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SANTALS IN MAL SUBDIVISION OF DOOARS: A WAY OF TRANSITION

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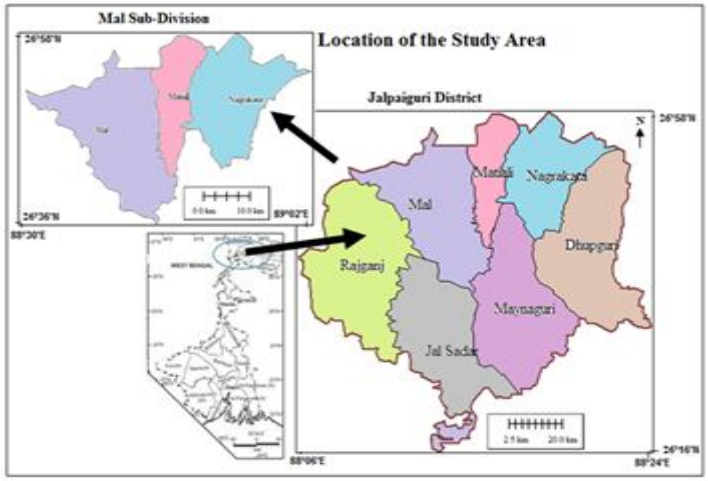
ABSTRACT
The Santals are one of the largest ethnic group of people living in India. They occupy primarily the Chotanagpur plateau and the Santal Parganas district is considered to be the heart of the Santals area. Prior to the nineteenth century, the basic subsistence pattern of occupation of Santals were hunting and gathering. But with an ever-increasing population and the rapidly decreasing game supply, the Santals have since turned to agriculture and industrial labourers. They used to love music and their age old traditional dances. With the changes of their occupation and impact of modernization and mainstream Indian culture their value based cultures are gradually decreasing. In Dooars of Jalpaiguri district Santals were borrowed as tea garden labourers, as a result their culture has been changing rapidly and they are in way of transition. Present paper focuses the pattern of changes of their livelihood.

Keywords: Culture, Santal, Socio-economic conditions, Transition, Traditional value.

INTRODUCTION
The Santals are a nomad race, mostly inhabited in Santal Parganas of Jharkhand. The Santals are absolutely the best specimen of the wild tribes in India. Grierson (1990) opined that the word is derived from '*Kherwar'*. Two major incidents cause migration of Santals and other tribal people from Chhotonagpur region to Dooars region during British period: a) loss of right on jungles due to new forest policy of British Government in Chhotonagpur areas whereby felling of trees in reserved forests were prohibited and declared punishable by law, deprived them of their traditional ways of living and forced them to leave homeland. It was for that reasons, thousands of labourers emigrated from Chhotonagpur to the tea gardens of Dooars (Sunders, 1895). b) Introduction of tea plantations in Dooars causes job opportunity. Santals spread out in all the districts of West Bengal from there. They are short heighted, well-made, and active man, having a round face, and the thick lips, high cheek-bones, and spread nose, straight haired. Common Santal surnames are Murmu, Tudu, Hansda, Hembrom, Soren and Santal etc.



Present study focuses the Santals living in Mal subdivision of Dooars. It is a subdivision of Jalpaiguri district consisting with three community development blocks, namely Mal, Matiali and Nagrakata, where altogether 22 gram panchayats are there. The region is a foothill of the Himalayas consisting with tea gardens and agricultural land.

MATERIALS & METHODS
To find out the changes of livelihood of Santals in present context comparing with their traditional culture qualitative and quantitative information both are important. Qualitative information gathered from different literatures dealt with tribal in general and Santal in particular. Quantitative information have been gathered from primary data collected from sample villages. Random samples have been incorporated taking samples from every Gram panchayat areas of the subdivision. To give the study a geographic view, census data have been incorporated to find out the spatial distribution of tribal people in each of the Gram panchayat. On the basis of the information of respondents statistical tool have been used to interpret the results.

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TRADITIONAL SOCIO-ECONOMIC STATUS OF SANTAL COMMUNITY

The tribal divisions of Santals are: the Saran, Murmu, Marli, Kisku, Besara, Hansda, Tudi, Baski, Hemroo, and Chorai; but they do not materially differ from each other in any respect. The chief God of all these groups is *Sing Bonga*, the Sun-God. The Santals are admirer of nature, and never fell down any useful or ornamental tree, which gives them clearings a park-like and unmistakable appearance; and they enjoy life better than other people of their same grade, being immensely fond of music and dancing. Their flute is a simple instrument made of the bamboo, but gives out deep, rich tones; and every village has a dancing ground where the youths and maidens meet in the evening to dance and sing. All marriages in the traditional Santal society are love matches. The selection is said to be preceded by a beastly festival, named *Bandana* which is held in the month of January, and lasts for six days. Polygamy is permitted, but seldom has recourse to; and the wife is always treated with kindness. Divorces are allowed in case of maladjustment. The chief ornaments in use among both sexes are flowers and feathers, and also cow tail-hair necklaces, which are very neatly manufactured. The women also wear on their arms, ankles, and throats ornaments made of brass and bell- metal, which are excessively heavy; and the love of the husband is in this sense, a sore burden to the wife (Dutt, 1984).

Santals are good hunters, good herdsman, and good agriculturist, and thereby self-dependent in everything. But they are mostly settled agriculturalists (Sharma, 2007). Santals always reclaim the jungle they come to inhabit, carefully collect all their products.

In Dooars areas the Santals are either agriculturalists or agricultural labourers. The hut of the Santal is well made, and well raised. Its walls are made of matting, or hurdle, or thin sticks smeared over with mud; and owing to love of colors, a grey appearance is often given to them by their painting with different shades of red, white, and black, according to the owner's fancy. The Santals usually have large family to accommodate in a house.

SPATIAL DISTRIBUTION OF SANTALS IN MAL SUBDIVISION OF DOOARS

Santals are the largest tribal community in West Bengal. They share 51.8% of the total ST population of the state (Census, 2001). The Santals are the third major tribal community of the Mal subdivision. About 8.43% of the total tribal households of the subdivision are occupied by the Santals. In every Gram Panchayat areas of the three blocks of the subdivision, the presence of the Santal households have been noticed. Maximum concentrations of Santals in respect of total tribal households occurs in Chapadanga GP (64%) followed by Moulani (51.33%), Kranti (36.25%) and Lataguri (18.40%). Almost in all GPs, shares of Santal households to total tribal households are significant in number. Highest numbers of Santal households are found in Damdim (440) followed by Matiali Batabari-I (422).

Highest share of Santal households to total Santal households of the Mal subdivision are found in Damdim GP (11.63%). The second and third position goes to Matiali Batabari-I (11.13%) and Rajadanga (7.96%) respectively. In Damdim Tea Garden mouza of Damdim GP and Jogesh Chandra Tea Garden mouza of Changmari GP, the Santals are densely concentrated. So, it may be said that the distribution of Santal households are found both in tea garden based GP areas and non-tea garden based GP areas.

Table-1: GP-Wise Distribution of Santal Households, Percentage to Total Tribal Households, and Percentage to Total Santal Households in Mal subdivision of Dooars

GP Name	Santal Households			GP Name	Santal Households		
	Total Hslds	% to Total Tribal Hslds	% to total Santal Hslds		Total Hslds	% to Total Tribal Hslds	% to total Santal Hslds
Bagrakot	202	5.05	5.33	Matiali Batabari-I	422	12.79	11.13
Odlabari	141	6.71	3.72	Matiali Batabari-II	75	4.17	1.98
Rangamatee	103	2.29	2.72	Bidhannagar	221	14.73	5.83
Rajadanga	302	13.13	7.96	Matiali Hat	60	3.75	1.58
Damdim	440	12.57	11.60	Indong Matiali	160	5.71	4.22
Tesimla	75	13.64	1.98	**Matiali Block**	**938**	8.53	24.74
Kumlai	275	12.50	7.25	Angrabhasa-I	149	16.56	3.93
Changmari	125	12.50	3.30	Angrabhasa-II	21	3.23	0.55
Kranti	145	36.25	3.83	Sulkapara	157	6.68	4.14
Chapadanga	32	64.00	0.84	Champaguri	297	6.32	7.83
Moulani	77	51.33	2.03	Looksan	267	6.07	7.04
Lataguri	46	18.40	1.21	**Nagrakata Block**	**891**	**6.85**	**23.50**
Mal Block	**1963**	**9.35**	**51.77**	**Mal Subdivision**	**3792**	**8.43**	**100.00**

Source: Compiled by the Researcher, 2017

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FINDING

Socio-economic status of Santals in Mal subdivision of Dooars Region

All tribal groups traditionally bear rich socio-cultural heritage but poor subsistence base of economy. After dislocation in Dooars area for plantation purpose, Santals with all other tribes assimilated with many other tribal and non-tribal communities. Following are the changes of Santals people:

a) Occupation & Economy: Earlier the Santal people used to depend on agriculture and hunting gathering, now in Dooars area they have totally changed their occupational pattern. Working as tea garden labour becomes their primary occupation mainly in tea garden dominated villages while agriculture and labour as agricultural field become their main occupation in villages of Lataguri, Moulani, Chapadanga and Kranti. Many of them are working on bamboo products, boulder lifting etc. A considerable portion depends earning from outside states.

Table-2: Occupational Pattern of Santal in Dooars

Occupation	Tea Garden	Agriculture	Agri-labour	Household Industry	Others
Percentage Share	51%	13%	19%	8%	9%

Source: Primary data, 2017

Economic conditions of Santals are relatively better than the other tribes of Dooars. Inter community study indicates that Santals position is 2nd after Munda in terms of economic *condition*. However, those who have lands earn more than the others. Santals are more in number in agricultural lands than the other tribal communities. Many of them living in Lataguri, Chapadanga are richer than tea tribes. Food habits of the Santals have remarkably changed.

b) Demographic Characteristics: Demography is the quantitative study of human population. Santals of Dooars are not much aware of their demographic records i.e. birth, death, history of their migration, age structure etc. Primary data regarding demography has been collected during household survey which are tabulated and analysed to give it a clear idea of the demographic pattern of tribal people. The present context focuses five indicators for demographic profiles of the tribal people: sex ratio, crude birth rate, crude death rate, infant mortality rate and age of marriage.

Table-3: Demographic Characteristics of Santals in Dooars

Demographic Element	Sex-ratio	Crude birth rate (CBR)	Crude death rate (CDR)	Infant mortality rate (IMR)	Average age of marriage	
					Male	Female
Numeric strength	1005	2.8%	1.1%	6.7	21	16

Source: Primary data, 2017

Tribal sex ratio is significantly high throughout the ages and spaces. Normally sex ratio is expressed as number of female population per 1000 male population. Santals have 1005 female per 1000 male population. Their birth and death rate both are very high compare to state and national average. A child below one year of age is called an infant. In terms of demography their age group is described as "Zero". Infant mortality rate of Santal is very high in Mal subdivision i.e 67 per 1000 live births. Poor income, malnutrition, poverty causes such high amount of infant mortality as well as adult mortality. However, birth rates have already been declined among all tribal communities. Contraceptives to control birth rates have been introduced in many families. Average age of marriage of a female is low compared to general prescription of rule i.e. 18 years. This is due to lack of marriage.

c) Social Customs: In the context of improving the conditions of backward people in the country, the development of tribal people deserves special attention as these aboriginal people have remained outside the mainstream of socio-economic conditions. They are normally poor, neglected, exploited and educationally backward. The Santals have their rich traditional folk cultures. Most of the times, the women perform the dancing and ceremonial rituals and the males play the rhythmic sets made by them. Now the question arises, are the tribal people changing their traditional age old customs and musical instruments after advent of many modern instruments? It is found that traditional belief and practice as a whole have been losing its appeal particularly among young people, rather, they prefer to participate in national as well as regional festivals like Durga Puja, Kali Puja, Laxmi Puja, and Holi etc. Musical instruments like Singa, Madol, bamboo flutes are accompanied or replaced by the modern instruments. Wooden *Ghangli* of the tribes are replaced by violin; piano is used instead of bamboo made *tirio flute*. The earlier open mouth tribal songs are abolished in many cases, instead of it, there could be found modern sound system. The Santals men and women are very fond of music and dance. Archer (1946) rightly called them a 'musical people'. They have elaborate song

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cycles for festival occasions and for the various stages of agricultural cycles. Religious beliefs has been changed from tribal animism to Hinduism and Christianity. With the impact of westernisation coupled with industrialization and urbanisation, the Santals have yielded a significant change in their life style (Mohsin, 1964). Santals' culture is gradually languishing due to modernisation in religious believes and modern technology (Prasad, 1971). They are now in a state of flux and in a process of putting on a new social identity and image over their crumbling norms. However, the Santals still retain the essential core of their unique socio-cultural background notwithstanding the diverse influence on them. Following traditional cultures and customs have been destroyed.

- Animism or tribal religious faiths have been largely converted to Christianity or Hinduism.
- Marriage outside the own community was prohibited but now it is widely practiced.
- Every clan or *goitra can* must bear totemic symbols now in way of abolition.
- After habitation in Dooars their clan or *gotra* wise division of labour or occupation is totally collapsed. Every one now familiar to be a tea garden labour or agriculturalist.
- Concept of local self-government leaded by *Morols* in the Santal society has been abolished today. Educated Santals started taking interest in village politics. Elections on all India level also affected them and the result was the growth of factions and parties in the villages and formation of regional political parties (Vidyarthi & Rai, 1976).
- Dress and ornaments of Santals are now westernised and modernised by the way of assimilation with non-tribal people.
- There is a tendency of youth Santals to disobey the traditional cultures. They are very much reluctant to follow their age old traditions.

ANALYSIS & DISCUSSION

Since independence, India has been actively thinking for the uplift of her tribal people. However after independence, there have been three main approaches or policies about tribal people: Policy of Segregation/ isolation, Policy of Assimilation and Policy of Integration. Elwin (1939) advocated for the establishment of a sort of 'National Park' for the isolation of tribal people. M.N. Srinivas (1957) considers assimilation as the process as '*Sanskritaization*'. Pandit J.L. Neheru 1958), advocated the integration policy to sought the tribes to develop along the lines of their own genius and in no case should there be any imposition in the name of their development.

It is no doubt gradually tribal culture is diminishing by means of sanskritization and assimilation not only in Dooars for Santals but for all tribal communities all over the globe. For Santals of Dooars 100 respondents aged above 50 years were asked few questions about their change of customs and others and their bad effects. The outcome or answers are tabulated below.

Table 4 Sample Questions and follow ups on Santals

Sr. No.	Questions asked on change/ introduction of the following customs	Response in favours of change and effects (%)	
		System	Negative effects
1	Marriage system & Customs	80	70
2	Totemic System	70	62
3	Occupation	90	50
4	Religious beliefs	75	45
5	Traditional Songs and dances	62	69
6	Dress and Ornaments	71	55
7	Food habits	69	55
8	System of local self- Govt.	89	65
9	Birth control measures adopted	42	20
10	Youths disobey traditional cultures	89	85

Source: Primary data, 2017

Pearson's product-moment correlation formula (r) is concerned with the measurement of the strength of association between variables (Das, 1997). The Pearson correlation coefficient (*r*) can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association and lower than 0 indicates negative relation. For the purpose of correlation,

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Percentage changes of system in respect of traditional customs are considered as independent variable (x); and opinion on negative effects as dependent variable (y).

Table-5: Correlation coefficient between changes of Customs and their negative impacts

Questions/ Topics	X	Y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$	$(x-\bar{x}).(y-\bar{y})$
Marriage system & Customs	80	70	6.30	12.40	39.69	153.76	78.12
Totemic System	70	62	-3.70	4.40	13.69	19.36	-16.28
Occupation	90	50	16.30	-7.60	265.69	57.76	-123.88
Religious beliefs	75	45	1.30	-12.60	1.69	158.76	-16.38
Traditional Songs and dances	62	69	-11.70	11.40	136.89	129.96	-133.38
Dress and Ornaments	71	55	-2.70	-2.60	7.29	6.76	7.02
Food habits	69	55	-4.70	-2.60	22.09	6.76	12.22
System of local self- Govt.	89	65	15.30	7.40	234.09	54.76	113.22
Birth control measures adopted	42	20	-31.70	-37.60	1004.89	1413.76	1191.92
Youths disobey traditional cultures	89	85	15.30	27.40	234.09	750.76	419.22
Sum	73.7	57.6			1960.10	2752.40	1531.80

Source: Computed by the Researcher

In equation form, the Pearson's product moment correlation is:

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2(y-\bar{y})^2}}$$

Where, r = Pearson's product moment correlation, $\bar{x}$ and $\bar{y}$ = Mean values of x and y respectively.

Correlation co-efficient for table-5 is:

$$r = \frac{1531.80}{\sqrt{1960.10 \times 2752.40}} = 0.66$$

Strong positive correlation between the variable indicates that there is direct positive relationship between X and Y. Without applying the test of significance, we cannot generalize this relationship for entire population as the number of sample in in the present case is very small. The test is carried in the following manner:

$$t = r\sqrt{\frac{n-2}{1-r^2}} = \quad 0.66\sqrt{\frac{10-2}{1-(.66)^2}} = 2.48$$

The tabulated value of t for 8 (10-2) degrees of freedom is 3.36 at 1%, 2.31 at 5% and 1.86 at 10% level of significance respectively. The computed value (2.48) is greater than the 10% and 5% tabulated value of t, hence the correlation coefficient is quite significant. Thus it may be concluded that impact of social customs and other related terms on the traditional livelihood pattern of tribal people has been immensely changed and grossly it causes negative impacts on their society and culture.

CONCLUSION

Santals in Dooars are undergoing change in their comprehensive life. Some of them are also educated, if not sizeable number, to review existing situation-political, economic, and socio-cultural. To save their age old rich traditional cultures we have to create enthusiastic environment. Growth of education, research and above all sufficient income should be provided. Otherwise modern world will lose their traditional value, cultures, medicines upon which they does rely year after years.

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EFFECT OF GIBBERELLIC ACID SPRAY ON GROWTH, ENZYMATIC ACTIVITIES, YIELD AND ESSENTIAL OIL CONTENT OF CORIANDRUM SATIVUM L.

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ABSTRACT
Coriander (Coriandrum sativum L.) plant bears numerous medicinal properties. The essential oils present in the herb are known to stunt bacterial production and multiplication. It is explored for it curative role in various type of disorders including digestive, respiratory and urinary systems. Coriander is considered as curative agents due to its properties of diaphoretic, diuretic, carminative and stimulant. Gibberellic acid (GA_3) plays an important role in modulating diverse physiological processes throughout the period of plant growth and development. The plants were sprayed with different concentrations (10^{-8}, 10^{-6} and 10^{-5} M) of GA_3 at 30 days after sowing. Control plants were sprayed with deionized water.

Among the applied treatments, a foliar spray of 10^{-6} M of GA_3 proved to be optimum and promoted the values for all studied parameters including growth (shoot and root lengths, plant fresh and dry weights), physiological and biochemical (total chlorophyll and carotenoid content, activities of nitrate reductase and carbonic anhydrase, leaf-nitrogen, phosphorus and potassium content) parameters, and yield and quality characteristics (number of umbel per plant, number of fruits per umbel, 100-seed weight, seed-yield and essential oil content). The results indicated that foliar applied GA_3 is highly effective for crop productivity and essential oil production.

INTRODUCTION
Gibberellic acid (GA_3) is a potent plant hormone, which promotes growth and elongation of cells. Since GA_3 regulates growth, applications of very low concentrations have a profound effect while too much have the opposite effect but eventually plants develop tolerance to it (Sadowska et al. 1984; Yamaguchi, 2008). GA_3 have also a number of effects on plant development including stimulate rapid stem growth, induce mitotic division in the leaves of some plants and increase seed germination rate (Riley 1987; Tipirdamaz and Gomurgan 2000). Earlier studies (Ohlsson and Berglund 2001; Srivastava and Srivastava 2007) suggested that GA_3 increases the production of active constitutes in all plant parts but minimize the total biomass production which result in decreased overall production of secondary metabolites such as alkaloid and essential oil.

Among aromatic plants, the coriander has much importance due to its versatile use as an herb as well as a spice. Coriander (*Coriandrum sativum* L.; Apiaceae family) is a culinary and medicinal plant and is widely adapted to a variety of climate and soil types in India. It occupies 0.42 million ha with an annual production of 0.25 million tonnes of seed and is mainly grown during the winter season on the northwestern plains of the country. Coriander seed oil is included among the 20 major essential oils in the world market. The productivity of coriander seed is 595 kg/ha in India, which is very low. One of the main reasons for the low productivity is that this crop is grown in areas characterized by light soils with medium fertility (Diederichsen 1996; Kumar et al. 2008). The plant reaches up to 50 cm. The flowering stem, which is slender and smooth, reaches a height of 20-120 cm. Hermaphrodite and staminate flowers occur in each umbel. The fruits are nearly globular, 3-4 mm in diameter and are yellow-brown when ripe. The fruits consist of two halves, single-seeded mericarps (The Wealth of India 2001). The fruits of coriander produce a normalizing action, and the related preparations containing ethereal oils are used to improve the appetite and digestion. The coriander plant yields two primary products that are used for flavoring purposes: the fresh green herb and the spice (Pruthi 1980; The Wealth of India 2001). Coriander fruits were also recommended as an antiseptic, expectorant and pain- relieving remedy in cases of gastritis and gastric ulceration. These fruits enter into the compositions of well-known bile- expelling and laxative herbal teas. Besides, it is a rich source of Vitamin C, K, minerals and proteins. Keeping the economical as well as medicinal value of coriander in mind, the study was conducted to find out the positive effect of GA_3 on growth, enzymatic activities, yield and quality characters including essential oil content.

MATERIALS AND METHODS
Experimental setup, growth and yield analyses
An earthen pot experiment was conducted in the natural condition of the net house. Prior to seed spreading, each pot was maintained with 5 kg soil and manure in ratio of 4:1. The soil was maintained at proper moisture to ensure better growth of the plants. The seeds were sown directly at a depth of 2 cm in each earthen pot. Treatment of GA_3 was applied as foliar spray at 10 days interval on plants to find out the agricultural response of plant. The plants were sprayed with deionized water (control), 10^{-8} M, 10^{-6} M and 10^{-5} M of GA_3 at 30 days

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after sowing (DAS). Each treatment was replicated four times. Plants were sampled at 70 days after planting (DAP). The pots were watered as and when required.

Growth characteristics

The growth parameters viz. length, fresh and dry weights of plants were determined at 70 DAP. Potted plants from each pot were evacuated carefully to measure various growth parameters. Water content of the plant was excluded using drying oven at 80° C for one day to record dry weight of the plants.

PHYSIOLOGICAL PARAMETERS

Total chlorophyll and carotenoids contents

Total content of chlorophyll and carotenoids in the leaves was estimated using the method of Lichtenthaler and Buschmann (2001). The contents were ex pressed as mg g^{-1} FW.

Nitrate reductase (NR) activity

The activity of NR was estimated by the intact tissue assay method of Jaworski (1971). The optical density of colour developed was read at 540 nm using a spectrophotometer. The NR activity was expressed as nM NO^{-} g^{-1} FW h^{-1}.

Carbonic anhydrase (CA) activity

The activity of CA was measured in the fresh leaves selected randomly, using the method described by Dwivedi and Randhawa (1972). The activity of CA was expressed as µ M CO2 kg^{-1} leaf FW s^{-1}.

Estimation of nitrogen, phosphorus and potassium content

The prepared aliquot (peroxide-digested material) was used to estimate N, P and K content. Leaf-N, P and K content were expressed in terms of percent dry weight. The content of N and P were estimated according to the method of Lindner (1944) and Fiske and Subba Row (1925), respectively. Potassium content was analyzed using a flame-photometrically.

Yield and quality parameters

Yield parameters were recorded at the time of harvest (90 DAS). Umbels were threshed and cleaned. The number of fruits per umbel was recorded. Afterward, 100 seed-weight and seed-yield per plant was calculated accordingly. The essential oil was extracted from dried seeds and determined gravimetrically according to the method of Guenther (1972). The content of essential in the fresh leaves was extracted by distillation method for 3 h, using a Clevenger's apparatus.

RESULTS

Effect on growth parameters

The effect of the foliar application of GA_3 was significant on growth parameters (shoot and root lengths, and plant fresh and dry weights) over the control. Of the four concentrations, 10^{-6} M of GA_3 proved to be the best concentration compared to other treatments (Table 1). This concentration was effective in increasing the values of all the growth attributes over the control. The applied treatment increased the shoot length, root length, plant fresh weight, and plant dry weight by 27.4, 31.0, 39.9 and 51.0% respectively, when compared to the control (Table 1).

Effect on physiological and biochemical parameters

As compared to control, foliar application of GA_3 improved all the physiological and biochemical parameters. Leaf-applied GA_3 increased the total content of chlorophyll and carotenoids significantly. However, it was noticed that spray at 10^{-6} M of GA_3 is highly effective in increasing the value of these contents by 19.5 and 15.6% respectively over the control (Table 2). GA_3 spray also increased the carbonic anhydrase (CA) activity. Application of GA_3 at 10^{-6} M increased the value of activity of CA by 28.8% compared to the control (Table 2). There was a significant improvement in the activity of nitrate reductase (NR) due to GA_3 application, compared with the control. GA_3 at 10^{-6} M recorded 22.0% higher value for NR activity over the control (Table 3). Foliar applied GA_3 at 10^{-6} M increased the leaf-N, P and K content by 22.8, 18.6 and 26.4% respectively, over the control (Table 3).

Yield and quality attributes

Exogenous application of GA_3 at 10^{-6} M was proved the best for the yield characteristics. The application of GA_3 at 10^{-6} M enhanced the number of umbel per plant, fruits per umbel, 100 seed-weight and seed-yield maximally, surpassing the control by 35.7, 25.00, 12.1 and 48.6% respectively (Table 4). This treatment also resulted in the highest essential oil content over the control by 16.2% (Table 4).

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DISCUSSION

It has been well documented that foliar application of plant hormones could improve the physiological efficiency and may play pivotal role in boosting the productivity of a crop (Alam et al., 2012). An increase in growth parameters like shoot and root lengths, fresh and dry weights in plants treated with application of GA_3 is in accordance with the well known fact that it promotes cell enlargement and cell division (Moore 1989; Arteca 1996; Buchanan et al. 2000; Taiz and Zeiger 2004). The increase in plant height led GA_3 treated plants to bear more leaves and thus had better chance to trap more sun light and produce more dry mass. Earlier studies have reported that GA_3 application as foliar spray on transplanted cuttings increased plant height (Sadowska et al. 1984, Idrees et al. 2010). Srivastava and Srivastava (2007) reported that foliar spray of GA_3 application increased plant height and leaf length. The present study reveals that there is a significant improvement in the values of chlorophyll and carotenoid content when GA_3 were applied on plants. An increase in total chlorophyll and photosynthetic CO_2 assimilation and specific activity of Rubisco by GA_3 (Salisbury and Ross 1992; Taiz and Zeiger 2004) have also been recorded.

A significant increase in carbonic anhydrase activity in plants treated with GA_3 was also observed. This elevation in the CA activity by GA_3 is in agreement with other findings (Idrees et al. 2010; Alam et al., 2012). In the present study, the NR activity in leaves was encouraging as a result of foliar application of GA_3 (Table 3). NR is the key enzyme in nitrogen metabolism and is responsible for the initiation of nitrate assimilation and hence protein synthesis. The level of the enzyme is dependent on a number of factors born within or outside the plant. GA_3 was proved as inducer of NR activity in earlier findings (Shah et al., 2006; Aftab et al., 2010).

Leaf-N and leaf-P contents were found maximum in plant treated with GA_3 increased membrane permeability (Wood and Paleg 1972; Crozier and Turnbull 1984; Al-Wakeel et al. 1995). An increase in membrane permeability would facilitate absorption and utilization of mineral nutrient (Ansari 1996) and also transport of assimilate. This would also contribute towards enhancing the capacity of the treated plants for biomass production as reflected in the observed increase in fresh and dry weights of plant. This continuous increase in all studied parameters of the GA_3 treated plants which are expected to culminate in maximization of number of umbel, number of fruits per umbel, 100 seed-weight and seed-yield would have a positive effect on the essential oil content. Thus, it may be concluded that foliar spray of GA_3 (10^{-6} M) on coriander plant would be highly effective for biomass (in terms of herbage) as well as essential oil production.

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Table-1: Effect of different foliar concentrations of gibberellic acid (GA_3) on growth characteristics of *Coriandrum sativum* L. Means within a column followed by the same letter(s) are not significantly different ($p \leq 0.05$).

Treatments (M)	Shoot length (cm)	Root length (cm)	Fresh weight per plant (g)	Dry weight per plant (g)
Control	76.45^{d}	15.14^{bc}	22.15^{d}	8.45^{c}
$GA_3\ 10^{-8}$	84.38^{c}	16.67^{b}	24.76^{c}	10.47^{b}
$GA_3\ 10^{-6}$	97.36^{a}	19.83^{a}	31.00^{a}	12.76^{a}
$GA_3\ 10^{-4}$	94.50^{b}	17.30^{b}	26.37^{b}	11.52^{ab}
LSD at 5%	2.84	2.32	2.20	1.96

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Table-2: Effect of different foliar concentrations of gibberellic acid (GA_3) on physiological and biochemical parameters of *Coriandrum sativum* L. Means within a column followed by the same letter(s) are not significantly different ($p \leq 0.05$).

Treatments (M)	Leaf-N content (%)	Leaf-P content (%)	Leaf-K content (%)
Control	2.342^{d}	0.236^{d}	2.278^{d}
$GA_3\ 10^{-8}$	2.594^{c}	0.250^{c}	2.254^{c}
$GA_3\ 10^{-6}$	2.876^{a}	0.280^{a}	2.924^{a}
$GA_3\ 10^{-4}$	2.825^{b}	0.236^{b}	2.879^{b}
LSD at 5%	0.030	0.014	0.020

Table-3: Effect of different foliar concentrations of gibberellic acid (GA_3) on leaf-N, P and K contents of *Coriandrum sativum* L. Means within a column followed by the same letter(s) are not significantly different ($p \leq 0.05$).

Treatments (M)	Total chlorophyll content (mg g^{-1} FW)	Total carotenoid content (mg g^{-1} FW)	CA activity [µmol (CO_2) Kg^{-1}(FW) S^{-1}]	NR activity (nM $NO^{2-}g^{-1}$FWh-1)
Control	1.537^{d}	0.450^{d}	239.0^{d}	356.2^{d}
$GA_3\ 10^{-8}$	1.694^{c}	0.493^{c}	280.2^{c}	396.4^{c}
$GA_3\ 10^{-6}$	1.836^{a}	0.520^{a}	307.9^{a}	434.6^{a}
$GA_3\ 10^{-4}$	1.743^{b}	0.477^{b}	284.5^{b}	408.5^{b}
LSD at 5%	0.119	0.028	3.86	3.62

Table4. Effect of different foliar concentrations of gibberellic acid (GA_3) on yield characteristics of *Coriandrum sativum* L. Means within a column followed by the same letter(s) are not significantly different ($p \leq 0.05$).

Treatments (M)	Umbel number per plant	Fruits per umbel	100 seed-weight (g)	Seed yield (g/plant)	Essential oil content (%)
Control	7.0^{b}	16.0^{c}	0.680^{d}	0.918^{d}	0.158^{c}
$GA_3\ 10^{-8}$	7.0^{ab}	18.0^{b}	0.700^{c}	1.130^{c}	0.167^{c}
$GA_3\ 10^{-6}$	9.5^{a}	20.0^{a}	0.762^{a}	1.364^{a}	0.182^{a}
$GA_3\ 10^{-4}$	8.0^{a}	18.0^{b}	0.716^{b}	1.320^{b}	0.132^{b}
LSD at 5%	1.29	0.24	0.014	0.028	0.025

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A REVIEW OF MAXIMUM POWER POINT TRACKING ALGORITHMS FOR SOLAR PHOTOVOLTAIC MODULE

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ABSTRACT
Maximum power point is considered most influence under various situations such as low temperature, cloudy or foggy days. Usually photovoltaic module has been considered to work better when cold weather along with maximum power point is applied to take out maximum power provide from them. In this research paper introduction to algorithm maximum power point addressing that engaged in accusing managers applied in case to obtain maximum represented power from photovoltaic module under sure conditions are discussed. Study of existing research relevant to maximum power point is discussed along with their objectives and benefits. Finally process of maximum power point addressing along with future scope of maximum power point is discussed.

Keywords: MPPT, PV Solar system, DC, Managers, Perturb and Observations, Incremental Conductance

1. INTRODUCTION

Solar Energy has been considered one of most promising green energy resources. It is because of its environment sustainability along with inexhaustibility. Solar Energy has assured feature over other Renewable Energy recourses such as wind, water of sea and hydro power station [1]. Photovoltaic energy has been considered a sort of solar energy. It is obtainable in all parts of world. It has least maintenance since it create a center of attention more researches. It is toward this type of spotless along with renewable energy. Algorithm maximum power point addressing has been considered as is involved in deploying managers. These managers are utilized to get maximum presented power from photovoltaic module. This is performed under sure conditions. Voltage where photovoltaic module is capable to generate maximum power has been considered as maximum power point. Maximum power is different in case of solar radiation, ambient along with solar cell temperature. Photovoltaic solar systems are available in various configurations. Central issues have been tackled by MPPT [2]. A MPPT solar charge manager has been considered as charge manager. It has been fixed with MPPT algorithm. It enables us to maximize current amount. It has been sent to battery from PV module [3]. Maximum power point addressing is Direct Current to Direct Current converter. It is operating by taking Direct current input from PV module. It is modifying it to alternate current and changing it back to a separate Direct Current voltage. It sends power to correctly compare PV component to battery. Boost converter is taken as power converter. Its redirect current input voltage is less as compare to Direct Current output voltage. PV input voltage is less as compare to voltage of battery. Buck converter has been considered as power converter. Here direct current input voltage is more than direct current output voltage [4].Maximum power point addressing algorithm could be applied to both of them. It depends on structure design. Buck converter is required when voltage of battery structure is equal or less than 48V [5]. Maximum power point addressing solar charge managers have been considered useful in case of off-grid solar power systems. In the forthcoming section the literature with significance of study of searchers is presented.

2. REVIEW OF LITERATURE

S. No.	Authors	Year	Titles	Significance
1.	Durgadevi, S. Arulselvi A.	2012	Anfis modeling, partial shading & maximum power point addressing managed the hardware investigation of standalone photovoltaic water pumping structure	The simulation conclusion indicates that the Incremental Conductance algorithm has its characteristics. For example, simplicity fast response, low over-tuning, high rate of control, precision and simple implementation. The results of hardware are in line along with simulated conclusion
2.	Jee H. J., Shehab A	2012	Real time simulation model enlargement in situation of single crystalline depended on photovoltaic panels.	Proposed entire model was experienced with the help of RT-LAB real-time simulator. It was indicating 62 % development in computation speed. It was over base model removed from literature. Changeable and non-Changeable features of proposed model

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				have also been effectively confirmed. It is occurs with the help of published photovoltaic experimental data both visually and statistically
3.	J.A. Ramos Hernanz J.J. Campayo J	2012	Two Photovoltaic Cell Simulation Models in MATLAB/Simulink	This model would be enhanced to a real-time model depend on manager for electrically to follow photovoltaic structure in physical Maximum power hardware edges
4.	JA. Ramos, JJ. Campayo, E. Zulueta, O.	2013	Achieving feature curves of a photocell by separate technique	The purpose of this paper is to indicate numerous models that simulate of a photovoltaic cell. They explanation of photovoltaic systems in an effectual structure needed a precise knowledge of fourths and photovoltaic features curves of those photovoltaic components.
5.	N. Belhaouas , M.S. Ait Cheikh, A	2013	MATLAB-Simulink of photovoltaic structure depend on two-diode model simulator in the shade solar cells	The conclusion implementation of many methods of simulation of a photovoltaic cell, representation of their IV & photovoltaic characteristic curves
6.	Alex D. & S. Berclin J.	2013	Modelling & Simulation of Photovoltaic Module in MATLAB	They have been presented an enhanced mathematical model for photovoltaic modules works only parameters given by maker's datasheets. It is without requiring use of any numerical scheme.
7.	G M.S. Sivagamasun dari, Dr.P.Melba Mary	2013	Maximum Power Point addressing For Photovoltaic structure by Perturb and survey Method Using Buck Boost adapter	They evaluated the other technique of maximum power point addressing, perturb. It monitor technique appears simply for optimization of photovoltaic arrangement with the help of buck boost adapter.
8.	S. Jacques, S. Bissey	2014	PV Lab, a Powerful, Innovative Software Package for Simulation of Photovoltaic Systems	They has been explains a latest highly modular, simulation tool named PV Lab and developed by GREMAN laboratory. PV Lab has a high level of flexibility, allowing its physical models & databases to be modified according to user's needs.
9.	M. Muthuramali ngam, P. S. Manoharan	2015	Energy comparative testing of maximum power point addressing mechanism for photovoltaic structure using interleaved soft-switching boost adapter [6]	This paper estimates analyzes presentation of P and O, IC, Fuzzy abd GA algorithms implemented in ISSBC for photovoltaic structures. Arrangement for present structure is formed and simulated with the help of MATLAB/semolina and implemented in 16F877A micro manager
10.	Sebastian valeriuhudişt eanu	2015	Five Parameter Model of Photovoltaic Panel Implemented in Matlab/Simulink, [7]	The aim of this paper to variation of output power, depending on voltage and current of photovoltaic panel, or variation of current within voltage.
11.	Aparna K P, Priya R, SindhuSurya narayanan	2015	Modellingand Simulation of a photovoltaic structure appling DC-DC adapter, [8]	The idea is to increase maximum performance of set-up irrespective of alternating in physical situation.

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12.	C.Navitha, Dr.R.Sureshkumar	2016	Modelling & Implementation of Efficient maximum power point addressing Algorithm for photovoltaic Water Pump Applications, [9]	This Project paper deals within modelling and implementation of a common but capable solar DC water pumping structure within battery backup by using MATLAB SIMULINK software. Performance of an overall solar pump structure could be broadly categorized by a Simulink model. MATLAB simulations ratify DC-DC converter design. This allows a lower cost system. Battery was used as a backup during night time.

After seeming within the literature survey, different maximum power point techniques surveyed and presented in following subsection.

2. PROCESS OF MPPT FOR PHOTOVOLTAIC MODULES/CELLS

The structure demands of a PV panel and power DC-DC converter. It also used many sensors to calculate the current and voltage. It also measures the maximum power point control unit along with a load. Electric power has generated by PV panel. It is used to load through a DC-DC adapter, managed by PWM signal. Output voltage along with current from PV panel is supplied to maximum power point control unit. It is used to decide managed voltage reference for DC-DC adapter. A generic Process of MPPT is shown in fig.1.

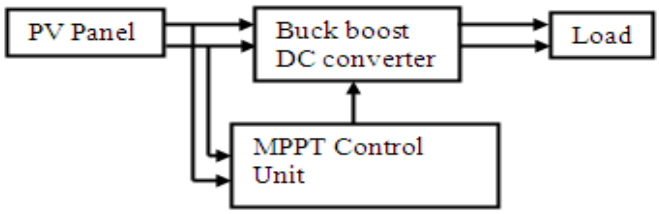

Fig-1: Process of MPPT

3. WORKING OF MPPT MANAGER

Maximum power point addressing is a technique utilized with wind turbines. It has been also utilized in case of photovoltaic solar systems. It has been required to maximize power extraction in several situations. Principles are generally applicable to sources with variable power. There examples have been optical power transmission along with thermo photovoltaic.

