONS

MR fluid is a smart fluid with wide application scope in the coming era. MR fluid is a rapid viscosity response requiring varying viscosity where we need to be effective. MR fluid's main advantage is prompt response, fewer moving parts and very simple technology. MR fluid also has an inconvenience when using heavy density magnetic particles, the product weight is higher and is also used prolonged in place of the heavy MR fluid product which is also used. MR fluid technology used in automotive industry for shock absorbing devices etc. This technology is also used in aerospace and in medical applications. Now days the main scope of the Magnetorheological Finishing Processes. The MRF process is used in various engineering applications and provides the best finish and improves product quality overall. The enhanced technology of the MRF makes it the future's smart technology.

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## A REVIEW ON BIOLOGICAL ACTIVITIES: 1,3,4-THIADIAZOLE AND ITS DERIVATIVES

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**ABSTRACT**

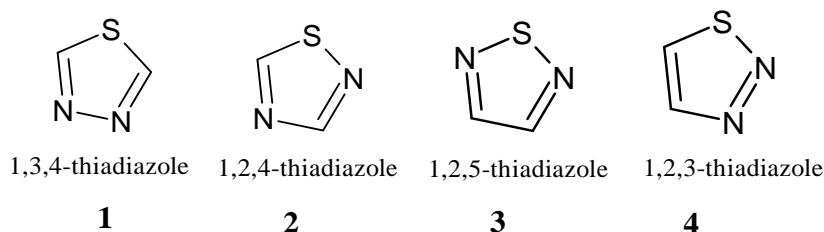
The thiadiazole is a heterocyclic compound containing one sulfur atom, two nitrogen atoms, and two double-bonded 5-membered ring systems. Heterocyclic compounds play an important role in medicinal chemistry with biological activity. The five-membered ring contains more than one or two heteroatoms also such as thiadiazole, oxazole, thiazole, azole, pyrrole, triazine, etc. Thiadiazole has been exhibited in a wide range of biological activities such as anticancer, anti-inflammatory, anti-diabetic, antimicrobial, antifungal, antibacterial, antiviral, anti-tuberculosis, anticonvulsant, antidepressant, antileishmanial, activities etc. In that anticancer, antimicrobial, antibacterial, and anti-inflammatory shows the promising activities.

Keywords: Thiadiazole, Heterocyclic, 1,3,4-thiadiazole,

**INTRODUCTION**

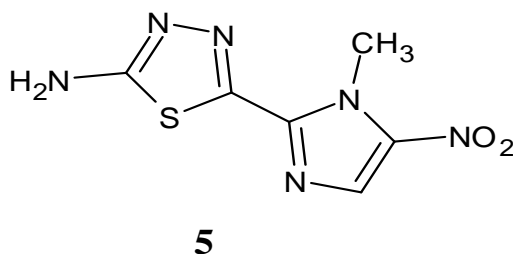
Heterocyclic compound plays an important role in medicinal chemistry with biological activity. The five-membered heterocyclic molecules are furan, thiophene, and pyrrole, each one of which has a heteroatom. There are one or more heteroatoms are present in five-membered ring structures are thiadiazole, oxadiazole, azole, thiazole, pyrrole, and triazine, etc. Hence heterocyclic chemistry is continuing to illustrate the awareness of synthetic organic chemists and huge scientific interest.

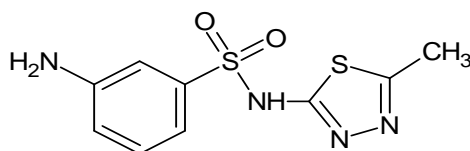
The thiadiazole is a 5- membered structure heterocyclic molecule having one S atom, two N atoms, as well as two double-bonded which are reported through an extensive choice of biological activity. Thiadiazole has an unsaturated ring structure with the molecular formula C<sub>2</sub>H<sub>3</sub>N<sub>2</sub>S. The thiadiazoles have occurred in form of four isomeric such as 1,3,4- thiadiazole, 1,2,4- thiadiazole, 1,2,5- thiadiazole, and 1,2,3- thiadiazole (1-4).



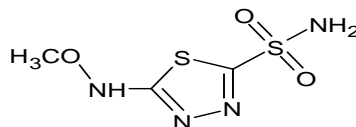
Amongst which 1,3,4- thiadiazole to be considered as one of the most significant and well-known heterocyclic nuclei, as it is reported with various pharmacological performance such as anticancer, anticonvulsant, analgesic, anti-inflammatory, anti-tubercular, anti-leishmanial, antimicrobial, anti-hepatitis-B, antioxidant, diuretic, antihypertensive, central nervous system (CNS) depressant, anti-diabetic, antiepileptic actions, and molluscicidal.

Using the moiety 1,3,4- thiadiazole, the isomer of the thiadiazole progression number of studies have been carried out. Some of the drugs which contain 1,3,4-thiadiazole nucleus are megazol, sulfamethizole, acetazolamide (5-7).





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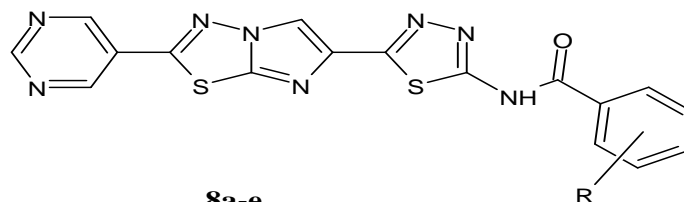
In addition, thiadiazoles are also reported with this usage in agriculture, plastics, polymers, and dyes. It has been used in the different activity of molecules bearing with the five-member heterocyclic ring. The current review focused on the various biological performances exhibited by 1,3,4-thiadiazoles.

### BIOLOGICAL ACTIVITIES RELATED TO 1,3,4-THIADIAZOLE

Several literatures have revealed the diverse biological performances of 1,3,4-thiadiazole derivatives. The broad-spectrum of 1,3,4-thiadiazole pharmacological activities are classified into the following categories.

#### ANTICANCER ACTIVITIES

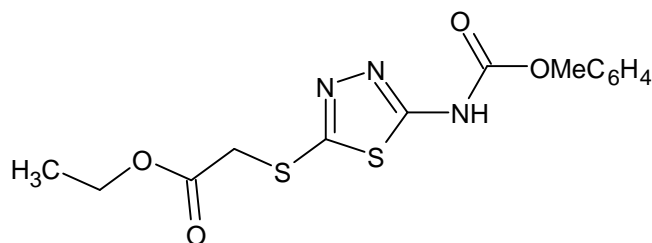
Sridhar *et al.* [1] have designed and synthesized a novel recorded of amide derivatives of imidazole[2,1-*b*][1,3,4]thiadiazoles as well as characters determined with  $^{13}\text{C}$  NMR,  $^1\text{H}$  NMR, mass, along with HRMS spectral information. In these studies, the entire anticancer compounds to be evaluated on cancer cell appearance similar to DU-145, MB-231, A549, and MCF-7 by MTT assay. The compounds reported with good anti-cancer activity were **8a-e**. Fig. 8



8a-e

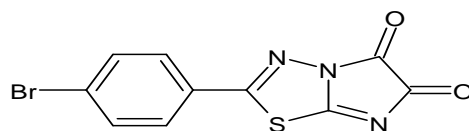
8R(a-e); a - 3,4,5-trimethoxy  
 b - 3,5-dimethoxy  
 c - 4-methoxy  
 d - 4-chloro  
 e - 4-methyl

Almasirad *et al.* [2] have synthesized a new sequence of ethyl 2-((5-(benzamido)-1,3,4-thiadiazole-2-yl)thio)acetates along with evaluated their *in vitro* actions aligned with HL-60, MOLT-4, as well as SKOV-3 on cancer cell form with MTT assay. Amongst them, compound **9** shows the most excellent inhibitor action aligned by the SKOV-3 cell, through an  $\text{IC}_{50}$  value of 19.5  $\mu\text{M}$ . Fig. 9

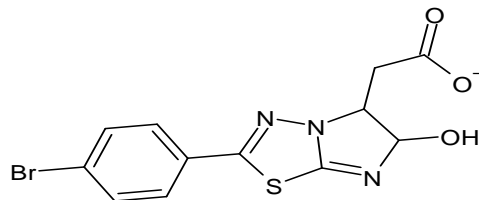


9

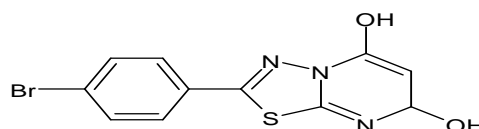
Rahman *et al.* [3] have synthesized new compounds with condensed heterocyclic substituted imidazo[2,1-*b*]-1,3,4-thiadiazoles, substituted 1,3,4-thiadiazole[3,2-*a*]pyrimidines and 1,3-disubstituted thioureas. The compounds **10**, **11**, **12**, **13(a-c)** were reported to be elucidated by using IR, NMR, and mass spectroscopy and check for their cytotoxic action against cancer cell line A549 using Sulfo-Rhodamine B standard method. Some compounds were shown to have cytotoxicity with  $\text{IC}_{50}$  2.58-6.47  $\mu\text{M}$ . Fig. 10-13



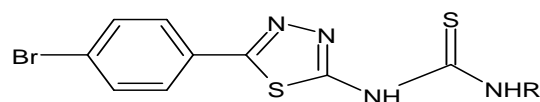
10



11



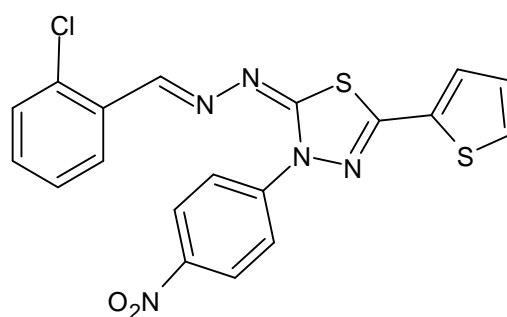
12



13a-c

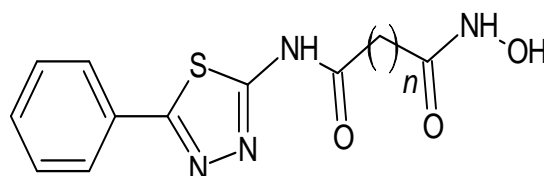
13R a= CH<sub>2</sub>CH=CH<sub>2</sub>b= C<sub>4</sub>H<sub>9</sub>c= C<sub>6</sub>H<sub>11</sub>

M Gomha *et. al.* [4] have synthesized a novel progression of 1,3,4-thiadiazole derivatives. Which to be investigated for their action aligned with human tumor cell lines and human hepatocellular carcinoma cell appearance. The attained compound **14** was reported with the higher potency IC<sub>50</sub>: 4.37 ± 0.7. When compared with cisplatin IC<sub>50</sub> 8.03 ± 0.5. Fig. 14



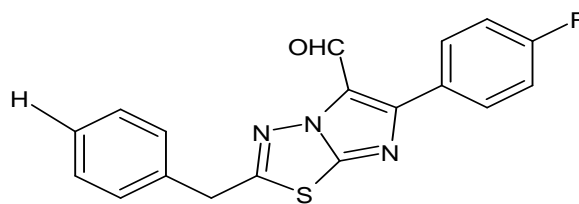
14

P Guan *et. al.* [5] contain designed and synthesized a new sequence of 1,3,4-thiadiazole based hydroxamic acid histone deacetylase (HDAC) inhibitors. Strong enzymatic inhibition was shown in compound **15** between the 5-6 carbon unit of the Zn<sup>2+</sup>. Fig. 15



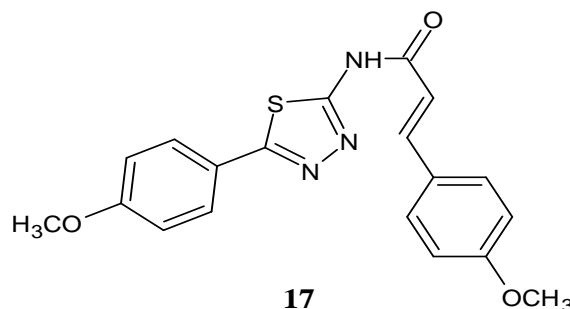
15

Karki *et. al.* [6] contain synthesize 14 new 2-alkyl-5-substituted-6-(4'-fluorophenyl)-imidazo[2,1-b][1,3,4]thiadiazole derivatives, where compounds **16** proved higher cytotoxicity. Fig. 16