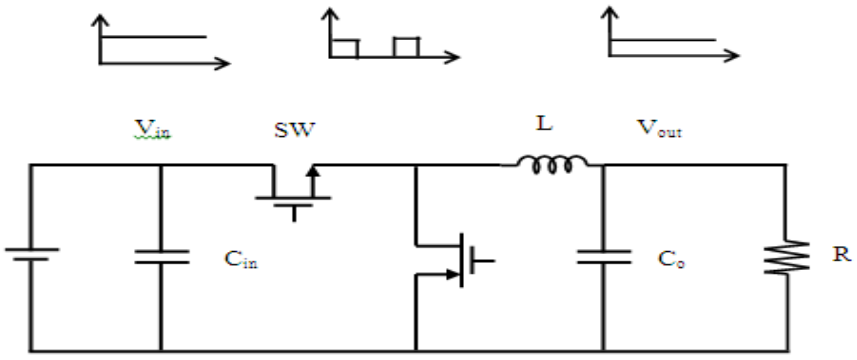

Fig-2: MPPT Circuit Using DC to DC Boost converter

Solar cells are having complicated relationship among temperature as well as complete resistance. It creates non-linear output proficiency. It could be analysed according to I-V curve.

Solar inverters are converting DC power to AC power. It also incorporates MPPT.

1. Power at MPP has been the multiplication of MPP voltage and MPP current.
2. Maximum power that cell could give with optimal burden in provided situations. $P = FF * Voc * Isc$
3. Power sends from or to tool has been optimized. It has been optimized to derivative dI / dV of I-V curve.
4. A load having resistance R. R is represented by V / I . It is same to mutual of value. It estimates maximum power from tool.

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4. MPPT ALGORITHM

MPPT algorithms are required in photovoltaic module. In such a way that make it capable to carry maximum quantity of power. It is from the solar array along with send to the load. MPP of a solar varies with temperature and irradiance.

There are various types of MPPT algorithm:-

4.1 Perturbation and observation algorithm

Perturbation and observation technique has been considered as dependent on hill principle. This method is most popular in MPPT algorithms due to their easy implementation and better performance, when the irradiance is constant. By taking V is the reference voltage signal, the target value approaching the reference voltage signal in the side of maximum voltage (V_{mpp}). According to result, the output power will achieve maximum power point.

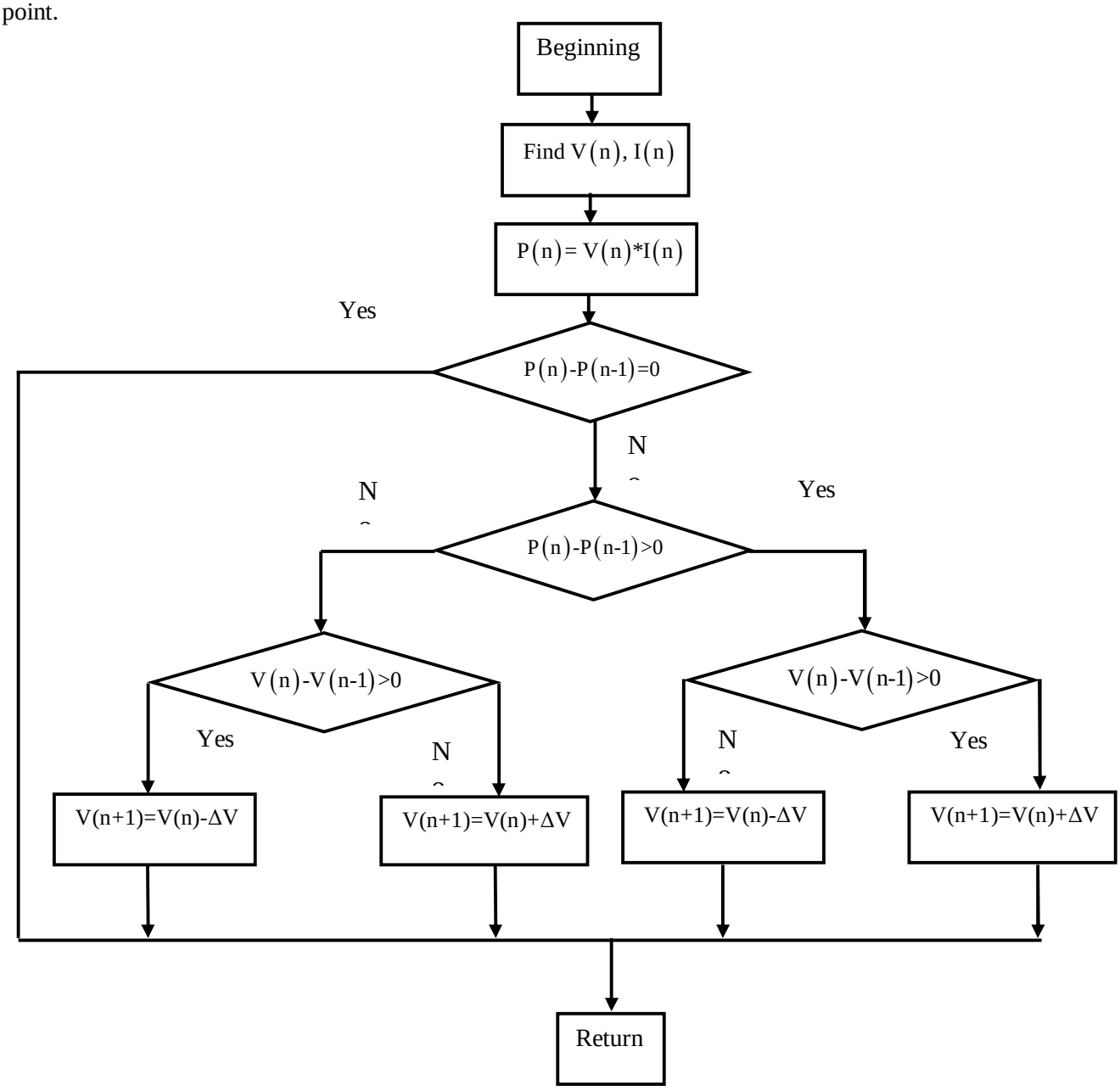

Fig-3: Flow chart of P&O algorithm [10]

Finally a constant perturb is used to the solar array voltage. The solar array voltage alters by using a tiny as well as constant value of perturbation. These are explains to ΔV in order to alter the operating point of the system. At every disturbance the output power variation dPo is calculated if Δp power is affirmative, it will along with MPP. At this place voltage disturbance having same symbol will used in following phases. If dPo has been considered the negative then power switched away from MPP .the contradictory sign will used on. This process will be repeated until the maximum point is achieved [10].

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4.2 Incremental Conductance Method

This technique consists of incline of the PV array power feature. It is used to examine the MPP. It is based on the fact that incline of PV array power curve is insignificant at MPP. It has positive side for values of output power which has small size as than MPP. It has negative side for values of output power which has great size as compare to MPP. Greatest output power of the scheme is,

$$P_{MPP} = I_{MPP} * V_{MPP} \quad (1)$$

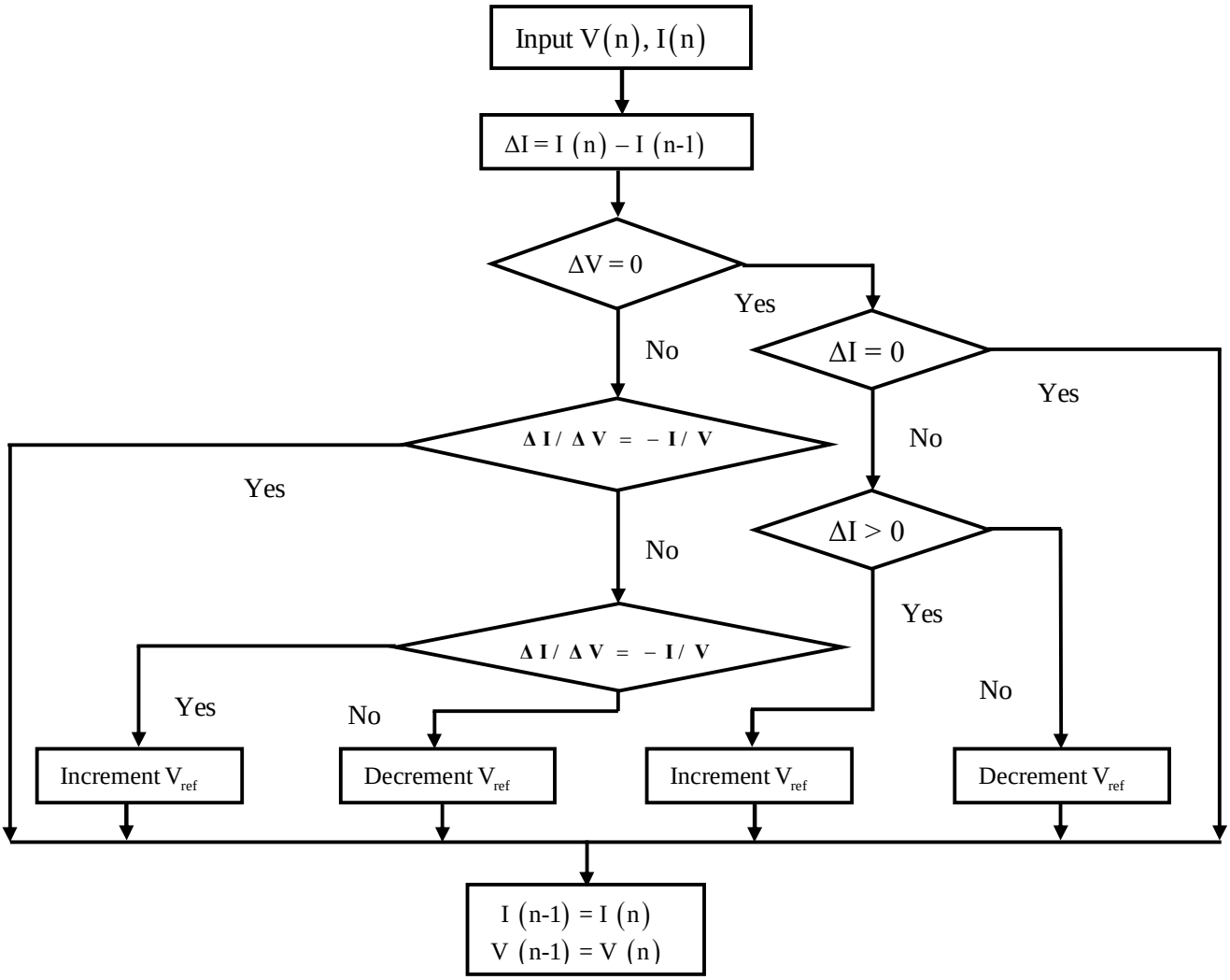

Fig-4: Flowchart for Incremental Conductance Algorithm[10].

So, by measuring the derivative, anyone can experiment to know either the PV creator is operating close to MPP or far away from it.

$$\frac{\partial P}{\partial V} = 0 \text{ or } \frac{\partial I}{\partial V} = -\frac{I}{V} \quad \text{MPP} \quad (2)$$

$$\frac{\partial P}{\partial V} > 0 \text{ or } \frac{\partial P}{\partial V} > -\frac{I}{V} \text{ Left of MPP} \quad (3)$$

$$\frac{\partial P}{\partial V} < 0 \text{ or } \frac{\partial I}{\partial V} < -\frac{I}{V} \quad \text{Right of MPP} \quad (4)$$

It might be checked by making comparison instantaneous conductance (I/V) to incremental as portrayed in flowchart shown in Fig.4. At MPP, reference voltage is same to the maximum voltage. Once MPP is calculated as parallel to operation of PV array is maintained. It is maintained at this point until an adaptation in atmospheric situation guiding to a variation in MPP. Then it addresses the MPP. It is occurred by using addition or decreasing to reference voltage. The amount of increment along with decrement searches the speed of MPP tracking. The bigger increment transports quick tracking but arrangement may not operate accurately at MPP and oscillate around the MPP. The benefit of this technique is that it provide helpful solution under alters in atmospheric situation. The limitation of this technique is that it demands the complex control circuitry [11].

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4.3 Short Circuit Current Method

This process needed an estimation linear connection between short circuit current (I_{SC}) of solar module along with MPP current (I_{MPP}). It describes the equation (5) [4] which are shown below:

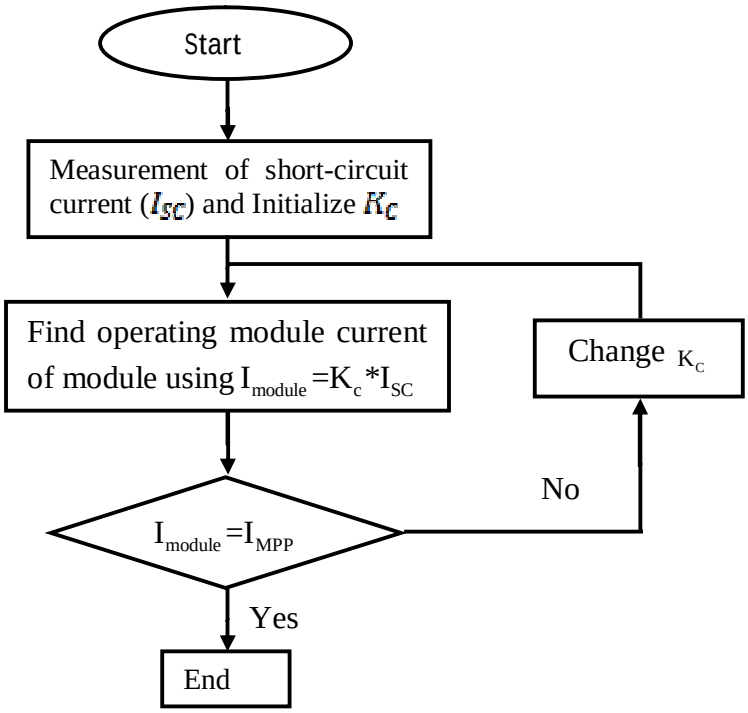

Fig-5: Flowchart for short-circuit current method [10].

$$I_{MPP} = K_C * I_{SC} \qquad (5)$$

Where, K stands for current factor. Its value happens in the middle of 0.8 and 0.9.The short circuit method is well-organized along with accurate as compare to open circuit voltage technique. A DC boost adapter is applied, where the switch in the adapter itself can be applied in order to use a short circuit to the PV array. The algorithm of short-circuit current indicates in Fig.5.

4.4 Open circuit voltage technique

This technique is used to inexact linear connection between open circuit voltage along with MPP voltage (V_{MPP}), which is portrays by the following given equation (6).

$$V_{MPP} = K * V_{OC} \qquad (6)$$

Where, K has been considered a constant along with its value depends upon the solar cell feature. The value of K is obtained from calculating the charge of open circuit voltage .it also achieved from maximum power point voltage below numerous atmospheric situations. At each succeeding level MPP is addressed. This value of MPP voltage is chose that the set point is contained to be constant over the broad variety of temperature along with irradiance [3, 10]. This method is described by the flowchart which is shown below in Fig.6.

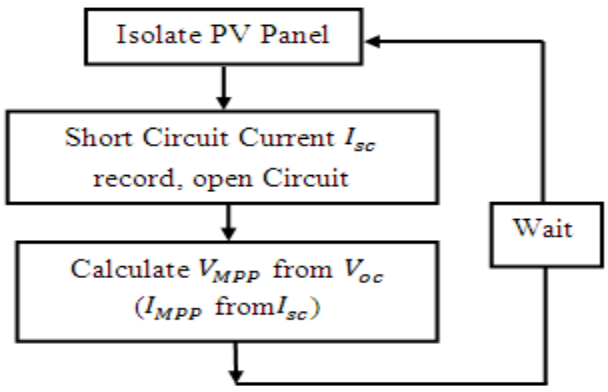

Fig-6: Flow chart of open-circuit voltage (short-circuit current) method [3, 10].

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5. COMPARISON OF MPPT ALGORITHM

Equation, efficiency, cost, complexity advantage, disadvantage etc. of different maximum power point tracking methods is presented in Table.2.

Table-2: MPPT Algorithms

Parameters	Perturb & Observation algorithm	Incremental conductance	Fractional open circuit algorithm	Short circuit algorithm
Equation Drive	H_{ph} - $I_0\left[\exp\left(\frac{V+R_s I}{KT}\right)-1\right]$ - $\left[\frac{V+R_s I}{R_{sh}}\right]$	$\frac{dI}{dV}=\frac{V}{dV}+I\left(\frac{V}{}\right)$	$D^{\alpha}[f(t)]=h^{-\alpha}\sum_{r=0}^{t/h}(-1)^{r}\binom{\alpha}{r}f(t-rh)$	$X_{01}=\sqrt{\left(Z_{01}^2-R_{01}^2\right)}$
Efficiency	Top-level efficiency	High	Better	Low
Cost	Expensive	Expensive	Inexpensive	Low cost
Processing time	No	No	Yes	Yes
Advantage	Trouble as well as detect has been considered as the most regularly applied Maximum power point addressing method because of its simplicity of implementation. Trouble as well as detect system may end result in high stage capability	Iterations needed by the inc MPPT process are less as compared to p and o process. The addressing speed of inc process is faster as compared to p and o Method.	The advantages of this technique that is really simple to implement, even in simulation we don't have problems to do it.	It helps in determining the series branch parameters of the equivalent circuit of a real transformer
Disadvantage	It takes more iteration as compare to INC MPPT Tracking speed is less than INC technique. The limitations of the Perturb along with detect process to address the peak power below the fast varying atmospheric situation is conquering by INC method.	Then the power-voltage curve of the PV is going in the case of any darkness on any of panels. Because they have been either series or parallel. It has numerous peaks along with P and O process. It can't search the actual peak.	Go through from the periodic failure of power in the time of calculating the open circuit voltage. Power has not been sent to load.	At time interval applied in measuring open-circuit voltage, PV creator does not consume the power. The higher stage of the irradiation at which the calculating is occurred. The larger missed the energy.
Complexity	Medium	Complex	Simple	Complex
Circuitry (Complex or simplicity)	Medium	Complex	Simple	Complex

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[5] CONCLUSION

In this paper, the MPPT based varying irradiance along with temperature circumstances has been described. Numerous Maximum power point addressing methods are exists as compare to address the maximum power point. In future time, maximum power point addressing could be applied in spite of using managers. It will occur to decrease cost along with difficulties of hardware. Battery can be used with bidirectional converter for string surplus energy during power to load during less generation of power. To increase efficiency of solar and wind new technique can be applied for MPPT. Optimization techniques can be used in order to minimize cost, sizing hybrid system.

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FLOOD SUSCEPTIBILITY PATTERN MAPPING ALONG VISAKHAPATNAM COASTAL ZONE OF INDIA, USING MULTI-INFLUENCING-FACTOR (MIF) TECHNIQUE IN CONJUNCTION WITH REMOTE SENSING DATA

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ABSTRACT
Flood activities have often inundated the Visakhapatnam Coastal Zone (VCZ) due to the occurrence of cyclone or gales in Bay of Bengal. Remote sensing (RS) technology has proven to be a dynamic tool for flood mapping, monitoring and management. Mapping of flood prone area is most crucial to reduce the effect of flood on environment. Flood zone delineation is very important for smart city planning to shield the built-up infrastructure. Present study has focused to assess the proximal flood prone zone over VCZ. In this study, multi-influencing factors corresponding to Land use land cover (LU/LC), drainage density (DD), slope and aspect have been used to derive the flood prone map. The vulnerability assessment was done based on the major and minor effect of the parameters on the occurrence of flood. Various thematic maps of the influencing parameters were derived from remote sensing satellite data. Later, particular weightages were given to each & every classes, based on the interrelationship between each and every parameters which influence the flood. Resultant flood prone map indicates that lowermost settlement region along various coastal zones (like, Srinivasa Nagar, Dwarika Nagar, HPCL steel plant, Visakhapatnam steel plant, Gollapalem, Palem, and NTPC Deepanjali Nagar, etc.), which are highly susceptible to the flood.

Keywords: Flood Susceptibility, VCZ, MIF Technique, Remote Sensing data, Mapping.

INTRODUCTION
The interface between the landmass and sea defines a coastal zone. Now a days, coastal environment are under stress due to various natural as well as anthropogenic activities, e.g., climate change, storms & gales, floods, sea level rise (SLR), population pressure and industrialization, etc. (Ranjan et al., 2017; Rao et al., 2013; Pradhan et al., 2009). According to the United Nations Environment Programme (UNEP)-2007, the average population density in the coastal zone had ~77 people/km2 in 1990 and ~87 people/km2 in 2000, and a projected ~99 people/km2 in next decade (UNEP, 2007; Vivek et al., 2013; Basheer et al., 2016). According to Mimura and Nicholls 1998, ~200 million people were estimated in the coastal floodplain in 1990 and it had been estimated that in future it will be ~600 million in 2100s (Kumar et al., 2010).

There are many impacting factors for coastal floodplain delineation, such as storm surges, cyclones, sea level rise, and shoreline erosion (Taubenbock et al., 2011), etc. Storm surge damage in the coast results from the interaction of winds, waves and rising water levels. Damaging impact of a storm depends on intensity of this potential event, and is caused by natural as well as man made changes to coastal system. There are several parameters which can describe the intensity of storm surge, such as sea surface temperature (SST), pressure, winds, waves, rainfall, etc. Shoreline changes and sea level rise are amongst the most important factors for changes in coastal floodplain.

Over the years, sea level rise has become the foremost issue for coastal environment (Demirkesen et al., 2007), which has been gradually influenced by the melting of glaciers, movement of tectonic plates, eutrophication, bio-magnification, etc. Generally, sea level changes could take place due to changes in water volume due to heating or cooling effects of oceans and due to change in atmospheric pressure or changes in ocean currents, etc. In the context of Sea-level rise, the great garbage patch also leads to increase in sea level rise. Tim Silverwood & his team sailed the wild seas with a research team in search of plastic pollution in the North Pacific Ocean and furthermore they conducted research in the Indian Ocean part and found huge levels of trash entering waterways and the ocean (The Great Garbage exposed, 2011). According to the Intergovernmental Panel on Climate Change (IPCC) - 2007, global sea level may rise from ~0.18 to ~0.59 m by the end of the 21st century. IPCC- 2001 has reported that 1m sea level rise can displace ~7 million people from their homes along the coastal regions of India (IPCC, 2001; Joshi et al., 2011; Fletcher 2009).

Flood phenomenon along coastal regions is one of the contemporary issue in the world, especially for the environment along the coastal regions. It has been often experienced that coastal regions of the world are dramatically being affected by flood activity. Flood is one of the most potent natural hazards in India. Flood can

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occur due to several circumstances, such as runoff waters from upstream to downstream, which is caused by heavy rainfall (Ouma et al., 2014). In the context of India, the coastal plains along the Bay of Bengal and Arabian Sea are vulnerable to floods caused by cyclones, gales and storms. In India, more than 250 million people live within ~50 km of coastal region (Senapati et al., 2014). In the last 30 years, it had been estimated that ~80 million people per year of the total population had been affected by natural disaster (International Federation, 2008; Bhatt et al., 2014). Recently, ~1094 people died due to Maharashtra flood in 2005, and it just happened after the Gujarat flood of 2005, where ~123 people were dead and ~250000 people were evacuated (List of worst and deadliest floods in the Indian history, 2015).

Cyclonic storm Hud-Hud (12th October 2014) has caused wide socio-economic damages and huge loss of life in Vishakhapatnam coastal regions. It had wind speeds of ~170-180 km/h, gusting to ~195 km/h. Heavy rainfall exaggerated the west and east Godavari, Vishakhapatnam, Vizianagram and Srikakulam of North Andhra Pradesh and some of the districts of South Odisha. According to initial report, the number of death was 45, with 37 casualty in Andhra Pradesh (25 in Visakhapatnam, 11 in Vizianagram and one in Srikakulam), 3 in Odisha, and 5 in Jharkhand. Due to Hud-Hud cyclone, ~450,000 acres crops were spoiled (CYCLONE HUDHUD secondary data analysis report, National coalition of Humanitarian Agencies of India, 2014).

Since the evolution of Remote sensing technology, it has been playing a crucial role in various natural resource monitoring and management by its specific capacity of aerial view and spectral response. The integration of Remote Sensing (RS) technique with Geographic Information System (GIS) has important role in sustainable coastal zone management. Sustainable coastal management will lead to decision making process, mitigation and prevention of flood impacts on environs etc. (Bhatta, 2011; Ranjan et al., 2016).

So far, a number of national and international studies have been conducted to map and assess the coastal prone areas using RS and GIS techniques, e.g., Manik et al. (2015), has studied about coastal vulnerability due to sea level rise of Gujarat coast using GIS technique. Basheer et al. (2016), has studied about the coastal vulnerability of Andhra Pradesh coastal region using Geo-spatial technique. T. Srinivasa et al., (2010) has studied about coastal vulnerability in the eastern coastal part of India. Ranjan et al., (2017) has reviewed various influences which have caused the flood activity along the coastal region. Zhane et al (2010) has assessed the vulnerability with combined impacts of sea level rise and coastal flooding using remote sensing and GIS in China's coastal region. Yaw et al., (2016) has focused on the coastal zone disaster management using GIS and remote sensing techniques in the Southern Mississippi.

The objective of the present study is to map the flood prone regions along the VCZ using MIF techniques in conjunction with satellite data. Flood prone areas were estimated based on the influencing factors (i.e. LU/LC, Drainage density, slope and aspect) of flood activities, which were derived from satellite imagery. The weightages for individual parameters were decided based on the mathematical calculation of major and minor effects of the parameters of flood activity. The flood prone map supports us to make a strategy for non-structural events which reduce the amount of damages and it will be a great support to implement a flood management plan (Samarasinghe et al, 2010).

1.1. Study Area

The present study was carried over Visakhapatnam Coastal Zone (VCZ) in Andhra Pradesh of India. The Area of Interest (AOI) of this study is geographically located between 17˚35'00″ N to 17˚50'00″ N latitude and 83˚10'00″ E to 83˚22'00″ E longitude, as shown in Figure-1. The study area is mostly covered with the settlements along with sparsely distributed vegetation and higher altitude terrain. Higher altitude region shows the Simachalam hilly range in the study area. Locations along the coastal zone, like Thimmapuram, Dwaraka Nagar, Visakhapatnam, and Visakhapatnam steel plant, are settled with massive human population and these are highly vulnerable to the flood. Visakhapatnam is the central hub of industries and education in Andhra Pradesh. Gangavaram port is eminent for the growth of petroleum, steel and fertilizer manufacturing. Fishing is the major sector for the economy of Visakhapatnam. Visakhapatnam port has three harbours- the outer harbour, inner harbour and fishing harbour. Fishing harbour is the largest harbour of this country for the fishing industry.

Dark red patches over the AOI shows the dense vegetation with fair altitude as shown in FCC image of the location map (Figure 1). Simachalam hilly range (dark red tone) covers the north-east and lower portion of the study area, whereas, faded pinkish colour shows the natural vegetation or less dense vegetation. Light grey colour shows the bare surface and light bluish colour shows the settlement environs. Dark blue colour are the water body and the eastern part of study area have Bay of Bengal which always affected the VCZ from the gales and storm originated in the Bay of Bengal.

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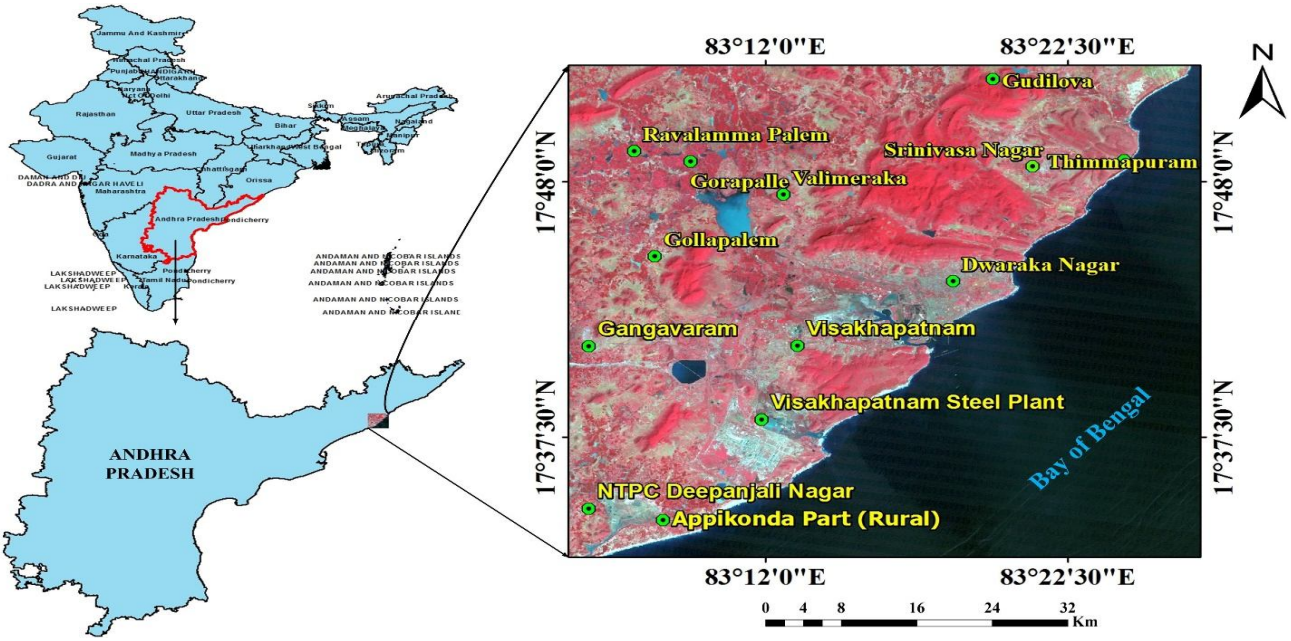

Figure-1: Location map of the study area with specific point location in False Color Composite (FCC) derived from Landsat 8-OLI satellite.

2. MATERIAL AND METHODS

2.1. Data used

The flood prone zone delineation and shoreline change analysis over Visakhapatnam coastal zone were done using remotely sensed satellite imageries. In this study, Landsat 8 satellite data with 30m spatial resolution and ASTER GLOBAL DEM with 30m spatial resolution were used. Landsat data were used for shoreline updating and preparation of LU/LC map and DEM data were used to derive slope, aspect and drainage map. Landsat data have TM and OLI/TIRS sensor and spectral band ranges from visible to NIR. The satellite data were freely collected from the United States Geological Survey (USGS) website (https://earthexplorer.usgs.gov/) and topographic maps were taken from University of Texas Library Topographic Maps (https://legacy.lib.utexas.edu/maps/ ams/india/) at the scale of 1:50,000. In addition, Sea Level Rise (SLR) data were analysed for a point location of Visakhapatnam site. National Oceanic and Atmospheric Administration (NOAA) provides point based SLR data across the world extended to 240 tide stations (https://tidesandcurrents.noaa.gov/sltrends/sltrends.html.). In this study, SLR data since 1937- 2007 of Visakhapatnam has been analysed.

Table-1: Data used in the present study, with specifications

Year	Satellite/Sensors	Spatial Resolution (m)	Source	Uses
1972	Landsat TM	30	USGS	Shoreline Delineation
1995	Landsat TM	30	USGS	Shoreline Delineation
2018	Landsat OLI/TIRS	30	USGS	Shoreline Delineation, LU/LC
2011	ASTER GDEM	30	USGS	Slope, Aspect, Drainage
1937-2007	NOAA	Point Data	PSMSL	Sea-Level Rise Analysis

2.2. Methodology

Throughout the study various steps were followed which is well presented in the flow chart (Figure 2). Stacking of individual band of satellite data into single file and geo-referencing of Toposheet were done in ERDAS IMAGINE software. Further image processing (i.e. AOI creation, shoreline updating, image classification, weighted overlay etc.) were completed in ArcGIS software. Shoreline delineation has accomplished through manual digitization of three different satellite data corresponding to 1972, 1995, and 2018. Further, LU/LC map of 2018 was prepared using maximum likelihood classification (MLC) which is a supervised classification. Slope, aspect and drainage maps were derived from ASTER GDEM data in ArcGIS software. The Drainage map were derived from GDEM data using hydrology tool in ArcGIS 10.4 software. Later, all these parameters were used in weighted overlay process to derive the flood prone zone over the study area. In this study, multi influencing factor (MIF) technique was used to assign the weightage to the individual parameters. In addition, NOAA based mean sea level data of Vishakhapatnam point location from 1937-2007 was analysed to understand the trend of sea level rise.

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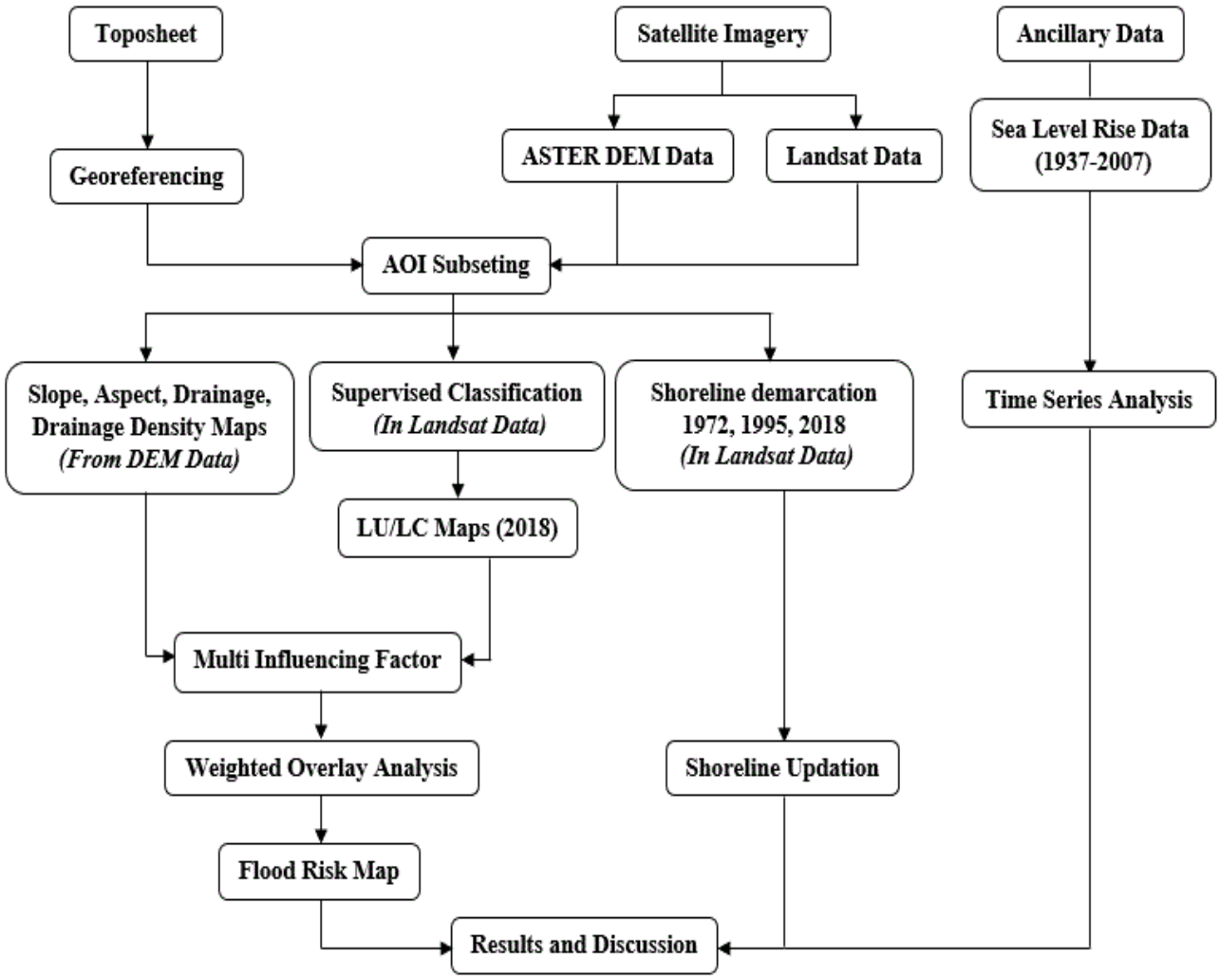

Figure-2: Flow chart of the adopted methodology, which was followed throughout the study.

2.3. Multi Influencing Factor (MIF) Technique

The MIF technique has ability to assign weightages to respective classes as per their influence on the flood activity (Ranjan et al., 2017, Maghesh et al., 2012). It is a mathematical approach to provide the appropriate ranks to the individual classes based on their influence on the flood. First, all the parameters are connected to each other with major and minor effect where major and minor effect of the features decide the highest or lowest rank as shown in Figure 3. Highest weighted value indicates the major effect and lowest weighted value indicates the minor effect. In this study, MIF technique was used to calculate the weightage of individual class. Afterward, weighted overlay analysis have been done on Arc map 10.4 software to derive the flood susceptibility map.

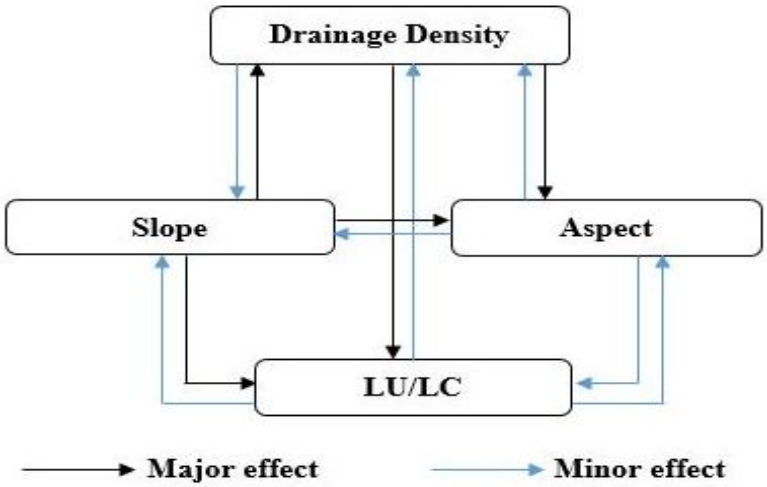

Figure-3: Interrelationship between Multi influencing factors, which were used to derive the flood susceptibility map.

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3. RESULT AND DISCUSSIONS

3.1. Land use and Land cover map

The land cover shows the physically enclosed land in the surroundings i.e. Grassland, forests, water bodies (sea, river etc.), bare land etc., whereas, land use represents the land which are being used for human beings either for their basic need or for development purpose, e.g., settlement, industrial region, crop land, roadways, playground, etc.

Land use and land cover (LU/LC) is the crucial parameter for flood susceptibility mapping. In the present study, land use and land cover map were prepared using supervised classification (maximum likelihood classification technique) in ArcMap 10.4 software. It was categorized in six prominent classes, namely Water bodies, Forests, Vegetation, Settlements, Fallow land and other features. Then, the weightage for flood susceptibility mapping was given based on the maximum impact of the flood on these features.

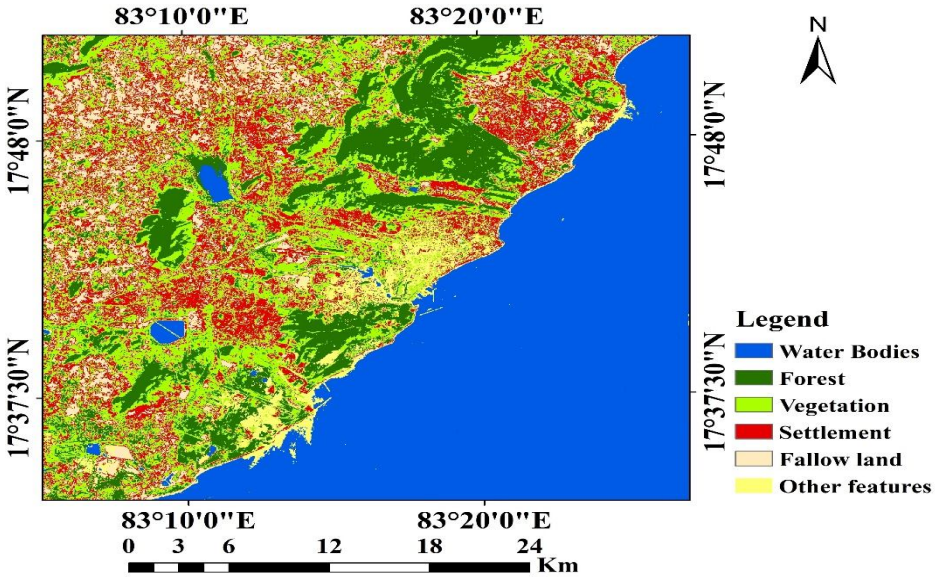

Figure-4: LU/LC map of the study area for 2018 prepared from Landsat 8-OLI satellite imagery using supervised classification technique.