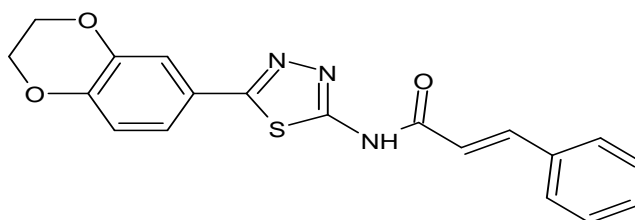
16

Hui Yang *et. al.* [7] had synthesized a sequence of new anti-tubulin polymerization inhibitors behavior 1,3,4-thiadiazole structure as well as cinnamon amide which were evaluated for biological activity. Amongst every molecule, compound shows the best effective inhibition action on the development of MCF-7 as well as A549 cell appearance through  $IC_{50}$  values of 0.52 and 0.28  $\mu\text{g/mL}$ . Further molecular docking study was carried out on the inhibitor-tubulin protein connections. Fig. 17



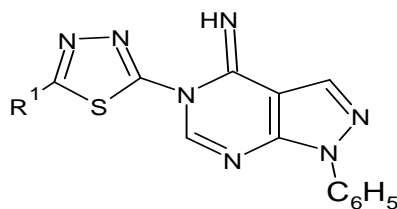
17

Sun *et. al.* [8] have synthesized a sequence of *N*-(5-(2,3-dihydrobenzo[*b*][1,4]dioxin-6-yl)-1,3,4-thiadiazol-2-yl)-substituted-acetamide as well as evaluate their anticancer actions. Molecule shows the most effective inhibitory action which inhibited the expansion of HEPG2 cells by  $EC_{50}$  of 10.28  $\mu\text{M}$  as well as inhibited the activity of focal adhesion kinase (FAK) kinase with  $EC_{50}$  of 10.79  $\mu\text{M}$ . A molecular docking study was carried out. Fig. 18

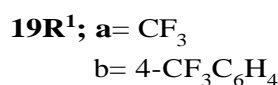


18

X J Song *et. al.* [9] have synthesized new fluorinated pyrazolo[3,4-*d*]pyrimidine derivatives containing 1,3,4-thiadiazole for microwave-assisted as well as assessed with HL-60 by an MTT assay. The compound exhibited additional effective anticancer inhibitory activity than doxorubicin. (19)



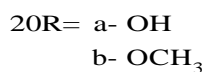
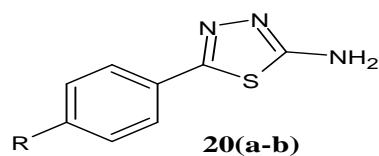
19



#### ANTIMICROBIAL AND ANTICANCER ACTIVITY

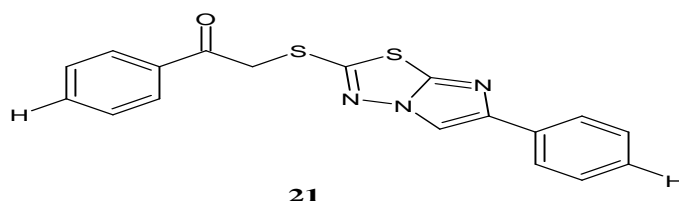
Upadhyay *et. al.* [10] have synthesized a sequence of 5-(4-substituted phenyl)-1,3,4-thiadiazole-2-amines which be prepared from dehydrocyclization of 4-substituted benzoyl thiosemicarbazides by concentrate sulphuric acid. Elucidation was done with Mass, NMR, and Infrared spectral techniques. The molecules exhibited good to moderated anticancer activities. Fig. 20a,b



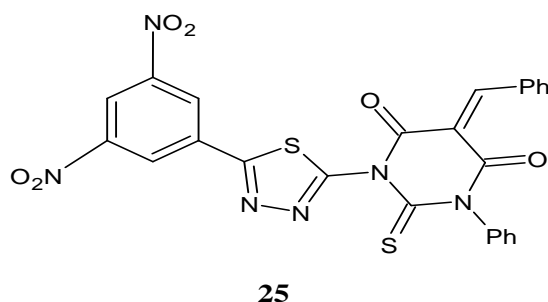
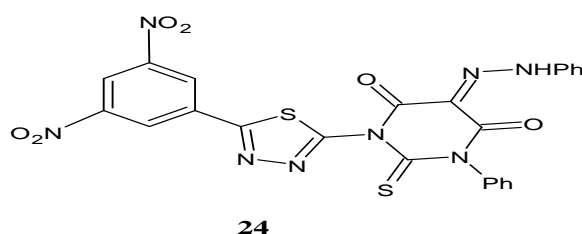
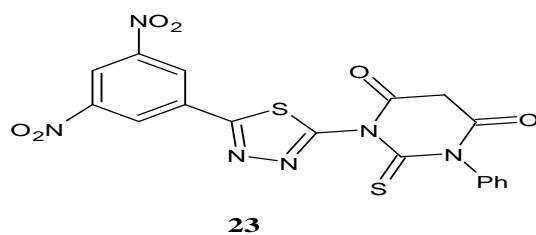
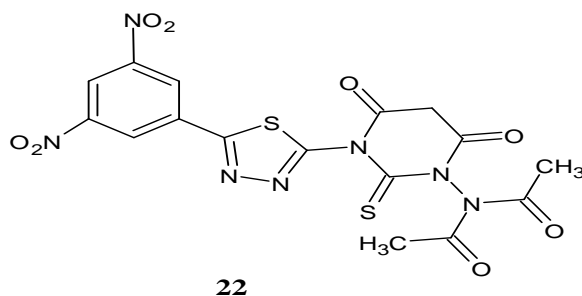


### ANTIMICROBIAL ACTIVITIES

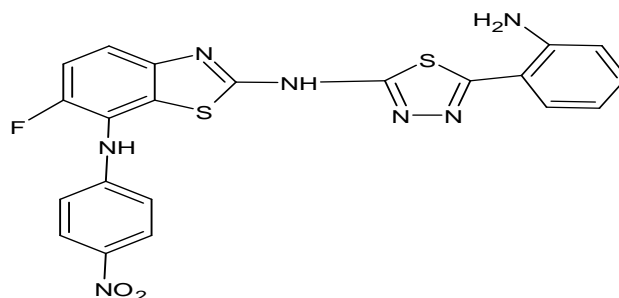
Tahtaci *et. al.* [11] have synthesized a new sequence of phenyl substituted imidazo[2,1-*b*][1,3,4]thiadiazole, as well as characterization, were assessed for antibacterial performance aligned with gram-negative, gram-positive, and antifungal activities along with elucidated by spectroscopic methods. Most of the molecules showed outstanding antifungal activity. The compound **21** was with the MIC value as low as 0.03μg/ml. Fig. 21



M. E. Naggar *et. al.* [12] synthesized a sequence of 5-(3,5-dinitrophenyl)-1,3,4-thiadiazoles as well as assess their *in-vitro* antibacterial, anticancer, and dihydrofolate reductase (DHFR) inhibition actions. Among them the molecules showed the effective DHFR inhibitors through IC<sub>50</sub> values of 0.04±0.82-1.00±0.85. The highly potent DHFR inhibitors docking studies were performed. Fig. 22-25

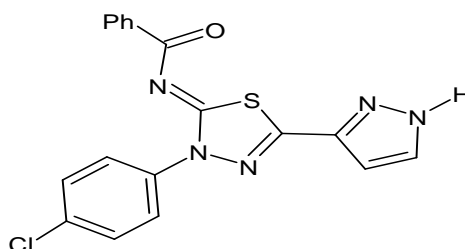


M. Sugumaran *et. al.* [13] have synthesized a novel sequence of flurobenzothiazole incorporated 1,3,4-thiadiazole. The compound was elucidated with UV, IR, Mass,  $^1\text{H}$  NMR, spectral techniques and was evaluated for their antimicrobial activity aligned with *Aspergillus flavus* ATCC 46646, *Micrococcus leutus* NL98, *Proteus vulgaris* NCTC 4635 by disc dispersion process. Amongst which, compound showed good activity. Fig. 26



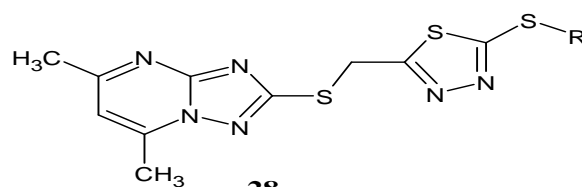
26

A. Farghaly *et. al.* [14] have synthesized a novel sequence of 1,3,4-thiadiazoles incorporate pyrazole, triazolopyrimidine, as well as benzimidazole-pyrimidine using reaction consisting of 1,3,4-thiadiazolenaminones, hydrazonoyl chloride, and nitrogen nucleophile. The synthesized compound showed promising activity. Fig. 27

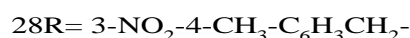


27

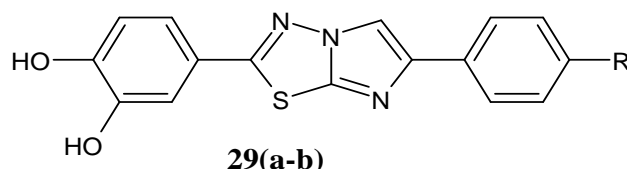
Yin Luo *et. al.* [15] have synthesized a sequence of new 1,3,4-thiadiazole derivative behavior 1,2,4-triazolo[1,5- $\alpha$ ]pyrimidine moiety. The screening was carried out for four bacteria, and five fungi strains. The compound shows excellent antifungal actions against *C. beticola* and *R. solani*. Fig. 28



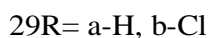
28



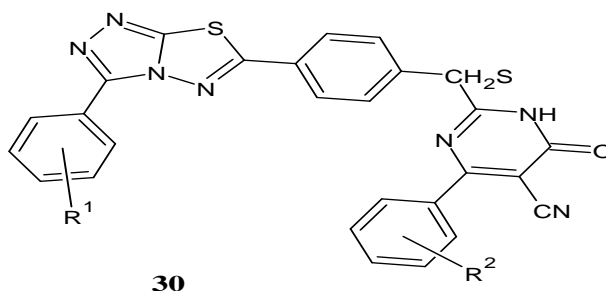
E Taflan *et. al.* [16] have synthesized a sequence of new imidazol[2,1-b][1,3,4]thiadiazole compound in which antimicrobial and antioxidant capacity were examined. Some new kind of ITD molecules having altered pharmacophores at C-2, C-5, as well as C-6 positions showed outstanding antimicrobial activity. Fig. 29



29(a-b)



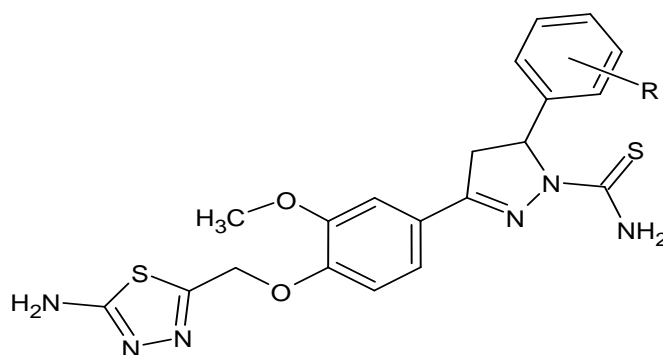
Penglei. C *et. al.* [17] synthesized a sequence of new thiouracil derivatives include a triazole-thiadiazole moiety by structural changes on a lead SecA inhibitor. Then assess for their antibacterial activity aligned with *Bacillus amyloliquefacines*, *Staphylococcus aureus*, and *Bacillus subtilis*. Among them, compound showed excellent inhibitory action aligned with SecA ATPase. Fig. 30



30

$R^1 = \text{H}$ ,  $R^2 = 2,4\text{-diCl}$

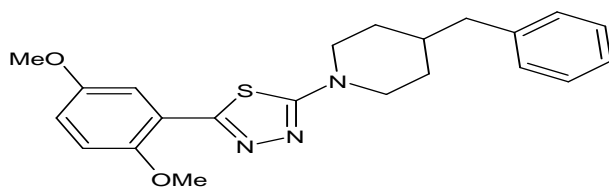
N. Noolvi *et al.* [18] synthesize a sequence of a 1,3,4-thiadiazole derivative of 2-(4-formyl-2-methoxyphenyl) acetic acid with cyclization of carboxylic acid group of 2-(2-methoxy-4-(3-oxo-3-substituted phenyl prop-1-enyl)phenoxy) acetic acid by thiosemicarbazide in the existence of  $\text{POCl}_3$  or PPA. The synthesized compounds to be a monitor for their antibacterial action aligned with *P. aeruginosa*, *V. cholera*, *S. enteria*, *S. aureus*, *B subtilis*, *S. enterica*, *P. mirabilis*, *M. smegmatics*, *E. coli V517*, and antifungal activity against *C. Albicans*. Among the tested compounds, possess significant antibacterial and antifungal activity. Fig. 31