3.2. Slope Map

The slope is one of the most important parameters for flood prone mapping which shows the steepness of the line. It has a great impact on flood prone assessment because higher elevation will show less impact and nearly level surface will have greater impact of flood. In this study, the slope map has been prepared using ASTER GDEM data in Arc Map 10.4 software. Slope map were categorized in 5 classes, i.e., nearly level, very gentle slope, gentle slope, moderate slope, and steep slope. Practically higher weightage were assigned to nearly level for the gentle incline of the floodplain whereas lower weightage were assigned for higher slopes.

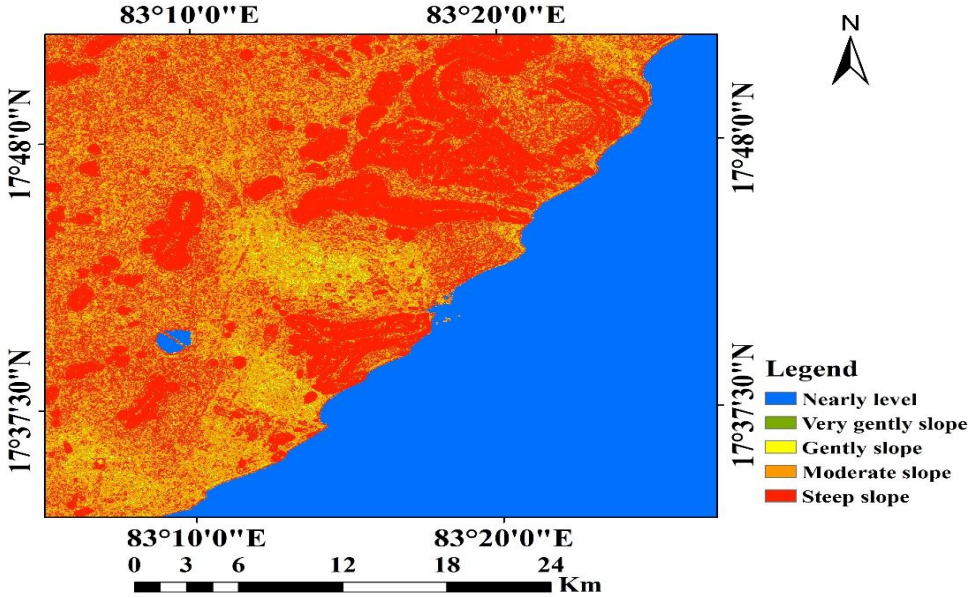

Figure-5: Slope map of the Study area prepared from ASTER DEM satellite data.

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3.3. Aspect map

Aspect is also an important parameter for directional measures of gradient faces. It is the accommodating parameter to know the physical appearance of the surface. Aspect categorises the gradient bearing by the maximum degree of change, showing the importance of individual cell to its neighbours. In this study, aspect map was prepared by spatial analyst tool in Arc map10.4 software using ASTER GDEM satellite data. Aspect map was categorized in ten classes, namely, flat, north (0˚-22.5˚), north-east, east, south-east, south, southwest, west, north-west and north (337.5˚-360˚). The higher weightages were given to south-west, west, and north-west whereas, rest classes were given lower and moderate weightages, based on the direction of study region.

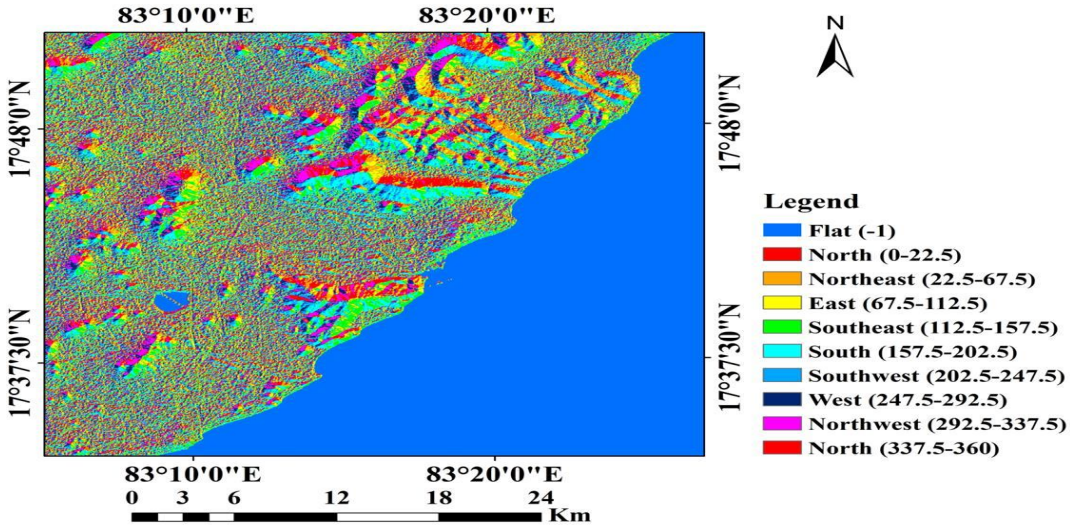

Figure-6: Aspect map of the Study area prepared from ASTER DEM satellite data

3.4. Drainage and Drainage density map

Drainage arrangement is the association of water bodies, which are formed by tributaries and other features. Drainage is one of the most essential parameter to condense the flood related activity. And its densities show the natural surroundings of soil and its geotechnical assets. Its points toward the higher density will have higher susceptible to erosion, as a result sedimentation will take place in the lower surface. Drainage map is being used to get more leverage in the recognition of surface and subsurface water flow. In the present study, drainage maps were prepared using ASTER GDEM satellite data. In ArcGIS 10.4, Arc hydro tool was used to extract the drainage features from the ASTER GDEM data. The drainage order was given to the pattern i.e. first order, second order, third order etc. Later, drainage maps were used to prepare the drainage density map. In the spatial analyst tool, line density tool were used to derive the drainage density map. Line density tool ease to calculate the magnitude per unit area from polyline features. Drainage density map was categorized in five respective classes, i.e., very low, low, moderate, high and very high. Higher rank was given to very low drainage density and lower rank was given for higher drainage density. The drainage density refers to the closeness of gaps of tributary networks within watershed boundary. Drainage density is a flexible concept in the domain of hydrology. It is well-defined as the proportion of length of the drainage per unit area of the basin. It is generally organized by penetrability & erodibility of surface materials, vegetation, gradient and time etc.

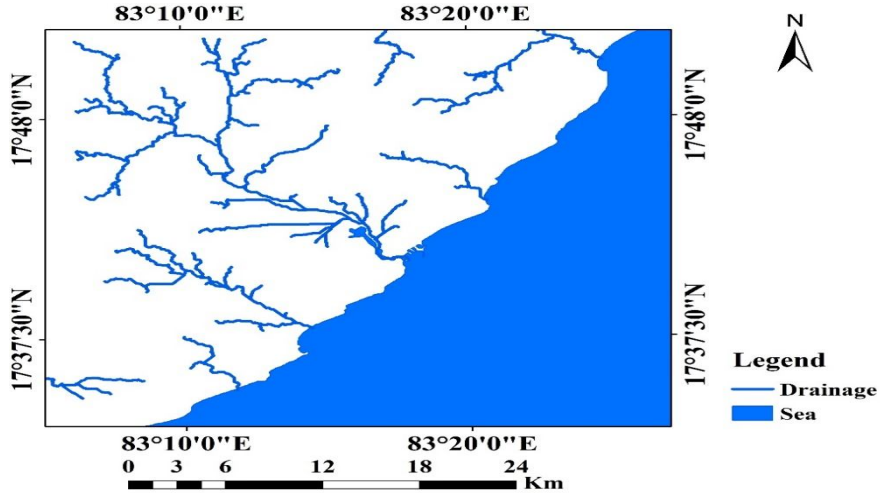

Figure-7: Drainage network map of the study area, the drainage patterns were extracted from ASTER DEM satellite data.

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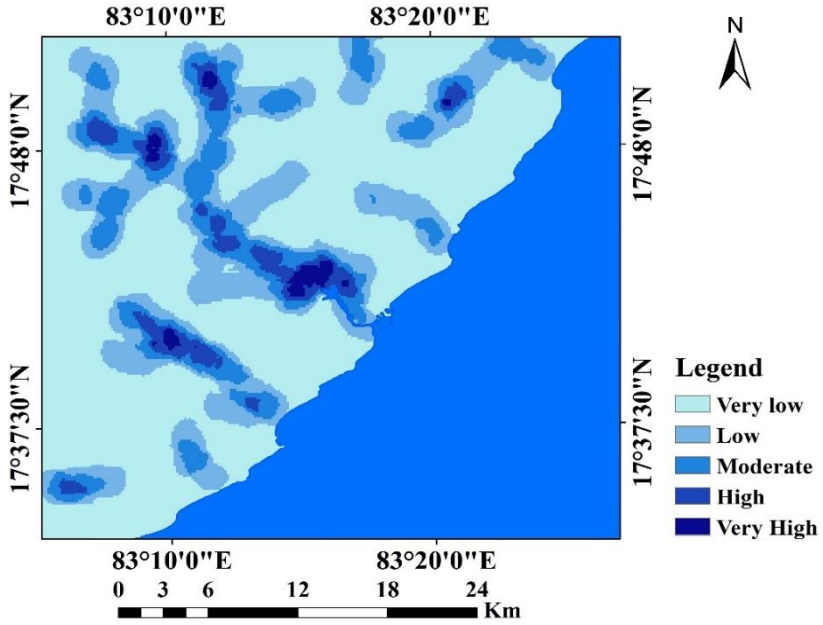

Figure-8: Drainage network density map of the study area, derived from drainage network map.

3.5. Weightage Calculation

Multi Influencing Factor (MIF) technique was used to assign the weightage to individual class. Four influencing factors, viz., land use/land cover, slope, aspect and drainage density were used for flood susceptibility mapping. These parameters have ability to delineate the flood prone zones. The weightage were decided as per the influence of major and minor effect of each parameter on flood activity. Weightage for minor and major effect were given to 1.0 and 1.5 respectively. The major and minor effects were allocated to estimate the relative weightages for specific features (Table 2). Weightage for individual features were derived using the equation 1. After having a total weightage for specific features, the % weightage was given to an individual class based on the hypothesis (Table 3).

$[(A+B)/\sum(A+B)]\times 100$ eqn … (1)

Where, A implies the major inter-relationship between two factors and B implies towards minor inter-relationship between two factors.

Table-2: Weightage calculation for individual features, using multi influencing factor technique

Features	Major effect (A)	Minor effect (B)	Total Y=(A+B)	Weightage (%) (100*Y/ΣY)
Drainage density	2*1=2	1*0.5=0.5	2.5	**29**
Slope	3*1=3	-	3	**35**
Aspects	-	3*0.5=1.5	1.5	**18**
LU/LC	-	3*0.5=1.5	1.5	**18**
Total	=		**ΣY=8.5**	**100**

Table-3: Weightage prioritization of the individual class to the respective features

Features	Classes	Weightage
LU/LC	Settlements	8
	Forest	1
	Water bodies	1
	Vegetation	3
	Fallow land	3
	Others	2
Drainage density	Very low	3
	Low	4
	Moderate	6
	High	7
	Very high	9
Slope	Nearly level	9
	Very gentle	8
	Gentle	7

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	Moderate	6
	Steep	5
Aspects	Flat	1
	North	2
	North East	1
	East	1
	South East	1
	South	2
	South West	3
	West	3
	Northwest	3
	North	1

3.6. Flood Susceptibility Mapping

Once the weightages were given to the individual classes of each and specific parameters, the flood susceptibility map was derived from weighted overlay process in GIS environment. The resultant flood susceptibility map is completely influenced based on the four influencing parameters viz. LU/LC, Slope, Drainage density and Aspect. Flood susceptibility map is broadly categorized in three zones, i.e., high, moderate and low flood prone zone. Resultant flood susceptibility map shows that low lying settlement areas are the highly vulnerable to the flood, whereas, highly gradient area (Simachalam hilly range) are lowest susceptible to the flood (Figure 9). Settlement region along the coastal zone viz. Srinivasa Nagar, HPCL steel plant, NTPC Deepanjali Nagar, Ravalamma, Palem, Gorapalle, Gollapalem and Gangavaram etc. are under the threat of high flood prone zone. These areas are having lower gradient, so this region will have larger inundation of water. As a result aforementioned industrial and residential areas may have to pay huge amount of socio-economic loss in the form of life and stuff loss, in case of heavy rainfall leading to floods. Similarly, Gudilova, Dwaraka nagar, Visakhapatnam, Valimeraka and Visakhapatnam steel plant etc. are lying in moderate flood prone zone and are relatively safer, whereas, higher gradient (Simachalam range) region over the study area are coming under low flood prone zone, and are much safe. These regions are mostly covered with forest in hilly region with higher altitude.

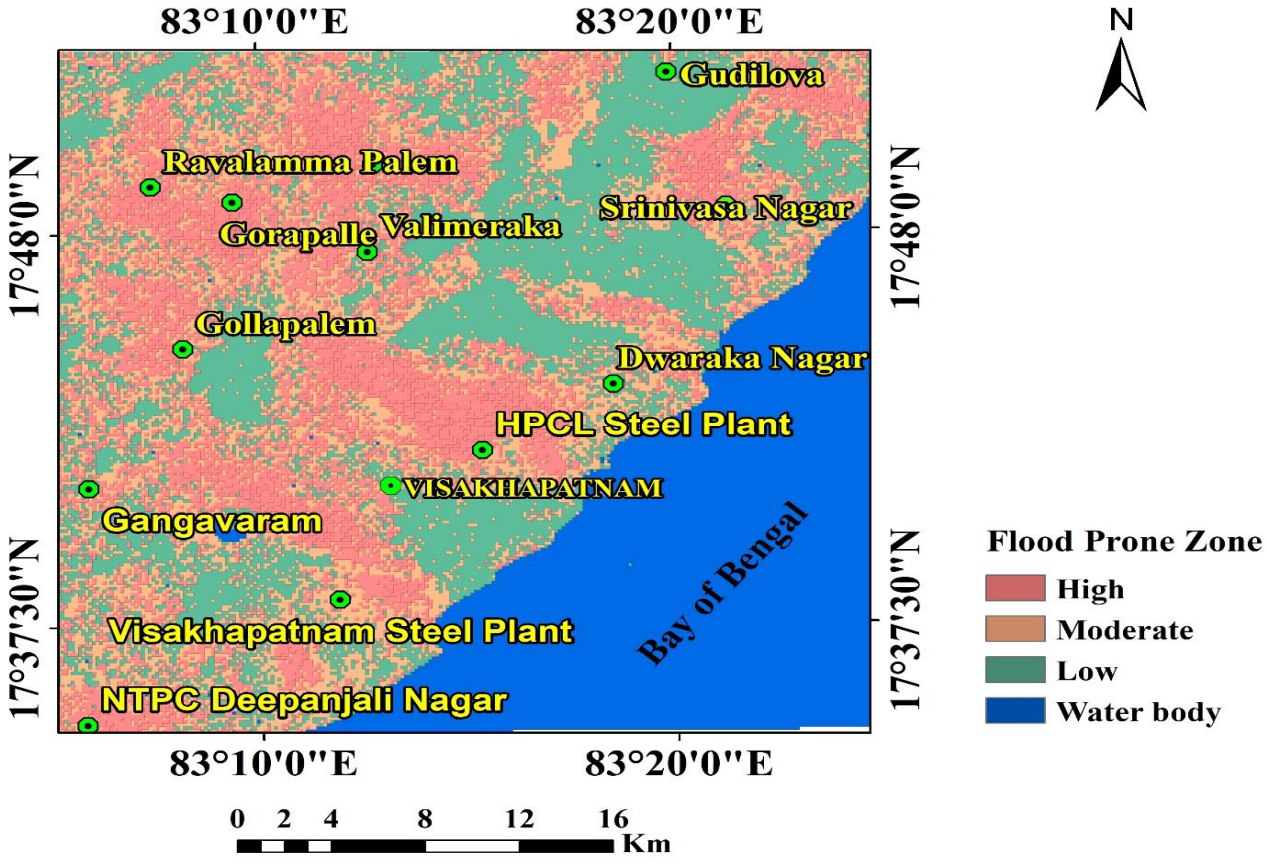

Figure-9: Location based flood prone map of Visakhapatnam coastal zone, flood susceptibility values were derived by GIS overlay technique based on the four influencing factors (i.e. LU/LC, slope, drainage density and aspect).

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Throughout the analysis of the flood susceptibility map, it has been noticed that ~307.46 sq.km (~34.42%) area are vulnerable to the high flood prone region; whereas ~265.84 and ~300.94 sq.km area are vulnerable to moderate and low flood prone zone respectively, corresponding to ~30.42% and ~34.42% of the total study area respectively (Table 4). These all statistics are estimated, based on the four major influencing factors, which were taken on the account of flood susceptibility mapping.

Table-4: Geo-statistics of flood prone areas with respect to flood zones over the AOI

Sl. No.	Flood zones	Area (sq. km)	Area (%)
1	Low	300.94	34.42
2	Moderate	265.84	30.42
3	High	307.46	35.16
Total	-	**874.24**	**100.00**

Hence, this study indicates that the low lying settlement region along the Visakhapatnam coastal regions is prone to the high flood zone. Higher inundation of water may affect the socio-economic conditions of the region. And some of the region near the coastal area, which have higher gradient (Simachalam hilly range) with very less settlement, belongs to the moderate and low flood prone region. This, study has demonstrated the flood prone zone with their scale. So, such kind of study will help to reduce the impact of flood on the socio-economic conditions of the study area. Furthermore, it will also help for sustainable city management and making rescue planning of the city. The excessive population pressure along the coastal regions is the contemporary issues, which govern various meteorological, hydrological, coastal and other calamities. Throughout the study, an attempt was made to detect the changes in coastal shoreline along the AOI. Shoreline along the study area were demarcated using the Landsat based three satellite images corresponding to 1972, 1995 and 2018 as shown in Figure 10.

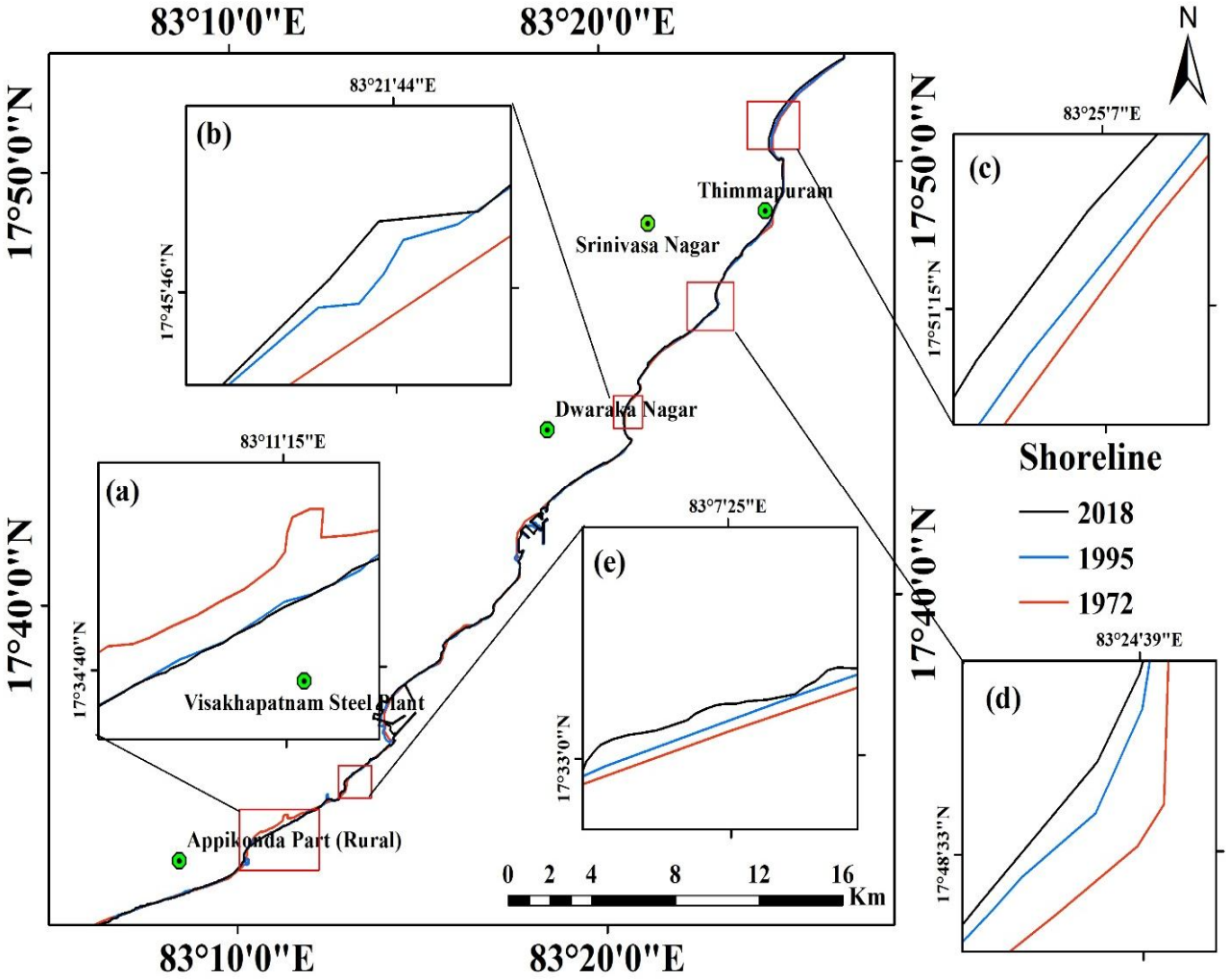

Figure-10: Shoreline change detection map over the AOI, 0.shoreline delineation was done using Landsat satellite data of three different time slots (1972, 1995 and 2018). Black color is corresponding to 2018, blue color is representing to 1995 and red color is showing shoreline of 1972.

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Along the coastal area mostly shoreline erosion can be seen whereas some region has accretion of the shoreline, which may be due to the establishment of the some development work in that area. Figure 10 (a) shows the accretion near the Appikonda rural part, in this portion some vegetative cover has been noticed. Similarly, an accretion can be seen at the Visakhapatnam due to the establishment of Visakhapatnam port as shown in Figure 11.

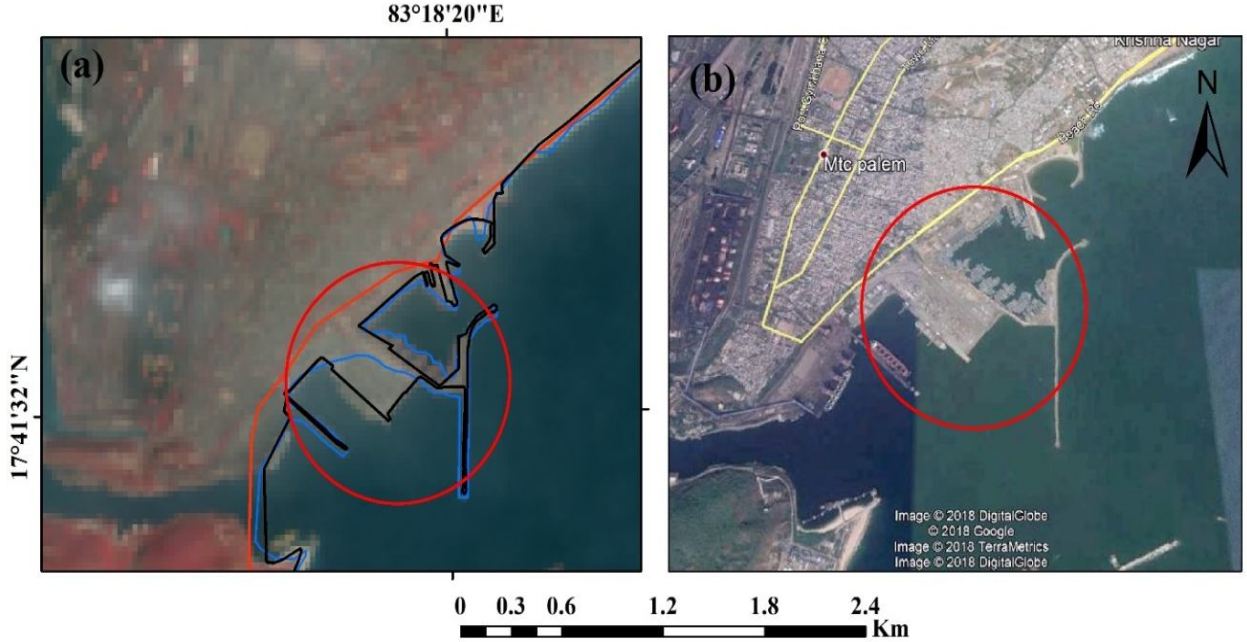

Figure-11: Map showing accretion near the Visakhapatnam due to formation of port.

Apart from the study area are detected under the shoreline erosion activity which may have been caused due to some storm, gales or due to sea level rise in the Bay of Bengal. The shoreline erosion along the study area is well demonstrated in Figure 10 (b) (c) (d) and (e). Only lower portion (near Appikonda part) have accretion of shoreline whereas rest on the upper portion have erosion of the shoreline. Such kind of shoreline erosion will lead to the displacement of settlement area and will cause the other coastal risk. The rise in the mean sea level for the point location of Visakhapatnam were analysed since 1937-2007 which were provided by NOAA PSMSL. Sea level fluctuation data shows that relative sea level trend is 0.79 mm/year. Whereas, monthly mean sea level is 0.45 mm/year which indicates the change of 0.26 feet in 100 years (Figure 12). Hence rise in sea level, shoreline changes, population pressure will be big challenge for the habitant along the coastal zones.

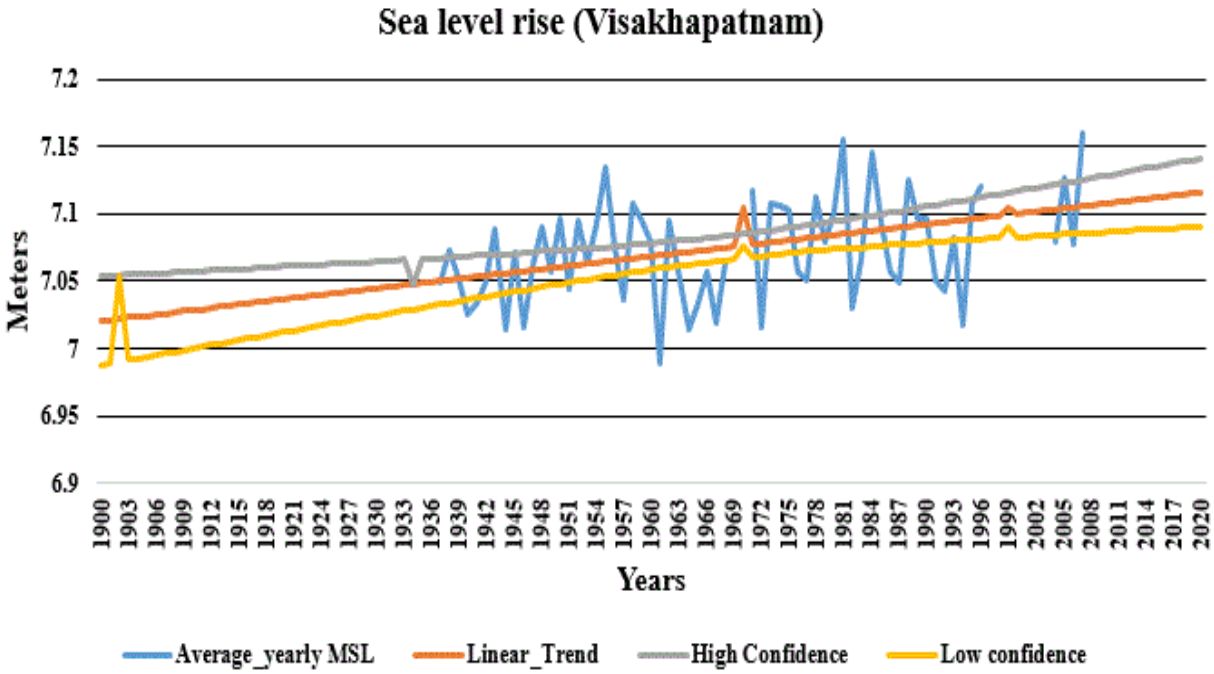

Figure-12: Graph showing sea level fluctuation at the Visakhapatnam point location since 1937-2007. This graph was derived from data, which are provided by NOAA PSMSL.

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4. CONCLUSIONS

Visakhapatnam coastal zone has been often being pretentious by the flood activity originating from Bay of Bengal So, in this study we have estimated the proximal flood prone zone along the Visakhapatnam coastal zone. Derived flood prone map has demonstrated that low lying settlement areas are highly susceptible to the flood. On the other hand, higher gradient region corresponding to Simachalam hilly range are lying in the low flood prone zone as shown in Figure 9. Approximately 307.46 sq.km, 265.84 and 300.94 sq.km corresponding to ~34.42% ~30.42% and ~34.42% of the total area lies under high, moderate and low flood prone zone. On the other hand, it has been remarked that mean sea level at the Visakhapatnam is ~0.45 mm/year which lead toward the loss of coastal shoreline. Throughout the analysis of Figure 10, it is observed that most part of the coastal shoreline are under the threat of erosion. Except the lower portion (near Appikonda part) of study area, all the regions have the erosion of shoreline. Loss of shoreline will cause the major challenge along the coastal environment. In short, Visakhapatnam coastal zone is under the threat of coastal vulnerability.

Henceforth, this study helps to recognize the spatial pattern of flood susceptible region over the VCZ and it can lead for sustainable city management planning. Similarly, impact of flood on the environs can be reduced by saving the lives and stuffs wherein such kind of study will help to prepare a rescue plan over the study region. Present study has shown the effectiveness of MIF technique with remote sensing tool for flood susceptibility mapping. MIF technique has shown their ability to assign the appropriate weightage to the individual class of the specific features. So, proper use of remote sensing technology should be preferred, instead of analysing by traditional methods only.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' Contribution

Satya Prakash has designed the research work, has written the whole manuscript and also has done the image processing work & prepared the maps, under the guidance of Somnath Mahapatra, who has given his valuable and constructive suggestions to improve the quality of the manuscript.

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SOCIAL PRESSURES THROUGH ONLINE SOCIALIZATION AMONG YOUTH

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ABSTRACT
Online Socialization has demonstrated a high degree of popularity among youth. Teenagers spend hours keeping their Facebook profile current and constantly updating their status. This regular engagement of the youngsters in social networking sites and consequent pressure felt has become a hot topic attracting broad interest. However there has been very little research on the sociological impact of these sites in Indian context. The study is conducted in three phases. In the first phase a general overview of usage pattern of youth on Social Networking Sites is made. In the second phase the levels and types of pressures felt are explored. In the third phase specific causes of social pressure are profiled.

Keywords: Online Socialization, Social Presser, Social Networking Sites

1. INTRODUCTION

Socialization is a key part of individual development because it helps sustain societies and cultures and also affected by both nature and nurture. Online Socialization is the process through which the individuals internalize and gain knowledge of the rules and values of a specific social and cultural context through the virtual relational spaces that are shaped in cyber world. This concept is relocating the former socialization perception, as the new technologies create new virtual socialization spaces beyond the individual, in the family and in the educational system. These new online socialization contexts do not refer to a specific space and time but in many cases they are created spontaneously and extended beyond the network arising virtual learning and socialization communities. Online groups provide a place to exchange useful information and social support, meet people, maintain social networks, discuss political and social issues, and entertain. Online groups have been growing rapidly and becoming increasingly important, which produces considerable revenue. Fourteen million users participate in Wikipedia, including 650,000 Wikipedians who edited at least 10 times. In addition, more than 2.000 WikiProjects are subgroups in Wikipedia and include collections of editors interested in improving the coverage and quality of articles in a particular domain.

Virtual or online socialization are having a major impact on society as a whole. Integration of such technologies into social settings has a major influence on social interaction among youth. It is evident from existing literature that new media technologies impact on the social interaction among youth in many different ways. Online socialization can assist in increasing interaction among youth. As a result, it can help bridge generational and digital divides. For that reason, we set out to investigate the research question; 'How online socialization impacting on social interaction within youth?'

Internet culture prevalent globally has given birth to a new era of online socialization through social networking sites. As the technology is advancing so is the usage of laptops, palmtops, and smart-phones. Globally, one in five users check their Smartphones or laptops for email, text, and social media updates at least every 10 minutes. One-third of respondents check at least once every 30 minutes. Overall 60 percent of Gen Y'ers subconsciously or compulsively checks their Smart phones or laptops for emails, texts or social media updates (SiliconIndia, 2012). Teenagers spend hours keeping their Facebook profile current, constantly updating their status. Now imagine the kind of social pressure on same generation of users and its impact. A social networking phenomenon has emerged over the past two decades. In that time, social networking sites (SNS) have grown from a niche to a mass online activity, in which tens of billions of internet users are engaged, both in their leisure time, and at work (Cachia, 2008). With the advance of Internet and Web technologies, the increasing accessibility of computing resources and mobile devices, the prevalence of rich media contents, and the ensuing social, economic, and cultural changes, computing technology and applications have evolved quickly over the past decade. They now go beyond personal computing, facilitating collaboration and social interactions in general. It has become a hot topic attracting broad interest from not only researchers but also technologists, software and online game vendors, Web entrepreneurs, business strategists, political analysts, and digital government practitioners, to name a few (Wang, Zeng, Carley, & Mao, 2007).

Social pressure can also have positive effects when people are pressurized toward positive behavior, such as volunteering for charity or excelling in academics or athletics, by their peers. This is most commonly seen in youths who are active in sports or other extracurricular activities where conformity with one's peer group is

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strongest. However, there has been very little research on the sociological impact of these sites in the Indian context. This paper presents different kinds and causes of social pressure and its degree on youth. Various aspects of social pressure will also be explored and discussed. For this purpose of study, youths using different Social networking sites were examined.

1.1 Social Networking Sites for online socialization

A social networking site is an online service, or a platform that focuses on facilitating the building of social networks or social relations among people who, for example, share interests, activities, backgrounds, or real-life connections. A social network service consists of a representation of each user (often a profile), his/her social links, and a variety of additional services (Social Networking Service, 2012).

The social networking phenomenon has taking over the world country by country. Vincenzo Cosenza, the man behind Vincos Blog, focusing on the topics of social networking, social media and photography, has published a World Map of Social Networks. The interactive map uses analyzed data from Google Trends for Websites to visually depict the most popular social networks by country. The map was first published in June 2009, when Facebook had more than 200 million users and was the most popular network in most places in Europe, Canada, Australia and the United States. The updated map shows Facebook's continuing trend of global domination, where the social network is the market leader in 100 out of 127 countries analyzed. (The Independent, 2009)

At the forefront of emerging trends social networking sites is the concept of "real-time web" and "location-based." Real-time allows users to contribute content, which is then broadcast as it is being uploaded - the concept is analogous to live radio and television broadcasts. Twitter set the trend for "real-time" services, wherein users can broadcast to the world what they are doing, or what is on their minds within a 140-character limit. Facebook followed suit with their "Live Feed" where users' activities are streamed as soon as it happens (Social Networking Service, 2012).

1.2 Social Networking Sites and Researchers

Facebook and other social networking tools are increasingly the object of scholarly research as they are intrigued by their affordances and reach. Scholars in many fields have begun to scrutinize the impact of social-networking sites, investigating how such sites may play into issues of identity, privacy (Gross & Acquisti, 2005), social capital, youth culture, and education (Boyd, 2007).

One other use that is being discussed is the use of social networks in the science communities. Julia Porter Liebeskind et al. have published a study on how new biotechnology firms are using social networking sites to share exchanges in scientific knowledge (Liebeskind & Porter, July–August 1996). They stated in their study that by sharing information and knowledge with one another, they are able to "increase both their learning and their flexibility in ways that would not be possible within a self-contained hierarchical organization." Social networking is allowing scientific groups to expand their knowledge base and share ideas, and without these new means of communicating their theories might become "isolated and irrelevant" (Social Networking Service, 2012).

1.3 Social Pressure

Social pressure is the influence exerted by peer group (friends on social networking sites) for encouraging people to change their perception, attitude and behavior in order to conform to the group norms (Peer pressure, 2012). In other words, social pressure is ‘actions caused through actions of others’.

The effects of social pressure have been a problem since the beginning of time, throughout history social pressure has led to bullying, murder, hate, judgment and persecution. Youth social pressure is found to be a huge issue frequently, because of the need to fit into a particular social group or circle. Being that peers are the people you spend most of your time with, generally in children and teens they are usually in the same age group, with adults it more of a common interests. It is found that most people that fall prey to peer/social pressure have a lack of self-esteem and confidence; this makes them easy prey for others to manipulate and influence. The negative effects of peer pressure can lead to dangerous habits like smoking, drinking, drugs or criminal behavior. There is also positive peer pressure with youth, in situations like a study groups, sports and other positive activities peer pressure can lead to one excelling. (Courtney, 2012)

2. RATIONALE

Social networking for online socialization is a potentially powerful tool to engage young users in building up relationships virtually. Youth nowadays are spending lot of time on social networking sites which has impacted their behaviors. Causes and impacts of social pressure need to be assessed, evaluated and measured. It is high time to test the impact of social networking sites that have created social pressure on youth before it gets settled/

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stabilized for better or worse. Research materials in form of research papers, conference proceedings, training manuals etc. are available. But there have been very few references available in which social pressure and its impact on users of social networking sites has been demonstrated.

3. LITERATURE REVIEW

3.1 Study on Social Informatics

A Research Paper on Impact of Social Informatics Published In Shod – Journal of Management Technology and Social Sciences was taken up to analyze different impact areas in which Social concern area has been selected for in-depth study in the present research.

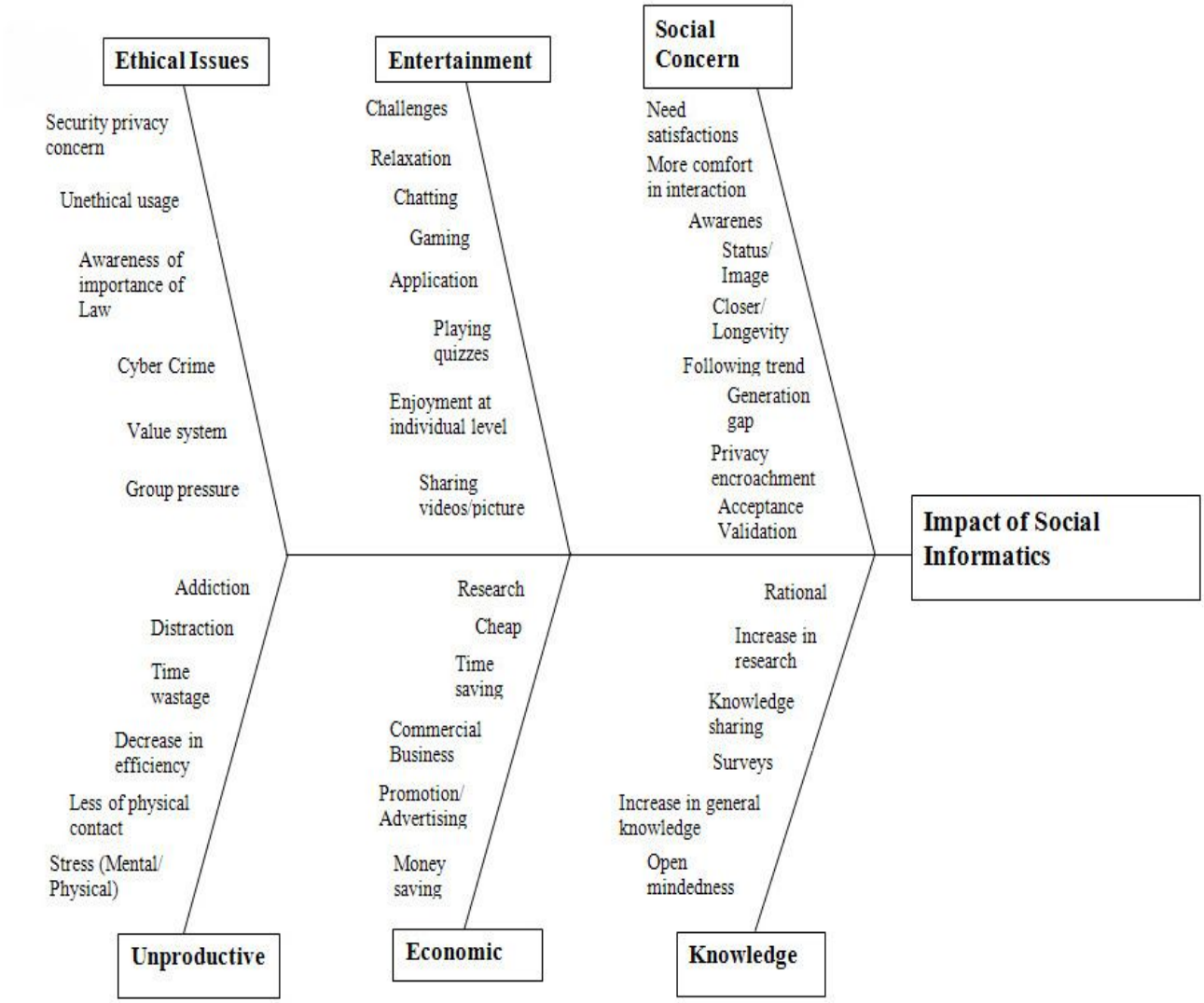

Figure-1: Fish Bone Diagram of Social Informatics (Kapoor & Srivastava, 2012)

3.2 Social Networking Sites in India

Social media is place where people with no restrictions of cast, creed, or nationality join hands. Actually the social networking sites in India may not be for all. But the fact to be accepted is that these social networking sites in India have now turned out to be an unavoidable part of our life and this can't be blindly ignored. Debates were there regarding whether the social networking sites in India are a boon or a bane (socialnetworkingsitesinindia.com, 2012). The social networking sites in India are one among those revolutionary ideas which have made huge variations in the existing situation. These social networking sites in India are never just a medium to maintain or to create relationships. But the social networking sites in India are also used as a tool to enhance the scope of business by many people (socialnetworkingsitesinindia.com, 2012). Participation with technology for social purposes has become the mainstream communication method for many people in the past several years, what started out as a hobby for some computer literate people has become a social norm and way of life for people from all over the world (Boyd, 2007). Teenagers and young adults have especially embraced these sites as a way to connect with their peers, share information, reinvent their personalities, and showcase their social lives (Boyd, 2007).

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The need for research on Social Networking Sites is heightened by their rapidly increasing utilization. Social Networking Websites (SNW) use has quickly become the fourth most popular online activity, surpassing the use of e-mail (Nielsen.com, 2009). Yet, unexplored is a theoretically grounded approach to the study of SNS information relevant to specific behavior patterns causing pressure, such as cyber bullying, privacy issues or understanding flows of change in human behavior socially.

3.3 Studies on Social Pressure

Baron and Byrne says that the social pressure created varies from conformity to intense indoctrination (Baron, R.S., 2000), where, Conformity refers to adjusting one's behavior or thinking to coincide with a group standard. In other words, Conformity is the act of matching attitudes, beliefs, and behaviors to group norms. Compliance refers to a response — specifically, a submission — made in reaction to a request. The request may be explicit (i.e., foot-in-the-door technique) or implicit (i.e., advertising). The target may or may not recognize that he or she is being urged to act in a particular way. Obedience occurs when people obey commands or orders from others to do something. Obedience is less frequent than conformity or compliance, because even persons who possess authority and power generally prefer to exert it through the velvet glove-through requests rather than direct orders. Indoctrination is the process of inculcating ideas, attitudes, cognitive strategies or a professional methodology. It is often distinguished from education by the fact that the indoctrinated person is expected not to question or critically examine the doctrine they have learned.

Solomon Asch's experiment - study on Conformity was devised to examine the extent to which pressure from other people could affect one's perceptions. In total, about one third of the subjects who were placed in this situation went along with the clearly erroneous majority. Asch was disturbed by these results: "The tendency to conform in our society is so strong that reasonably intelligent and well-meaning young people are willing to call white black. This is a matter of concern. It raises questions about our ways of education and about the values that guide our conduct." (Age of the Sage, 1958)

3.4 Social Networking Websites and Social Pressure

Social networking is a phenomenon which has existed since society began. (Barabasi, 2002) Human beings have always sought to live in social environments. The proliferation of social networking sites (SNS) and their pervasion in everyday practices is affecting how Western societies manage their social networks. To a significant extent, SNS have shifted social networking to the Internet. In less than five years, these sites have grown from a niche online activity into a phenomenon through which tens of millions of internet users are connected 24*7 (Lenhart, 2007).

There are various factors which have prompted us to consider the implications of these technologies for policy-making. One of these is the willingness of users to embrace SNS as a means of communication and social networking in everyday life. The increasing dependence on technology for basic communication also highlights the importance of analyzing how SNS are affecting daily processes. Sites like Facebook, Friendster and LinkedIn are influencing the way users establish, maintain and cultivate a range of social relationships, from close friendships to casual acquaintances. Finally, there has been very little research on the socio-economic impact of these sites in the Indian perspective.

4. OBJECTIVES

- To study various causes of social pressure created on young users of Social networking sites for online socialization.
- To categorize various causes on the basis of the degree of social pressure created.
- To study the impact of style and pattern of use of social networking sites on degree of social pressure created.
- To find out the underlying factors/ causes of Social Pressure experienced by the young users of Social Networking Sites for online social socialization.
- To study the impact of social pressure created through social networking sites on the basis of gender.

5. RESEARCH METHODOLOGY

This research constitutes a conclusive investigation of the social pressures created through SNS on youth. The study is conducted in three phases. In the first phase a general overview of usage pattern of youth on Social Networking Sites is made by conducting a focus group with youth. In which 12 students, age between 21 and 27, were asked about the social pressure they undergo while using Social Networking Sites. The participants of discussion were encouraged to give their views on how Social pressure is exerted on various facets of their life

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while using Social Networking Sites. In the first round of discussion all the possible factors of Social pressure were noted down as it came.

In the second phase the levels and types of pressures felt are explored. In this a panel discussion was conducted with faculty members of a management institute for categorizing the social pressure issues emerged in the first phase. In this round of discussion, with consensus 20 factors were highlighted and put under the category of major areas depicting Social pressures. In the third phase specific causes of social pressure are profiled. For this a questionnaire was developed which included the 20 causes of pressure and certain style and pattern of usage of Social Networking Sites.

6. RESULTS AND DISCUSSIONS

6.1 Phase 1: Focus Group with Students

A focus group is a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs, and attitudes towards a product, service, concept, advertisement, idea, or packaging. Questions are asked in an interactive group setting where participants are free to talk with other group members.

The results of phase 1 were in terms of their views regarding usage of social networking sites and pressures they feel while using it, which were then converted into 20 meaningful statements. These statements are different causes of social pressure created through social networking sites.

Kinds of Social Pressure created as evolved through focus group factors

1. Data being misused (Privacy)
2. Compulsion to check on a regular basis
3. Wanted to be liked/ accepted by others
4. Sharing appropriate information for differentiated groups on SNS
5. Reciprocation to like
6. Difficulty in managing different relations at same time
7. Processing too much information at a time (information overload/ infobesity)
8. Disconnect from real world while on SNS
9. Complexity in managing different roles at a time (social image)
10. Encroachment of homepages with too many likes/ comments
11. Posts like Jai Mata di, martyrs for chain sharing
12. Sharing immediate locations (he visited a particular place so I should visit it or tag myself to a place)
13. Fake profiles (Misunderstanding created through fake profiles)
14. Time killing (productive hours are reduced)
15. Threat of viruses/ hacking through click on links/photos/videos
16. Overload of Spams/ Advertisements
17. Emotional connectivity in real life reduced
18. Ruining your professional life
19. Cyber bullying/ suicidal cases due to comments or posts
20. Like newsfeeds of employer/organization/groups

6.2 Phase 2: Panel Discussion with Faculty

A panel discussion is a situation in which a group of people are gathered together to discuss an issue, often to provide feedback on something, to brainstorm solutions to a problem or to discuss an issue of public concern. Questions are asked regarding the topic of discussion where panelists are free to talk and give their views.

The results of phase 2 were in terms of identifying and validating these causes and then categorizing them into 4 categories of social pressures identified through the research by Baron and Byrne.

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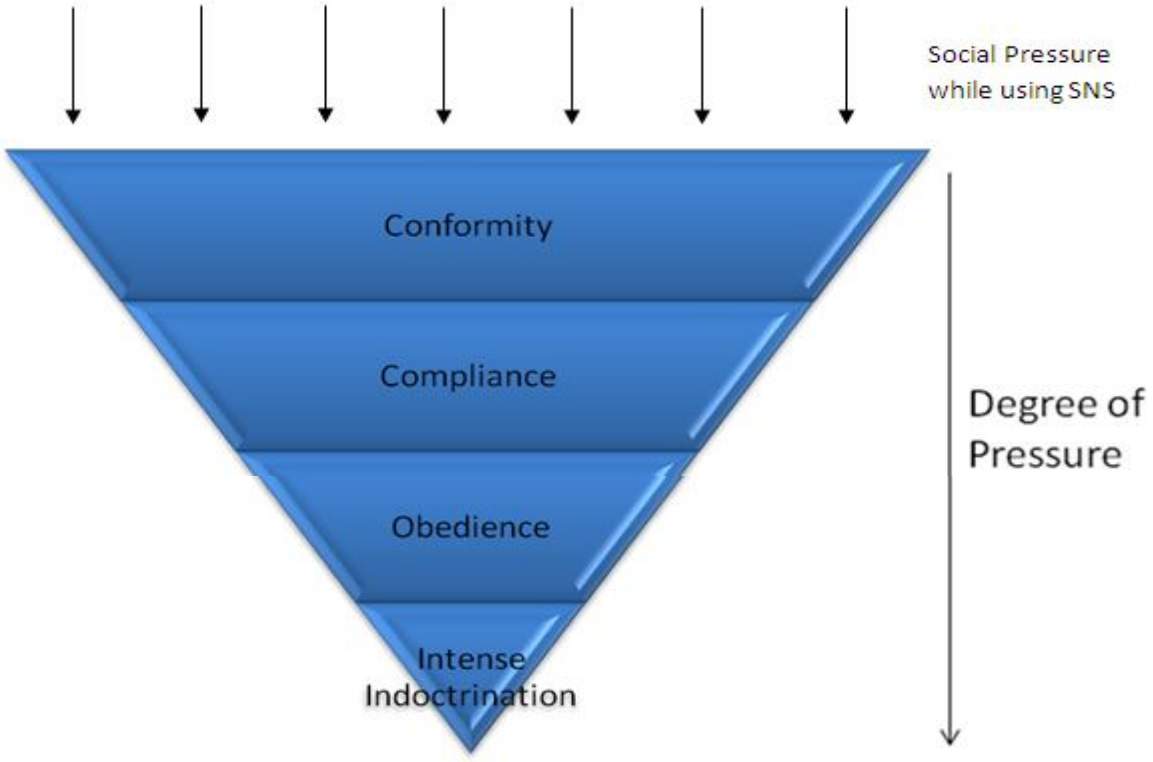
Categories of Social pressure	Causes of Social pressure through SNS
Conformity (Behavior in accordance with socially accepted conventions or standards)	1. Personal Information being misused (Privacy)
	2. Compulsion to check on a regular basi
	3. Desire to be liked/ accepted by others
	4. Sharing appropriate information for different groups on SNS
	5. Complexity in managing different roles at a time (social image)
	6. Sharing immediate locations by comments and tags
	7. Fake profiles creating misunderstanding/ misidentification
	8. Time killing (productive hours are reduced)
	9. Emotional dis-connectivity in real life
Compliance (tendency to agree to do *what is* requested)	1. Reciprocation to like/ comment
	2. Difficulty in managing different relations at same time
	3. Processing too much information at a time (information overload/ infobesity)
	4. Anxious of being disconnect from real world while on SNS
	5. Encroachment of homepages with too many likes/ comments
	6. Threat of viruses/ hacking through click on links/photos/videos
	7. Overload of Spams / Advertisements
Obedience (tendency to agree with someone's wishes or orders or acknowledgment of their authority)	1. Behaving as per people who can have impact on your profession or career
	2. Responding to newsfeeds of seniors/ organization/ groups
Intense Indoctrination (tendency to accept principle or doctrines uncritically without analyzing)	1. Posts compelling for chain sharing like Jai Mata di, martyrs, God, etc.
	2. Cyber bullying/ suicidal cases due to comments or posts

6.3 Pictorial depiction

After we have categorized the 20 causes into 4 areas of Social Pressure we can clearly visualize that conformity was the major area of social pressure that youths feel while using social networking sites which is followed by compliance, obedience and Intense Indoctrination respectively.



Different Areas and Degree of Social Pressure

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6.4 Phase 3: Questionnaire based on usage of Social Networking Sites for online socialization

The instrument presented 10 items and Social Pressure created through them. Using a 5 point Likert scale, youths were asked to indicate the extent to which they viewed the statement as Strongly Agree to Strongly Disagree.

This included questions relating to above analyzed causes from focus group and panel discussion.

In the third phase a questionnaire was developed which included the 20 causes of pressure and certain style and pattern of usage of Social Networking Sites which will help in empirically understanding and exploring about social pressures created through social networking sites.

6.5 Data Analysis

The Survey Results and Analysis depicted with the help of tables and graphs. Responses on different questions are separately shown as follows.

6.5.1 Style and Pattern

The sample frame constitutes students of different management colleges. All Management students surveyed used Social Networking Sites.

Table-I: Management Students' responses on being a part of a social networking society (eg Facebook, Twitter etc)

Response Yes/No	Frequency	Percent
Yes	204	100.0
No	0	0

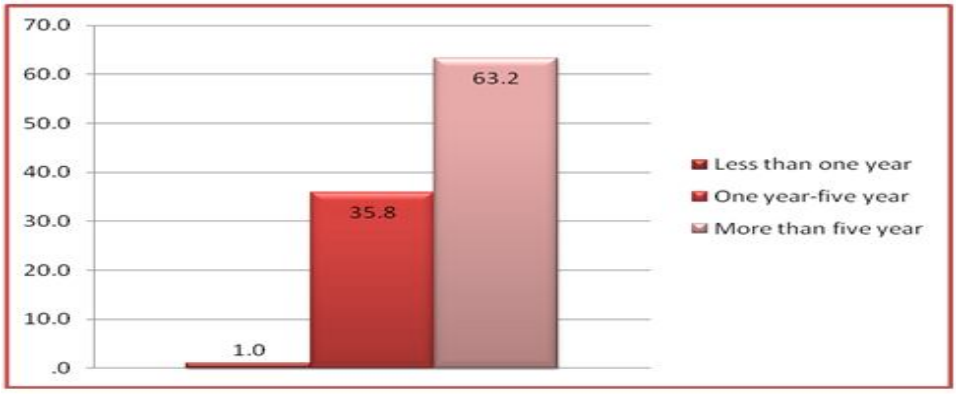
Graph I: Management Students' responses on being a part of a social networking society (eg Facebook, Twitter etc)

All the respondents (100%) surveyed used Social Networking Sites.

Table-II: Management Students' responses on no. of years of usage

No. of years of usage	Frequency	Percent
Less than one year	2	1.0
One year-five year	73	35.8
More than five year	129	63.2
Total	204	100.0

Graph II: Management Students' responses on no. of years of usage



Majority (63.2%) of the respondents have been using internet for more than 5years. This indicates that concept and usage of internet is not a new for them.

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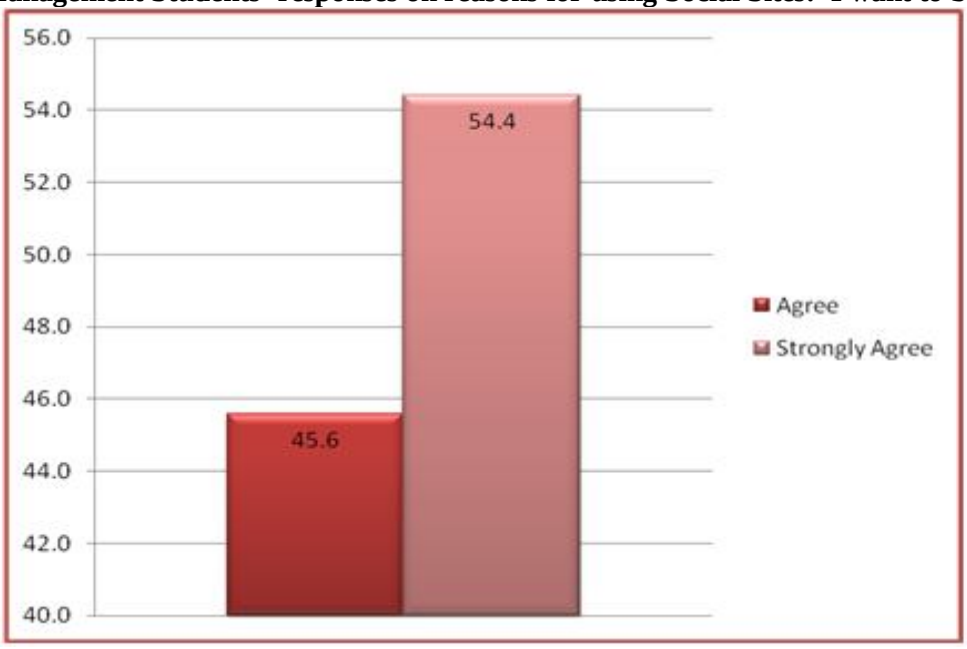
Table-III: Management Students' responses on reasons for using Social Sites: I want to be with people

I want to be with people	Frequency	Percent
Agree	165	80.9
Strongly Agree	39	19.1
Total	204	100.0

Graph-III: Management Students' responses on reasons for using Social Sites: I want to be with people

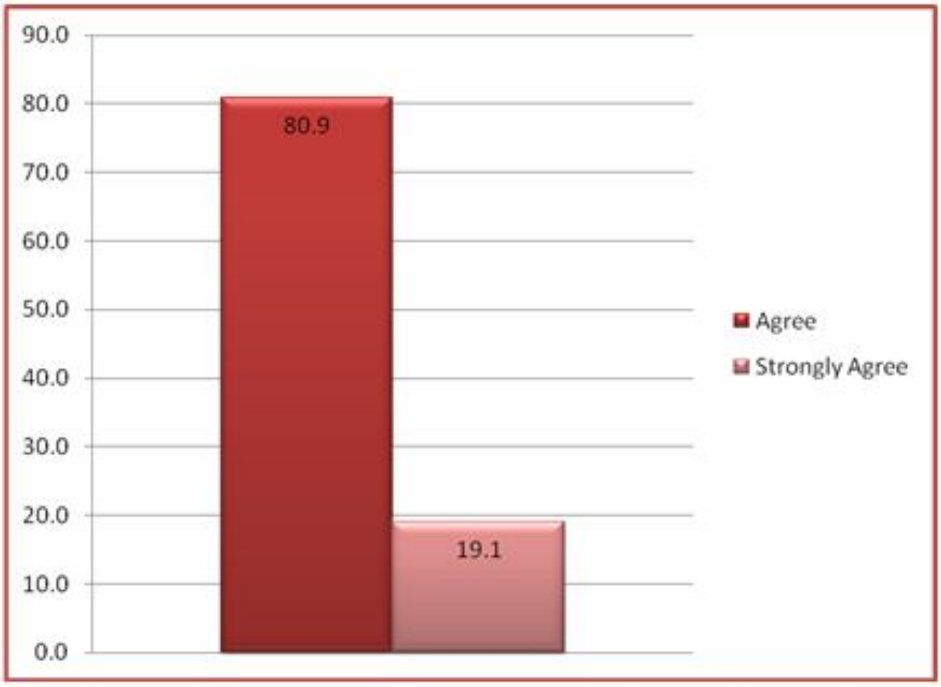


Majority (54.4%) of the respondents strongly agree on the reason for using Social Sites as they want to be with people. This indicates that the respondents strongly follow conformity behavior.

Table-IV: Management Students' responses on reasons for using Social Sites: My friends invited me to join

My friends invited me to join	Frequency	Percent
Agree	165	80.9
Strongly Agree	39	19.1
Total	204	100.0

Graph-IV: Management Students' responses on reasons for using Social Sites: My friends invited me to join



Majority (80.9%) of the respondents agree on the reason for using Social Sites as their friends invited them to join social networking sites. This indicates that the respondents follow compliant behavior.

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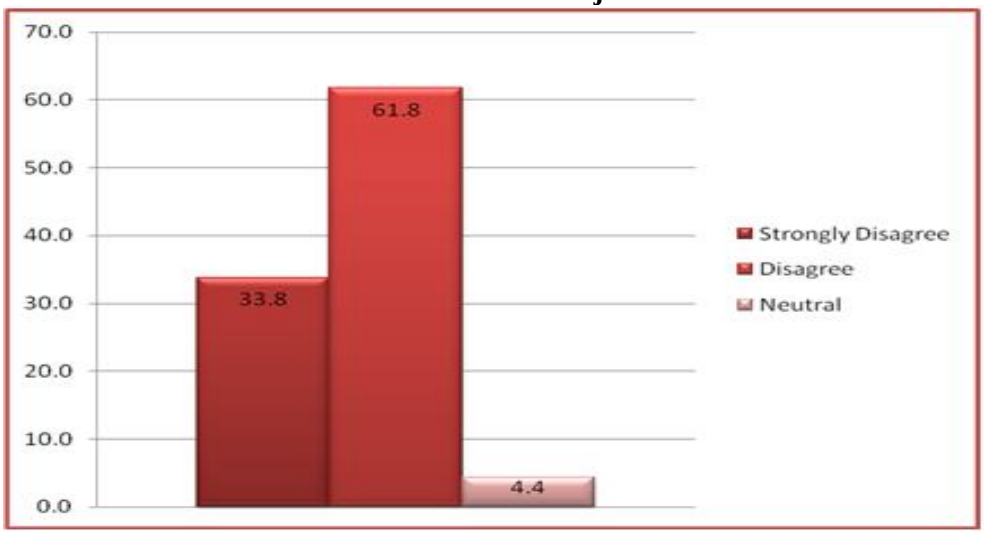
Table-V: Management Students' responses on reasons for using Social Sites: My organization/ seniors have ordered me to join

My organization/ seniors have ordered me to join	Frequency	Percent
Strongly Disagree	69	33.8
Disagree	126	61.8
Neutral	9	4.4
Total	204	100.0

Graph-V: Management Students' responses on reasons for using Social Sites: My organization/ seniors have ordered me to join

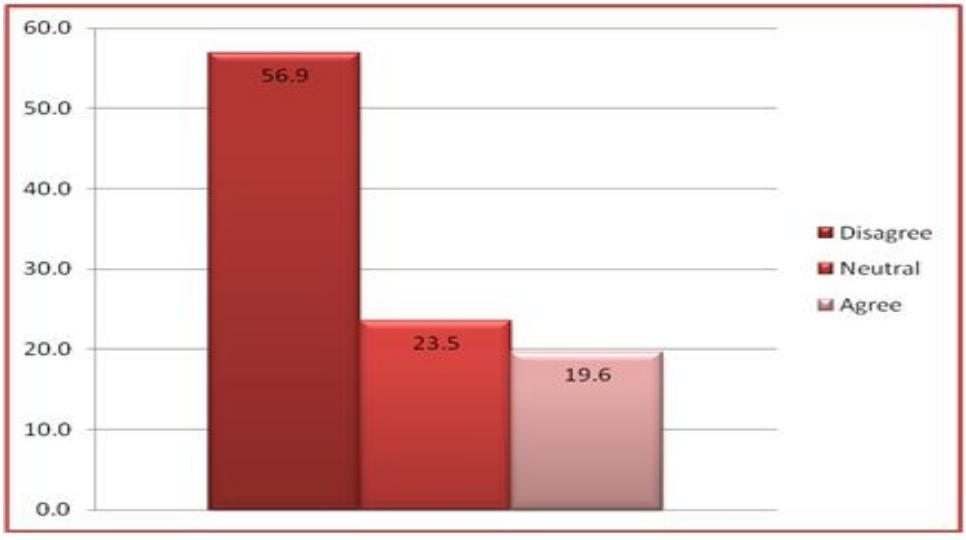


Majority (61.8%) of the respondents strongly disagree on the reason for using Social Sites as their organization/ seniors have ordered them join social networking sites. This indicates that the respondents do not follow obedient behavior.

Table-VI: Management Students' responses on reasons for using Social Sites: I could not reject the request from my social group

I could not reject the request from my social group	Frequency	Percent
Disagree	116	56.9
Neutral	48	23.5
Agree	40	19.6
Total	204	100.0

Graph-VI: Management Students' responses on reasons for using Social Sites: I could not reject the request from my social group



Majority (56.9%) of the respondents disagree on the reason for using Social Sites as they could not reject the request from their social group. This indicates that the respondents do not follow intense indoctrinate behavior.

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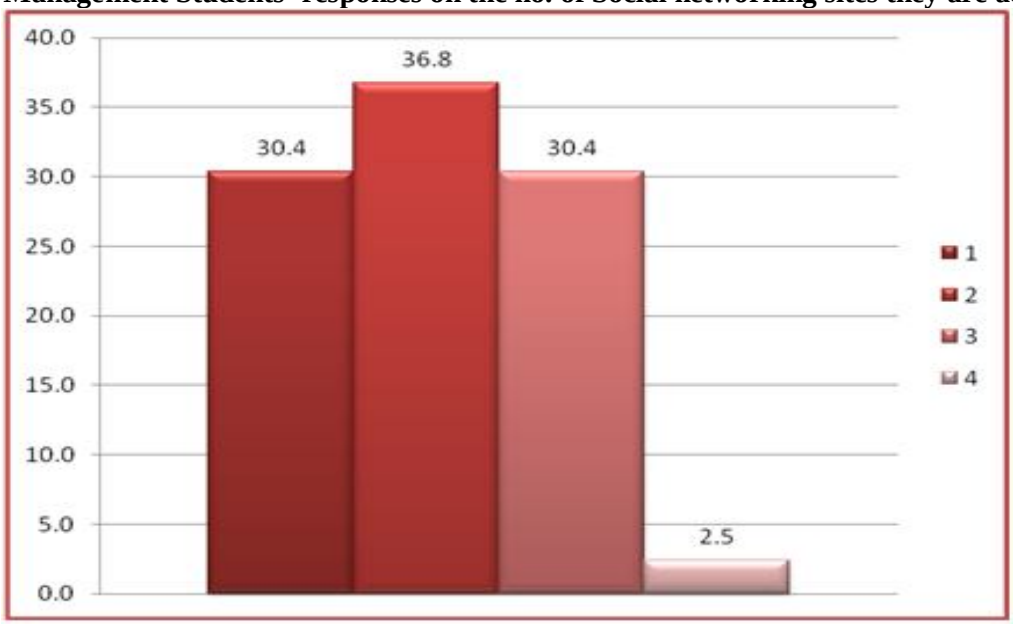
Table-VII: Management Students' responses on the no. of Social networking sites they are actively using

No. of Social networking sites they are actively using	Frequency	Percent
1	62	30.4
2	75	36.8
3	62	30.4
4	5	2.5
Total	204	100.0

Graph-VII: Management Students' responses on the no. of Social networking sites they are actively using

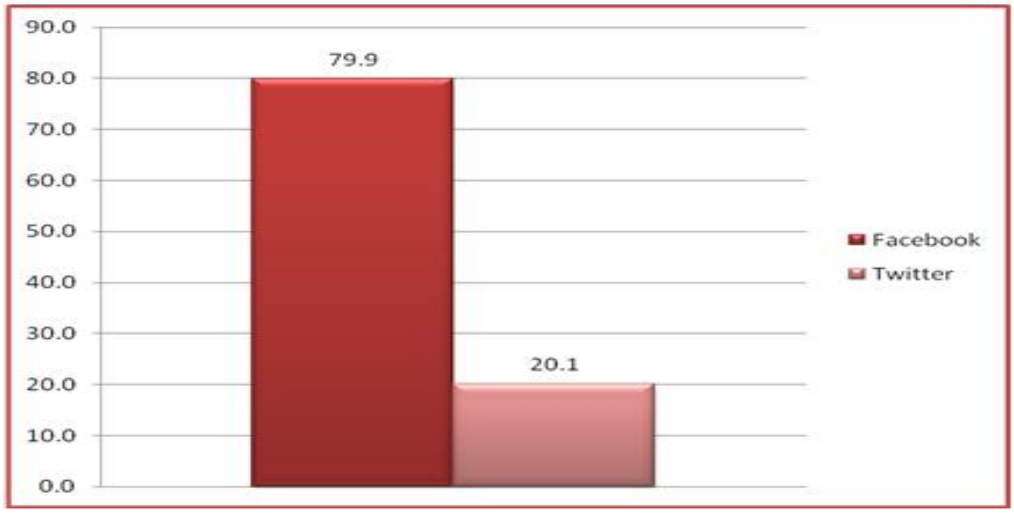


Approximately 36.8% of the respondents actively use 2 Social Networking Sites which also is the majority group and indicates the popularity of two Social Networking Sites like Facebook and Twitter. 30.4% of the respondents actively use only 1 Social Networking Site, 30.4% of the respondents actively use 3 Social Networking Sites and just 2.5% of the respondents actively use 4 Social Networking Sites.

Table-VII: Management Students' responses on their favorite Social networking site

Favorite Social networking site	Frequency	Percent
Facebook	163	79.9
Twitter	41	20.1
Total	204	100.0

Graph-VIII: Management Students' responses on their favorite Social networking site



Approximately 79.9% of the respondents choose Facebook as their favorite Social Networking Site and 20.1% of the respondents choose Twitter as their favorite Social Networking Site. This also indicates the popularity of two Social Networking Sites.

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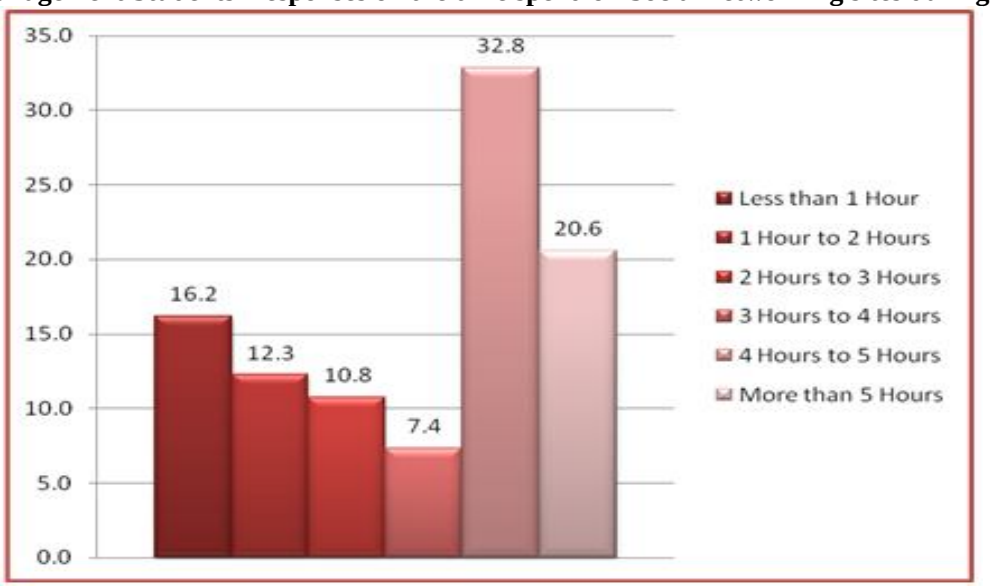
Table-IX: Management Students' responses on the time spend on Social networking sites during a typical day

Time spend on Social networking sites during a typical day	Frequency	Percent
Less than 1 Hour	33	16.2
1 Hour to 2 Hours	25	12.3
2 Hours to 3 Hours	22	10.8
3 Hours to 4 Hours	15	7.4
4 Hours to 5 Hours	67	32.8
More than 5 Hours	42	20.6
Total	204	100.0

Graph-IX: Management Students' responses on the time spend on Social networking sites during a typical day

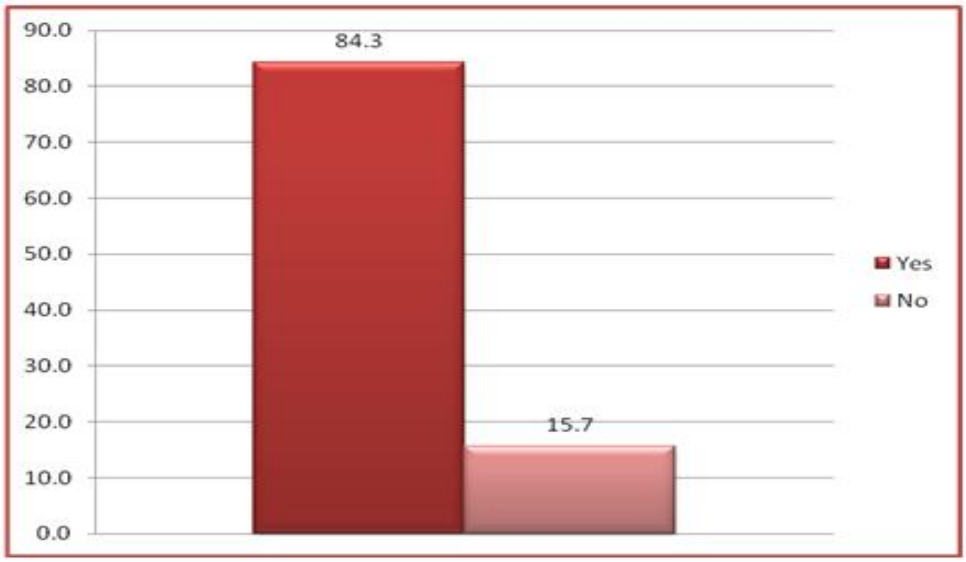


Approximately 32.8% of the respondents spend 4 to 5 hours and 20.6% of the respondents spend more than 5hrs on Social Networking Sites which indirectly shows the kind of Social pressure these respondents would be going through.

Table-X: Management Students' responses on being more sociable as a cause of using Social networking sites

Being more sociable as a cause of using Social networking sites	Frequency	Percent
Yes	172	84.3
No	32	15.7
Total	204	100.0

Graph-X: Management Students' responses on being more sociable as a cause of using Social Networking Sites



Approximately 84.3% of the respondents agree on being more sociable as a cause of using Social Networking Sites. On the contrary only 15.7% of the respondents disagree by saying no on being more sociable.

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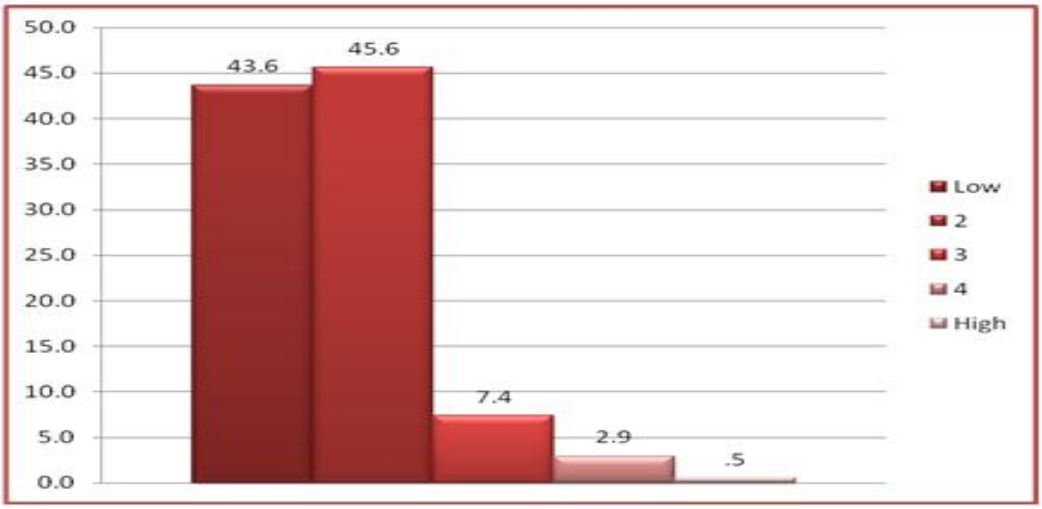
Table-XI: Management Students' responses on the level of pressure experienced while using facebook

Level of pressure experienced while using facebook	Frequency	Percent
Low	89	43.6
2	93	45.6
3	15	7.4
4	6	2.9
High	1	.5
Total	204	100.0

Graph-XI: Management Students' responses on the level of pressure experienced while using facebook



Majority (89.2%) of the respondents feel low level pressure while using Facebook.

6.5.2 Factor Analysis on the causes of Social Pressure

Factor Analysis is used to club variables into certain factors, identifying those factors and interpreting what they represent for further analysis. The following hypotheses were framed for testing whether factor analysis is justifiable or not.

Ho: Correlation matrix is identity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.650**
Bartlett's Test of Sphericity	Approx. Chi-Square	419.244
	df	190
	Sig.	.000

□2 = 419.244

df = 190

The Bartlett's Test of Sphericity significance value (p-value) is 0 which is less than 0.05. Therefore, correlation matrix is not identity or we can say the sample inter-correlation matrix did not come from a population in which the inter-correlation matrix is an identity matrix and factor analysis is justifiable.

The KMO = 0.650

The degree of common variance among the 20 variables is middling, we can say 65% of variation is being explained by underlying factors. If a factor analysis is conducted it is going to be useful.

The Results of the Initial Solution showed 4 main factors out of 20 factor components extracted, the same as the number of variables factored. It was also found that Personal Information being misused (Privacy concern) is the most important cause followed by compulsion to check and difficulty to manage different relationships. This may be a reason behind the privacy features, reminders in forms of notifications and creating different friend lists for different people added by Social Networking Sites.

The results of factor analysis were as expected by the researcher. The first factor is 'Compliance', second factor is 'Conformity', third is 'Intense- Indoctrination' and fourth and last factor is 'Obedience' as expected by the researcher.

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6.5.3 Relationship among the reasons for using Social Sites

	I want to be with people	My friends invited me to join	My organization/ seniors have ordered me to join	I could not reject the request from my social group
I want to be with people	1	.323	.672	.771
My friends invited me to join		1	.250	.906
My organization/ seniors have ordered me to join			1	.954
I could not reject the request from my social group				1

Among all the 4 Reasons for using Social Sites there is no Correlation as significance value is greater than 0.05. Therefore, we can infer that all 4 reasons which indicate Conformity, Compliance, Obedience and Intense Indoctrination are significantly different from each other.

6.5.4 Relationship between reasons for using Social Sites and the level of Social Pressure

To test the relationship between different kinds (reasons for using Social Sites: I want to be with people, My friends invited me to join, My organization/ seniors have ordered me to join and I could not reject the request from my social group) and levels of Social Pressure. The results showed nearly no correlation between different reasons for using social networking sites and the level of pressure felt by the respondents while using social networking sites as the significance value in all the four cases was higher than 0.05.

6.5.5 T-test between gender and Reasons for using of social sites

To test the relationship between different reasons for using Social Sites (I want to be with people, My friends invited me to join, My organization/ seniors have ordered me to join and I could not reject the request from my social group) and gender. Following hypotheses were framed for testing.

Ho: There is no difference between the gender groups in terms of different reasons for using Social Sites

Levene's test for equal variance

For all the four variables the levene's test showed to be significant value as all the values were greater than 0.05. Therefore, we can infer that both the samples of males and females had equal variances.

T-test

For three variables that indicated conformity, compliance and intense indoctrination, the T-test showed to be significant value as all the values were greater than 0.05. Therefore, null hypothesis is accepted and consequently we can infer that there is no difference between the gender groups for all the four variables individually. But in case of obedience we could gauge a difference in genders as the significance value was less than 0.05.