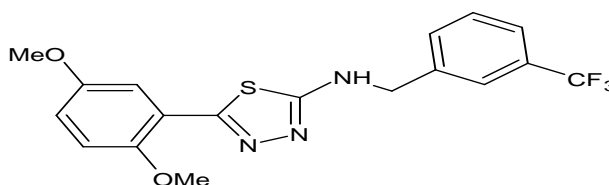
31(a-e)

R; a= 3- $\text{NO}_2$   
 b= 3-OH  
 c= 2,4-diOH  
 d= 4- $\text{NH}_2$   
 e= 4- $\text{NO}_2$

N. Polkam *et al.* [19] have synthesized a sequence of a 2,5-disubstituted-1,3,4-thiadiazole derivative as well as monitored for their *in vitro* antimycobacterial action against *Mycobacterium smegmatis* MC-155. The synthesized compound to be evaluated with spectral analysis viz.  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, FT-IR, Mass, and HRMS. The compounds exhibited the best antimycobacterial activity with MIC values at 65.74  $\mu\text{M}$  and 40.86  $\mu\text{M}$ . Fig. 32, 33

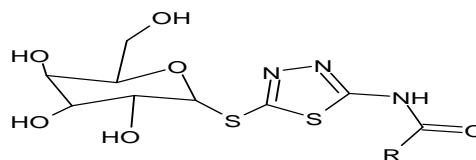


32



33

Vudhgiri *et al.* [20] have synthesized a sequence of 5-fatty-acylamido-1,3,4-thiadiazole-2-thiols with different fatty acid chlorides. Antimicrobial and cytotoxicity actions of compounds to be tested. The compound oleic acid, and free hydroxyl lauric derivatives showed potential activity against cervical cancer cell lines. Fig. 34



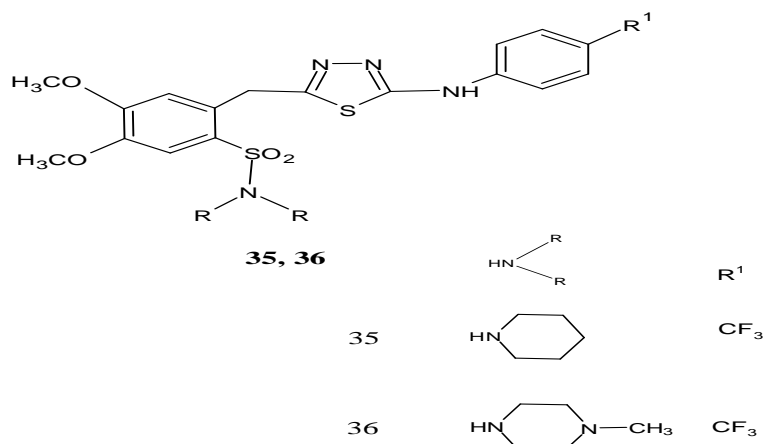
34a,b

a=  $-(\text{CH}_2)_{10}-\text{CH}_3$ ,

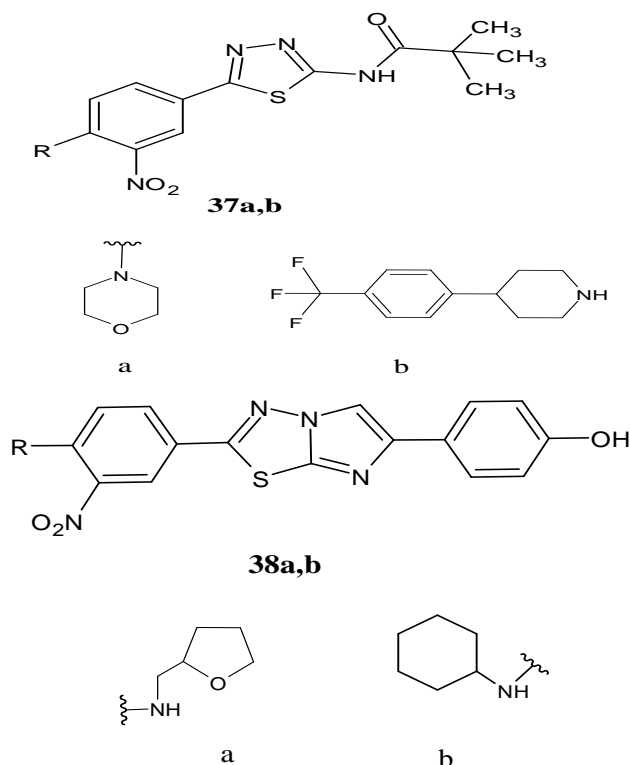
b=  $-(\text{CH}_2)_7-\text{CH}=\text{CH}-(\text{CH}_2)_7-\text{CH}_3$

### ANTIFUNGAL AND ANTIBACTERIAL ACTIVITY

C. Camoutsis *et. al.* [21] have synthesized a sequence of new sulfonamide-1,3,4-thiadiazole as well as tested them for *in vitro* antifungal and antibacterial activity. The compound N-{5-[2-(N-substituted sulfamoyl)-4,5-dimethoxy benzyl]-1,3,4-thiadiazole-2-yl}-N-arylamines shows potential antifungal activities aligned with all the micromycetes. Compound **35** showed better antibacterial activity and **36** shows excellent antifungal activities. Fig. 35, 36

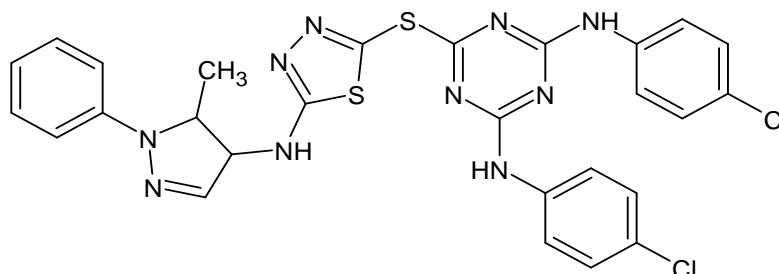


B. Chandrakantha *et. al.* [22] have synthesized a new series of N-[5-(4-alkyl/aryl)-3-nitro-phenyl]-[1,3,4-thiadiazol-2-yl]-2, 2-dimethyl-propionamide and 6-(4-Methoxy-phenyl)-2-(4-alkyl/aryl)-3-nitro-phenyl-Imidazole [2,1-b][1,3,4]thiadiazole. The synthesized molecules to be considered with Mass, IR, NMR spectral and elemental analysis. Among which these compounds were reported to be effective antibacterial and antifungal with showed-reasonable to excellent activity. Fig. 37, 38

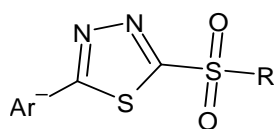


**ANTIBACTERIAL ACTIVITIES**

V. Dubey *et. al.* [23] synthesized a few hybrid 1,3,4-thiadiazole-1,3,4-triazine derivatives and to be characterized by the aid of spectroscopic and elemental analysis. Then it was evaluated for their antibacterial activities aligned with selected gram-positive and gram-negative bacteria. The present compound shows excellent to moderate antibacterial activity. Fig. 39

**39**

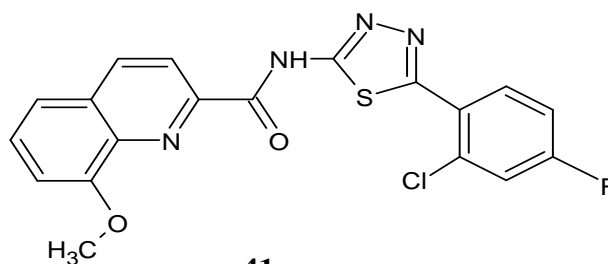
M. Yazdanian *et. al.* [24] synthesize a novel sequence of 2-(5-nitro-2-heteroaryl)-1,3,4-thiadiazole derivatives and monitor *in-vitro* for their inhibitory activity touching eight bacterial strains. The compound showed best antibacterial activity against gram-positive. Fig. 40

**40**

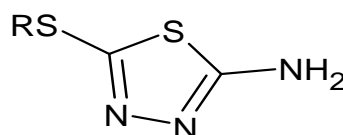
R= Pentyl

Ar= 5-nitro-furan-2-yl

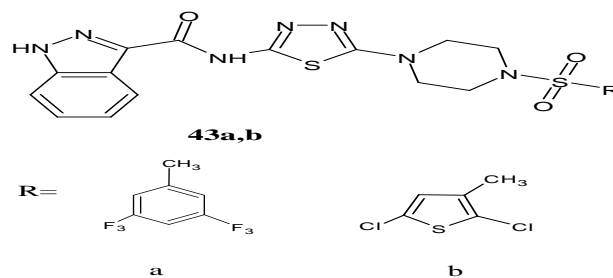
T. Qu *et. al.* [25] designed and synthesize a sequence of a novel 8-methoxyquinoline-2-carboxamide compound having 1,3,4-thiadiazole moiety. The compound to be assessed in *in-vitro* against three gram-positive and three gram-negative bacteria. The compound shows potential antibacterial activity against all the evaluated bacterial strains, particularly for *B. subtilis*. Fig. 41

**41****ANTIDEPRESSANT AND ANXIOLYTIC ACTIVITY**

F. Clerici *et. al.* [26] have synthesized a series of 2-amino-5-sulfanyl-1,3,4-thiadiazole derivatives behavior with different substituents and to be monitored. They were evaluated for their central nervous system activity. Among them, compound showed an outstanding psychopharmacological structure in animal activity with antidepressant and anxiolytic action. Fig. 42

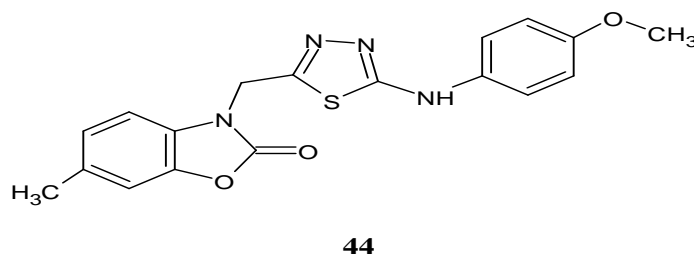
**42**R= 3-CH<sub>3</sub>O-benzyl,**ANTICONVULSANT ACTIVITY**

P. Harish *et. al.* [27] have synthesized a sequence of new indazole substituted 1,3,4-thiadiazole derivatives and characterized them with different spectral studies. Their anticonvulsant activities to be tested, among the synthesized molecules, compound shows outstanding activity. Fig. 43

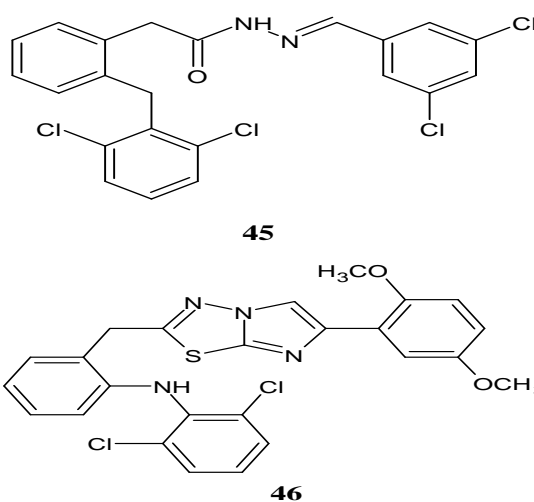


### ANTI-INFLAMMATORY ACTIVITIES

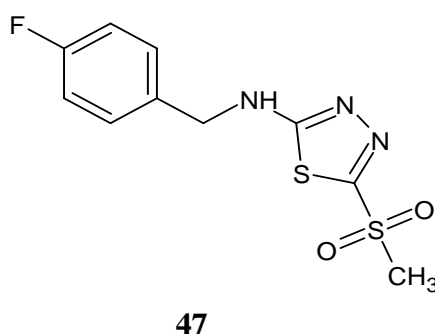
S. Haider *et. al.* [28] have synthesized a focussed library of 1,3,4-thiadiazole-based benzoxazinone and monitor for anti-inflammatory and antinociceptive activity. The molecule shows hydrogen bonding with GLN 61 and interaction with GLY 12, TYR 119, and TYR 12. Fig. 44



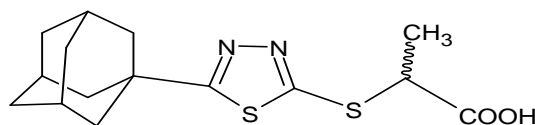
Manjula K *et. al.* [29] have synthesized some novel sequences of Schiff base and imidazo-(2,1-b)-1,3,4-thiadiazole derived from Diclofenac. The formation of final compounds to be established with spectral data, <sup>1</sup>H-NMR, IR spectral techniques. All the newly synthesized compounds to be a monitor for anti-inflammatory activity using the carrageenan-induced rat paw edema process. The anti-inflammatory activity of the synthesized molecules revealed that compounds were most active as compared to the reference diclofenac. Fig. 45, 46



Varandas *et. al.* [30] synthesis and evaluation of anti-inflammatory property of novel 1,3,4-thiadiazole derivatives were reported and exploring the molecular hybridization approach among diuretic drug acetazolamide and 1,3-benzodioxole COX-2 inhibitor new lead compounds to classify the *para*-fluoro-substituted derivative showed more active at the same time same molar concentration. Fig. 47



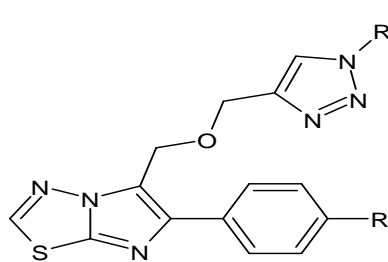
A. A. Kadi *et al.* [31] have synthesized a sequence new 5(1-adamantyl)-1,3,4-thiadiazole as well as evaluated for *in vitro* activity against a panel of gram-positive and gram-negative bacteria along with a yeast-like pathogenic fungus *Candida albicans*. The propionic acid derivative produced an outstanding performed anti-inflammatory activity. Fig. 48



48

### ANTI-TUBERCULAR ACTIVITIES

Ramprasad *et al.* [32] designed and synthesized a new sequence of triazole-imidazo[2,1-b][1,3,4]thiadiazole hybrids with molecular hybridization. The final compound was characterized by using Mass,  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, spectroscopic techniques, and elemental tested. The compounds exhibited excellent activities against the growth of mycobacterium tuberculosis (*Mtb*) with a MIC of 3.125  $\mu\text{g}/\text{mL}$ . Fig. 49

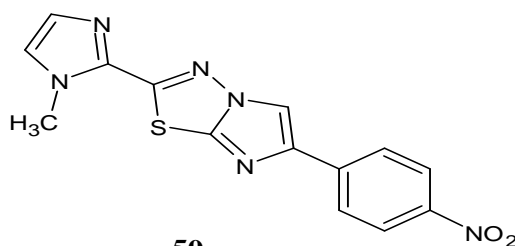


49

R; a=  $\text{OCH}_3$ , b= Cl

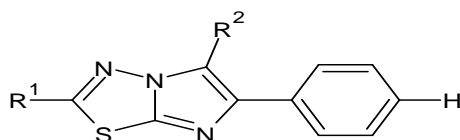
$\text{R}^1$ ; a=  $\text{CH}_2\text{-C}_6\text{H}_5$ , b =  $\text{CH}_2\text{-CH}_3$

H. M. Patel *et al.* [33] synthesized a sequence of imidazo[2,1-b][1,3,4]thiadiazole and characterized by IR,  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, and mass spectral. Then tested for their *in vitro* antitubercular activity against *Mycobacterium tuberculosis*. The compound has shown the maximum (98%) inhibitory action through a MIC of 3.14  $\mu\text{g}/\text{mL}$ . Fig. 50



50

Kolavi *et al.* [34] synthesize a sequence of 2,6-disubstituted and 2,5,6-trisubstituted imidazo[2,1-b][1,3,4]thiadiazole. Then evaluated as well as monitor for antitubercular activity against *Mycobacterium tuberculosis*, antibacterial, and antifungal agent by moderate to good activity. The molecules have shown the maximum (100%) inhibitory activity. Fig. 51

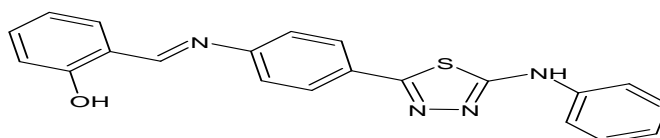


51a-b

a;  $\text{R}^1$ = 2-Furyl,  $\text{R}^2$ = CHO

b;  $\text{R}^1$ = Cyclohexyl,  $\text{R}^2$ =  $\text{CH}_2\text{OH}$

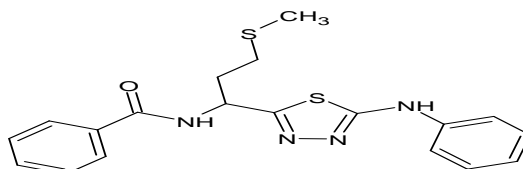
N. Solak *et al.* [35] synthesize a sequence of novel Schiff bases with the condensation reaction of 1,3,4-thiadiazole included. The synthesized molecules to be a monitor for anti-tuberculosis activity against *Mycobacterium tuberculosis H37Rv*. Along with the tested compound, have shown the maximum inhibitory activity (51%). Fig. 52



52

### ANTITUBERCULOSIS AND ANTIVIRAL ACTIVITY

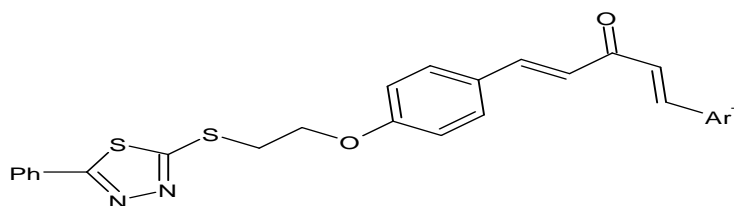
E. Tatar *et. al.* [36] have synthesized series of a few new 1,3,4-thiadiazole and 1,2,4-triazole analogs carrying amino acid moiety. The compounds to be confirmed with the  $^{13}\text{C}$  NMR, IR, and  $^1\text{H}$  NMR, spectral data, and elemental techniques. The molecule to be identified as the most effective inhibitor of Influenza A H<sub>3</sub>N<sub>2</sub> virus by an EC<sub>50</sub> of 31.4  $\mu\text{M}$ . Then evaluated their antituberculosis and antiviral activity. Fig. 53



53

### ANTIVIRAL ACTIVITIES

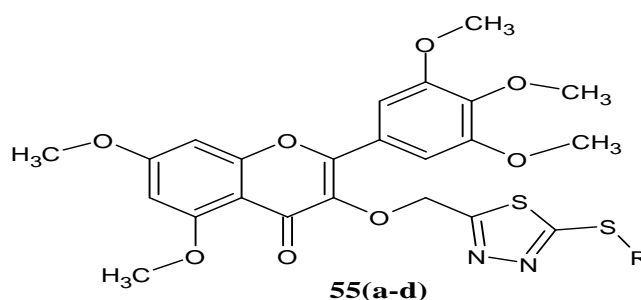
Lu Yu *et. al.* [37] have designed and synthesized a sequence of new 1,4-pentadien-3-one derivatives that have 1,3,4-thiadiazole moiety. Their structure was confirmed with  $^1\text{H}$ -NMR,  $^{13}\text{C}$ -NMR, IR spectroscopy as well as elemental techniques. Then the compounds to be tested against tobacco mosaic virus as well as cucumber mosaic virus *in vivo*. Among the compounds, shows good protection activity against tobacco mosaic virus (TMV). The EC<sub>50</sub> values of **54a-f** were 105.01, 254.77, 135.38, 297.40, 248.18, and 129.87  $\mu\text{g/mL}$  respectively. Fig. 54



54(a-f)

Ar: a= 4-OCH<sub>3</sub>-Ph,  
 b= 4-F-Ph,  
 c= Ar- 4-Br-Ph,  
 d= Ar- 2-F-Ph,  
 e= Ar- 3-NO<sub>2</sub>-Ph,  
 f= 2,6-diCl-Ph,

Zhong *et. al.* [38] synthesized a sequence of new *myricetin* derivatives that have 1,3,4-thiadiazole moiety. The molecules to be tested against antibacterial activities against *Xoo* and *Rs*, as well as their antiviral activity against tobacco mosaic virus (TMV) were. Some targeted compounds were showed excellent antibacterial and antiviral activity. Along with, shows outstanding curative activity against TMV, by EC<sub>50</sub> values of 152.8, 99.7, 127.1, and 167.3  $\mu\text{g/mL}$  respectively. Fig. 55

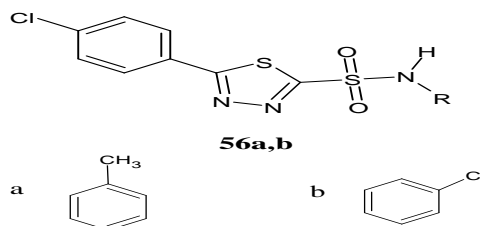


55(a-d)

R= a- 4-CIPh,  
 b- 2-CIPh,  
 c- 2,4-di-CIPh,  
 d- 2-Cl-thiazol-5-yl,

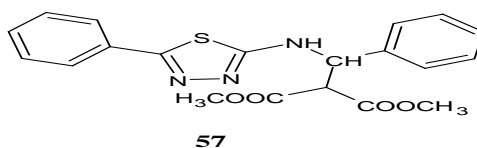


Chen *et. al.* [39] have synthesized 5-(4-chlorophenyl)-N-substituted-1,3,4-thiadiazole-2-sulfonamide derivatives from P-chlorobenzoic acid. The compounds to be evaluated with NMR, IR, as well as elemental analysis. The tested compounds showed promising antiviral activity against TMV. Fig. 56



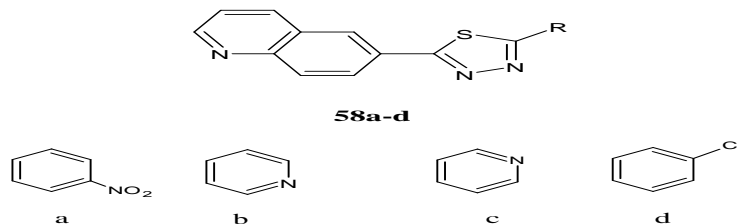
### ANTI-PLANT VIRUS

S. Bai *et. al.* [40] synthesized a sequence of new chiral 5-(substituted aryl)-1,3,4-thiadiazole derivatives Mannich reaction by cinchona alkaloid-squalamine. Compound showed good to excellent potential anti-plant virus activity against tobacco mosaic virus TMV. Fig. 57

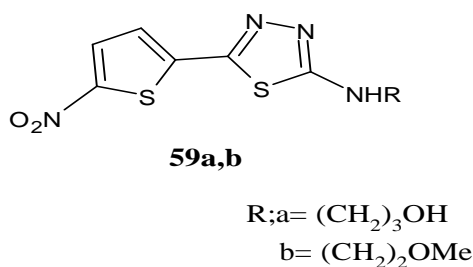


### ANTILEISHMANIAL ACTIVITY

N. B. Almandil *et. al.* [41] synthesized a novel sequence of quinoline-based thiadiazole and to be characterized with EI-MS, <sup>1</sup>H NMR, and <sup>13</sup>C NMR. The compounds showed good inhibition with IC<sub>50</sub> 8.20 ± 0.35, 9.20 ± 0.40, 7.20 ± 0.20, and 9.60 ± 0.40. Fig. 58

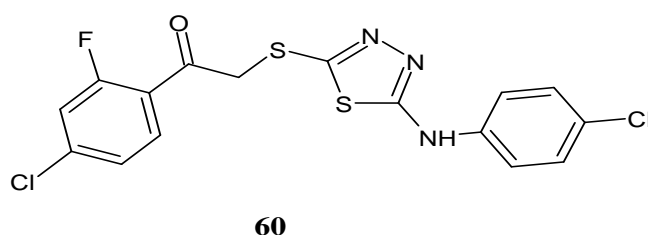


A. Tahghighi *et. al.* [42] have synthesized a novel sequence of 5-(5-nitrofuran-2-yl)- and 5-(5-nitrothiophen-2-yl)-1,3,4-thiadiazole-2-amines behavior with an acyclic amine at the C-2 position and then tested *in vitro* activity against promastigote and amastigote forms of *L. major*. The compounds shows excellent antileishmanial activities. Fig. 59



### ANTIFUNGAL ACTIVITY

A. C. Karaburun *et. al.* [43] synthesized sequences of novel 1,3,4-thiadiazole derivatives and tested their potential antifungal activities against different fungal strains. The compounds showed excellent antifungal activity due to the fluoro and chloro groups at the second position of the phenyl moiety. Fig. 60



**CONCLUSION**

1,3,4-Thiadiazole as a well-known heterocycle has versatile bioactivity and pharmacological properties. Development and discovery of novel 1,3,4-thiadiazole moiety is one the important area in medicinal chemistry; hence, researchers have focused and developed 1,3,4-thiadiazole-based different biological agents. In this review, 1,3,4-thiadiazole derivatives with outstanding activity potency were reviewed, and their cytotoxic effects against various invitro studies were mentioned. In summary, development of compounds bearing 1,3,4-thiadiazole nucleus is an attractive as well as promising area in medicinal chemistry, and pharmacophore possessing this heterocyclic ring have potentiality for discovery of new biologically active drug. In general, 1,3,4-thiadiazole is a special compound that is linked to several biological activities. Through the anticancer, antimicrobial, antibacterial, and anti-inflammatory are shows promising activities. This review shows the 1,3,4-thiadaizole associated with the different pharmalogical and biological activity.