7. CONCLUSIONS

The findings of the present study suggest that youths feel pressurized while using social networking sites but the level of Social Pressure experienced was low in majority cases. These causes of pressure are identified and categorized into areas of social pressures. With the help of these causes certain style and pattern of usage of social networking sites were empirically studied. The conclusions drawn were like majority of the respondents have been using internet for more than 5years. This indicated that concept and usage of internet is not a new for them. Then majority respondents strongly agreed upon following conformity rather than complaint behavior. They also strongly disagreed upon not following intense indoctrination and disagreed upon not following obedient behavior.

Facebook was among the top of the most favorite Social Networking Site and the time spend on them was approximately four to five hours daily. These websites have not only increased the level of Sociability but also the level of daily pressure in terms of handling relationships, information overload, etc. Important and significant causes were clubbed together to form 4 factors which represented four different kinds of Social Pressure. We also got a confirmation on the fact that there was no difference found between gender groups except in one case where the reason for using Social Sites indicated obedience behavior. There was no correlation found among different kinds and levels of Social Pressure. That is to say the pressure felt by the respondents is unrelated to the type of pressure. In other words compliance, conformity, obedience and intense indoctrination as different kinds of social pressure which remain unaffected by how much Social Pressure were felt by the respondents in general.

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Technology has brought the world closer but has ways to go to make it a better place, yet reaching out to the people is the most important part of being connected. Giving advices to the naïve and young generation, to help them through crisis even if it comes down to limiting virtual socializing or its better/effective utilization for reducing the behavioral impact of Social pressure experienced while connected though Social Networking Sites.

8. LIMITATIONS

The scope of study is limited due to the following reasons:

- **Sample size-** the sample is restricted to Facebook users. With the bigger sample size that means including more social networking websites we could have made more accurate conclusion and better generalization.
- **Bound to only Kanpur city -** the other limitation of the study is it is limited to only the main city area of Kanpur and ignores the samples from the smaller parts of the district. The behavior of an individual varies from place to place.
- **Awareness -** the sample taken and the conclusion drawn can be led to only one side if there is lack of awareness about SNS among certain students.

9. AREAS FOR FURTHER RESEARCH

Some more Empirical work is needs to be done in this regard to further understand the degree of social pressure created through Social Networking Sites and its impact on youths. More people can be taken up as a part of focus groups to completely understand the causes of pressure which is limited in this research. Some other hidden variables can be researched upon through further in-depth study.

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GRAFTING OF SODIUM SALT OF PARTIALLY CARBOXYMETHYLATED GUAR GUM WITH ACRYLONITRILE USING K2S2O8/ASCORBIC ACID REDOX INITIATOR

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ABSTRACT
An efficient redox system, potassium persulphate (KPS)/ascorbic acid (AA) was employed first time to initiate the graft copolymerization of acrylonitrile (AN) onto Sodium salt of Partially Carboxymethylated Guar Gum Na-PCMGG ($\overline{DS}$ = 0.15) in an aqueous medium, under a nitrogen atmosphere. The grafting yields (%G and %GE) were varied with concentrations of AN, KPS and AA as well as reaction time, temperature and amount of backbone and the reaction conditions for optimum grafting were evaluated. Maximum values of the grafting yields achieved were %G = 301.49 and %GE = 97.77 at optimized conditions. The reaction mechanism could explain very well the experimental results. Grafting process was confirmed with the help of FTIR, thermal (TGA/DSC), XRD and SEM techniques.

Keywords: acrylonitrile, characterization, graft copolymerization, optimal reaction conditions, redox pair, sodium salt of partially carboxymethylated guar gum.

INTRODUCTION
The graft copolymerization process, for chemically modifying a polymeric material, from renewable resources, has been widely accepted as an effective method to impart useful properties to the backbone polymer without significantly affecting the original ones. Of the various methods of initiation of grafting, chemical initiation is easier because the activation energy of the redox initiation is quite low in comparison to that of the other methods (Bhattacharya and Mishra, 2004). However, the choice of redox initiating system has a great influence on the grafting result.

Guar gum (GG) is a naturally occurring galactomannan polysaccharide isolated from the seed endosperm and having linear chain of β-D-mannopyranosyl units linked (1→4) with single Corresponding author: Dr. Jignesh H. Trivedi, Post Graduate Department of Chemistry, Sardar Patel University, Vallabh Vidyanagar-388120, Gujarat State, India, Tel.: +91-2692-226856 Extn.214, Fax: +91-2692-236475 member α-D-galactopyranosyl units (1→6) as side branches (Goldstein, Alter, & Seaman, 1973) Due to the incomplete hydration of GG at ambient temperature and poor solution clarity as well as the desire for products with modified or special properties, we have used the carboxymethylated derivative of guar gum i.e. sodium salt of partially carboxymethylated guar gum (Na-PCMGG) in the present work. Guar Gum and its derivatives find applications not only in petroleum, textile, paper, food and explosive industries but also in mining and minerals as well as in pharmaceuticals, medicines and drugs (Gupta, 1998). Thus, even though guar gum and its derivatives enjoy wide number of applications, however, like other polysaccharides they are also susceptible to easy biodegradation (Whistler, 1973) which could be improved by grafting of vinyl monomers onto them.

To date many investigations have been carried out on grafting of vinyl monomers onto guar gum (Srivastava et al., 2010; Thimma, Reddy, Tammishetti, 2003; Mundargi et al., 2006) and sodium salt of partially carboxymethylated guar gum (Yadav, Mishra, & Behari, 2011; Trivedi et al., 2005; Trivedi et al. 2005; Trivedi et al., 2008; Tripathy et al., 2008) using various redox initiating systems. The comprehensive literature survey reveals that there are only few reports on grafting of different vinyl monomers onto guar gum using potassium persulphate/ascorbic acid as redox initiating system (Bajpai, Alka, & Sandeep, 1990; Bajpai, Mishra, & Raj, 1993; Singh et al. 2004, Singh, Srivastava & Sethi, 2004). However, as per the authors' knowledge there is no published report regarding the modification of sodium salt of partially carboxymethylated guar gum (Na-PCMGG) by following the grafting technique using potassium persulphate/ascorbic acid as a redox initiator. Recently, therefore, as a part of our research programme we have successfully carried out modification of Na-PCMGG ($\overline{DS}$ = 0.15) by graft copolymerization with acrylonitrile (AN), methyl acrylate (MA), methyl methacrylate (MMA) and butyl acrylate (BA) using potassium persulphate/ascorbic acid as a redox initiator. However, in the present work we report the evaluation of the optimal conditions for affording maximum percentage of grafting of AN onto Na-PCMGG ($\overline{DS}$ = 0.15) by employing potassium persulphate/ascorbic acid as a redox pair and the characterization of the products using FTIR, thermal (TGA/DSC), XRD and SEM

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techniques. The optimally synthesized graft copolymer (Na-PCMGG-g-PAN, % G = 301.49) was then further saponified to form a superabsorbent hydrogel, H-Na-PCMGG-g-PAN. The swelling behaviour of the hydrogel has also been studied in low conductivity water as well as in different saline solutions and the preliminary results are reported elsewhere (Trivedi & Prajapati, 2015).

EXPERIMENTAL

Materials

Sodium salt of partially carboxymethylated guar gum (Na-PCMGG, $\overline{DS}$ = 0.15) sample was kindly supplied by Encore Natural Pvt. Ltd. Naroda, Ahmedabad, Gujarat, India. It was purified by precipitation method and the salt was removed by washing the sample repeatedly with 95% aqueous methanol and finally with pure methanol and ether respectively. It was dried in a vacuum oven at 40^{o}C. Potassium persulphate (KPS) (Qualigens Glaxo Indid Ltd.) of analytical reagent grade was used as received. Ascorbic acid (AA) (Samir Tech. Chem. Baroda, Gujarat) of analytical reagent grade was also used as received. Acrylonitrile (AN) (Samir Tech. Pvt. Ltd. Baroda, Gujarat) was distilled out at atmospheric pressure and the middle fraction was collected and used. All other reagents and solvents used in the present work were of reagent grade. Nitrogen gas was purified by passing through fresh pyrogallol solution. Low conductivity water was used for the preparation of solutions as well as for polymerization reactions.

Graft copolymerization

A 250 mL three-necked flask equipped with mechanical stirrer, a reflux condenser and a gas inlet system was immersed in a constant temperature bath for grafting reaction. In a typical reaction, varying amount (0.25-3.5 g) of sodium salt of partially carboxymethylated guar gum (Na-PCMGG, $\overline{DS}$ = 0.15) was dissolved in low conductivity water (110 mL) with constant stirring and bubbling a slow stream of nitrogen for 1h at the desired temperature (20 to 80^{o}C). Nitrogen gas was continuously passed through the reaction solution and the freshly distilled AN (0.037-0.665 mol/L) was then added. After 5 minutes, the freshly prepared 10 mL solution of AA (10×10^{-3} to 50×10^{-3} mol/L) in low conductivity water was added and stirred for 20 minutes. After 30 minutes, the freshly prepared 10 mL solution of KPS (5×10^{-3} to 45×10^{-3} mol/L) in low conductivity water was added, and this time of addition of persulphate was taken as zero time for reaction. The grafting reactions were carried out for different time intervals (0.5 to 10h). After completion of the reaction, the mixture was immediately poured into excess of methanol to coagulate the crude graft copolymer. The crude graft copolymer product was filtered, repeatedly washed with 95% methanol and finally with pure methanol. The crude graft copolymer thus obtained was dried under vacuum at 40^{o}C. The homopolymer (PAN) was separated from the crude graft copolymer by extraction with dimethyl formamide for 48h. After complete removal of the homopolymer, the pure graft copolymer was dried at 40^{o}C under vacuum to a constant weight.

The value of the percentage of grafting (%G), percentage of grafting efficiency (%GE) and percentage of homopolymer (%H_p) were calculated by using the following expressions (Trivedi et al., 2013):

$$\text{(i) Percentage Grafting (\%G)} = \frac{\text{Wt.of polymer grafted}}{\text{Initial wt. of backbone}} \times 10^2 \quad (1)$$

$$\text{(ii) Percentage Grafting Efficiency (\%GE)} = \frac{\text{Wt.of polymer grafted}}{\text{Wt. of polymer grafted} + \text{Wt. of homopolyme r}} \times 10^2 \quad (2)$$

$$\text{(iii) \% Homopolymer (\%H}_p\text{)} = 100 - \%GE \quad (3)$$

Isolation of Grafted chains

The graft copolymer of Na-PCMGG ($\overline{DS}$ = 0.15) containing PAN (i.e. Na-PCMGG-g-PAN) was hydrolyzed by refluxing it for 12h in 1 mol/L HCl for the isolation of the grafted PAN chains (Brockway & Seaberg, 1967).

FTIR spectra

FTIR spectra of Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN samples were taken in KBr pellets using Nicolet Impact 400D Fourier Transform Infrared Spectrophotometer.

Thermogravimetric analysis (TGA)

The thermal behaviour of Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN was studied in an inert atmosphere at a heating rate of 10^{o}C/min with the help of a Dupont 951 thermogravimetric analyzer.

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Differential scanning calorimetry (DSC)

The DSC scans of Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN were recorded in an inert atmosphere at a scan rate of 10°C/min on DSC 2920 TA instrument.

X-ray diffraction (XRD) analysis

X-ray diffraction analysis of Na-PCMGG ($\overline{DS}$ = 0.15) and Na-PCMGG-g-PAN (%G = 301.49) was carried out with the help of X-ray diffractometer (model X' Pert, Philips, Holland) with a Cu k_a radiation source. The samples were scanned from 5° to 70° at a scan rate of 2°/minutes.

RESULTS AND DISCUSSION

Graft copolymerization mechanism

The initiator used in the present work was potassium persulfate (KPS) in combination with ascorbic acid (AA). The kinetics of this novel redox initiator system was studied by Mehrotra and Mushran and a mechanism for the sequential formation of the primary radicals like $SO_4^{-\bullet}$, $^{\bullet}OH$ and $AH^{\bullet}$ (ascorbate radical) has been proposed as shown in Scheme 1. These primary radicals are expressed as $X^{\bullet}$ as shown in the reaction Scheme 2, which has been proposed with a view to elucidating the mechanism of grafting of AN onto CMGG ($\overline{DS}$ = 0.15) initiated by KPS/AA redox initiator in an aqueous medium. From the scheme 2, it becomes clear that the primary radicals (generated as per Scheme 1), which are also known as chain carriers, initiate the vinyl polymerization reaction because of the fact that H abstraction from the CMGG backbone by

$$\text{Initiation}: \quad S_2O_8^{2-} \rightarrow 2SO_4^{-\bullet} \tag{1}$$

$$AH_2 \rightarrow AH^- + H^+ \tag{2}$$

$$\text{Propagation}: \quad SO_4^{-\bullet} + H_2O \rightarrow SO_4^- + {}^{\bullet}OH + H^+ \tag{3}$$

$${}^{\bullet}OH + AH^- \rightarrow {}^{\bullet}AH + OH^- \tag{4}$$

$${}^{\bullet}AH + S_2O_8^{2-} \rightarrow A + SO_4^{2-} + SO_4^{-\bullet} + H^+ \tag{5}$$

$$\text{Termination}: \quad {}^{\bullet}AH + SO_4^{-\bullet} \rightarrow SO_4^{2-} + H^+ + A \tag{6}$$

$${}^{\bullet}AH + {}^{\bullet}OH \rightarrow A + OH^- + H^+$$

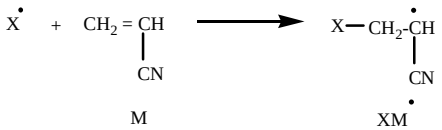
OR (7)

$$A + H_2O$$

Where AH_2 represents the ascorbic acid (AA) which is equivalent to ascorbate ion (AH^-), $^{\bullet}AH$ is the ascorbate free radical and A represents the dehydroascorbic acid.

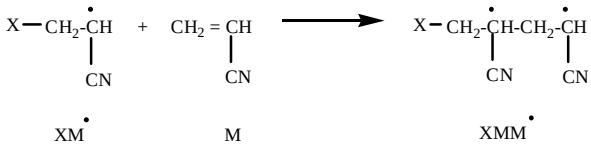
Scheme 1: Reduction of KPS by ascorbic acid leading to the sequential formation of primary radicals.

Initiation:



(1)

Propagation:



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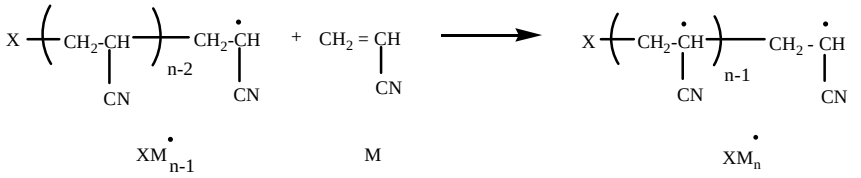

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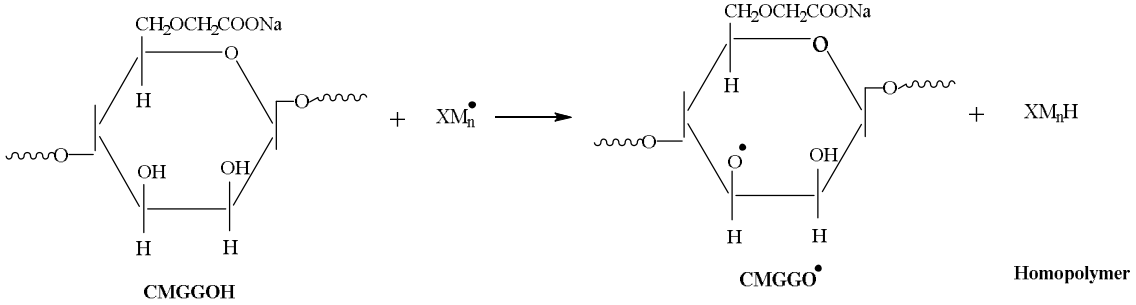
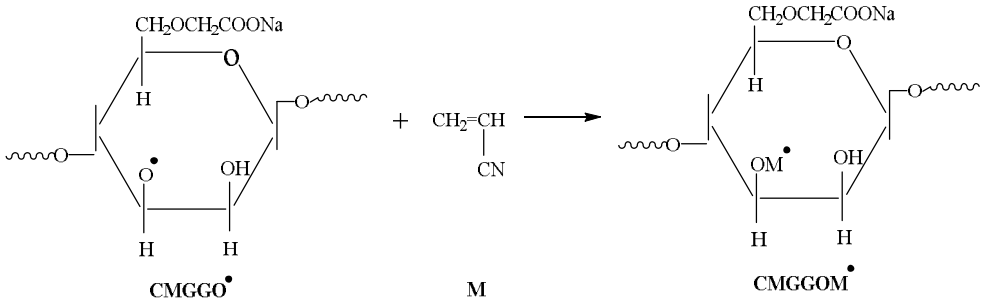


(4)



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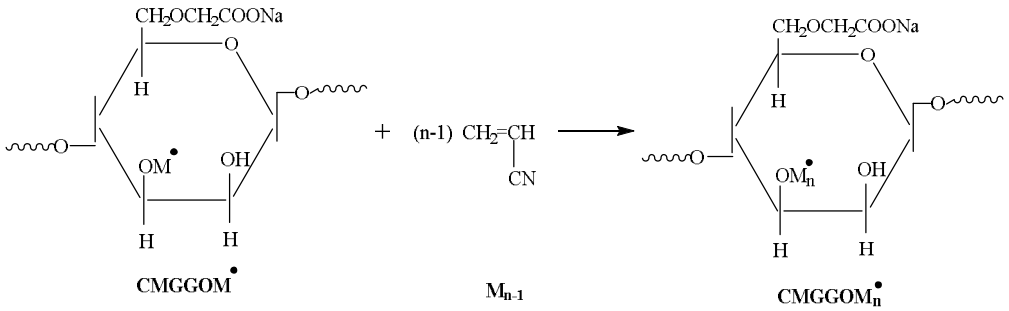

(6)

$$CMGGOM_n^{\bullet} + CMGGOM_n^{\bullet} \longrightarrow \textbf{Graft Copolymer} \qquad (7)$$

where $X^{\bullet}$ are primary radicals like $SO_4^{-\bullet}$ OR $^{\bullet}OH$ OR $^{\bullet}AH$ and M represents acrylonitrile monomer.

Scheme-2: Reaction mechanism for the synthesis of CMGG-g-PAN using KPS/AA redox pair.

Primary radicals is reported to be the slower in comparison to that of vinyl polymerization[13]. As per equation (4), the macro-radical ($CMGGO^{\bullet}$) which has been generated may add on to the monomer acrylonitrile leading to the formation of a new radical $CMGGOM^{\bullet}$ [Scheme 2, Eqn.(5)] which is further capable of attracting more and more number of monomer molecules available in the reaction system and thereby the chain will grow continuously till it gets terminated by combining with other such growing chain to form the graft copolymer, CMGG-g-PAN [Scheme 2, Eqn.(7)].

Influence of Reaction Parameters on Grafting Yields

In order to optimize the reaction conditions for grafting, various reaction parameters including amount of backbone, concentrations of monomer (AN), potassium persuphate (KPS) and ascorbic acid (AA) as well as reaction time and temperature were varied keeping the total volume of the reaction mixture to be 150 mL. The influence of various reaction parameters on grafting yields was also studied as described below:

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(a) Effect of backbone concentration

The effect of backbone concentration on grafting yields is shown in Figure 1(a). It has been found that initially both percent and efficiency of grafting increased with increase in backbone concentration which may be attributed to the greater availability of grafting sites at Na-PCMGG molecules. With a further increase of backbone concentration, the higher viscosity of reaction solution medium made the diffusion of monomer more difficult and Na-PCMGG macroradicals (Na-PCMGGO$^{\bullet}$) interacted with each other to terminate the chain propagation reaction leading to a decrease in percentage of grafting [cf. Figure 1(a)]. However, the value of %GE also varies in the similar manner, with increase in backbone concentration as shown in Figure 1(a).

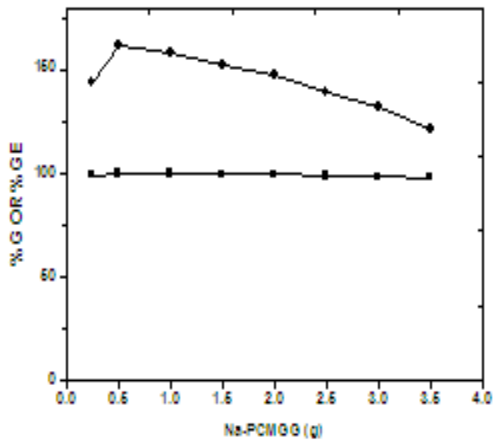
(b) Effect of monomer concentration

The influence of monomer (AN) concentration was studied by varying its concentration from 0.037 to 0.665 mol/L while keeping other reaction parameters constant and the results are depicted in Figure 1(b). It can be revealed from the figure that there is a marked increase in %G with increase in monomer concentration. This can be explained by the fact that (i) at the high monomer concentration, a larger amount of the growing polymeric chains that are formed are involved in generating additional active sites onto Na-PCMGG and (ii) with the increase of monomer concentration, the viscosity of the medium would be increased owing to the solubility of PAN in its own monomer, which will hinder termination, particularly by the coupling of growing polymer chains.

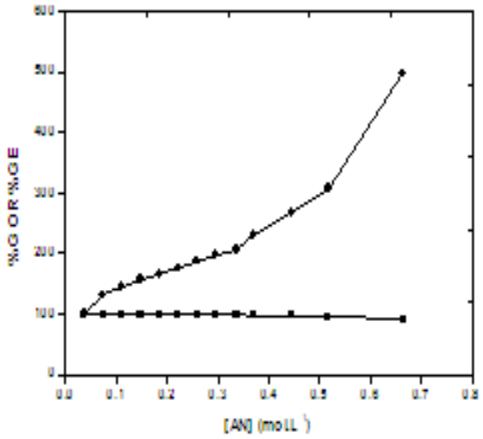
However, grafting efficiency is found to be decreased with increasing monomer concentration [Figure 1(b)], showing that even when %G is increased, it has not contributed to a progressive increase in grafting efficiency. This may be due to the grafted chains acting as diffusion barriers, which may impede diffusion of monomer into the backbone. As a result, less monomer would be available for grafting and more of it may be used for homopolymerization.

(c) Effect of Potassium persulphate concentration

The effect of potassium persulphate (KPS) concentration on grafting yields was studied in the concentration range from 5 x 10^{-3} to 45 x 10^{-3} mol/L as shown in Figure1(c). It can be seen from the



(a)



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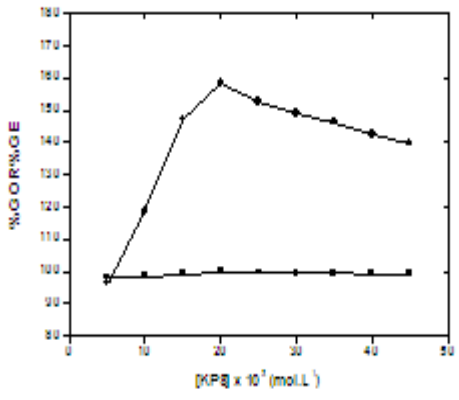
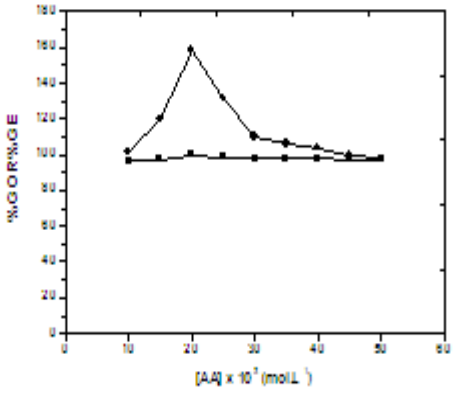


(c)



(d)

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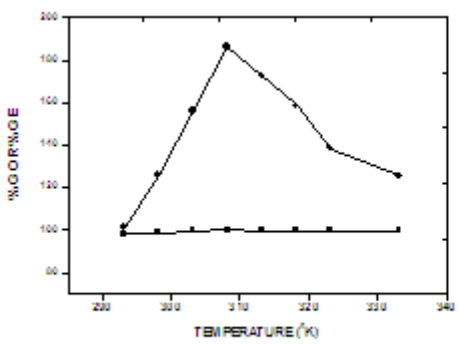
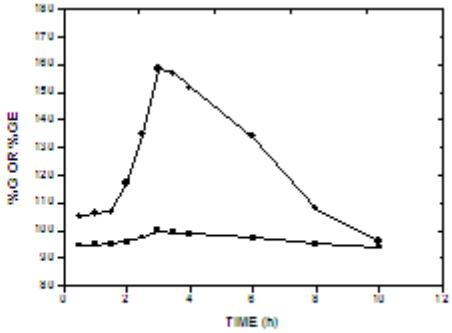


(e)



(f)

Figure-1. Influence of **(a)** amount of carboxymethyl guar gum (CMGG); **(b)** acrylonitrile (AN) concentration; **(c)** potassium persulphate (KPS) concentration; **(d)** ascorbic acid (AA) concentration; **(e)** reaction temperature and **(f)** reaction time on: -●- %G ; or -■- %GE.

Results that at a reasonably small initiator concentration, the percentage of grafting (%G) is found to be reasonably in appreciable amount. This can be attributed to the fact that the ionization of carboxyl groups on the backbone resulted in increased attraction of an initiator (KPS) to the backbone which is turn leads to the creation of more active centers giving rise to usually higher value of %grafting.

The values of %G and %GE are found to be increased with increase in initiator concentration and reached a maximum value of 158.36% at [KPS] = 20 x 10^{-3} mol/L [Figure 1(c)] but decreased at higher concentrations. The enhancement in percentage of grafts within the cited range is due to the fact that during polymerization, more primary radicals [as per Eqns. (3) to (5)] are generated leading to the increase in the number of propagating radicals which in turn will increase the number of grafting sites on the Na-PCMGG backbone. However, beyond the optimum concentration of KPS (20 x 10^{-3} mol/L) the concentration of $SO_4^{-\bullet}$ and $^{\bullet}OH$ radicals get increased resulting in abundance of free radicals, which may enhance the rate of termination, thereby decreasing the percentage of grafting. However, the variation in the value of %GE also follows the same trend but the variation is very slow.

(d) Effect of Ascorbic acid concentration

The results obtained by varying the concentration of ascorbic acid are summarized in Figure 1(d). The grafting yields, as is evident from the figure, increased upon increasing the concentration of ascorbic acid from 10x10^{-3} to 20x10^{-3} mol/L. The observed increase might be due to increase in $^{\bullet}AH$ and $SO_4^{-\bullet}$ radicals concentration [eqns. (1) – (4)], which attack the Na-PCMGG molecule, resulting in more active sites and Na-PCMGG backbone where the addition of monomer (AN) takes place quickly. But on further increase in ascorbic acid concentration, i.e. beyond 20 x 10^{-3} mol/L, the grafting yields were decreased which might be due to the increased formation of ascorbate radical ($^{\bullet}AH$) which are mainly responsible for homopolymerization.

(e) Effect of temperature

The grafting reactions were carried out at different temperature (20-60^{o}C) keeping other reaction parameters constant. Figure 1(e) represents the influence of temperature on the grafting yields. A perusal of the results indicates that %G increases with rise of temperature from 20^{o} to 35^{o}C but they decreases with further increase in temperature. The observed increase with temperature can be explained in terms of the favourable influence of temperature on: (i) the swelling of Na-PCMGG; (ii) the enhanced diffusion of monomer (AN) molecules from the aqueous phase to the Na-PCMGG backbone; (iii) the increase in the mobility of the monomer molecules and their collision with Na-PCMGG macroradicals, and (iv) the rates of initiation and propagation of grafting. However, the observed decrease in the grafting yields beyond 35^{o}C could be ascribed to the formation of homopolymer over graft copolymerization. In addition, at higher temperature various chain transfer processes are also accelerated that lead to decrease in %G and %GE [cf. Figure 1(e)]. However, the value of %GE also varies with temperature in the similar manner but the variation is very very slow.

(f) Effect of Reaction time

The influence of reaction time on the grafting yields (%G and %GE) is represented in Figure 1(f). It can be seen from this figure that the values of %G and %GE increased with increase in reaction time up to 3h and thereafter they are found to be decreased. The increase in the values of the grafting yields is attributed to the increase in

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the number of grafting sites on the Na-PCMGG backbone as reaction progresses. But after 3h, the observed decrease in the values of the grafting yields is due to the depletion of monomer and initiator concentration as well as shortage of the available grafting sites.

From the foregoing discussion, the optimized reaction conditions evaluated in the present study of grafting AN on to Na-PCMGG (= 0.15) using KPS/AA redox system were: Na-PCMGG (dry basis = 0.15 g, [KPS] = 20 x 10^{-3} mol.L^{-1}; [AA] = 20 x 10^{-3} mol.L^{-1}; [AN] = 0.337 mol.L^{-1}; Time = 2h, Temperature = 35oC and Total Volume = 150 mL. The maximum values of grafting yields achieved were %G = 301.49, %GE = 97.77 and $\%H_p$ = 2.23%.

CHARACTERIZATION OF GRAFT COPOLYMER

(a) FTIR analysis

Grafting of AN onto Na-PCMGG ($\overline{DS}$ = 0.15) was confirmed by FTIR studies. FTIR spectra of Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN (isolated by hydrolysis) are displayed in Figures 2-4. The IR spectrum of Na-PCMGG ($\overline{DS}$ = 0.15) (Figure 2)

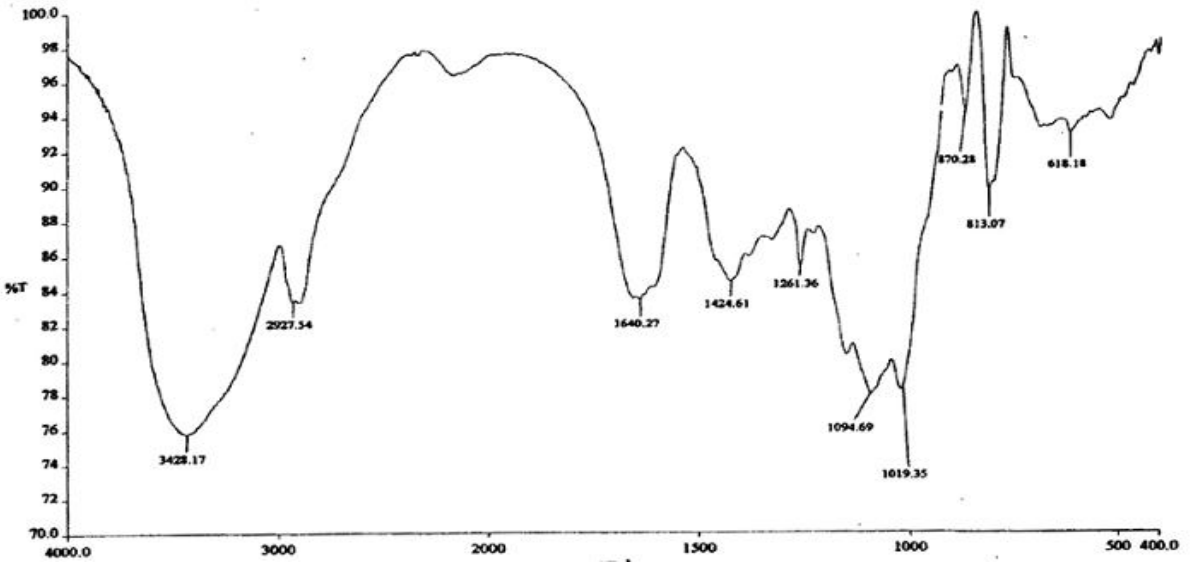

Figure-2: IR spectra of sodium salt of partially carboxymethyl guar gum (Na-PCMGG, $\overline{DS}$ = 0.15).

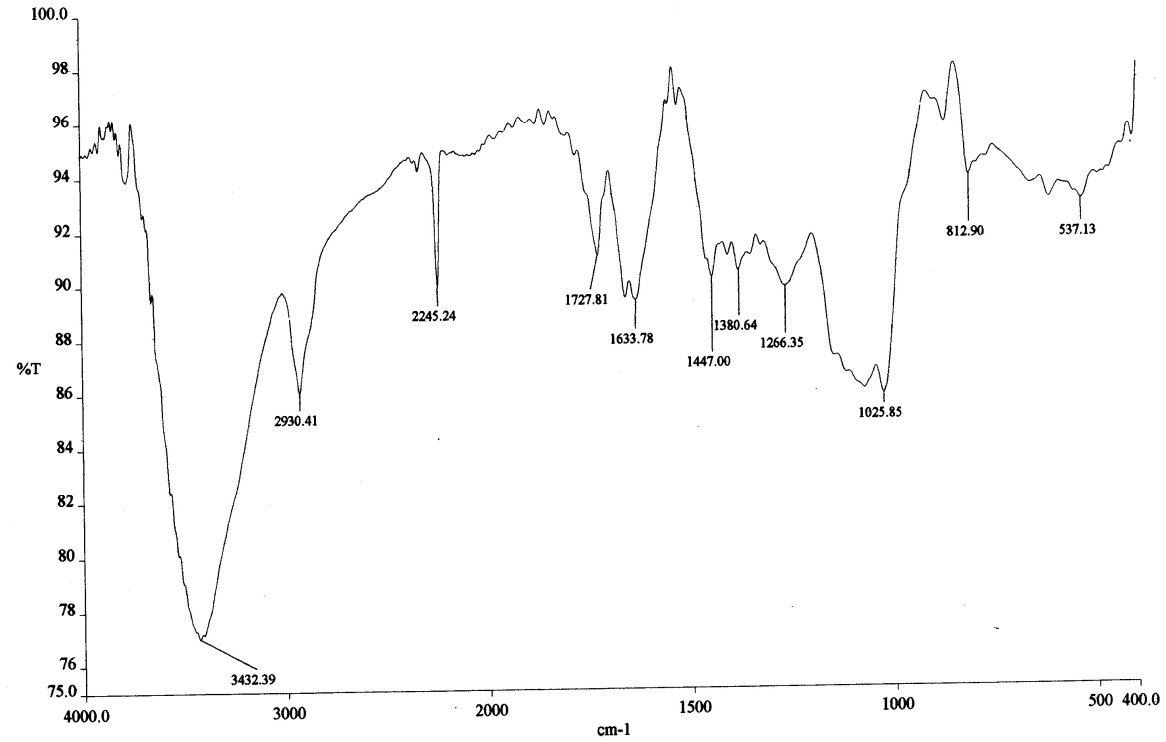

Figure-3: IR spectra of Na-PCMGG-g-PAN (%G = 301.49) sample.

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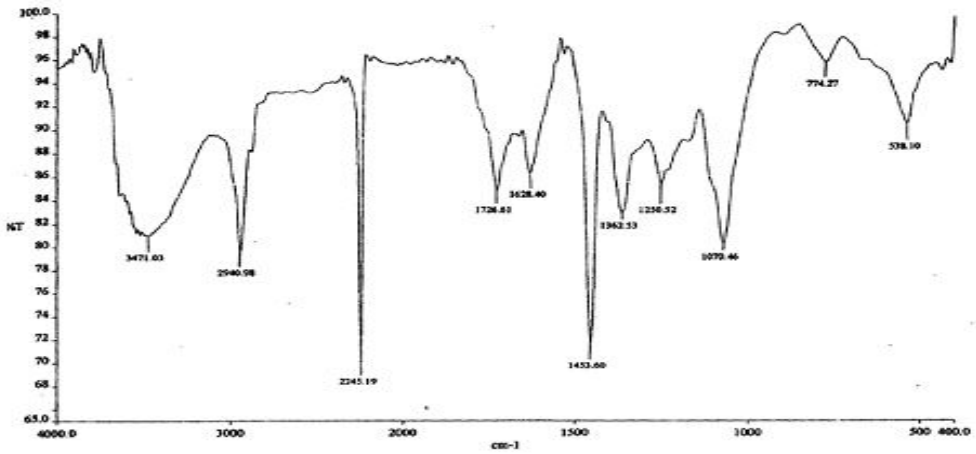

Figure-4: IR spectra of polyacrylonitrile (PAN) sample.

Shows the presence of a very strong and broad absorption band at ~3428 cm^{-1} due to –OH stretching. The presence of a band at ~2927 cm^{-1} was due to –CH stretching. The asymmetric and symmetric vibrations due to –COO- moiety were assigned to ~1640cm^{-1} and ~1424 cm^{-1} respectively. This could be attributed to the presence of carboxymethyl groups in Na-PCMGG.

The IR spectra of Na-PCMGG-g-PAN (%G = 301.49) (Figure 3) showed absorption bands of Na-PCMGG ($\overline{DS}$ = 0.15) [Figure 2(A)] as well as an additional band at ~2245 cm^{-1}, indicating the presence of C≡N moiety which is characteristic of PAN (Figure 4).

(b) Thermogravimetric analysis (TGA)

The primary thermograms obtained at a scan rate of 10°C/min for the Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN in an inert atmosphere are shown in Figure 5.

It can be observed from the figure that Na-PCMGG sample shows a single step of degradation. The decomposition starts at 165°C and proceeds at faster rate up to 300°C and at this temperature sample loses 47% of the original weight. Beyond this temperature the degradation proceeds at a slow rate up to 700°C. This temperature range i.e. 300°-700°C involves about 18% weight loss. The decomposition at which the maximum rate of weight loss occurs is 240°C. The overall degradation leaves about 29% residue.

The Na-PCMGG-g-PAN (%G = 301.49) sample involves single step of degradation. The sample begins to decompose at about 115°C and proceeds at a fast rate up to 300°C involving about 28.5% weight loss. Beyond 115°C, the degradation follows at a slow rate. The degradation is complete at about 700°C leaving about 49% residual weight. The maximum rate of weight loss occurs at 285°C.

In the case of PAN (Figure 5) it is also observed that the sample involves single step of degradation. The degradation occurs in the temperature range 160°-700°C involving about 42.5% weight loss with a maximum weight loss at 350.5°C. The final residue at 700°C amounts to about 57.5%.

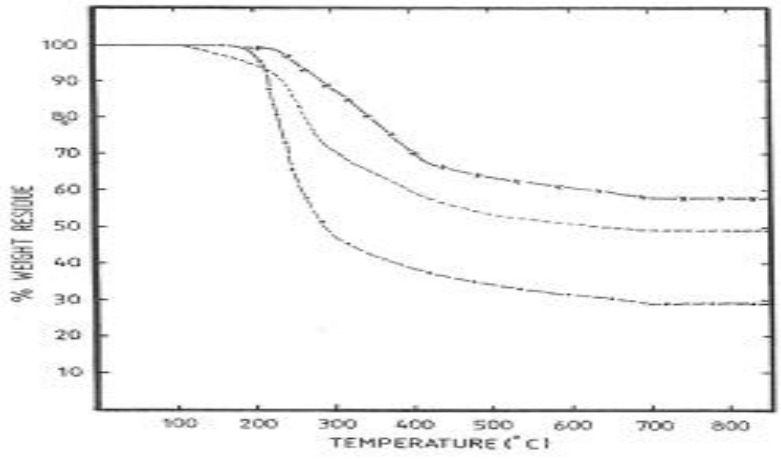

Figure-5: TG thermogram for (-•-•-) CMGG ($\overline{DS}$ = 0.15); (----); CMGG-g-PAN (%G = 301.49) and (-x-x-) PAN at 10°C/min.

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The values of the temperature characteristics and the Integrated Procedural Decomposition Temperature (IPDT) for Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (% G = 301.49) and PAN samples are tabulated in Table 1. The examination of IPDT values indicates that the overall thermal stability of Na-PCMGG has been increased to a greater extent upon grafting of AN on to it. The increased ring formation at higher temperature may be responsible for the observed higher value of IPDT for the graft copolymerization compared to that of Na-PCMGG. The value of IPDT for PAN sample is found to be higher than that of the graft copolymer (Na-PCMGG-g-PAN) as well as Na-PCMGG ($\overline{DS}$ = 0.15) samples. Thus, the results of TGA (Figure 5 and Table 1) also provide an additional evidence that the grafting has taken place.

Table-1: Thermal Analysis of Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN samples.