**LIST OF ABBREVIATIONS**

CNS: central nervous system

C NMR: carbon nuclear magnetic resonance

H NMR: hydrogen magnetic resonance

HRMS: high-resolution mass spectroscopy

MTT: diphenyltetrazolium bromide

IR: infrared

NMR: nuclear magnetic resonance

HDAC: histone deacetylase

FAK: focal adhesive kinase

DHFR: dihydrofolate reductase

ATP: adenosine triphosphate

FT-IR: fourier transform- infrared

UV: ultraviolet

MIC: minimum inhibitory concentration

COX: cyclooxygenase

TMV: tobacco mosaic virus

EI-MS: electron ionization mass spectrometer

**ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

NA

**HUMAN AND ANIMAL RIGHTS**

No humans were used in this study

**CONSENT FOR PUBLICATION**

Not applicable

**CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest

**FUNDING**

None

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**SUPPLEMENTARY MATERIAL**

Supplementary material is available on the publisher's web site along with the published article.

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**PHYSICO-CHEMICAL ANALYSIS OF SOIL OF HINDOLI TEHSIL OF BUNDI DISTRICT AND ITS STATISTICAL INTERPRETATION**

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**ABSTRACT**

*Role of soil is very important in the Earth's ecosystem. Without soil human life would be very difficult. Soil provides plants with foothold for their roots and provides the necessary nutrients to grow; it filters the rainwater and regulates the discharge of excess rainwater, preventing flooding; it is capable of storing large amounts of organic carbon; it buffers against pollutants, thus protecting groundwater quality; it provides Man with some essential construction and manufacturing materials. Soil functions are general capabilities of soils that are important for various agricultural, environmental, nature protection, landscape architecture and urban applications. Agricultural products are the major source of food supply for the huge population of our country. Agriculture remains the primary source of income for India's population, and the majority of India's farmers subsist on small farms. This study was set-up to determine the key factors affecting soil quality of Hindoli Tehsil of Bundi District. This Physico-Chemical study of soil is based on various parameter like pH, Electrical Conductivity (EC), Total Organic Carbon, Available Nitrogen (N), Available Phosphorus (P<sub>2</sub>O<sub>5</sub>) and available Potassium (K<sub>2</sub>O).*

*Keywords—Agriculture, Hindoli, Nutrients, Soil, Soil functions.*

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**I. INTRODUCTION**

Soil sampling is perhaps the most vital step for any soil analysis. As a very small fraction of the huge soil mass is used for analysis, it becomes extremely important to get a truly representative soil sample of the field. Soil test based nutrient management has emerged as a key issue in efforts to increase agricultural productivity and production since optimal use of nutrients, based on soil analysis can improve crop productivity and minimize wastage of these nutrients, thus minimizing impact on environment leading to bias through optimal production. Deficiencies of primary, secondary and micronutrients have been observed in intensive cultivated areas.<sup>[1]</sup>

This study is an attempt to analyse the soil quality of Hindoli tehsil of Bundi District. The soil samples were collected and analyzed for specific physical and chemical quality indices. Factors affecting soil quality maintenance in the area according to the findings are natural and man-induced, including agricultural practices in general and deforestation, soil degradation and erosion, as well as biodiversity loss in particular.

Hindoli is a Tehsil / Block (CD) in the Bundi District of Rajasthan. Total area of Hindoli is 1,356 km<sup>2</sup> including 1,354.18 km<sup>2</sup> rural area and 1.58 km<sup>2</sup> urban area. There are about 177 villages in Hindoli block. Hindoli Tehsil has total population of 221,601 as per the Census 2011. The latitude of Hindoli, Rajasthan, India is 25.574915, and the longitude is 75.501465. It is located with the gps coordinates of 25° 34' 29.6940" N and 75° 30' 5.2740" E. Hindoli is on National Highway Number 52. Hindoli is surrounded by small hills. It is directly connected to Jaipur - the capital of Rajasthan. Hindoli is 190 km from Jaipur and 65 km from Kota - a district in Rajasthan that is famous for its industries and coaching institutes. Tourism attractions in the area include the Ramsagar Lake, Paal bhaag, Triveni chowk and Bhijasan Mata mandir. Situated in the lap of the Arawalli Hills, the town is a trade center for many small villages. Wells are the major sources of irrigation here.

Types of soil found in Hindoli tehsil include Lithosol and Rigosols of hills, Yellowish -Brown soils of foot hills and Brown soils -saline phase. The major crops grown in the area are, Jowar, Bajra, Wheat, Barley, Maize, Rice, Gram, other kharif cereals, Tur, other rabi cereals, Rai & Mustard, Til, Ground Nut, Arandi/ Taramira, Cotton, Onion, Red chilli, Tobacco, Potato, Jute. The soil and vegetation of the state of Rajasthan varies with its wide-ranging topography of arid plains or parched regions, hilly tracts of the Aravalis, the flood prone plains of Eastern Rajasthan. Soil quality and fertility is largely influenced by controlling factors like climate soil topography whereas soil erosion is a serious problem for productive agricultural land. The purpose of present study is to create awareness about the soil quality of above said region which might help in maintaining and improving yield and economy.

**II. MATERIALS AND METHODS**

For the Physico Chemical analysis of soil of Hindoli tehsil, soil samples were collected from eight locations named village Bara Naya Gaon, Alod, Pech ki Bauri, Bhawanipura, Ranipura, Dablana, Sathoor and Cheta. In

the present work, samples collected from Hindoli tehsil of Bundi district are discussed. For analysis of physicochemical properties all parameters such as % OC, pH, EC, N, P, K, Zn, Fe, Cu and Mn were analyzed at Umedganj Research Centre of Kota district which comes under Kota Agriculture University.

**III. EXPERIMENTAL DATA OF HINDOLI TEHSIL, BUNDI**

Table 1: Experimental Data of Hindoli Tehsil, Bundi

| Property / Samples         | BH1  | BH2  | BH3    | BH4   | BH5  | BH6   | BH7  | BH8   |
|----------------------------|------|------|--------|-------|------|-------|------|-------|
| <b>Physical Properties</b> |      |      |        |       |      |       |      |       |
| OC (%)                     | 0.34 | 0.65 | 0.68   | 0.44  | 0.31 | 0.51  | 0.36 | 0.68  |
| pH                         | 8.93 | 7.66 | 8.1    | 7.39  | 8.21 | 7.92  | 8.48 | 7.12  |
| temp (°C)                  | 34   | 36   | 37     | 39    | 32   | 41    | 39   | 40    |
| EC (dS/m)                  | 0.42 | 0.66 | 0.44   | 0.42  | 0.68 | 0.57  | 0.72 | 0.66  |
| <b>Micronutrients</b>      |      |      |        |       |      |       |      |       |
| Cu (ppm)                   | 66.3 | 71.7 | 82.12  | 71.56 | 55.3 | 49.36 | 39.3 | 72.31 |
| Fe (ppm)                   | 33   | 64.1 | 49.16  | 40.59 | 48   | 52.98 | 52.7 | 49.95 |
| Zn (ppm)                   | 0.76 | 0.66 | 0.78   | 0.68  | 0.58 | 0.89  | 0.68 | 0.56  |
| Mn (ppm)                   | 15.1 | 16.6 | 15.63  | 17.11 | 18.3 | 11.52 | 12.5 | 14.18 |
| <b>Macronutrients</b>      |      |      |        |       |      |       |      |       |
| N (%)                      | 0.66 | 0.73 | 0.61   | 0.54  | 0.58 | 0.65  | 0.36 | 0.86  |
| P (Kg/ha)                  | 30.8 | 46.9 | 45.22  | 33.33 | 42.5 | 53.51 | 35.6 | 53.29 |
| K (Kg/ha)                  | 227  | 251  | 396.36 | 325.8 | 345  | 374.1 | 312  | 281.7 |

\*BH – Bundi Hindoli.

**I. STATISTICAL INTERPRETATION OF DATA OF HINDOLI TEHSIL OF BUNDI DISTRICT**

**1) MEAN ( $\bar{X}$ )**

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$$

Where,

$f_i$  = frequency of regarding class

$x_i$  = intermediate of class

$f_i x_i$  = multiplication of frequency and class intermediate

$\Sigma$  = symbol of summation

**2) MODE**

$$Mode = L + \frac{(f_m - f_1) \times h}{(2f_m - f_1 - f_2)}$$

Where,

L = Lower limit of modal class

$f_m$  = Frequency Point of modal class

$f_1$  = Frequency Point of class preceding the modal class

$f_2$  = Frequency Point of class succeeding the modal class

h = Size of class interval

Table 2: Calculated Mean and Mode values of data collected

| PROPERTIES         | MEAN VALUES | MODE VALUES |
|--------------------|-------------|-------------|
| Organic Carbon (%) | 0.496       | 0.68        |
| pH                 | 7.927       | 8.1         |

|                                |         |        |
|--------------------------------|---------|--------|
| Electrical Conductivity (dS/m) | 0.571   | 0.66   |
| Copper (ppm)                   | 63.481  | 72.31  |
| Iron (ppm)                     | 48.807  | 52.66  |
| Zinc (ppm)                     | 0.698   | 0.68   |
| Manganese (ppm)                | 15.121  | 15.63  |
| Nitrogen (%)                   | 0.623   | 0.66   |
| Phosphorous (Kg/ha)            | 42.635  | 46.9   |
| Potassium (Kg/ha)              | 314.133 | 325.83 |

#### IV. RESULTS AND DISCUSSIONS

- i. Organic Carbon: - Soil organic carbon is the seat of nitrogen in soil and its determination is often carried out as an index of nitrogen availability <sup>[2]</sup>. It releases nutrients for plant growth, promotes the structure, biological and physical health of soil, and is a buffer against harmful substances. In Hindoli Tehsil the percentage of OC varies from 0.31-0.68.
- ii. pH: - The most significant property of soil is its pH level, Its effects on all other parameters of soil. Therefore, pH is considered while analyzing any kind of soil. If the pH is less than 6 then it is said to be an acidic soil, the pH ranges from 6-8.5 it's a normal soil and greater than 8.5 then it is said to be alkaline soil<sup>[3]</sup>. The soil samples collected from Hindoli Tehsil has pH ranging from 7.12- 8.93.
- iii. Electrical Conductivity: - Soil electrical conductivity (EC) is a measurement that correlates with soil properties that affect crop productivity, including soil texture, cation exchange capacity (CEC), drainage conditions, organic matter level, salinity, and subsoil characteristics <sup>[4]</sup>. The soil samples collected from Hindoli Tehsil has EC ranging from 0.42-0.72.
- iv. Copper: - Copper once was considered as a plant poison, as indeed it may be when excessive amount of it is used on soil. Other research workers determined that copper is distributed through all plant tissues in small amounts <sup>[5]</sup>. The function of the copper in the mineral nutrition of plants appear to be numerous, varied, and complex <sup>[6]</sup>. Copper is an activator of several enzyme systems in plants and functions in electron transport and energy capture by oxidative proteins and enzymes. It may play a role in vitamin A production. In Hindoli Tehsil the range of copper is 39.3 to 82.12 ppm.
- v. Iron: - Iron is a very important element on earth and in soil it is mainly present in the form of silicate minerals and iron oxides. Iron (Fe) is required for the formation of chlorophyll in plant cells <sup>[7]</sup>. In Hindoli tehsil the range of Iron is 33 to 64.1 ppm.
- vi. Zinc: - Zinc is plant micronutrient which is involved in many physiological functions its inadequate supply will reduce crop yields. Zinc deficiencies can affect plant by stunting its growth, decreasing number of tillers, chlorosis and smaller leaves, increasing crop maturity period, spikelet sterility and inferior quality of harvested products <sup>[8]</sup>. The soil samples collected from Hindoli Tehsil has Zinc amounts ranging from 0.56-0.89 ppm.
- vii. Manganese: - Manganese (Mn) is an important micronutrient for plant growth and development and sustains metabolic roles within different plant cell compartments. Its deficit is dangerous for chloroplasts because it affects the water-splitting system of photosystem II (PSII), which provides the necessary electrons for photosynthesis <sup>[9]</sup>. In Hindoli tehsil the range of Manganese is 14.52 to 17.11 ppm.
- viii. Nitrogen: - Nitrogen is found in all soils, and is required by all living creatures. If the soil Nitrogen content is low, the application of N fertilizers becomes indispensable. Adequate supply of this element is associated with the plant growth and the deep green plant color. The excess of this element can delay the crop maturity and prolong the growth period <sup>[10]</sup>. The soil samples collected from Hindoli Tehsil has Nitrogen percentage varies ranging from 0.54 to 0.86.
- ix. Phosphorous: - Phosphorus is an essential nutrient both as a part of several key plant structure compounds and as a catalysis in the conversion of numerous key biochemical reactions in plants. Phosphorus occurs in soil in both organic and inorganic form <sup>[11]</sup>. The inorganic form is more important for the crop nutrition. Phosphorus is noted especially for its role in capturing and converting the sun's energy into useful plant compounds. The soil samples collected from Hindoli Tehsil has Phosphorous amounts ranging from 30.8 to 53.51 Kg/ha.