Sample	Thermogravimetric analysis data						Transition Data from DSC	
	T_i	T_f	T_{max}	T_{10}	T_{50}	IPDT*	T_1	T_2
	(^oC) (IDT)	(^oC) (FDT)	(^oC)	(^oC)	(^oC)	(^oC)	(^oC)	(^oC)
Na-PCMGG	165	700	240	205	285	444.80	173.82 (endo)	286.67 (exo)
Na-PCMGG-g-PAN	115	700	285	240	630	513.38	143.48 (endo)	306.52 (exo)
PAN	160	700	350.5	285	----	569.86	307 (exo)	----

c) Differential Scanning Calorimetry (DSC)

From the DSC traces (not shown) for Na-PCMGG ($\overline{DS}$ = 0.15), Na-PCMGG-g-PAN (%G = 301.49) and PAN, the derived transition data are tabulated in Table 1. The endothermic transition appeared at 173.82^{o}C is attributed to the melting of Na-PCMGG but the exothermic transition observed at 286.67^{o}C is due to the decomposition of sample.

In the case of Na-PCMGG-g-PAN sample, the endothermic transition appeared at 143.48^{o}C and the exothermic peak appeared at 306.52^{o}C may be attributed respectively to the gross melting and grass decomposition of the graft copolymer sample. However, the exothermic transition appeared at 307^{o}C is due to the pyrolytic decomposition of the PAN sample. Thus, the results of DSC transition data also provide an additional evidence of grafting.

d) X-ray diffraction analysis

The powder X-ray diffractograms of Na-PCMGG ($\overline{DS}$ = 0.15) and Na-PCMGG-g-PAN (%G = 301.49) are shown in Figures 6(a) and 6(b) respectively. The XRD pattern of Na-PCMGG ($\overline{DS}$ = 0.15) showed it to be in amorphous state [Figure 6(a)]. However, the XRD pattern of Na-PCMGG-g-PAN [Figure 6(b)] showed strong diffraction peaks appeared at 2θ = 17.19^o, 2θ = 29.94^o and 2θ = 31.01^o which may be attributed to the occurrence of crystallization of PAN chains to some extent during graft copolymerization. Thus, XRD analysis further provides a substantial evidence of grafting of AN onto Na-PCMGG.

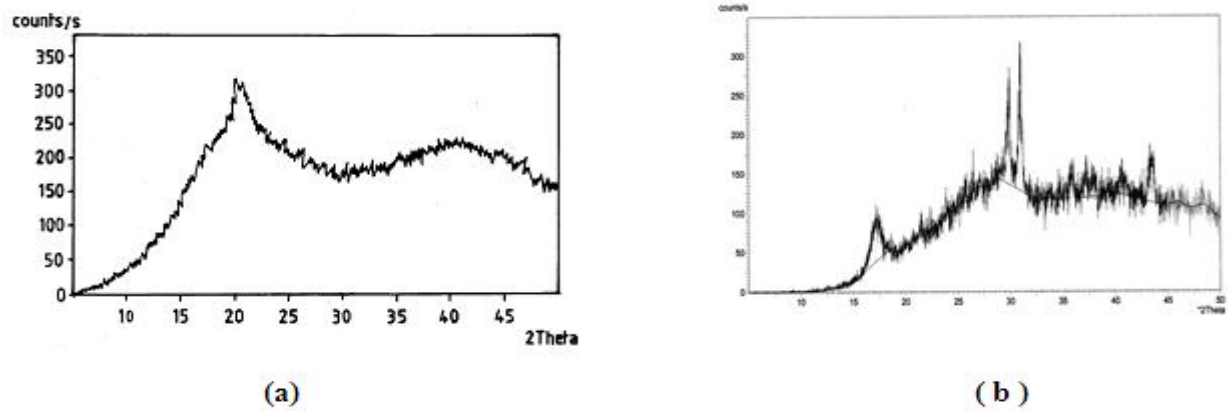

Figure-6: X-ray Diffraction (XRD) patterns for (a) Na-PCMGG ($\overline{DS}$ = 0.15) and (b) Na-CMGG-g-PAN (%G = 301.49)

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e) Scanning Electron Microscopy (SEM)

The morphology of Na-PCMGG ($\overline{DS}$ = 0.15) [Figure 8(a)] shows the clustering of the granules and

(a) **(b)**

Figure-8: Scanning Electron Micrographs of (a) Na-PCMGG ($\overline{DS}$ =0.15) (500X) and (b) Na-PCMGG-g-PAN (500X).

The granules could be distinguished from one another. However, upon grafting of AN onto Na-PCMGG, the morphology of Na-PCMGG has got changed. The twisted filament-like morphology is observed [Figure 8(b)] which is due to the grafted hydrophobic PAN chains and/or overall array of the polysaccharide-g-PAN chains. Thus, the surface evidence supports the grafting of PAN onto the Na-PCMGG.

CONCLUSIONS

In the present study, sodium salt of partially carboxymethylated guar gum (Na-PCMGG, $\overline{DS}$ = 0.15) was successfully grafted with acrylonitrile using KPS/AA redox pair. The influence of various reaction conditions such as concentrations of monomer (AN), KPS and AA as well as reaction time, temperature and amount of substrate on grafting yields was discussed in light of the proposed reaction mechanism of grafting. Various analytical techniques such as FTIR, TGA, DSC, XRD and SEM were successfully utilized and the results confirmed the grafting of poly(acrylonitrile) onto (Na-PCMGG, $\overline{DS}$ = 0.15). The optimally synthesized graft copolymer after hydrolysis with alkali may be used as water sorbents which may find potential industrial applications. The detail studies in this direction are in progress.

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COMPARISON OF FOUR PRECIPITATION BASED DROUGHT INDICES IN MARATHWADA REGION OF MAHARASHTRA INDIA

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ABSTRACT
Drought is an insidious hazard of nature. It is conceivably the most complex natural hazard.Its impact varies from region to region. It originates from lack of precipitation over an extended period of time. The opulence of drought mitigation largely depends upon timely information on drought onset, progress, and areal extent. These kinds of information are better linked with drought monitoring which is performed generally by using various indices. However the presence of multiple time steps in drought indices make it harder to decide the best time step to show the drought conditions.The present study evaluates the performance of four precipitation based drought indices likethe Standardized Precipitation index (SPI), China-Z index (CZI), Modified China-Z index (MCZI) and Z-score on 1, 3, 6, 9 and 12 month timescales using monthly precipitation data from 1902 to 2001 at eight locations to specify the drought conditions in Marathwada region of Maharashtra, India. Out of the eight locations taken two locations are selected for the regression analysis to find out the best possible correlation of drought indices with SPI. The study reveals that 1 month time step for all the drought indices taken yield fallacious result as they are weakly correlated with Standardized Precipitation Index. On the other hand at higher month time scales e.g. 3 months, 6 months, 9 months and 12 months, all the drought indices are found to be best correlated with the SPI at the correspondingly same time steps. Linear Regression (R2) values were very close to unity (up to 0.9839 for Osmanabad and 0.9929 for Prabhani).

Keywords: Standardized Precipitation Index (SPI); China-Z index (CZI); Modified China-Z Index (MCZI), Statistical Z-Score and Linear Regression (R2)

I. INTRODUCTION
Drought is perhaps the most complex natural hazard. Drought is a prolonged dry period in natural climate cycle. It is a slow onset phenomenon caused by rainfall deficit combined with other factors. It is sometime referred to as a "Creeping Phenomenon". Climate change and increasing water demands enhances the duration and prevalence of droughts worldwide. Drought sometimes results in mass displacement of population. It leads to cause water and food shortages and leads to have long term environmental, economic and health impact on the population(Heim, 2002; Hao and Singh, 2015). The drought initially occurs when there comes a deficiency in the amount of precipitation for prolonged period which may even crawls to other deficiencies of other hydrological parameters depending on different time scales. Thus the impacts of drought can be categorized into four parts i.e. Meteorological drought, Agricultural drought, Hydrological drought and Socio-economic drought (Wilhite and Glantz, 1985). According to National Drought Mitigation Center the Meteorology defines the drought as the degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal and annual timescales. The Hydrology defines the drought as the effect of precipitation shortfalls on stream flows and reservoir, lakes and ground water level. Agricultural engineering defines drought as the soil moisture deficiencies relative to water demands of plant life, usually crops.

The preparedness and planning to cope with the adverse impacts of a drought depend on the information about its areal extent, severity and duration. A number of drought indices have been put forward to quantify drought severity. The Palmer drought severity index (PDSI; Palmer, 1965) which is widely used in the United States is one of those. It is considered as a lodestar in drought research. The PDSI uses precipitation, moisture supply, runoff and evaporation demand at the land surface to get fit into water balance equation thereby stating the period of dryness and the period of wetness. Over the years less complex alternatives of PDSI have been proposed by various authors and organizations. The Decile index (Gibbs et al., 1967) is one of those which is used in Australia. It requires a monthly precipitation totals from a long term record which are first ranked from highest to lowest to construct a cumulative frequency distribution. The distribution is then fragmented into 10 parts. The first decile is the precipitation value not exceeded by the lowest 10% of all precipitation values in a record. The second decile is between the lowest 10 and 20% etc. Comparing the amount of precipitation in a month with the long term cumulative distribution of precipitation amount in that period, the severity of drought can be assessed. The China- Z index (CZI) which is used by the National Meteorological Centre of China (Wu et al., 2001) can also be used to monitor droughts., the Surface Water Supply Index (SWSI- Shafer and Dezman,

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1982) is used by several states in the United States, and the Standardized Precipitation Index (Mckee et al., 1993) which has got worldwide acceptance because of its adaptability to different time scales and climatic conditions. Most of these indices are calculated using climate data (rainfall or temperature). At present there is no drought index which is capable of assessing drought exactly for all places and for all time (Svoboda et al., 2015). The drought interpretation at different time scales using SPI has been proved to be superior to Palmer Drought Index (Guttman, 1998; Smakhtin and Hughes, 2007), developed software to compute and apply different rainfall based indicators for quantitative assessment of meteorological drought. McKee et al.,(1993) suggested the SPI ranges for different severity levels of drought. The choice of the indices for monitoring drought in a specific area should primarily be based on the quantity of climate data available and on the performance of the index to concisely detect spatial and temporal variations during a drought event. In view of the above, the objective of this paper is to evaluate and compare the performance of four precipitation based drought indices to characterize the drought trend in Marathwada region of Maharashtra, India. Under present study CZI, MCZI and Statistical Z score have been compared with SPI at different time scales at two out of eight locations in Marathwada region.

II. STUDY AREA AND DATA USED

Marathwada is a region of the Indian State of Maharashtra. It coincides with Aurangabad division of Maharashtra. It shares its border with the state of Karnataka and Telangana. It lies to the east of Vidarbha and Khandesh region of Maharashtra. The largest city of Marathwada is Aurangabad. It has a total area of 64590km2 and had a population of 18,731,872 according to 2011 census of India. Major districts of Marathwada include Aurangabad, Nanded, Beed, Osmanabad, Latur, Jalna, Prabhani and Hingoli. Marathwada is one of the drought prone region of Maharashtra. It is in a part of scanty rainfall area of central Maharashtra. This region of Maharashtra has faced several droughts in the past. Drought has occurred in the year1899, 1918, 1972 and 2012 onwards. It is a landlocked region. The entire region is drained by Godavari River along with its tributaries. Most of its tributaries e.g. Dudhna, Purna, Shivna, Bindusara, Vedganga etc. are non-perennial. They carry water only during rainy season. As the summer approaches they become dry. Only Godavari is the perennial river in that region. Even Godavari carries very less amount of water during summer season. Major dams have been constructed in this region e.g. Upper dudhna on Godavari River in Jalna, Lower dudhna in Prabhani, Sindhphana and Bendsura in Beed, Majira in Latur and Ujjani in Aurangabad. Most of the time these reservoirs get dried up due to failure of the Monsoon. As far as the climatology of the region is concerned, it is under the influence of southwest monsoon. When southwest monsoon reaches in western coast in the month of June, heavy rainfall occurs in its western coasts but as rainfall decreases from west to east,so when it reaches to the concerned region, the average rainfall becomes scanty. Figure 1 shows the location Map of Marathwada region of Maharashtra, India

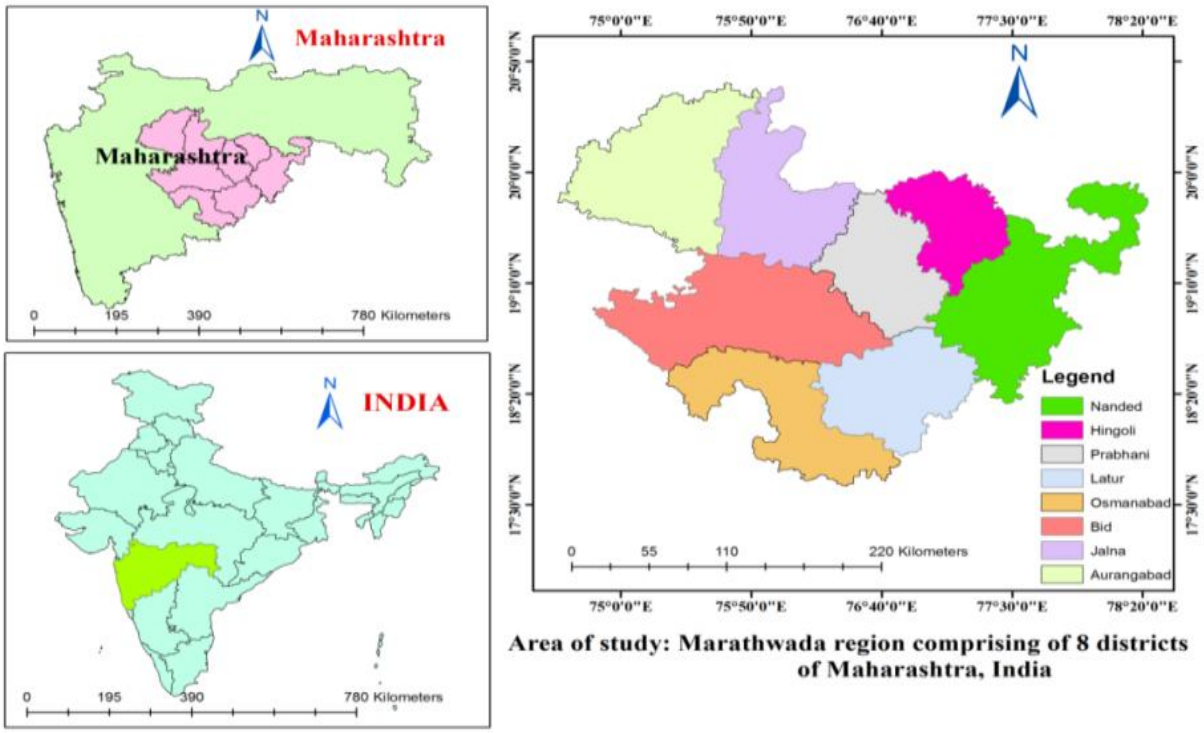

Figure-1: Location Map of Marathwada region of Maharashtra, India

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The monthly precipitation data right from 1901 to 2002 has been used as an input parameter for the computation of SPI, MCZI, CZI and Z-score. The data is taken from the India Water Portal (IWP). The excel spread sheet is used for the computations of indices at different timescales along with the use of MDM (Meteorological Drought Monitoring) software. Location map of Marathwada region has been plotted using ArcMap. Finally the graph has been plotted using Origin8.5 Pro Software.

1. Rainfall Variability

The success or failure of crops especially under rain fed conditions is closely linked with rainfall patterns. In rain fed agriculture, the adequacy of rainfall to meet the water requirements of crops and other consumptive and non-consumptive, water need is a basic requirement (Shinde et al., 2016 and Kumari et al., 2018). Figure 2 shows the time series precipitation of Marathwada region from 1901-2002.

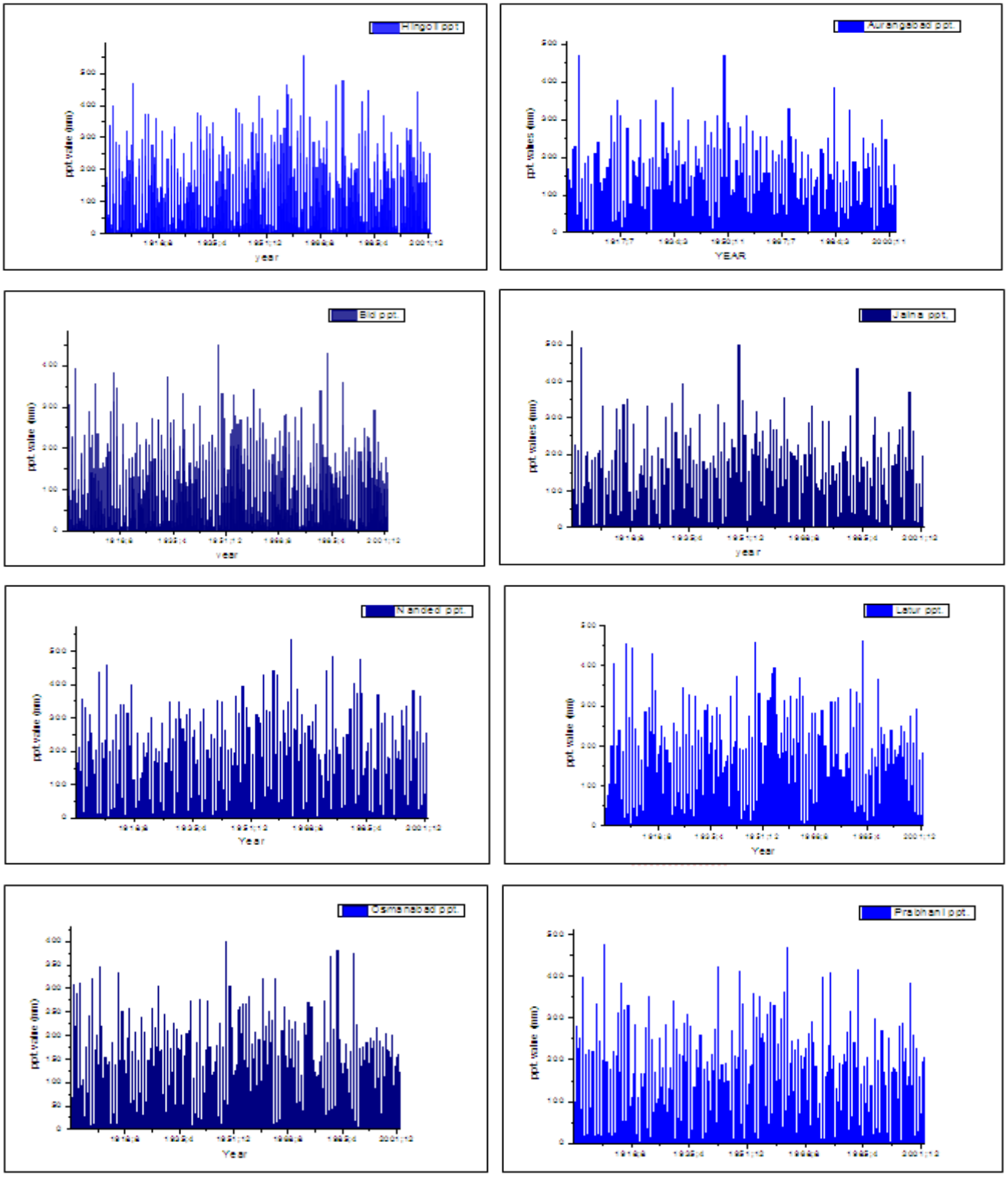

Figure-2: Time series precipitation of Marathwada region from 1901-2002

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If the rainfall pattern over Marathwada region is examined precisely, spatial as well as temporal distribution can be visualized. Over the regions like Aurangabad highest precipitation value from 1901-2002 is recorded in the year 1949 with precipitation value almost equal to 450mm. In the same way when other regions like Bid, Hingoli, Jalna, Latur, Nanded, Osmanabad and Prabhani are examined, highest precipitation values are recorded in the year 1949, 1965, 1948, 1985, 1962, 1948, 1962 respectively. Most of the years can be seen over these districts covering Marathwada region with almost no or scanty rainfall. These years are primarily associated with drought years. Statistical average even would not give the correct measure for the amount of precipitation occurring over the Marathwada regions as these regions are associated with lots of fluctuation as far as rainfall pattern is concerned. Through close examination it can be verified that rainfall distribution is not uniform and thus the curve obtained would not be smooth. This is the main reason behind promoting the use of Index for monitoring extreme events.

2. Precipitation Based Drought Indices Calculation

i. Standardized Precipitation Index

The SPI is designed to quantify the precipitation deficit for multiple timescales. These timescales reflect the impact of drought on the availability of different water resources. The SPI for any location is based on long term precipitation record for a desired period. This long term record is fitted to a probability distribution i.e. gamma distribution which is then transformed into a normal distribution function so that mean SPI for the location and the desired period is zero. Soil moisture conditions respond to precipitation anomalies on generally short scale. Groundwater, stream flow and reservoir storage reflect the longer-term precipitation anomalies. Because the SPI is normalized so wetter and drier climates can be represented in the same way. Mckee (1993) and others used the classification system shown in the SPI value.Table1 defines the drier or wetter period resulting from the SPI.

$$G(X)=\frac{\int_0^x x^{\alpha-1} e^{\frac{-x}{\beta}} dx}{\beta^{\alpha}\Gamma(\alpha)}$$

Since the gamma function is undefined to x=0, and precipitation value may contain zero value then the cumulative probability becomes:

H(x)=q+(1-q)G(x)

Where q is the probablity of zero.

The cumulative probablity is H(x) then transformed into standard normal variable Z with the mean zero and standard deviation one, which is finally represents the value of SPI following Edward and McKee (1993).Table 1 shows the values of SPI with description.

Table-I: Values of SPI with description

SPI	CONDITION
2.0+	Extremely wet
1.5 to 1.99	Very wet
1.0 to 1.49	Moderately wet
-0.99 to 0.99	Near normal
-1.0 to -1.49	Moderately dry
-1.5 to -1.99	Severely dry
-2 and less	Extremely dry

ii. China Z- Index (CZI) and Modified China-Z-index (MCZI)

The CZI works on the Wilson-Hilferty cube root transformation (Kendall and Stuart, 1977)**.** It is assumed that precipitation data follows the Pearson type III distribution. The only difference between CZI and MCZI is that MCZI requires median instead of mean. The algorithm for its calculation is listed below. Table 2 gives theValues of CZI/MCZI with description.

$$CZ_i = \frac{6}{C_s}\left(\frac{C_s}{2}\varphi_i + 1\right)^{\frac{1}{3}} - \left(\frac{6}{C_s}\right) + \left(\frac{C_s}{6}\right)$$

$$C_s = \frac{\sum_{i=1}^{n}(x_i - \bar{x})}{n * \sigma^3}$$

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$$\varphi_i = \frac{x_i - \bar{x}}{\sigma}$$

Where,

φ_i = Statistical Z-Score

C_S = Coefficient of Skewness

n = Month in record

Table-II: Values of CZI/MCZI with description

CZI/MCZI	CONDITION
2.0+	Extremely wet
1.5 to 1.99	Very wet
1.0 to 1.49	Moderately wet
-0.99 to 0.99	Near normal
-1.0 to -1.49	Moderately dry
-1.5 to -1.99	Severely dry
-2 and less	Extremely dry

iii. Statistical Z-Score

It is calculated by subtracting the long term mean from a monthly rainfall value and then dividing the difference by standard deviation. It does not need fitting gamma distribution or Pearson type III method. Because of its simplicity and effectiveness, Z-scores have been used in many drought studies (Akhtari etal.,2009;Tsakiris and Vangelis, 2004). It is as good as SPI as per the comments of the different researchers. In this report it is computed over 1, 3, 6, 9-and 12-month timescales. The Table 3 below defines the wetter and drier period in terms of Statistical Z-score.

$$\varphi_i = \frac{x_i - \bar{x}}{\sigma}$$

Table-III: Values of Statistical Z-Score with description

Z – SCORE	CONDITION
No Drought	>0.25
Weak Drought	0.25 to -0.25
Slight Drought	-0.25 to -0.52
Moderately Drought	-0.52 to -0.84
Severely Drought	-0.84 to -1.25
Extremely light	< -1.25

III. RESULTS AND DISCUSSIONS

1. Evaluation of Precipitation Drought Indices

The temporal variations of observed drought have been examined. Figure 3A and 3B represents the time series of SPI calculated for 1,3,6,9 and 12 months' time scales over Osmanabad and Prabhani districts of the region. For simplicity, only data of Osmanabad and Prabhani districts have been used for the calculation of the indices. Similarly Figures 4A and 4B, Figures 5A and 5B and Figures 6A and 6B represents the time series of CZI, MCZI and Statistical Z-score calculated for same time steps as for SPI for the same districts.

Figure 3A

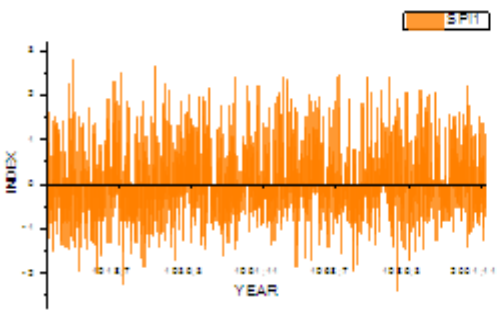
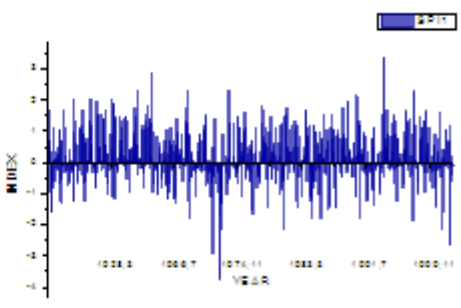


Figure 3B



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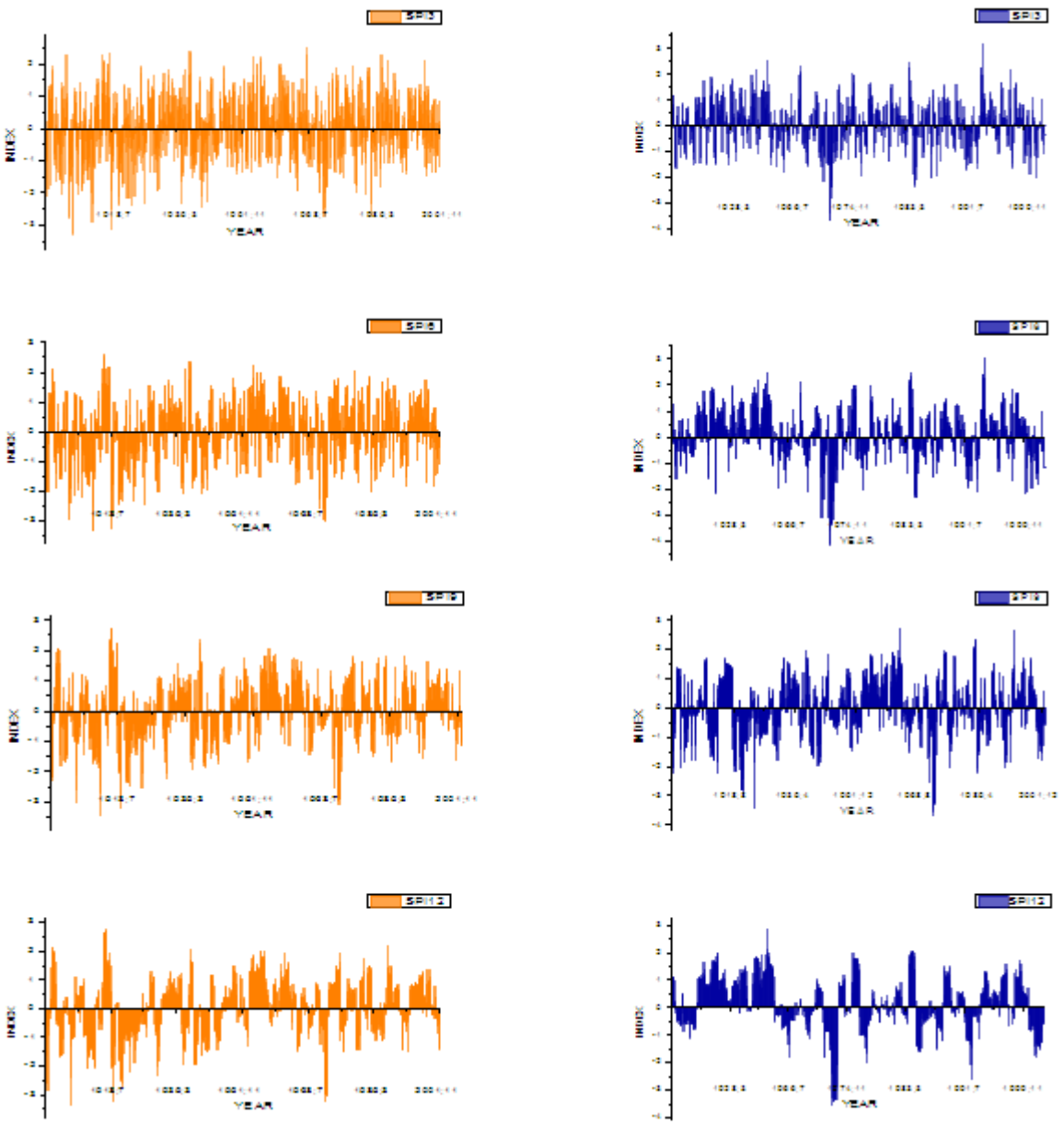
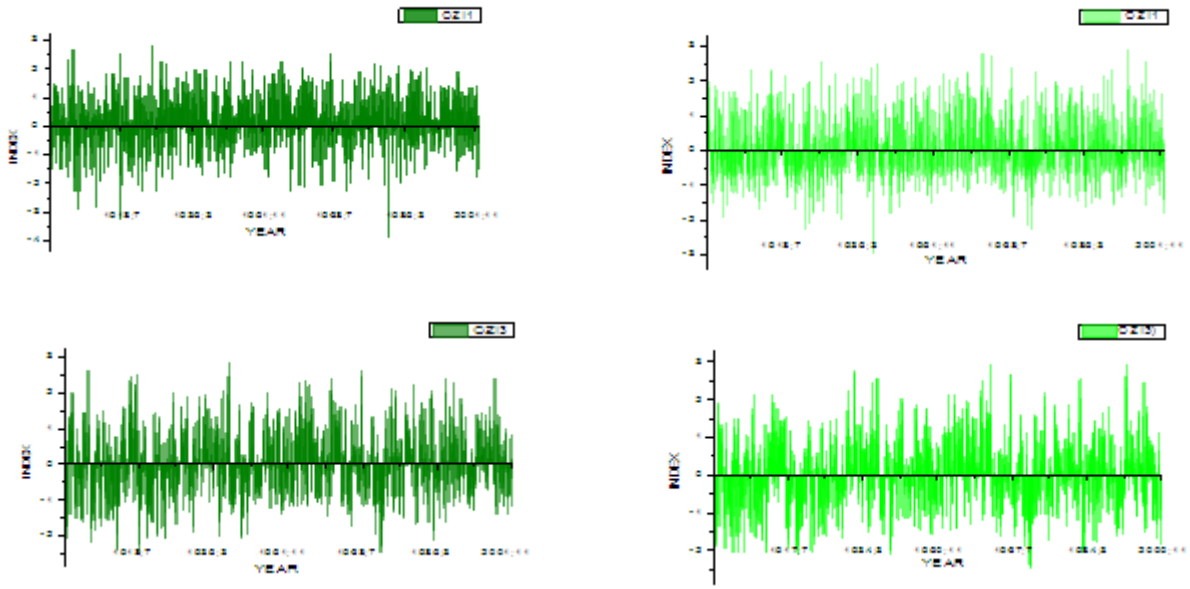


Figures-3A and 3B: Time series of SPI at 1, 3, 6, 9 and 12 month time scales. (A) Osmanabad (B) Prabhani

Figure 4A

Figure 4B



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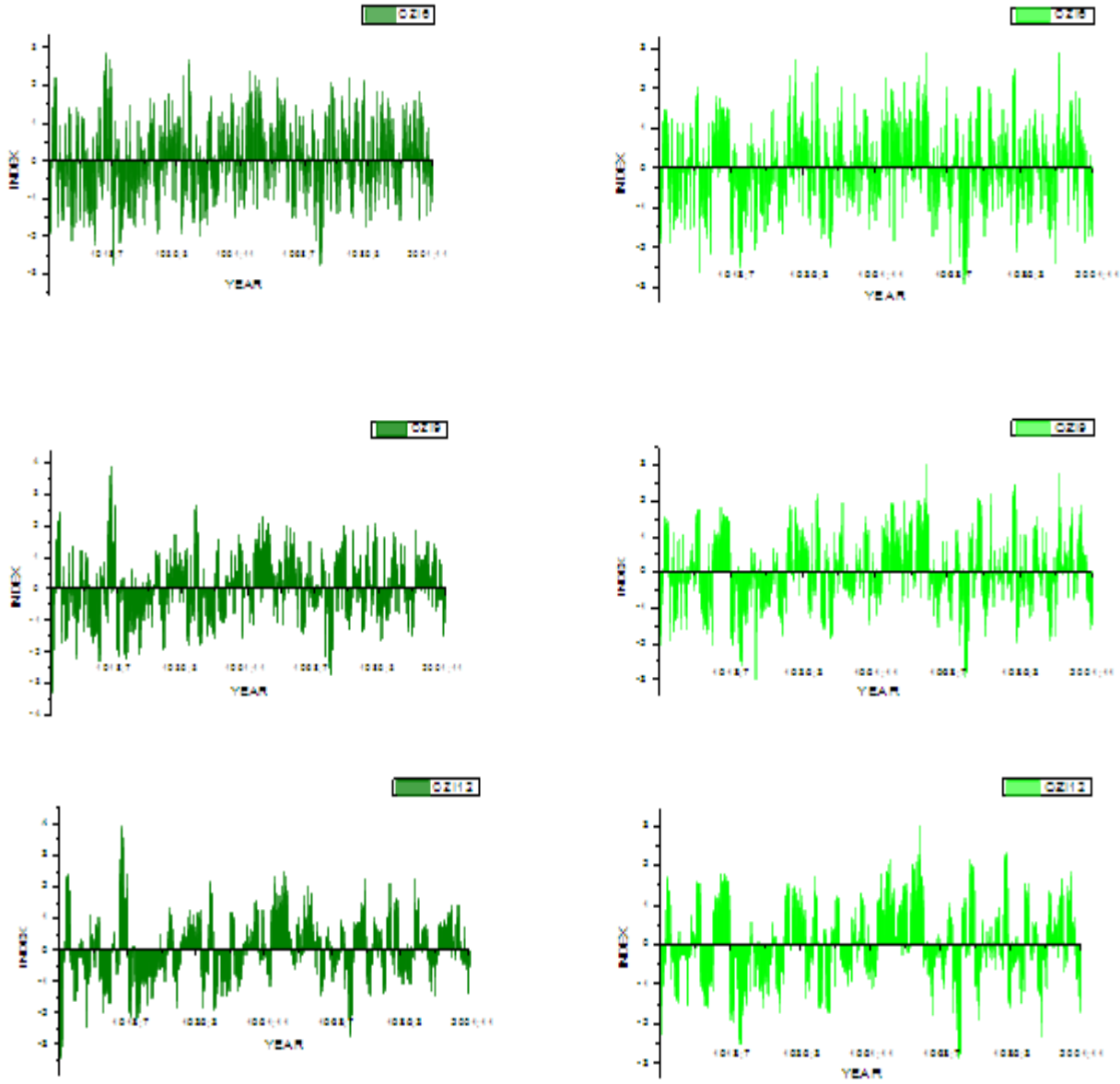


Figures-4A and 4B: Time series of CZI at 1, 3, 6, 9 and 12 month time scales. (A) Osmanabad (B) Prabhani

Figure 5A

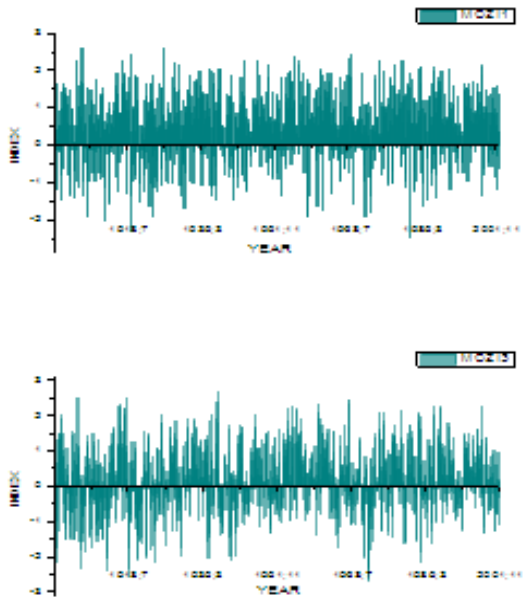
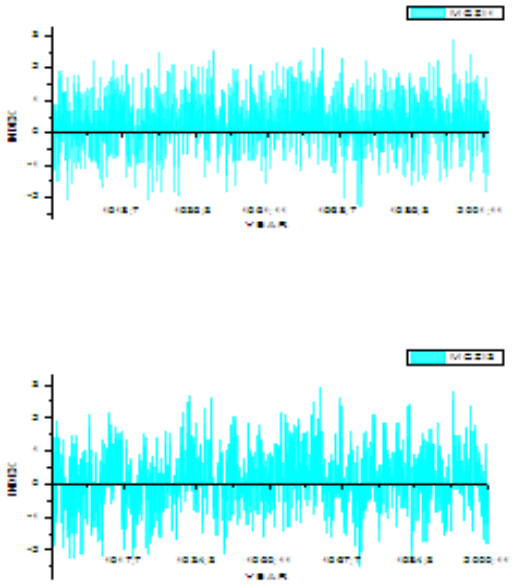


Figure 5B



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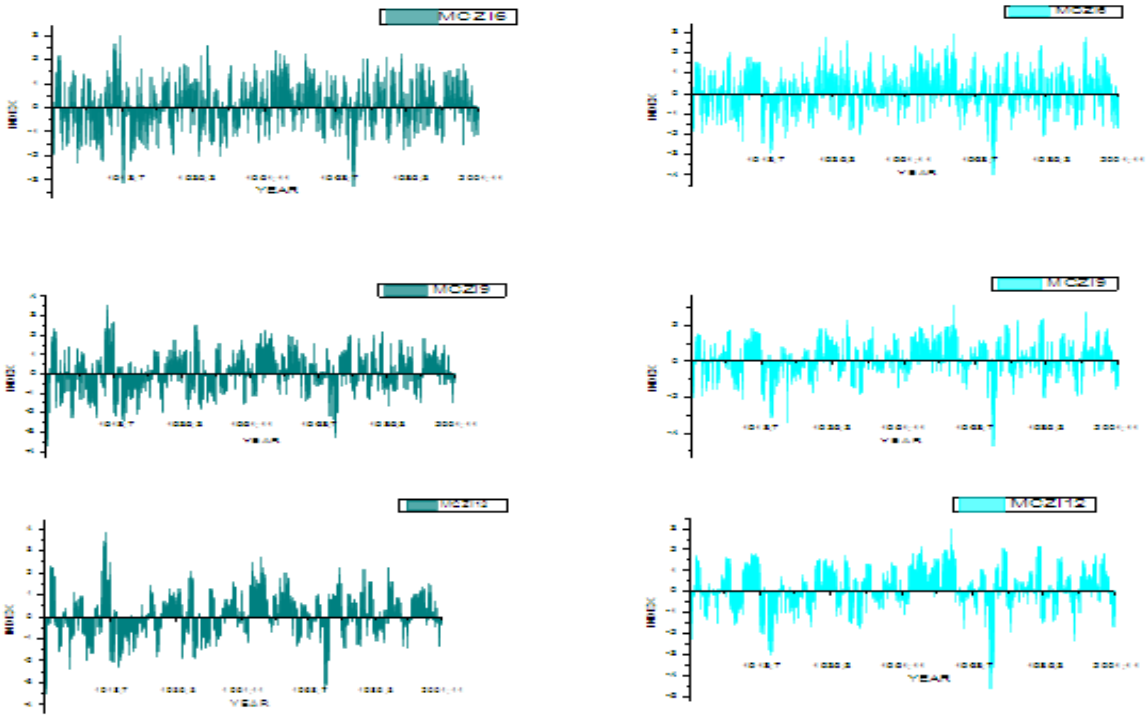


Figures-5A and 5B: Time series of MCZI at 1, 3, 6, 9 and 12 month time scales. (A) Osmanabad (B) Prabhani

Figure 6A

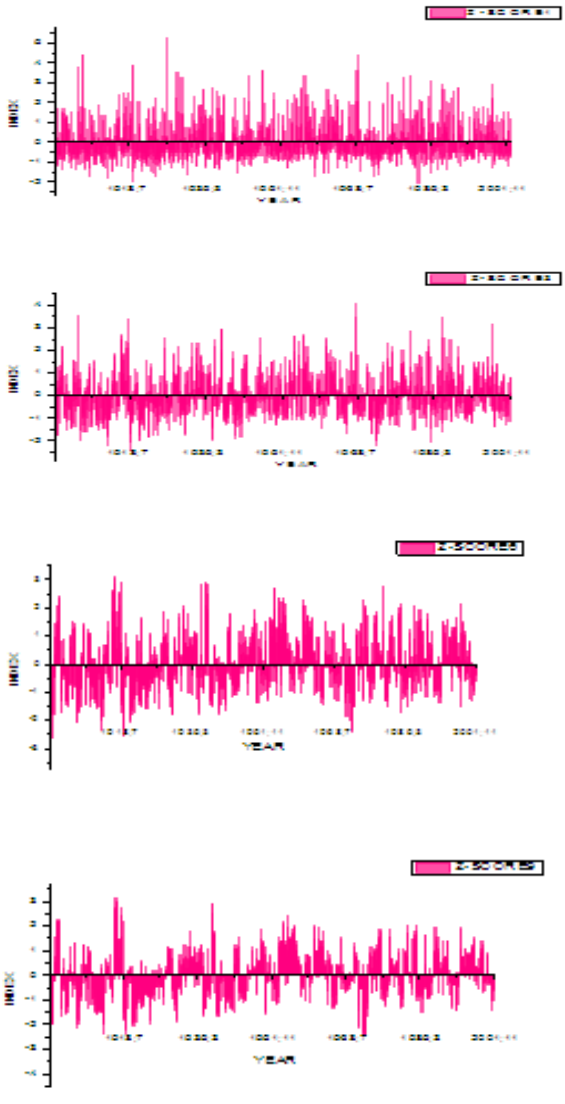
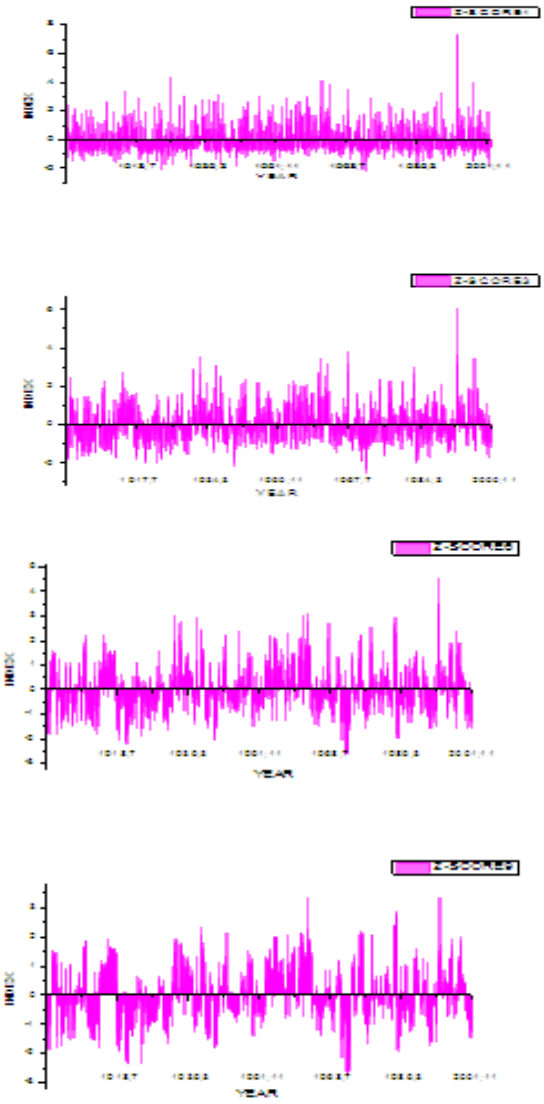


Figure 6B



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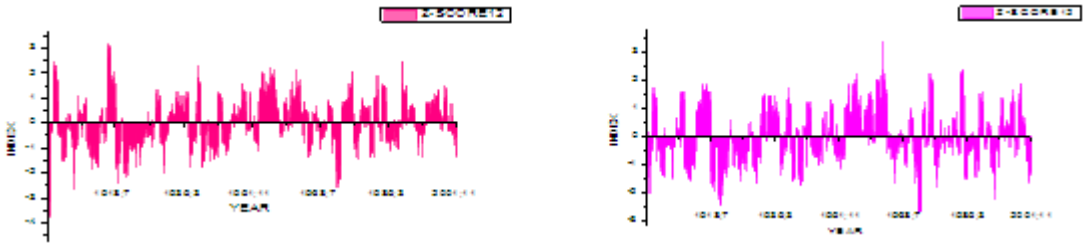


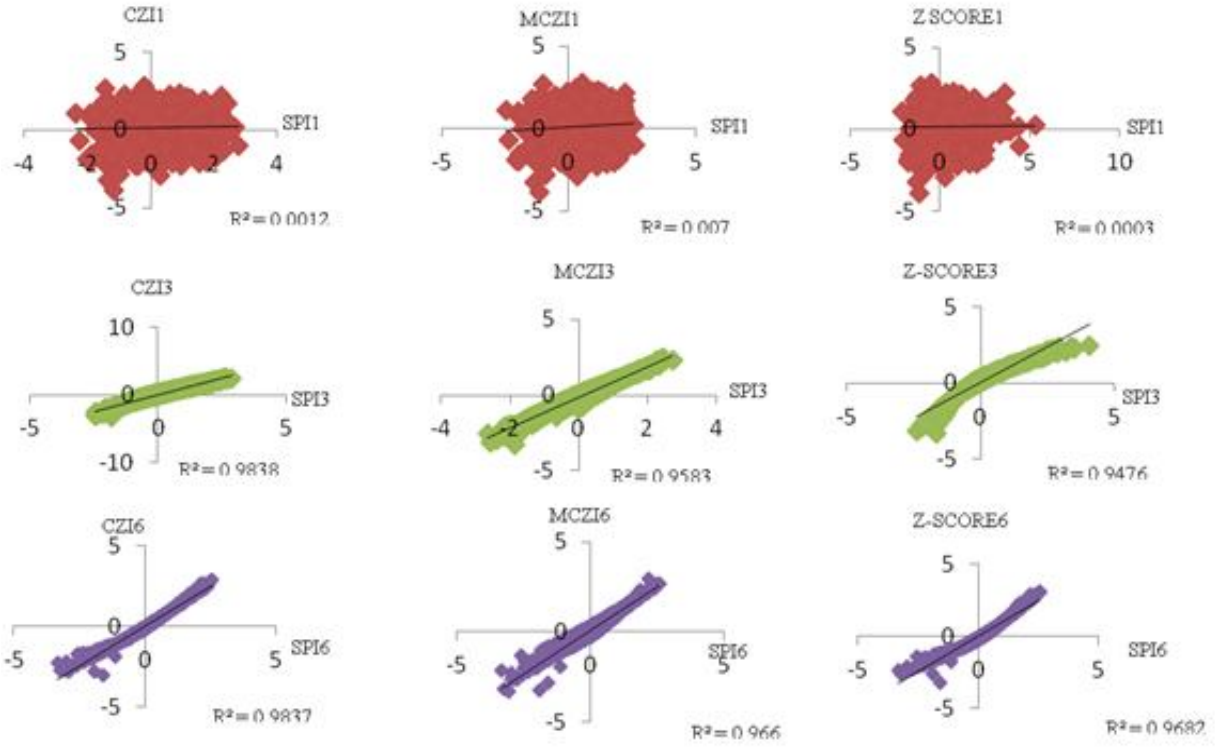
Figures-6A and 6B: Time series of Statistical Z-Score at 1, 3, 6, 9 and 12 month time scales. (A) Osmanabad (B) Prabhani

2. Comparative Analysis of Precipitation Based Drought Indices

The linear regression analysis with R2 (Pearson Correlation Coefficient) value have been shown in the graphs for two stations of Marathwada region i.e. Prabhani and Osmanabad. For this part of the analyses, the Pearson Correlation Coefficeint (R2) for the SPI versus the CZI, MCZI and Z-Score have been computed. Figure 7 and figure 8shows the linear regression graphs between the values of SPI and CZI, MCZI and Statistical Z-Score from 1901 to 2002 for Osmanabad and Prabhani. It is important to note that two indices have a good relationship particularly at higher time steps while it is very weak for 1-month time step. Regression analysis of CZI with SPI at 1 month time scale shows R2 value equal to 0.0012. The same trend is followed by other drought indices too in the same region at 1 month time scales. The regression analysis at Prabhani between SPI and CZI at one month time step also yields very weak correlation value equal to 0.0023.

On the other hand when drought indices are compared at higher month time steps, R2 values became close to unity.CZI,MCZI and Statistical Z-score at 3-month time scales at Osmanabad yielded R2 values equal to 0.808, 0.953 and 0.9348 respectively. At higher month time steps e.g.6, 9 and 12, values became closer to 1. At 12 month time steps drought indices (CZI, MCZI, Statistical Z-score) at Prabhani produced R2 values equal to 0.9929, 0.9925 and 0.9864 respectively. In the same way when R2 value is analyzed at 12 month time scales at Osmanabd region values were 0.9344, 0.9253 and 0.9242 for CZI, MCZI and Statistical Z-score respectively.

However Morid et al 2006 reported greater mismatch between MCZI and SPI when the study was carried out in Iran almost at all time steps. But then the study needs some more investigation. It is so because all the drought indices are regional specific. The same study when it was done in Ken River basin in Jain et al2015 found very strong correlation with MCZI. It might be possible that both the areas cover different climatic variability and hence difference in amount of precipitation and its trend. Figures 7 and 8 shows the regression analysis of CZI, MCZI and Statistical Z-Score with SPI at different time scales at Osmanabad and Prabhani district of Maharashtra.



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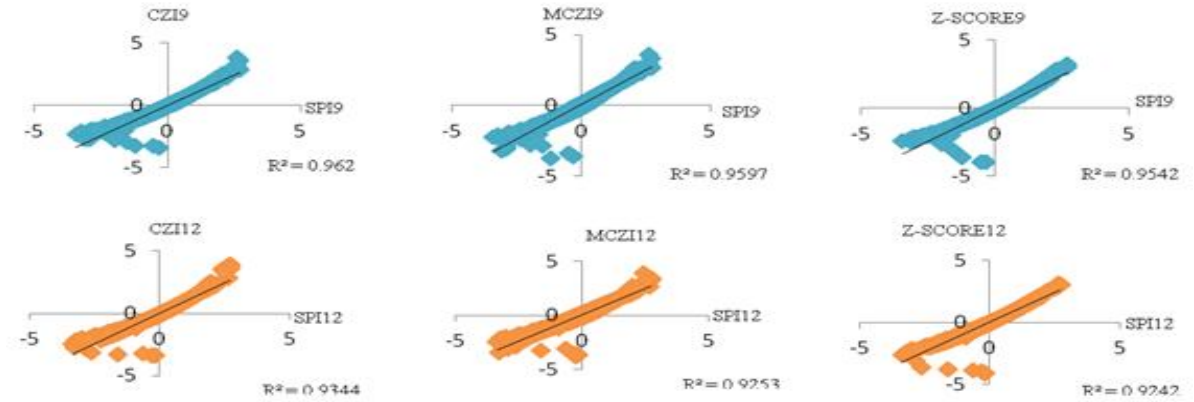

Figure-7: Regression analysis of CZI, MCZI and Statistical Z-Score with SPI at different time scales at Osmanabad district of Maharashtra

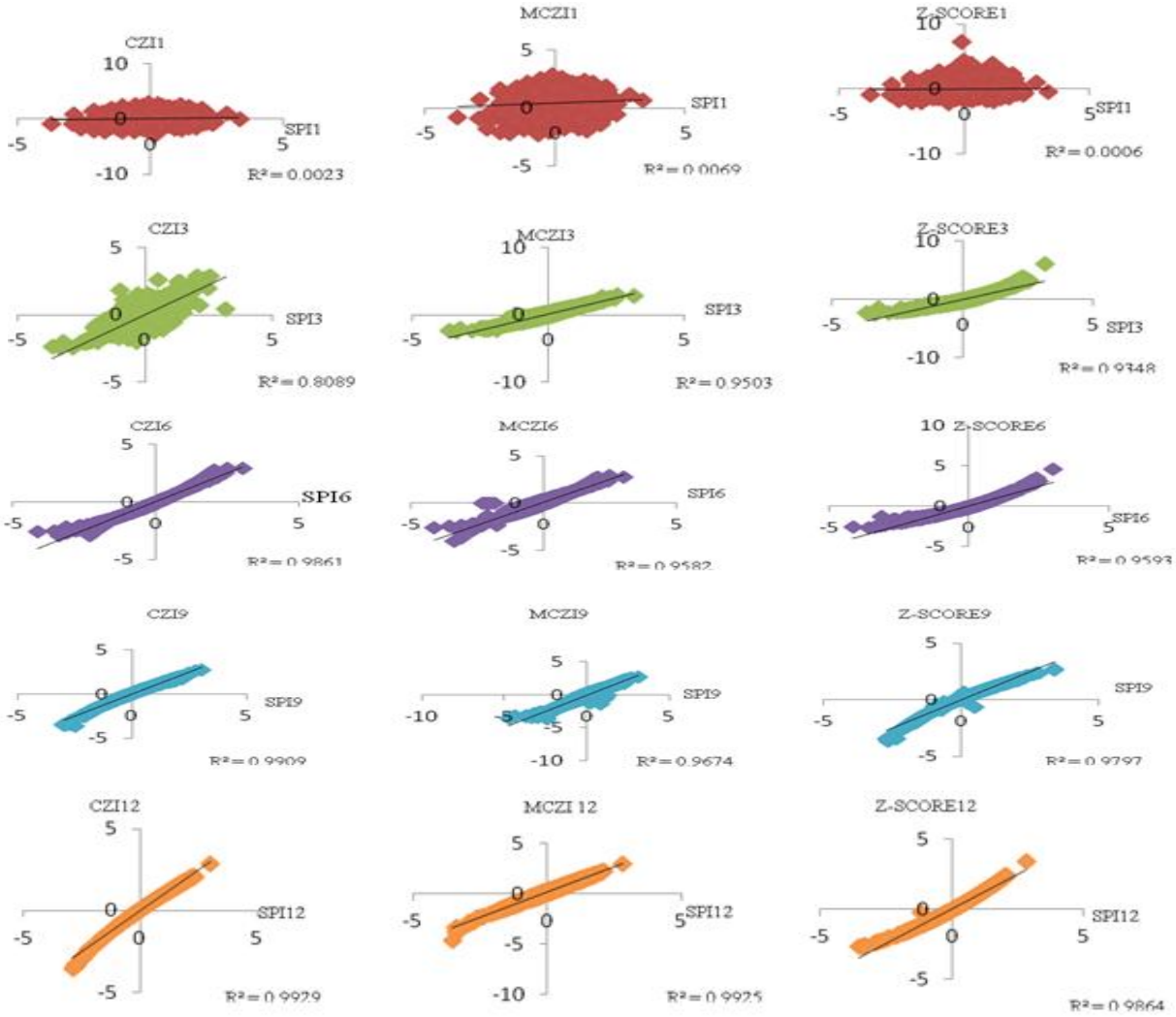

Figure-8: Regression analysis of CZI, MCZI and Statistical Z-Score with SPI at different time scales at Prabhani district of Maharashtra

IV. CONCLUSIONS

R2 value being close to unity strengthens the fact that other drought indices like CZI, MCZI & Statistical Z-Score can be used as an alternative to SPI. But as drought indices are region specific, their behavior is prone to change as region changes so more studies are required to assess drought significantly. It is better to monitor drought at higher month time steps as at 1month time scale poor correlation values were obtained. All indices can be used to cross validate the results which will definitely increase the percentage of precision. This will help a lot in effective and powerful policy making for mitigation of drought conditions. Proper assessment of drought and with greater precision will help farmers to take necessary steps well in advance to face drought so that their economy may not get fully dismantled and no death trolls of farmer to be recorded in future.

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EVALUATING THE EFFECTIVENESS OF CRM IMPLEMENTATION IN INDIAN TELECOM INDUSTRY

Dr. Prachi Bansal

Abstract

ABSTRACT

Until 1995 deregulation, the entire Indian telecom sector was managed and run by MTNL and BSNL, and thereafter, they started facing an intense competitive pressure from several private telecom service providers. Presently, they are striving and struggling with many complicated issues at hand, encountering advanced technologies, constant innovations with new attractive products, with value added services. Thus, the customers started joining to alter their service providers instantly, without much cost. Therefore, the MTNL and BSNL started losing almost 2% customers every month, measuring around 24% per annum. They were too late to implement CRM to achieve their targeted goal as they were not aware of the effectiveness and the power CRM implementation in Indian Telecom Industry, which could have offered a comprehensive application software suite to enhance the customer base, improve productivity and revenue, mainly strengthening the customer satisfaction and loyalty and by synchronizing and integrating customer interactions at several touch points like distribution channels, developing direct contacts using the internet automation system, special website, customer contact center, in the organization field. Hence, this research paper reviews the effectiveness of CRM in Indian Telecom Industry, and explores various CRM strategies to pursue and assess the promptly changing the customer base, and business scenario in this exceptionally competitive ambience. At the same time, this study makes an attempt to measure the service quality in relation to customer satisfaction. The latest e-CRM advanced operations research, technology evaluates the DEA - Data Envelopment Analysis, the new concept provides every telecom company to perform personal, interactive, appropriate communication with the customers through the electronic media and traditional channels by integrating every e-business application. The time has come for the telecom companies to grab the opportunities to find customer requests, economies, so as to impact new customers, providing real time value based, additional services to effectively achieve complicated tasks of e-CRM. The CRM relevance and functions are not properly understood by the people. Hence, this paper intensely explores the effectiveness of implementing CRM and e-CRM to understand its applications and implications to its prevailing business database using the relevant marketing practices.

1. CRM ROLE TO CHANGE THE FACE OF THE INDIAN TELECOM INDUSTRY

The CRM concept operates as the most effective and automated software operated tool, which has recently emerged out of the back-office, working as the shadows of ERP - Enterprise Resource Planning software market.

Figure-1: CRM Approach (Leite et al., 2011).

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Until 1995, the Indian telecom sector dominated the major infrastructure (Telecom India Daily, 2008). Having a telephone was a luxury, while the waiting time of new telephone landline connection extended several months. The Indian Tele-density was extremely low. After liberalization, the foreign and private sectors entered the Indian telecom business arena, and launched more sophisticated and advanced telecoms with better facilities, and operational functionalities. The TRAI - Telecom Regulatory Authority of India aimed for an affordable communication system throughout India and around the world for all citizens and proposed that telephony be readily available everywhere. A brief telecom timeline policy evolution is explained below (Malhotra, 2014).

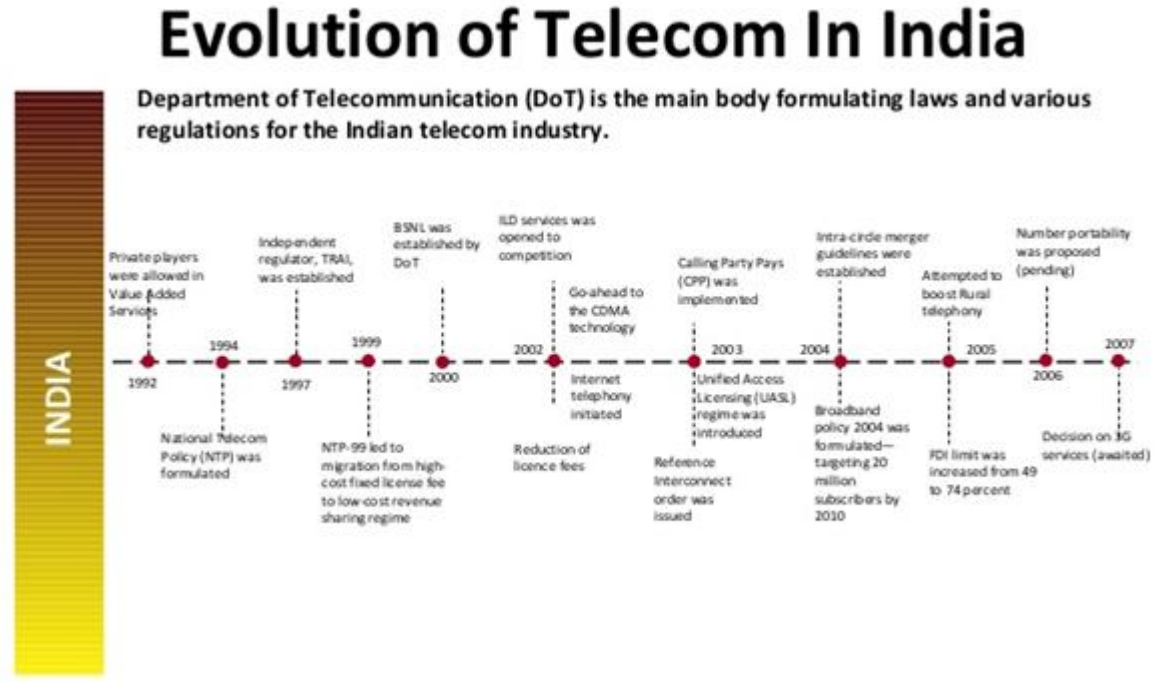

Figure-2: Indian telecom evolution timeline (Malhotra, 2014).

CRM - Customer Relationship Management helped all the telecom segments and operators cultivate and enhance the main purpose of using the telephone for meaningful life, helping improve customer relationship by linking relationship in the society and organizations to build a conclusive bond between the service providers, customers and the organizations (Agrawal & Rastogi, 2009).

After deregulation, the Indian telecom industry saw a drastic transformation from a monolithic regime, through an age of several technological, commercial, economical and marketing developments with privatization and deregulation, rapidly rising market players to offer innovative products with the value added services. An intense growth created tremendous competitive difficulties. The major telecom sector players started entering the field after 2000. Every service provider of telecom started struggling with many complicated matters regarding new technologies arriving daily, building up value added promotional services, and constant innovation (Haridasan & Venkatesh, 2011). Most of the telecom industries got affected due to customer leaving and joining the new telecom sector instantly. The latest survey indicates that there are almost 2%, careful churning each month, and operators losing almost 25% customers per year. Due to this, the telecom industry is severely affected, as the customers regularly started shifting their alliance to the new telecom sector because of their own reasons. Under the circumstances, the ultimate goal of CRM in the telecom sector is to offer more effectiveness of functioning with the relevant package of software application to enhance customer loyalty, productivity, satisfaction, and revenue, and this could be done by managing customer coordination, synchronizing the interaction level at each touch point inclusive of customer contact field center, organization website, and generating more distribution channels. This review paper highlights the effectiveness due to improved marketing strategies introduced by Indian telecom industries to develop a better Customer Relationship in the prevailing extremely competitive, changing telecom environment, to gain valuable customer loyalty and satisfaction, with better service quality (Elangovan et al., 2017).

The vision of Indian government, in the previous two decades, concerning the cellular telephony has considerably increased to accomplish this government vision. In reality, they achieved the 510 million, telephone connections as targeted to reach well before time in September 2009 (Telecom Talk, 2009). Also, out of prevailing 509.65 million telephones in India, the subscribers of mobile phone created an amazing 92.6% figure (TRAI, 2009). Mostly, the customers of cellular phones from the urban region were benefitted, as they

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had a good selection choice of products as well as operators, while the call rates were considerably reduced (Prabhu et al., 2014).

This abrupt transition towards the growth phase leading to maturity level, included with the imminent progressive technology linking 3G and MNP regulatory policies, brought quick changes, when the QoS – Quality of Service developed systematic plans by adding telecom towers everywhere. The government agencies offered better planning with a long term, improved and long lasting safety approach with the effective policy decisions (Ray, 2007).

2. EVALUATING THE EFFECTIVENESS OF CRM IMPLEMENTATION IN INDIAN TELECOM INDUSTRY

CRM has finally emerged as the integration of software, hardware, applications, processes with the management commitment so as to enhance customer service facilities, retain more customers, provide better analytical capabilities. The CRM concept is presently considered as the most popular buzzword in every business segment, particularly in the marketing section as the software helps with automation process, materialized from ERP - Enterprise Resource market planning software (Arora M. 2013). Until now, the intense functions its applicability is not entirely understood. The main CRM constituents start with advanced technology, to reach people, and the processes. By gaining significant knowledge of customers, the service providers can reach and serve customers effectively to hold them loyal and contented forever. The prime CRM theme is simply by understanding the meaning of CRM, and the purpose it serves. The CRM adds to its business philosophy, apprehending business strategies, called as a business application process, applied as an additional technical tool. It works like a business philosophy (Ryals & Knox, 2001), generates customer relationship orientation, retention, and improves customer value generation applying process management. Using the business strategy, CRM works at the customer oriented activity, apples business strategies to enhance customer satisfaction and loyalty by offering better customized, responsive services (Croteau & Li, 2003). CRM is a macro-level, aggregated system, includes many sub-procedures, like prospect identification, creation of customer knowledge (Srivastava et al., 1999).

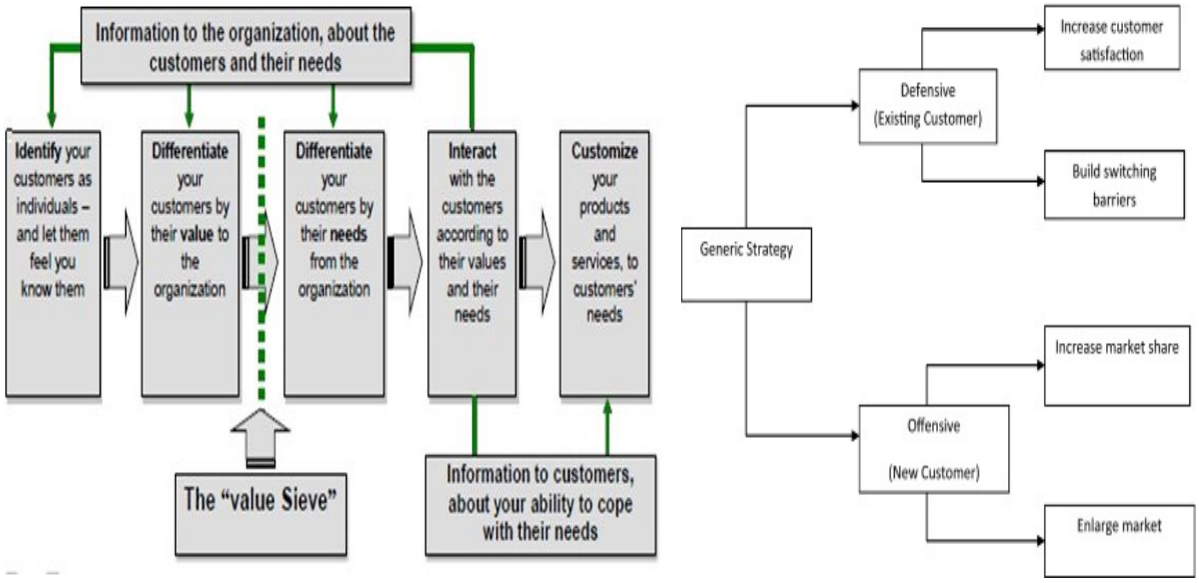

Figure-3: The CRM process connections (Vaish, et al., 2016).

The CRM advanced technology helps organizations to develop and promote better understanding and relationship with all the customers. The CRM means (1) Different to various researchers and scholars having diverse career backgrounds; (2) It is an emerging dynamic trend that aligns various business needs needing more time and analysis to reach a consensus; (3) The multidisciplinary functions of CRM combine management, marketing, and service regulations. However, the CRM concept also derives balanced perspective, that creates a philosophy, policy, and also coordinates more intervening strategies by several Information Technologies to generate multifunction, effective two way communication with customers (Rababah et al., 2011). Hence, the organization can gather an in depth information and knowledge of their needs, wants, and buying patterns. Moreover, CRM cultivates are always customer-specific, understands cultural trend of customer to develop strategies, by which, more results can be generated to enhance the revenues by the application of IT to retain more customers. In this extremely competitive marketplace, the management of customer relationship is crucial for the company's profitability, as well as long-term success (Peppers and Rogers, 2004).

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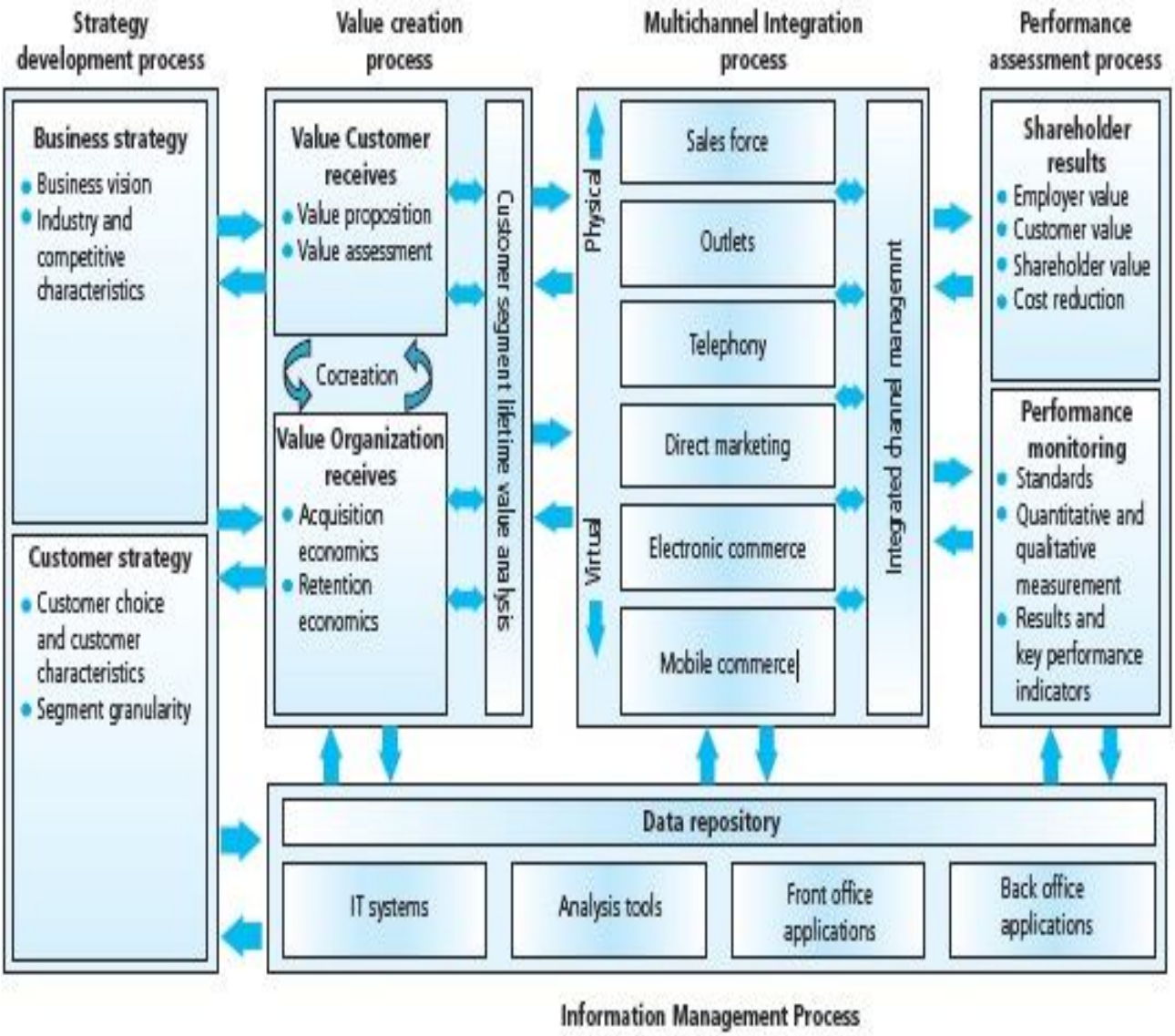

Figure-4: CRM Processing Model (Peppers and Rogers, 2004).

CRM helps gain more benefits for the customers and organizations, drives an increased CRM awareness, to critical and extensive search for elements and components of program initiatives. Three main pillars develop CRM; people, processes, and technology. Overall, while CRM implementing, the failure rate is also high. For example, in 2003 the failure rate of CRM was around 55% to 75%. Around 70% CRM effected projects showed a loss without performance improvement (Zhang, et al., 2006). Therefore, all the CRM applications must have (1) Very efficient management so as to transform and improve business procedures; (2) Aligning business processes systematically with IT operations; and (3) The better understanding of CRM functioning. The main CRM failures can be due to (1) Improper engineering applications, and inadequate business procedures; (2) Not adequately defined business procedure before CRM implementation; (iii) The troubles measuring effectiveness of CRM deployment (Adebanjo, 2006).

3) CHALLENGES AND OPPORTUNITIES IN CUSTOMER LOYALTY, SATISFACTION AND PREFERENCES

The Maturity CRM Model acts like a tool for rating enterprises based on their capability to use CRM effectively. To establish this category, they have to first evaluate the overall CRM vision and strategies, consistent customer experience, organizational process collaborations, technological information and metrics.

The Telecom sector constantly tries to gratify customers, and in return, expect them to purchase more, and further inform others regarding their product experiences. They are also willing to pay an additional value for processing transactions with the acceptable supplier they fully believe and trust. The statistical results show that the maintenance cost of old customers is simply a small part of capturing a new customer. Therefore, by accomplishing customer satisfaction, they can provide measure where exactly the company marketing strategy stands from the customer satisfaction and loyalty level (Finnegan & Currie, 2010).

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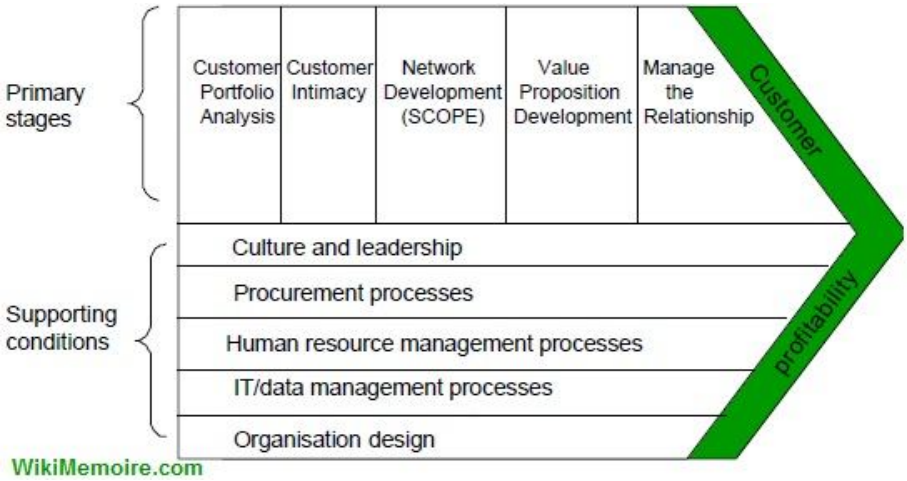

Figure-5: The customer satisfaction level (Hague & Hague, 2017).

Certain companies are unsuccessful in satisfying customers? When the customer purchases a product, he expects the product to be suitable for his needs and the price is also correct. To get the buying satisfaction and using that product, the customer pays money for it. In the due course, the satisfaction level can increase each day. Therefore, the companies strive to gain a high level of customer satisfaction by impressing them.

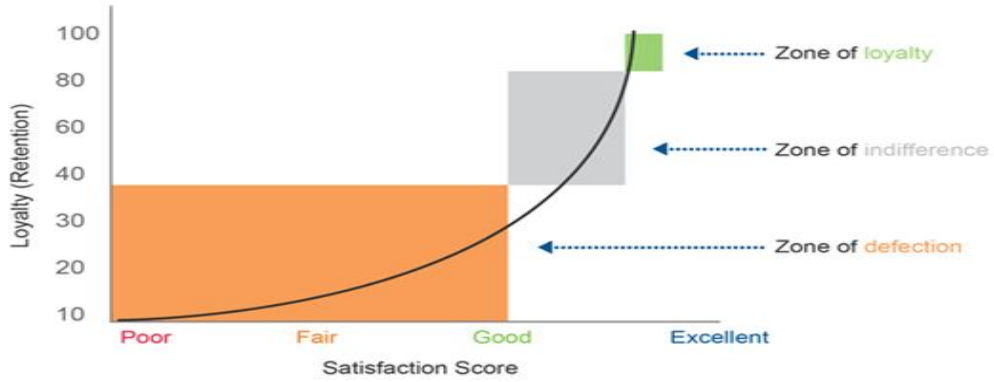

Figure-6: Customer satisfaction and loyalty effects (Hague, et al., 2017).

A market and business traders constantly try to evaluate the customer satisfaction levels. They keep directly in touch with customers to understand whether any system of functioning going wrong and where it is correctly done. This informal feedback is beneficial for them, however, it becomes difficult to administer and control. Hence, the customer survey helps to justify, measure and track the level of customer satisfaction (Finnegan & Currie, 2010).

They normally take five steps: To spot the gap; Redefine the processing and segmentation; Redefine the Customer Value; Generate better action plan; Review by measuring the satisfaction level of customers.

Figure: Customer satisfaction stages (Hague & Hague, 2017).

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4) ECRM PROCEDURE FOR CUSTOMER SATISFACTION AND LOYALTY

The e-customer specifies the relationship management, while e-CRM is the latest technique mostly applied to enhance marketing abilities, and automation capabilities. The procedures integrate the technology, science, and marketing features of business elements. The e-CRM covers every need of the customer to provide an extensive online transaction with the complete business cycle experience of Pre, During and After sales (Alhaiou, Irani & Ali, 2012).

The e-CRM, Customer Satisfaction and Loyalty develop a comprehensive model to explain the e-CRM effects at all, e-loyalty stages at several transaction cycle phases of adoption. The research study displays the entire features of e-CRM to generate a strong impact on the level of e-satisfaction. It creates a considerable effect on e-loyalty, whereas the mediating role is developed by e-satisfaction, which clearly specifies the model. The study result demonstrates the specific managerial role indicating proper developments in executing e-CRM strategies. As mentioned by Alhaiou et al. (2012), each e-CRM transaction takes care of Pre-service; At service; and Post-service aspects to strengthen the customer relationship, which increases the entire customer satisfaction levels.

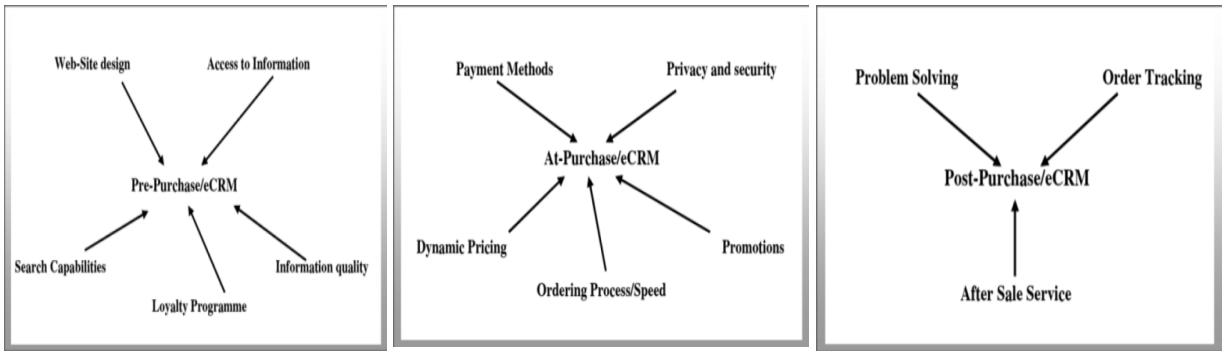

Figure: Pre purchase (Alhaiou, Irani & Ali, 2012).