- x. Potassium: - Among the plant nutrients, potassium (K) is one of the vital elements required for plant growth and physiology. Potassium is not only a constituent of the plant structure but it also has a regulatory function in several biochemical processes related to protein synthesis, carbohydrate metabolism, and enzyme activation. Several physiological processes depend on K, such as stomatal regulation and photosynthesis<sup>[12]</sup>. The soil samples collected from Hindoli Tehsil has Potassium amounts ranging from 297 to 396.36 Kg/ha.

## V. CONCLUSION

As per the results obtained it can be concluded that all data are in optimum range and soil of Hindoli Tehsil of Bundi district is suitable for agricultural purpose. As the pH is above 7 so the soil is alkaline in nature. All micronutrients viz. Copper, Iron, Zinc and Manganese are present within the optimum range. Similarly, macronutrients like Nitrogen, Phosphorus and Potassium amounts are also in the desired range. Sufficient amount of NPK indicates that use of Urea is not required in the soil. However, for the cultivation of some crops DAP fertilizers may be required.

## VI. ACKNOWLEDGEMENT

We express our gratitude to Career Point University for providing platform for conducting this research. This research was supported by Agriculture university Research centre, Ummadganj, Kota in terms of support extended in analysis of soil samples collected for this research.

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**TALENT MANAGEMENT STRATEGIES IN PRIVATE BANKS IN BILASPUR DISTRICT****Poornima Thakur<sup>1</sup> and Dr. (Mrs.) Archana Agrawal<sup>2</sup>**<sup>1</sup>Ph.D Scholar, Dr. C.V. Raman University Kota, Bilaspur 495001 (C.G.)<sup>2</sup>Associate Professor (Commerce & Management), Dr. C.V. Raman University Kota Bilaspur 495001 (C.G.)**ABSTRACT**

*These days organization's talent is its primary source of competitive advantage. Performance of organization depends upon performance of its employees. If employees of an organization possess unique competence, that will differentiate them from their competitors. In this competitive environment retention of talented workforce is a major task for HR managers along with acquisition. Talent management is a very complex task. Right Talent acquisition makes organization strategy healthier. The current global economic situation has increased overall job-seekers in employment market worldwide, but there is still notable talent shortage in different sectors and different countries, this leads to increase the problem of "Talent Mismatch". As today's corporate world requires a person with multitasking skill, talent acquisition is becoming very difficult. As a result, finding the "right" person for a particular job is becoming more challenging. Not only acquisition even retention of talented workforce has become greatest challenge for organization.*

**Keyword:** Organization, Acquisition, Retention, Talent Management, Today Economic Situation.

**INTRODUCTION**

Human resource management is not only to hire the people but also to develop the employee, sustain performance and be competitive, and Human Resource Management or Personnel Administration to measure Employee's Absenteeism, Salary, Employee Turnover, Cost and Similar measurement. Human resource management is the most important for any organization to make the organization run smoothly. This helps in achieving the goal of organization and employment. In today's era, human resource management is given importance, such as Cultural, Structural Building, Companies Competitive, Development Competent and committed employees. Talented employees increase the benchmark of the bank, which shows the performance of banks, good, great being research. There are many ways to hire the productivity of an organization, including higher productivity, lower employee turnover, better client service, greater employee morale and motivation also. Talented employees will have to face challenges in the coming four years of this banking sector, because senior employees will retire and new employees will come, which will bring change in the performance of the organization. It is the fact that the employer must face a challenge in recruiting the talented people. The object of this paper is to fill the gap with the challenge.

**Evolution of the Human resource function**

The evolution of experience human resource function in three parts-the personal department strategic human resource, talent management phase (Bersin, 2006). The graphic quoted from Bersin's article named —talent management, what is it? Why it? Can illustrate these three phase quite clear.

**Stage 1: personal department**

At a time when the Personnel Department had a good existence in the 1970s and 1980s, which was responsible for the business work. The main job of this department was to ensure payment, salaries, jobs etc. to the employees. It was necessary for employees benefit. In these systems which grew up to support for employee, this function were batch payroll Systems & provide welfare facility. In this role, the personnel department was a well understood business function; the talent management is not involved as well as the human resource management.

**Stage 2: strategic human resource department**

The concept of Time Human Resource of the 1980s and 1990s emerged. At that time, people in the organization realized a lot of work of human resources, such as employing employees for roles, designing the organization, recruiting the most talented employees, and ensuring training of the employees. In this time provided various facility as a- employee welfare, insurance, bonus and salary.

**Stage 3: talent management in the organization**

It's actually a term that has always had a variable definition, and Talent management in the organization develops by itself. If seen, what was 20 years ago and what is today. Talent management changes according to time. When talent is managed in the organization, then only the most talented employees are able to stay in the company or else. This is very important.

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**REVIEW OF LITERATURE**

**Dilshath (1992)** this chapter reviews different studies with regard this time says that directly and indirectly related to retail banking. The study acts as a tool for the growth of the future, and forms the basis. Therefore, the present study required investigation. In today's time, this needs improvement in the direction of progress. It has attracted a lot of scholars. Then how much it develops, whether it is more or less, this is why this study is reviewed.

**Philabaum, N (1999)** it is essential for developing the quality of talent in organization, and focusing on employee retention. It not only attracts talent, but also develops the leadership strategy sand it is necessary to create a strategy, So that the most talented employees will be able to sustain our organization, identify senior executives and create strategy in all the banks of the attracted talent and retain them.

**Farley C. (2005)** The current trend, reveals that individuals are less-focused on self improvement and are taking a longer term view of their skill development and hence more scope for selective about their choice of company. Thus organizations have started focusing on talent management issues Farley and employer & employee performance.

**Figliolini et al. (2008)** this study shows that there is a need to emphasize both development and competition. That is why some organization of South Arabia needs a change in culture and three elements that focus, such as talent; team and technology etc.

**Kehinde, (2012)** Talent management strategy is a strategy in which practice is indicated before hiring a talent. Talent becomes a group of executives who become senior executives in the future of the company.

**Festing&Schäfer, (2014)** In this research paper definition, the importance of employee in organization, benefits of organization, talent management, elements, strategy, and challenge are explained. And in conclusion, it was found that all the top level officers of the organization agreed. Human resources have a significant contribution in the organization and provide long-term competition in the market, so that the trade is as much as in war.

**RESEARCH METHODOLOGY**

Research Methodology is the theory of the creation of methodical process and methods.

**OBJECTIVES OF STUDY**

- To assess the effectiveness of talent management practices used by private sector banks to manage talent.

**THE POPULATION**

This study is aimed assessing Private Bank Sector in Bilaspur and hence all the employee of the Private Banking Sector in Bilaspur would be considered as population of this study.

**SAMPLE SIZE**

Total sample size is 250. Out of those 250 respondents, 109 samples from Axis bank, 101 sample from ICICI bank and 40 samples from HDFC bank.

**RESEARCH DESIGN**

For this study researcher were decided to use sampling techniques for this work. This approach was exact for the study, since the researcher intended to collect detailed information through descriptions and was useful for identifying variables and hypothetical constructs. In this method was provided descriptions of the variables in order to answer the research questions in the study.

**HYPOTHESIS**

H1: Employee satisfaction has a significant impact on talent retention & talent acquisition.

**LIMITATIONS OF THE STUDY**

- Time constraint along with limitations in budget is the major limitations in this research work.
- The sample size is limited to 200 respondents which may provide a biased result as the actual population is large and unknown.
- There is possibility of occurring errors in selection of sample, collecting responses from respondents and interpretation of the collected responses.
- Time is always a limit.
- Study is limited to private Bank of KorbaI.e. ( Axis, ICICI & HDFC Bank).

**DATA ANALYSIS****Hypothesis**

H1: Employee satisfaction has a significant impact on talent retention & talent acquisition.

**Model Summary**

| Model | R     | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------|----------|-------------------|----------------------------|
| 1     | .121a | .015     | .005              | .61041                     |

a. Predictors: (Constant), Employee Retention, Talent Acquisition

In the above table, it is found that Adjusted R Square of current model is 0.005 and R-square is 0.015, that means the linear regression explains only 1.5% of variance of data. The factor Employee retention, Talent Acquisition and Employee satisfaction is having R value of 0.121 and hence it indicates that predictors and dependent variable show only 12.1% relation.

**ANOVAa**

| Model | Sum of Squares | df     | Mean Square | F    | Sig.  |       |
|-------|----------------|--------|-------------|------|-------|-------|
| 1     | Regression     | 1.097  | 2           | .549 | 1.473 | .232b |
|       | Residual       | 73.402 | 197         | .373 |       |       |
|       | Total          | 74.500 | 199         |      |       |       |

a. Dependent Variable: Career Planning

b. Predictors: (Constant), Employee Retention, Talent Acquisition

In the table above, F value is low so that there is a chance to reject a null hypothesis and accept the alternate hypothesis. Here, the null hypothesis is "Employee Satisfaction has no significant impact on talent retention talent acquisition" is **accepted** because the sig. value obtained in above table is 0.232 which is more than alpha value of 0.05 ( $p > 0.05$ ).

**CONCLUSION**

Organization takes lots of efforts for the retention of its employees and hence an attempt is made to identify the employee performance & retention activities provided in private banks. Majority of the employees agree that they are provided with flexibility in work (e.g. working from home, flexible timings etc.), employees also agree that in their organization leaves are comfortably granted to employees for meeting their personal and family obligations. Majority of the employees do agree that measures are taken in their organization to help employees balance their professional and personal lives. It is further found that employee-morale surveys are periodically conducted in the organization to assess the views of employees regarding organizational environment. Most importantly, it is found that the appraisal process in the organization is uniform.

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**ECONOMIC DISPATCH OF REAL POWER GENERATION USING LAGRANGE MULTIPLIER ALGORITHM****Ismail Marouani<sup>1</sup> and Hsan Hadj Abdallah<sup>2</sup>**<sup>1</sup>Assistant Professor and <sup>2</sup>Professor, Control & Energies Management, (CEM-Lab) National Engineering, School of Sfax, ENIS Sfax, Tunisia

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**ABSTRACT**

*The economic dispatch of generators is a key element in the optimal operation of power generation systems. Many power system optimization problems including economic dispatch (ED) have nonconvex characteristics with heavy equality and inequality constraints. Although, in this paper, the dynamic economic dispatch (DED) problem with active power flow limits and transmission line loss is solved using Lagrange multiplier algorithm (LMA). The objective of the DED problem is to find the optimal power output of each unit at each time so as to minimize the total generation cost. In addition, this optimal solution must meet the demand power in a given time interval. The performance and effectiveness of the proposed algorithm are verified via numerical studies on the 26-bus test system network. The results of simulation are obtained using matlab Simulink.*

*Keywords: Economic Dispatch problem, Lagrange multiplier optimization, costs of generation, demand power, power losses.*

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**MULTI-OBJECTIVE OPTIMIZATION BASED ON NSGAI2 APPLIED FOR ACTIVE AND REACTIVE DISPATCH PROBLEM**

**Ismail Marouani<sup>1</sup> and Hsan Hadj Abdallah<sup>2</sup>**

<sup>1</sup>Assistant Professor and <sup>2</sup>Professor, Control & Energies Management, (CEM-Lab) National Engineering, School of Sfax, ENIS Sfax, Tunisia

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**ABSTRACT**

*This paper presents the application of an elitist multi-objective evolutionary algorithm based on the Genetic Non-Dominated Sorting Algorithm II (NSGAI2) applied to solve the active and reactive dispatch problem ARDP. This problem consists to optimizing simultaneously three objective functions, such as the real power loss in the transmission lines, the voltage deviation at the load buses and the cost of the active power production, while satisfying several equality and inequality constraints. To validate this optimization technique, a 14-bus test system is used. The results of simulation are obtained using matlab Simulink.*

*Keywords: Economic Dispatch problem, Lagrange multiplier optimization, costs of generation, demand power, power losses.*

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# MANUSCRIPT SUBMISSION

## GUIDELINES FOR CONTRIBUTORS

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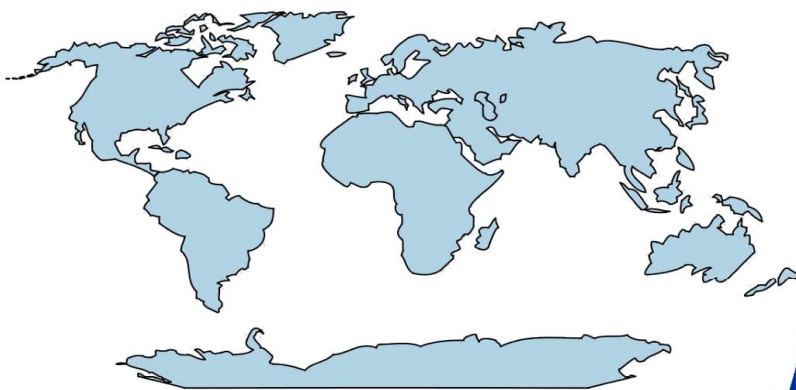


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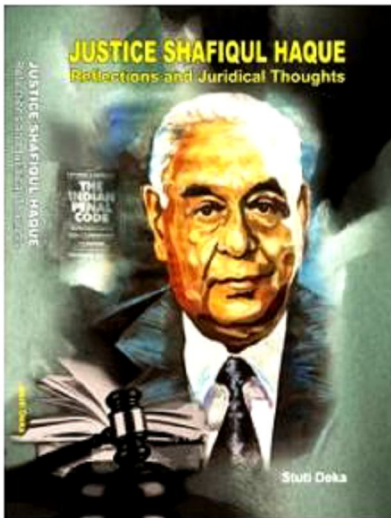


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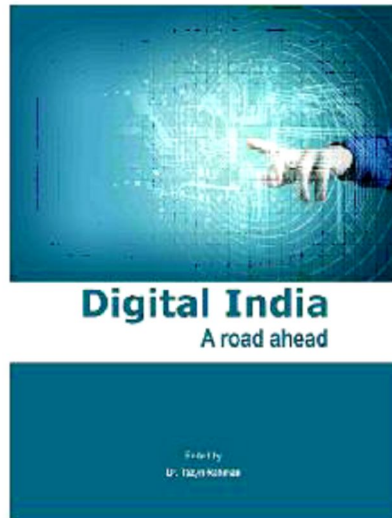
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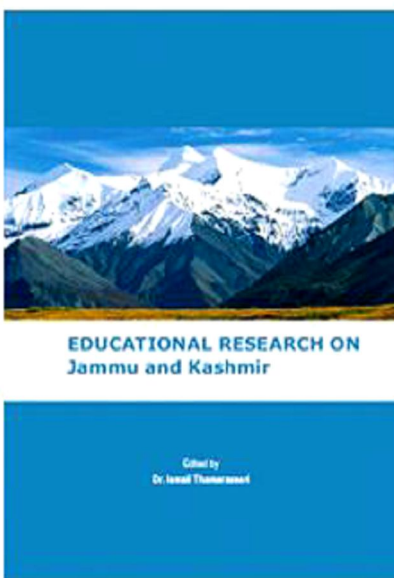
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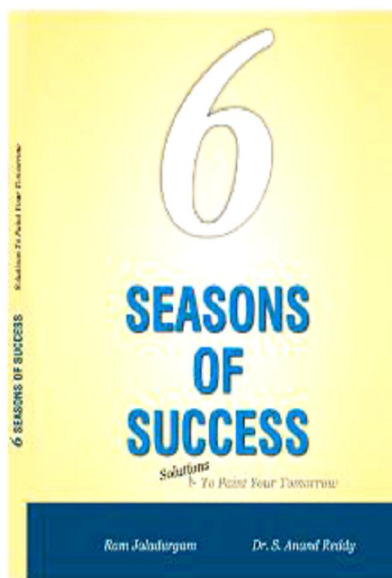
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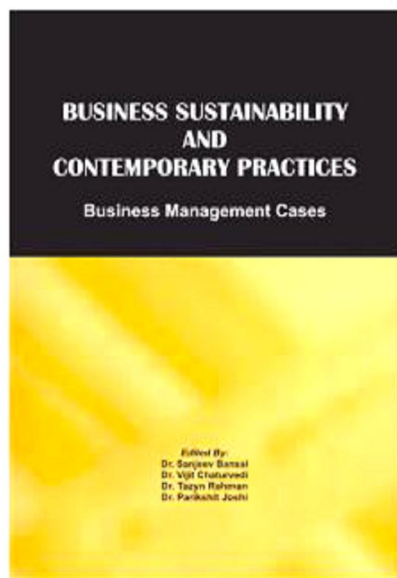
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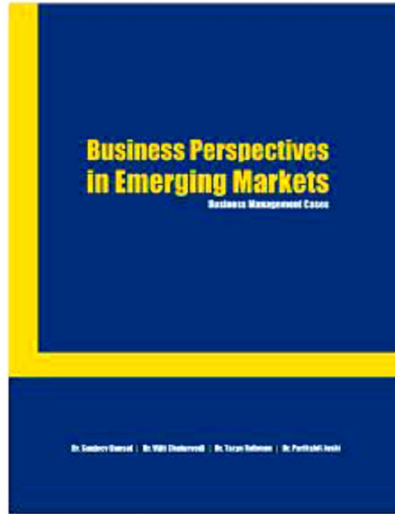
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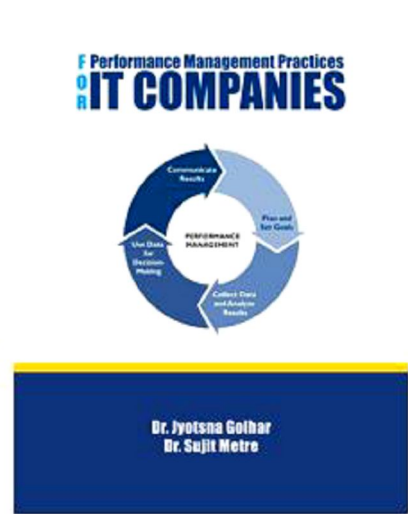
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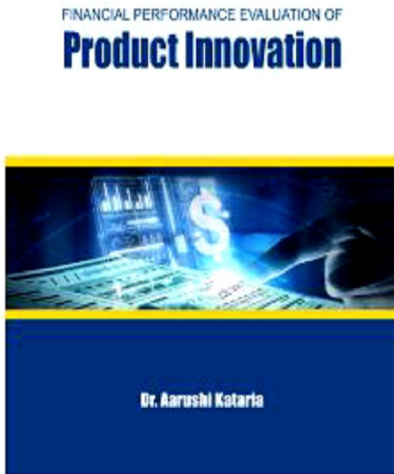
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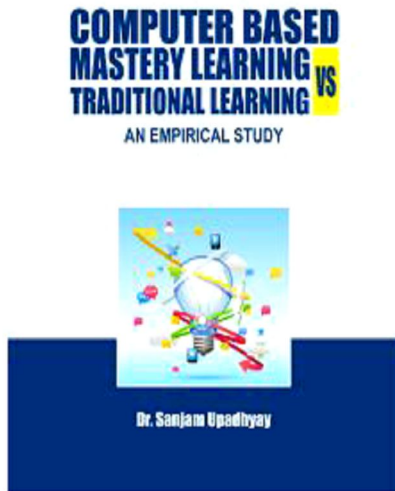
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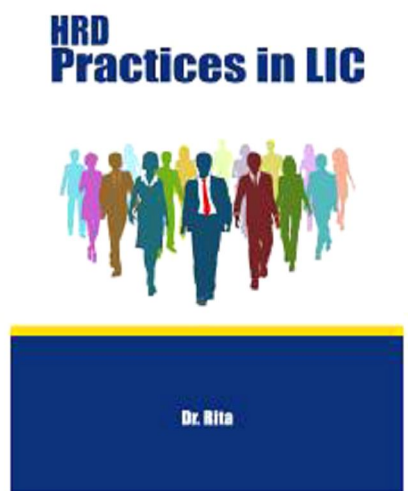
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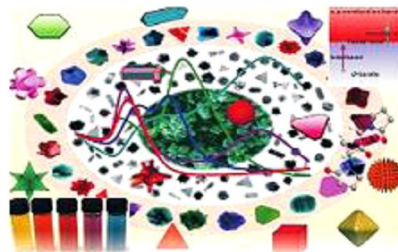


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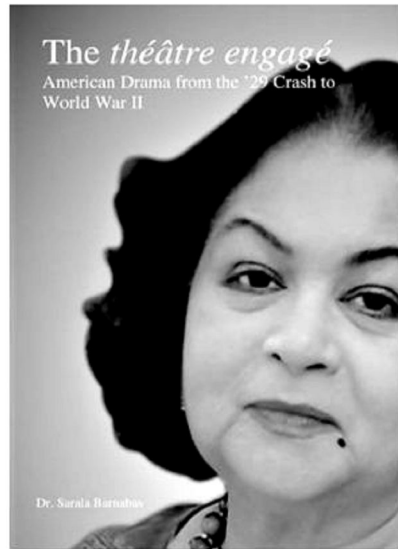
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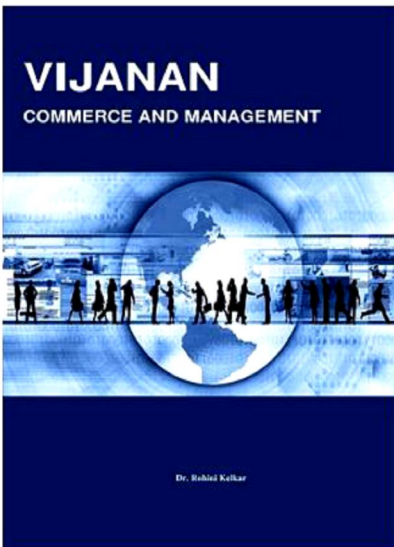
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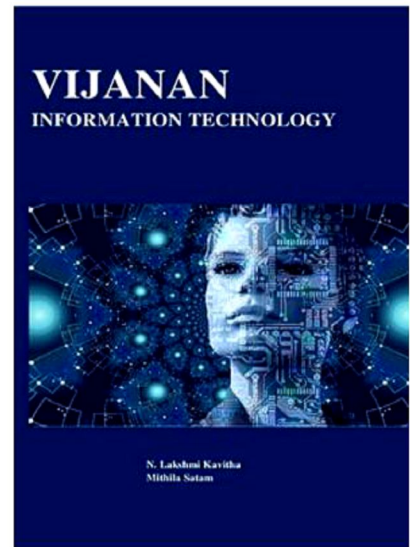
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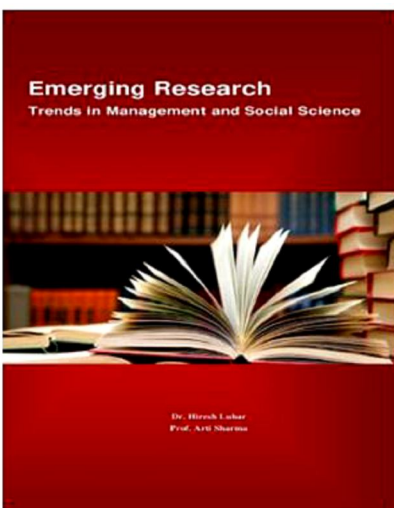
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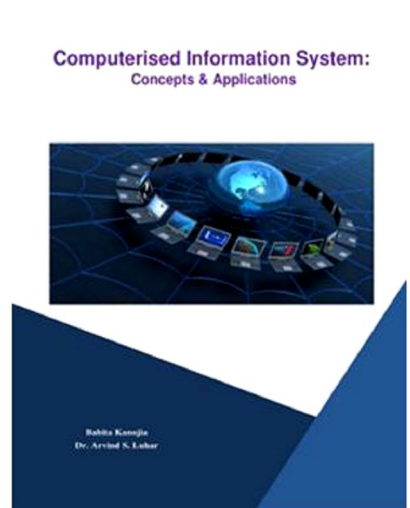
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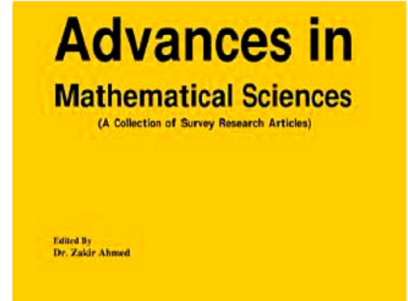
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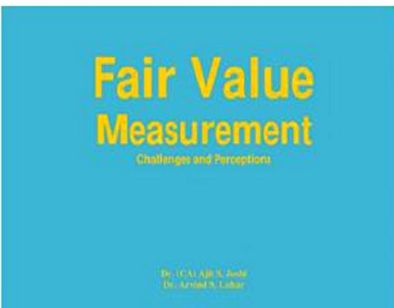
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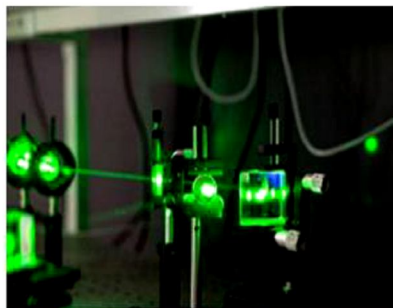
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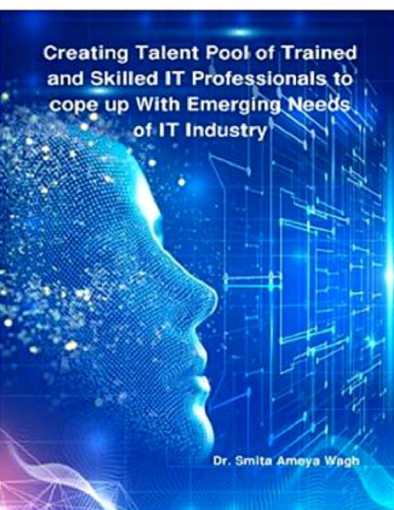


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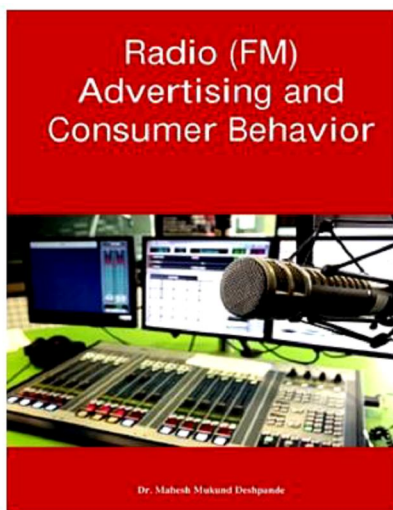
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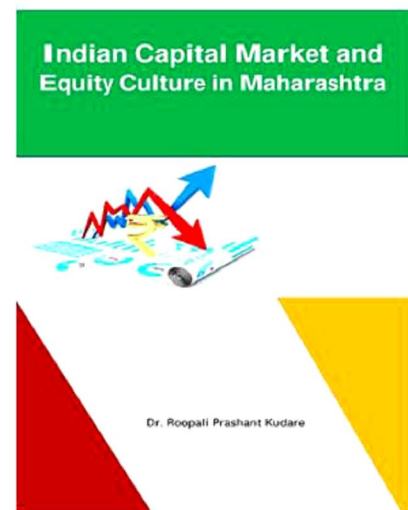
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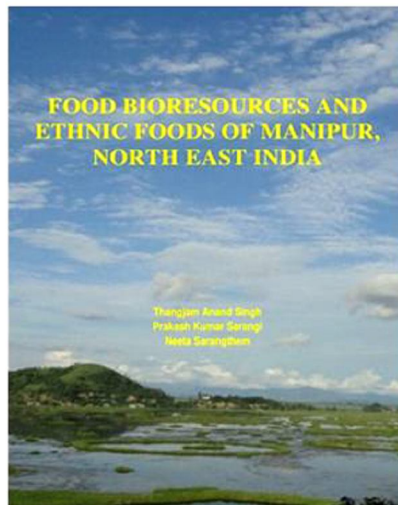
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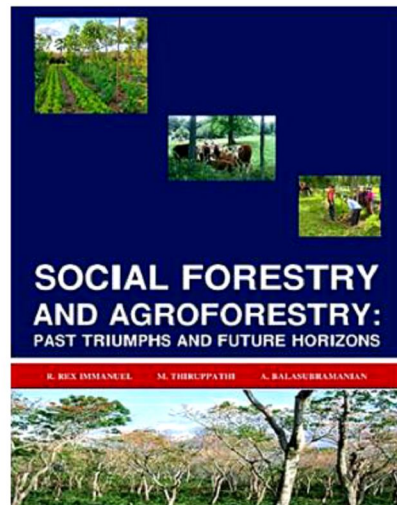
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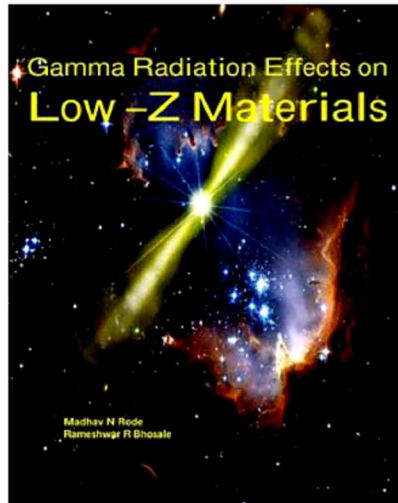
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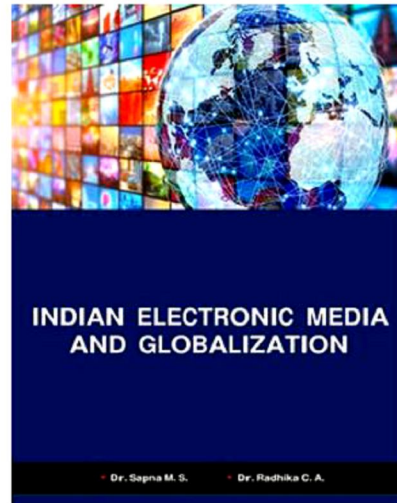
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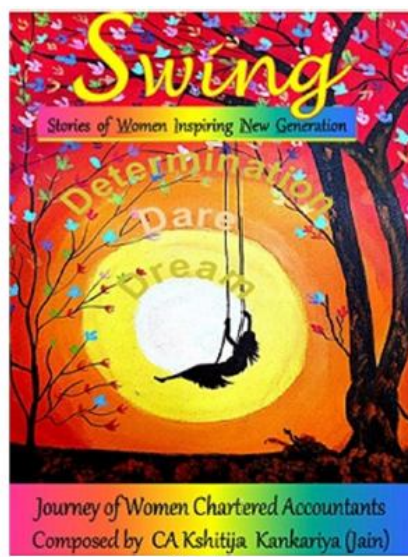
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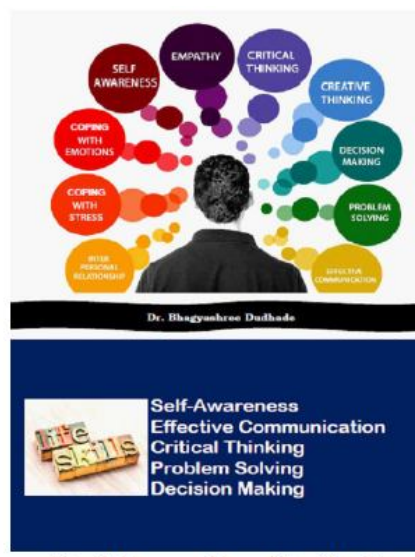
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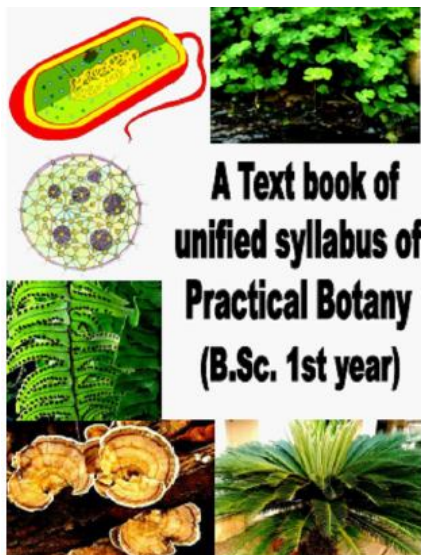
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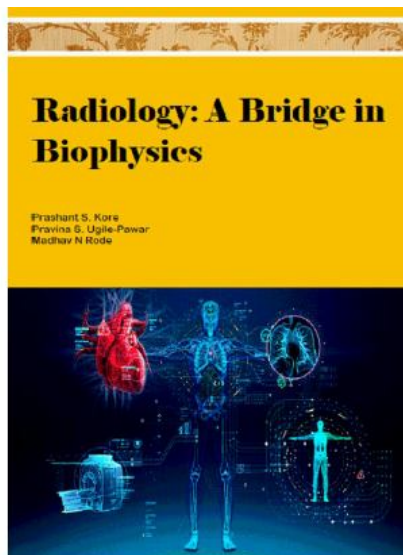
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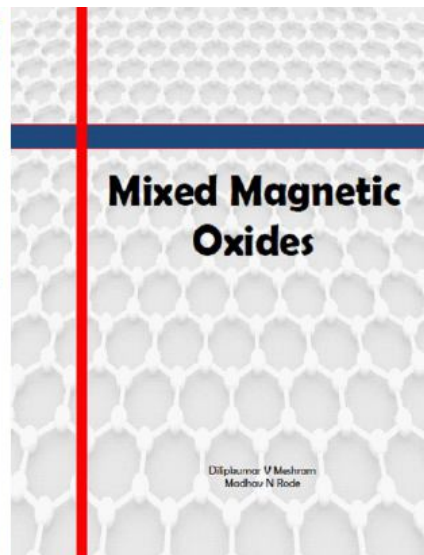
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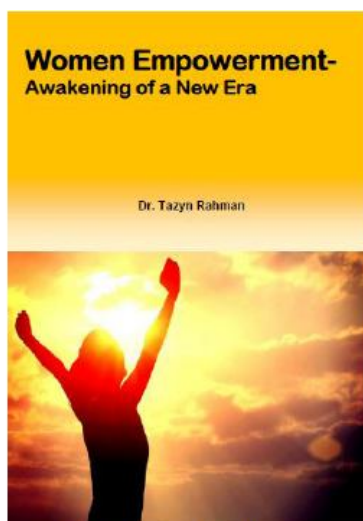
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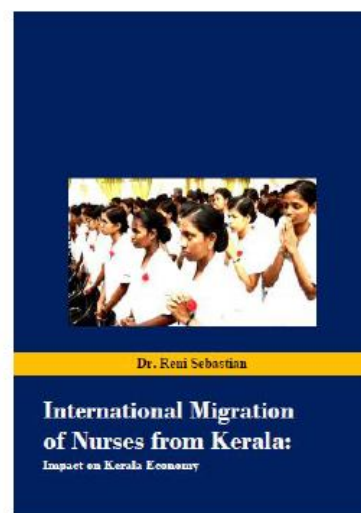
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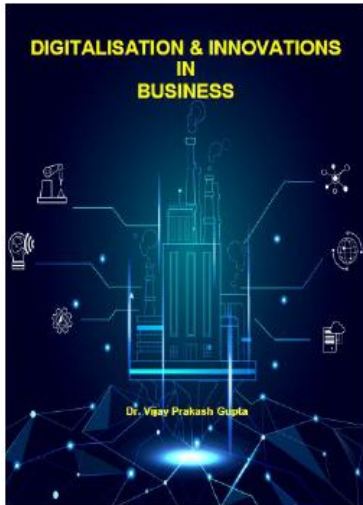
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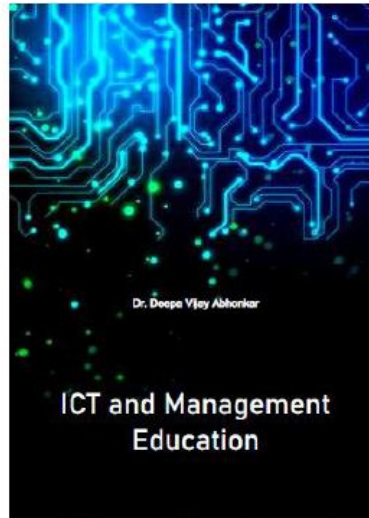
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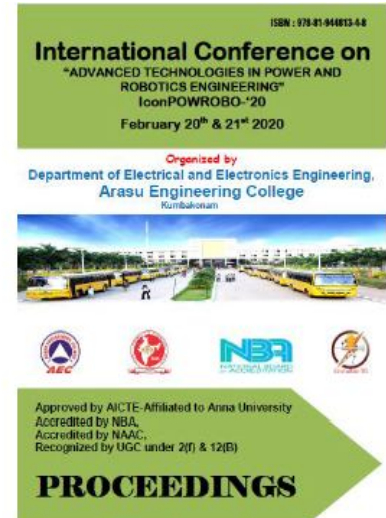
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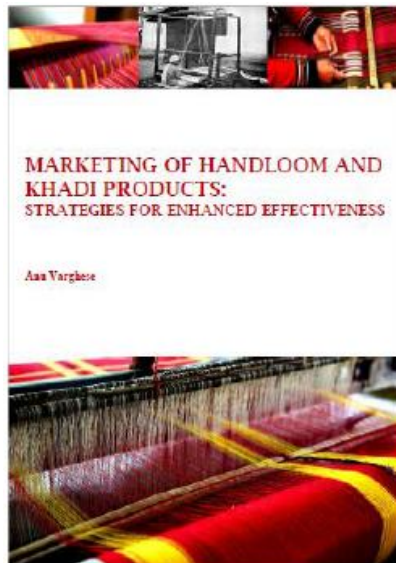
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