The electronic transactions online encompasses three systems covering online purchases and services. They are sale and service at pre-product condition to provide information during the search, During the sale services offered At the sales point, and after the sale and service (Ismail and Hsieh (2009). Every phase of e-CRM transaction definite many features like pre-service, during sales and service, and after sales service, and all of them, strengthen, over the internet, the online customer relationship helping to increase an entire satisfaction level of the customer. As such, e-transaction features of sales with service cycle are always useful to examine, understand, and maintain the link between e-CRM; e-Customer; e-Loyalty; and e-Satisfaction.

Every organization, thereon, can obtain further information concerning their customers, by applying customized alert methods using packages sent and send information as required by every customer needs (Lun, et al., 2008).

5) THE IMPACT OF CRM, AND ITS NEED OF THE HOUR

The CRM is basically used to improve the customer strength by increasing the base, satisfying their requirements and improve their buying satisfaction by generating the customer loyalty. CRM involves the philosophical concept, using the relationship building combination with customers together with advanced marketing techniques to influence sales and customer satisfaction to gain customer loyalty (Heidari & Najjari, 2015).

Figure: Customer Ideal Lifecycle starting with Experience to Advocacy (Guinn J. 2018).

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Thus, formats of CRM integrates several practices for the entire organization to accept, approve, maintain, and implement to improve and strengthen the customer base. Several empirical researches and systematic reviews were conducted using different journals, conference sources, by gathering study materials and papers, from 2007 to 2017. Depending on the industries, the results were varied, due to different CRM classifications, publication trend, performed in different countries. These results were divided into three segments, and applied regularly in various studies that involved the applications and impact CRM generated on the customer satisfaction and loyalty, together with the SQ - Service Quality features; SA – Access to effective Service; and finally HC - Handling of Complaints. These particular factors were scrutinized to develop a specific effect on the customer loyalty and satisfaction levels, which cannot be undervalued or refused, because only the happy customers come forward to provide free product promotion and advertising of the company. It was also argued that preserving, sustaining and maintaining the prevailing customers is rather easy, when compared with locating new customers (Ogunnaike et al., 2014).

6) CRITICAL ANALYSIS OF CUSTOMER PREFERENCES AND SATISFACTION MEASURE

Customer Retention is highly vital and the most constructive process is to persuade the existing customers about their value and importance to the organization. They resume using the service of the organization, without considering to change to another competitor. In the case of Telecom sectors, due to high competition, effectiveness of CRM, implementing customer retention procedures commence with connection, communication, and dealings, to continue throughout the business lifecycle. The ability of telecom service provider to retain their existing customers not merely depend on services provided, but further efforts to serve in a more organized manner. The retention of previous customers is very vital and is the most demanding missions of the company. Also, the retaining cost of old customers is very low compared to drawing new customers. Hence, the company directs their efforts to channelize their money, time, and energy to maintain the on hand customers, while conducting an immaculate marketing strategy to acquire new ones, effectively gain their confidence; loyalty and satisfaction in a most improved manner (Terblanche & Boshoff, 2010).

Figure: Stages of customer retention (e-Marketing Mixology. 2012).

In case the number of competitors keeps on increasing, the customer retention becomes very difficult, as the fierce competition can divert most of the customers by providing attractive product and service. The attrition rate in the telecom sectors becomes quite large due to less cost of switching over. The churning of customers only by 1% indicates a million dollar cost to the company. Therefore, CRM has become the most effective strategy to overcome existing business complications. As per Ramakrishnan (2006), CRM application processes from the technology point of view, the infrastructure must analyze, capture, and share every attribute of customer understanding to maintain good relationship with the company in a more emblematic manner (Sarkar, 2017).

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5. CONCLUSION

The Indian telecom BSNL and MTNL had the monopoly earlier, the telephone call charges remained extremely high, giving rise to dishonesty, and corruption, with only Landline phones available. Very few Mobile phones utilized only by ultra rich families. After the economic liberalization, the private and foreign investors started flooding the Indian economy with advanced telephonic services. The fierce competition resulted in an idyllic diffused telecom service, triggering a large scale telecom revolution, to become the 2nd largest global telecom market with more than a billion telephone customers. Today, the mobile phones dominated the Indian market, and the landline phones have become an extinct class. In such situations, the CRM application to promote products has become the most important part of the marketing strategy by providing several value added services, low tariff, introducing technically advanced phones, with demand creation and customer retention technique, gaining loyalty and satisfaction, have become the inseparable part of our life. The induction of smart phones entering India with 3G and 4G services, another revolution has commenced in the ever growing Indian telecom sector (International journal for innovative research in multidisciplinary field, 2016).

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MARITIME TRADE AND ECONOMIC DEVELOPMENT OF NORTH EAST –A NEW APPROACH TO ANALYZING THE IMPACT

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ABSTRACT
Geographical locations of India and Bangladesh complement each other and present an opportunity for both nations to strengthen their connectivity and integrate with economic growth centres which in turn, would create positive changes in the local economy and promises to provide exponential benefits for both the countries. For India, in particular, transit and transshipment across Bangladesh is important as it is expected to boost the economy of India's Northeast which is a vibrant source of India's largest perennial water system- the river Brahmaputra and its tributaries, which can be tapped for energy, irrigation and transportation. Among the various avenues for that can promote trade, inland waterways (IWT) can play a major role as it entails less than 10% of the cost of developing a four lane highway of equivalent freight capacity. It consumes just 4.93 g/Tkm, 15 and 54% of that of road and railways transport respectively. It also ensures lower environmental costs, as accidents, pollution and climate change impacts are significantly lower compared to the other means of transport. IWT routes in India, by definition, are location specific and hence, limited in their extent. Against this backdrop, this study is an attempt to analyze the importance of IWT in facilitating the economic development of North east. Various indicators like port efficiency, regulatory environment are considered to analyze the impact of trade facilitation for substantial gains in terms of economic growth, new livelihood generation and prosperity, leading to political, economic and social stability.

Keywords: in land water ways, trade, economic growth

1. INTRODUCTION

The Strategic location of Assam, in proximity to the growing Association of South East Asian Nations economies, provides easy access to a market of over 800 million consumers. All the major cities of ASEAN are located geographically closer to Assam, when compared to the other major cities of the country. Being the heart of Northeastern states, Assam offers proximity in meeting the demands from neighboring states.

Assam's linear area profile, from upper (Tinsukia) to lower Brahmaputra (Dhubri, via Guwahati), with almost the entire state's geographical territory being included in the zone of the mighty river's catchment, makes it the ideal destination to ramp up inland waterways logistics and transport, through diverse models of projects. Road transport can potentially be reduced to relevance only in terms of connecting the Brahmaputra and Barak valleys.

Lack of efficient connectivity for transport of goods and people to and from NER is widely recognized as one of the most important impediments in faster economic growth of the region. A list of the different means of transport as available in North East is shown in the following table:

Table-1: List of the different means of transport

Mode	VOC/Freight(INR/T km)
Railways	1.36
Highways	2.50
IWT	1.06

Amidst this scenario waterways can play a big role in the faster economic development of the region. Inland waterways provide a sustainable and less expensive substitute to road and rail cargo movement in many countries. Navigable inland waterways are defined as stretches of water that are not part of the sea, but are suitable for navigation of vessels. Cargo movement by inland waterways is not only cost –effective but is fuel-efficient and thus environmental friendly means of transport. With increasing congestion and emissions from road cargo movement, inland waterways offers a major scope for increased utilization in the coming decades, providing a more environment friendly alternative to roads and railways in terms of energy efficiency, noise pollution and emissions. Inland Water Transport is an energy efficient and cheaper mode of transport for bulk commodities, especially those originating and terminating on the water fronts. It is environmental friendly and has high employment potential. It is estimated that one litre of fuel can move 24MT on road, 85MT on railways and 105 MT on inland water. Inland waterways in India makes up only less than 1 percent of total transport, compared with China's 8.7 percent and the European Union's 7 percent. Neighbour Bangladesh transports around 35 percent of its total freight by IWT

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2. LITERATURE REVIEW

An extensive literature review gives the following details

Chatterjee et .al (2015) on their project on India Bangladesh connectivity discusses about improving connectivity for a region's security and development. Transformations taking place in the region, as elsewhere in the world, necessitate and facilitate greater connectivity between countries. Connectivity may provide the transmission channels through which development impulses can spread across the region and can add to the dynamism of economic and social progress of both India as well as its eastern and south-eastern neighbours. Connecting low-income countries like Bangladesh and Myanmar, to large countries like India and China, can narrow existing development gaps. In addition, India needs to connect to China and Southeast Asian economies through Myanmar (which is opening up rapidly) and Bangladesh by creating cross- border transport-cum economic, energy and telecommunications corridors. The ease of Indian national connectivity, particularly for its north eastern region depends on its connectivity with Bangladesh. Experts opine that infrastructure connectivity is essential in trade integration and enhancement through lowering trade and logistics costs. Involvement of Northeast India, Bangladesh, and Myanmar are crucial for enhancing connectivity between south and Southeast Asian countries as well as India's national connectivity.

The Monthly E-Newsletter of South Asia Watch on Trade, Economics and Environment (2016) has discussed about harnessing waterways for commercial navigation. Developing waterways for commercial navigation would provide the people of the region with cheaper and cleaner mode of freight transport. Moving cargo through water is cheaper than on trucks or railways. According to a study conducted by an India based Rail India Technical and Economic Service (RITES) Ltd, inland water transport would only cost INR 1.06 per tonne/km, as opposed to INR 1.41 per tonne/km for rail and INR 2.58 per tonne/km by road. Likewise, water transport offers better fuel efficiency as one horse power can ferry four tonnes of cargo on water, while the equivalent is 150 kg and 500 kg by road and rail, respectively. This makes water transport relatively less harmful to the environment.

Wilson et. al. (2003) in their article analyses the relationship between trade facilitation and trade flows in the Asia Pacific region. Country specific data for port efficiency, customs environment, regulatory environment and e- business usage are used to construct indicators for measuring trade facilitation.

Valentine and Gray (2001)in their paper investigates the efficiency of differently owned container ports, comparing privately owned ports against those remaining in the public sector, and those that have elements of both public and private ownership patterns. In addition, the organisational structure was analysed and classified.

3. OBJECTIVES

1. To examine the existing and planned networks of inland water connectivity under various bilateral, sub-regional and regional initiatives between India and its neighbours
2. To analyse the progress of such initiatives in terms of cargo movement across NW-2.
3. To analyse the impact of select indicators in trade facilitation across NW2

4. EXISTING AND PLANNED NETWORKS OF INLAND WATER TRANSPORT

Inland Water Transport (IWT) had traditionally been an important mode of transport of cargo as well as people for NER since time immemorial, mainly because of the mighty Brahmaputra and beautiful Barak rivers flowing through the region. India has navigable waterways aggregating to about 14500 km of which 5200 km of major rivers and 485 km of canals are suitable for operation of mechanized crafts. Most of the waterways suffer from navigational hazards like shallow waters and narrow width of the channel during dry weather, siltation, and bank erosion, absence of infrastructure facilities like terminals and inadequacy of navigational aids. The existing availability of vessels for IWT in the public and private sectors put together is less than 400 vessels including tankers, bulk carriers, barges and other vessels of average capacity of 600 tonnes.

4.1Freight Movement through IWT

The total cargo movement on India's waterways depends on three operational National Waterways (spanning UP, Bihar, Jharkhand, West Bengal, Assam and Kerala) and two waterways in states of Goa and Maharashtra. In terms of tonnage Goa (14.49MMT) and Maharashtra (33.2MMT) accounted for28.23% and 62.89% respectively of the total cargo volume in 2016-17. Balance 8.88% is being handled by the three National waterways. IWT now carries less than 0.5% of India's freight traffic, whereas roads carry about 66percent and railways about 27%.

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4.2 Cargo movement through IWT and growth potential

Sustained economic growth has brought about expansion of the transportation sector in India. The growth of transportation sector has been the same as the growth in GDP over the last five years. However the contribution of inland water transport to the GDP has remained stagnant at 0.2%.Even though transporting goods through road is 2.5 times expensive than IWT, the modal mix of transporting freight in India is heavily skewed towards road and rail. Freight traffic is expected to grow by 500% to 13000 BKTM by 2032. With the increasing congestion of traffic on road and railways, modal shift towards waterways is key to achieving cost effective long term growth.

Table-2: Diagram of Inter Regional traffic Projections for Rail and Road (in BKTM) PG 11

Years	Total inter –regional traffic for rail and road (in BKTM)
2017-18	2,952
2022-23	4316
2025-26	5,345

Source: Planning Commission

The growth in rail and road traffic is adding further pressure on the already saturated rail and road network in the country. The expected growth in the total inter-regional traffic needs to be shared by other means of transports, primarily Inland Waterways as well as Coastal Shipping.

4.3 National Waterway No.2

The Sadiya-Dhubri stretch on river Brahmaputra in the state of Assam, with a length of 891 km was declared the National Waterway-2 in 1988.This NW connects North Eastern Region with Haldia and Kolkata ports through Indo-Bangladesh Protocol (IBP) route. NW-2 is already operational and a number of important infrastructural facilities have been developed thereon. The IBP route also provides seamless connectivity among NW-1(Ganga river from Allahabad to Haldia), number ports in Bangladesh, Sunder bans region of India and Bangladesh, Assam, Meghalaya and Arunachal Pradesh. The construction of a permanent Ro-Ro terminal at Dhubri has been completed which is now operational. A similar terminal will be developed at Hatisingimari on the opposite bank of river Brahmaputra, once the river bank stabilizes at Hatisingimari. To facilitate dry docking repair in the North Eastern Region, a project for construction of slipway at Pandu has been sanctioned and the work is scheduled to be completed by December 2018.

4.4 Existing IWT infrastructural facilities on NW-2 (Brahmaputra)

1. Development and maintenance of navigable channel of 45m width and 2.5m depth between Dhubri and Neamati(630 km);2.0 m between Neamati and Bogibeel(120km) and 1.5 m between Bogibeel and Sadiya(141km).
2. Day and Night navigation facilities for safe movement of vessels carrying cargo, passenger and tourists.
3. DGPS connectivity in entire waterway.
4. Multimodal terminal at Pandu with low level and high level jetties.
5. Permanent RCC Ro-Ro jetty at Dhubri.
6. Temporary Ro-Ro jetty at Hatsingimari.
7. Ro-Ro Services between Dhubri and Hastiningimari enabled to avoid circuitous road travel of approx.220 km through Jogighopa Bridge.
8. Floating terminals at 11 locations.

5. PLANNED NETWORKS OF INLAND WATER INDO- BANGLADESH PROTOCOL ROUTE

A Protocol on Inland water on Transit and Trade (PIWTT) between India and Bangladesh has been in existence since 1972 facilitating movement of inland cargo vessels of one country on designated routes other country for transit and trade of goods through inland waterways. It connects NW- 2(Brahmaputra) and NW-16(Barak) with Kolkata and Haldia ports through Bangladesh and Sunderbanswaterways. The designated inland water routes under this Protocol are (i) Kolkata- Silghat-Kolkata ,(ii) Kolkata- Karimganj-Kolkata, (iii)Rajshahi-Dhulian,Rajshahi and(iv) Silghat- Karimganj-Silghat. For inter-country trade, five ports of call have been designated in each country. These are Haldia, Kolkata, Pandu, Karimghat and Silghat in India; and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh. These protocol routes also connect National Waterway-1(The Ganga River) with National Waterway-2(The Brahmaputra River) and NationalWaterway-16(Barak river).A MoU has been signed between India and Bangladesh to facilitate movement of passengers and tourists also through these Protocol Routes.

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5.1 Cargo Movement through National Waterway No.2

400 tonnes of cement consignment of Star Cement Ltd moved from Pandu to Dhubri in December, 2017. In September 2017, lime stone cargo was moved from Karimganj to Ashuganj in Bangladesh. Ro-Ro vessel, MV Gopinath Bordoloi (Capacity 250 DWT) was flagged off from Ro-Ro terminal at Pandu with 8 army trucks and 20 personnel on April 23, 2017. Regular over Dimensional Consignment (ODC's)-Transformers of Power Grid Corporation, which cannot be transported by rail and road are taking place in Brahmaputra (NW-2). These ODC'S are transported from Haldia/Kolkata to North East through the Indo- Bangladesh Protocol (IBP) route. Two long cruise vessels MV Mahabaahu and MV Charaidew are regularly operating between Saulkuchi (a place downstream of Guwahati) and Majuli carrying foreign tourists. IOCBitumen (1200 tonnes) was transported by IWAI vessel from Haldia to Guwahati. M/s Vivada moved POLproduct of Numaligarh Refining Ltd between Silghat and Kolkata. Coal is proposed between Jogighopa and Kolkata. Cargo movement can again be classified as: Unorganised Cargo and Organised Cargo.

5.11 Unorganised Cargo: Any cargo movement by country boat and mechanised boat is referred to as unorganised cargo. Unorganised cargo movement is within NW2 only and it doesnot make use of the protocol routes. They also move from one small ghat to another. These ghats are monitored by the state IWT dept. Their movement is usually confined from one ghat to another in traditional conventional vessels within river Brahmaputra and its tributaries.

5.12 Organised Cargo: Sometimes country boats are used but generally the cargo is transported on barges with the help of tugs, self-propelled vessels and are in large quantities and ODC (over dimensional cargo). Generally Cargo movement using Protocol routes is termed as organized. However, the cargo is also moved from one ghat to the other ghats within National Waterways No2 and its tributaries and imported or exported to neighboring country using Protocol routes. These usually involve long haults and move through the protocol routes. They lead to revenue earning in the form of taxes through waterway usage charge, pilotage, loading, unloading if needed, berthing charges, storage charges etc.

AN ANALYSIS OF THE PORT EFFICIENCY THROUGH CARGO MOVEMENT ACROSS NW-2

Table-3: Cargo movement through River Port in NW -2 during the year 2014-15

Sl. No	Name of the port/location	Organised cargo/ODC	Unorganised cargo (goods, passenger, vehicle, animaletc.)	Remarks
1	Pandu port			Terminal is used for bathing of IWAIvessels
2	Jogighopa/Goalpara	1702MT	53347MT	ODC came from Kolkata through National Waterways
3	Dhubri	-	265332MT	
4	Silghat	-	-	
5	Bhomoraguri	-	12872MT	
6	Biswanathghat	1120MT	-	ODC came from Kolkata through NW
7	Neamati Ghat		74970MT	
8	Oriamghat		833MT	
9	Bogibeel		96642MT	
10	Sengajan			
11	Dibrugarh			Terminal is used for bathing of IWAI vessels and tourist vessels for logistic support
12	Total	2822MT	504910MT	

Source: Field Survey

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Table-4: Cargo movement through River Port in NW -2 during the year 2015-16

Sl. No	Name of the port/location	Organised cargo/ODC	Unorganised cargo(goods, passenger,vehicle, animaletc)	Remarks
1	Pandu port			Terminal is used for bathing of IWAIvessels
2	Jogighopa/Goalpara	1780MT	51683MT	ODC came from Kolkata through National Waterways
3	Dhubri	-	357284MT	
4	Silghat	-	-	
5	Bhomoraguri	-	15158MT	
6	Biswanathghat	750MT	-	ODC came from Kolkata through NW
7	Neamati Ghat		78775MT	
8	Oriamghat		638MT	
9	Bogibeel		96201MT	
10	Sengajan		103 MT	
11	Dibrugarh			Terminal is used for bathing of IWAI vessels and tourist vessels for logistic support
12	Total	2530MT	5998420MT	

Table-5: Cargo movement through River Port in NW -2 during the year 2016-17

Sl. No	Name of the port/location	Organised cargo/ODC	Unorganised cargo (goods, passenger, vehicle, animal etc)	Remarks
1	Pandu port			Terminal is used for bathing of IWAIvessels
2	Jogighopa/Goalpara	1060MT	51792MT	ODC came from Kolkata through National Waterways
3	Dhubri	-	356780MT	
4	Silghat	-	-	
5	Bhomoraguri	-	12872MT	
6	BiswanathGhat		-	ODC came from Kolkata through NW
7	Neamati Ghat		10822MT	
8	OriamGhat		640MT	
9	Bogibeel		100955 MT	
10	Sengajan			
11	Dibrugarh			Terminal is used for bathing of IWAI vessels and tourist vessels for logistic support
12	Total	1060MT	607715MT	

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Table-6: Cargo movement through River Port in NW -2 during the year 2017-18

Sl. No	Name of the port/location	Organised cargo/ODC	Unorganised cargo (goods, passenger, vehicle, animal etc)	Remarks
1	Pandu port	1462MT		Terminal is used for bathing of IWAI vessels
2	Jogighopa/Goalpara	770MT	51504MT	ODC came from Kolkata through National Waterways
3	Dhubri	-	306230MT	
4	Silghat	-	-	
5	Bhomoraguri	-	11402MT	
6	BiswanathGhat		-	ODC came from Kolkata through NW
7	Neamati Ghat			
8	OriamGhat		96505MT	
9	Bogibeel		595MT	
10	Sengajan		95234MT	
11	Dibrugarh			Terminal is used for bathing of IWAI vessels and tourist vessels for logistic support
12	Total	2232MT	561470 MT	

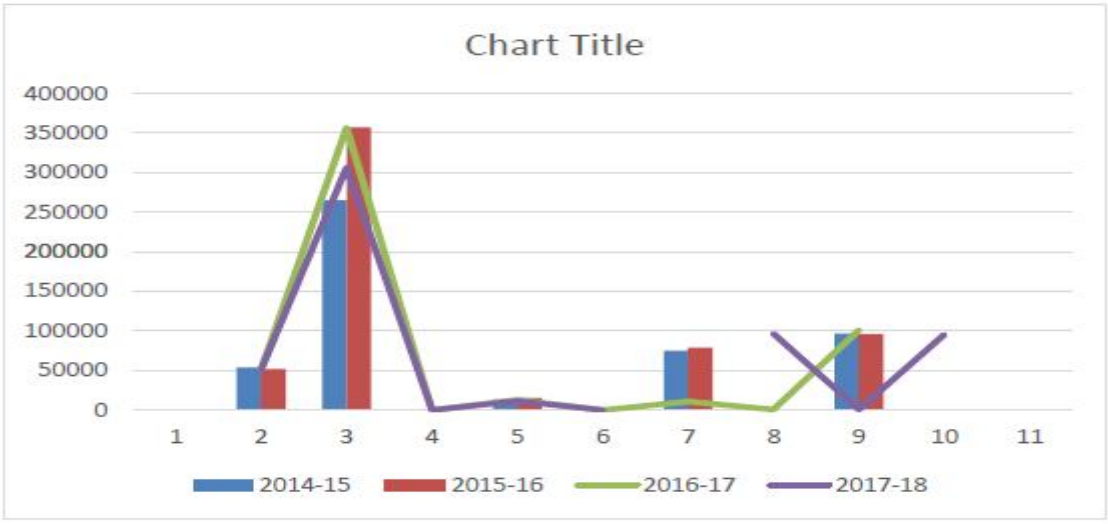

Fig-1: A graphical representation of the unorganized cargo movement spread across different years.

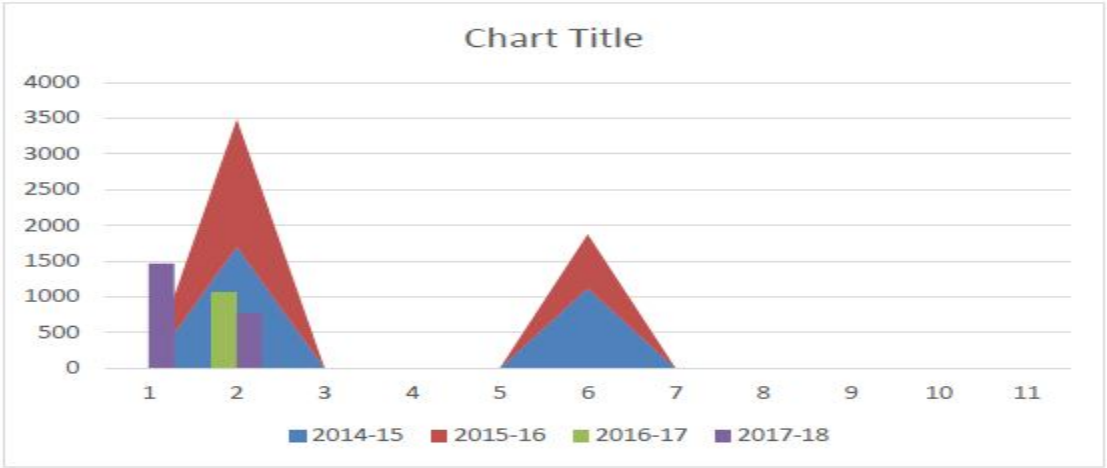

Fig-2: A graphical representation of the organized cargo movement spread across different years

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An analysis of these diagrams reveals that organized trade takes a back foot when it comes to trade across NW2. Most of the cargo movement is concentrated only with one port i.e. Jogighopa. There is very less movement of cargo across the other ports leaving aside the 6th port i.e. Biswanath Ghats. However a rosy picture dominates the trade across the NW2 when it comes to unorganized one. So in spite of sincere efforts by the Government to popularize rive trade perhaps the infrastructural facilities is not sufficient enough to encourage trade in this periphery. A long has to be done than said.

The efficiency of a port can be measured if it is able to produce a maximum output for given inputs or uses a minimal input for the production of a given level of output. Here when it comes to port efficiency cargo movement is considered as an indicator and accordingly the efficiency of the ports across the various years are calculated.

Table-7: A table showing the cargo movement across the different years

	2014-15	2015-16	Efficiency	2016-17	Efficiency	2017-18	Efficiency
1							
2	53347	51683	96.8808	51792	97.08512	51504	96.545
3	265332	357284	134.655	356780	134.4655	306230	115.41
4	-	-		-		-	
5	12872	15158	117.759	12872	100	11402	88.58
6	-	-		-		-	
7	74970	78775	105.075	10822	14.43511		0
8	833	638	76.5906	640	76.83073	96505	11585
9	96642	96201	99.5437	100955	104.4629	595	0.6157
10		103				95234	

The table shows that port efficiency in terms of cargo movement has increased over the period. The second and the third port shows a record increase in cargo movement. The infrastructural initiatives taken by the Government has facilitated trade on NW2. Enhancement of waterways has given a boost to import and export trade. Private cruise operations has also been on the rise. It has also encouraged local employment for the various vessels and training initiatives for the local crew has also been undertaken from time to time.

6. CONCLUSION

In line with Look East Policy of Govt. Of India, several initiatives of the Government has accelerated the development of IWT sector in the NER. With the prominent NW-2 and NW-16, a number of infrastructural development has been undertaken .A step in this direction would ensure a cheaper and more eco-friendly way to shuttle people .The development of inland waterways could create a cheaper and more eco-friendly way to shuttle people and goods between countries and enhance economic opportunities for communities living along the banks in terms of boat making industry, freight handling, tourism, etc. However it should be always kept in mind that a balance is always desired lest it works against the interests of local communities and the environment.

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NATURE OF EMPLOYEES IN SELECT ORGANIZATIONS IN PRIVATE SECTOR – A CRITICAL STUDY

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ABSTRACT

*Employment is a **Psychological Contract,** based on **Mutual Trust and confidence** between the employer and the employee. Although the employer is the same, the impact of his practices differs from employee to employee. Unless there reaches a **Reconciliation of Institutional and Individual objectives**, there cannot be expected smooth functioning.*

*It is no exaggeration to state that there are many employers who have flouted Management Principles and have ignored good Management Practices; still, they are going great guns. The employees in a few Private Sector Organizations can be classified on the basis of the nature of their position in the organization as **Permanently Permanent, Permanently Temporary and Temporarily Temporary.***

In general, Permanently Permanent employees are the employees who belong to the Top Management, Permanently Temporary employees are the employees who belong to the Middle Level Management and Temporarily Temporary employees are the employees who belong to the Middle and Lower Level Management.

Permanently Permanent employees are quite often well relaxed as threat to their jobs is never suspected; forget; experienced as it is almost non-existent in practical nature. Permanently Temporary employees are not fully relaxed with respect to their jobs, they are always more vigilant about it. In spite of completion of many years in the organization, they do not feel secured. Temporarily Temporary employees may find themselves secure but only for short time, they cannot predict near –future; forget distant- future; in the same organization.

Keywords: 1. Psychological Contract

2. Mutual Trust and Confidence

3. Unwritten Political Rule

4. Employee Retention Policies

INTRODUCTION

As a matter of fact, Employment; in itself; is a ***Psychological Contract*** between the employer and the employee. It is, more often than not, based on ***Mutual Trust and Confidence.*** A job appears pleasant or an enjoyment for an employee so far as trust is reasonably; may necessarily not be fully; maintained by the employer. On the contrary, a job turns troublesome, especially when the employer engages in malpractices which finally amount to Breach of Trust. This degree of breach is experienced more vigorous when in-spite of putting in the best efforts by the employee and attempting to excel in organizational work, there results breach of Trust. In other words, those employees whose approach to work is too casual and also who are not so serious and sincere in their attitude towards work, indeed, do not, at all, get hurt even if a few malpractices are practiced by the employer. Thus, ***as an interesting observation, although the employer is the same, the overall impact of his practices, whether Good Practices or Malpractices; differs from employee to employee, quite drastically and dramatically, within the same organization.***

Furthermore, as per one of the fourteen ***Principles of Management***, as suggested by ***Henry Fayol*** in ***1916;*** one hundred and two years earlier, who is popularly regarded as the ***Father of Modern Operational Management Theory***, in an Organization, there should be ***Subordination of Individual Interest to Institutional (Organizational) Interest.*** An Institution recruits and selects an individual on a specific position for achievement of Institutional Objectives and not for achievement of Individual Objectives. At the same time, an individual joins an Institution for achievement of his Individual Objectives and not for Institutional Objectives. Therefore, ***unless and until there reaches a Rational Reconciliation or an Intelligent Integration of both these objectives, that is, Institutional as well as Individual, there can certainly not be expected smooth and satisfactory functioning within the organization.***

RATIONALE OF THE RESEARCH PAPER

Indeed, it is a well known fact that there is experienced ***Wide Gap***, quite often, between ***Ideal Theory and Actual Practice***. In simple words, in modern organizations mutually conducive environment of Trust and Confidence just does not exist, simply because the employers, by and large are, in fact, not interested in creation of such an organizational environment. Moreover, they also do not care too much for their employees as they do

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not believe in protection of interest, psychological as good as practical; of their employees. ***It is no situational exaggeration to state over here that there are a number of employers who have flouted majority of the Management Principles and have ignored many best Management Practices, still, they are observed going great guns. This research paper focuses on the 'Poor' employees working in organizations where these kinds of circumstances exist, in majority of the cases, years after years.***

RESEARCH PAPER OBJECTIVES–

The following are the Objectives of the Research Paper.

1. To Classify the employees in different Categories
2. To Critically Study features of different Categories of Employees

RESEARCH PAPER SCOPE

The Scope of this Research Paper extends to all the employees working in Private Sector which *prima facie* include almost all small scale Institutions like Traders, Sole Proprietors, Private Limited Companies and a few Educational Institutions, too.

In contrast to the Private Sector Organizations referred to in the Research Paper below, there are some other organizations in Private Sector itself where the environment is exactly contrary to what has been described in the Research Paper. The Scope of the Research paper does not extend to such Organizations. As a result, the observations made in this Research Paper are not applicable to such organizations.

RESEARCH PAPER METHODOLOGY

The Methodology adopted for writing the research Paper is ***'Observation.'***

CLASSIFICATION OF EMPLOYEES

The employees in the select organizations of Pvt. Sector can comfortably be classified in the following three categories on the basis of the nature of their position in the organization.

I. Permanently Permanent

II. Permanently Temporary

III. Temporarily Temporary.

Let us study these different categories of employees in the following lines in detail, one by one.

I. Permanently Permanent

In general, these are the employees those belong to the Top Management. In most of the organizations, they are observed to be the relatives and the friends of the employers or the owners. Also, they are, more often than not, not recruited or selected after following proper scientific procedure as prescribed by the Practicing Management Consultants or Expert Academicians. The employability prerequisites such as Educational and Technical Qualifications as well as Soft skills backed by relevant experience literally play second fiddle in their case. Instead of own merit they rely more on their Relations, Liaison or Networking. As a result, they enter the organization preferably from the back door. They are, by and large, nominated by the dominant members of the Top Management.

Furthermore, they may not be assigned too much official responsibility also they may not be accountable for any important organizational work whatsoever. At the same time, they may not hold real or official authority as such over others, but, other concerned employees may perceive that they have apparent authority. They may be appraised annually in respect of their organizational performance just like other employees. However, it does not; at all; affect them, quite adversely. In simple words, in their case, Annual Performance Appraisal which amounts to a serious exercise for other employees; simply turns out to be causality or formality to gift (give) an Annual Notional Normal or Extra-ordinary Increment, irrespective of their performance whether satisfactory or otherwise.

For this reason also, they take organizational tasks quite lightly always as there does not result any harm or serious action whatsoever even in cases of lapse or gapes in the expected output. They hardly like to engage themselves in relatively difficult or complicated tasks and therefore, many a time, they tend to get their organizational work done either by hook or crook through their other colleagues or associates. They may not evade entire official task allotted to them; yet, they may perform only a simple part of it and may like to create a good show of great work done by them within the organization and thereby portrait a picture of their Pseudo Indispensability. Moreover, they never develop any tension or fear for failure since they do not like to excel in their work. They are quite often well relaxed as threat to their jobs is never suspected; forget; experienced as it is almost non-existent in practical nature. In this narrow sense, they can certainly be interpreted as '***Permanently permanent.'***

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II. Permanently Temporary

In general, these are the employees who belong to the Middle Level Management. Although they possess ample potential to hold senior positions, as an ***Unwritten Political Rule***, they are not promoted to the higher Positions because the Management interested in playing nasty politics, does not intend to promote an efficient and a competent employee. On the contrary, its interest lies in offering the same position to an inefficient and incompetent employee who remains in their tight control, all the time. Such an employee understands it very well that he himself just does not deserve the position he is given, but is gifted; and also that it is broadly meant to dictate the management terms on other employees working at lower levels in the organization. Moreover, the employees belonging to this category may or may not have any liaison, bonding or networking with the influential people from the Top Management. Even if it is found, it is experienced to be too feeble to reach to the category of 'Permanently Permanent.' They are selected after adopting proper scientific selection procedure, meticulously, ruthlessly or relentlessly. It may necessarily, not; at all; be out of place to point out over here that in some organizations, those employees are selected; deliberately; who are either partially or fully disqualified or partially or fully unfit to hold a specific official position involving consequent consistent delegation of Authority and sharing of the Responsibility with other strong colleagues or associates. As they themselves are well aware about their disqualifications or unfitness, they never ever raise their voice against any malpractice of Management like No Increment, Low Increment, Depriving the employees of their genuine or legitimate Rights as prescribed by the Statues and other Regulatory Authorities or suppression of the employees etc. They are afraid to face the practical consequences, in case they tend to travel against the actions or the decisions of the Management. It is needless to point out that no practical and prudent employee would ever like to endanger his official position on his own.

In respect of employees belonging to this category, the Annual Performance Appraisal is carried out very strictly. In most of the cases, the objective of this Appraisal is noticed as to find out the faults and errors in the performance, in order preferably not to give or reduce the amount of the increment, if any. In some exceptional cases in some organizations, the detail and satisfactory justification for low increment or no increment too is not given. Furthermore, this kind of ***'No-Increment Strategy'*** is adopted for giving increments simply because the management does not intend to retain its existing employees. At the same time, it is a plain fact that a number of employees of required job description are abundantly readily available in India when the rate of unemployment, especially of educated youngsters, is rising at an alarming rate every year. The existing employees cannot leave their present job even when the increment is not given, forget; low increment is given; basically because new job opportunities are very rare in India, at present. There are experienced situations in many organizations that in spite of putting in very hard efforts and fulfilling all the expectations of the management, quite satisfactorily, normal increment also is not given years after years. In such organizations helpless employees do continue years over years with tremendous monetary dissatisfaction, not out or liking but indeed out of severe compulsion.

The rate of growth of such organizations is registered comparatively low, no doubt; however, the management hardly bothers about this point. Besides, in order to disprove (to show that an employee cannot perform or has no capability to perform) an employee for a particular job, purposefully he is asked to perform a challenging or a difficult task. His services may not be immediately terminated, at this stage, on this ground, but he is constantly kept under tension of losing of his job for want of Technical Skill Set or Soft Skill Set. On top of it, Training Needs of the Employees, which is one of the significant official needs, are not, at all; identified. Even if they are identified, training is not given, correctly and properly with the intention to continue to keep the employees with the lack of skills always.

Besides, the employees belonging to this category, no doubt, engage themselves in some or the other organizational work, however, as there are experienced inherent practical limitations on their performance, the valuable organizational work from their contemplation too, more often than not, is perceived as insignificant, being subordinate in nature; by the Top Management. As a matter of fact, this type of perception on the part of Top Management is not correct because, though relatively unimportant, such work is also required to be performed by someone within the organization, simply because its non-performance may hamper the main organizational work. Whenever these employees get free time after completion of their individual organizational work, they tend to help their other colleagues or associates with the objective to create a good image within the fraternity of personnel where they work. In respect of these employees, there is hardly observed any tension or fear whatsoever for failure because they hesitate to accept the challenging jobs within the organization on their own and incline to perform only those repetitive jobs with which they are quite comfortable. Although these employees are not fully relaxed with respect to their jobs, they are always more vigilant about it. In spite of completion of a number of years in the organization, the employees do not feel security for the job. In other words, in the broader sense, they can be treated as '***Permanently temporary.'***

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III. Temporarily Temporary

In general, these are the employees who belong to the Middle Level and Lower Level Management. The overall organizational tenure of the employees belonging to this category is observed very short, that is, these are new employees. Thus, they do not possess more knowledge about the organization, its policies, especially related to personnel as well as its style of functioning. As a result, a question as regards their promotion just does not arise. Moreover, the employees belonging to this category do not have any liaison, bonding or networking with the influential people from the Top Management. They are selected, no doubt, after adopting proper scientific selection procedure, however, the Management is not observed serious or keen about their selection. The task of selection of these employees is sometimes delegated to Middle Level Managers.

In respect of employees belonging to this category, the question of Annual Performance Appraisal hardly crops up, because hardly any employee belonging to this category completes one year. Even if one or more employees complete one year, they are given nominal or arbitrary increment which may not be equivalent to ordinary Notional Increment. The Management does not bother too much for these employees because it proceeds with the hypothesis that if one employee of this category leaves, he can be easily substituted by minimum two employees and in most of the cases, this hypothesis stands proved. So also several Managements do not design ***Employee Retention Policies,*** quite seriously. On the other hand, such policies though well drafted remain only on Paper as those are never executed in the organizations. From the perspective of the Management, the employees of this category do not make any remarkable impression on the growth of the organization as a whole and in the long run. Hence, although they are not altogether ignored as regards their legal rights or demands, t proper attention is not paid on these vital matters of employee concern.

At times, these employees are experimented for some new jobs, more or less of the same level or the nature which they are performing, and on such experiment if they prove themselves, they are continuously shifted from one job to the other strictly depending upon the need of the organization. Especially when the jobs are changed quite frequently or with regular intervals of time, an employee does not experience stability. He may find himself secure; say only for a day or so or until the time a specific task is fully accomplished; but thereafter he cannot predict even his near –future; forget distant- future; in the same organization. His services are not terminated at this juncture itself, yet, in some cases a situation is created whereby an employee leaves on his own. Under such instable or uncertain organizational circumstances, best work cannot result. In this sense, it can be interpreted that these employees can be interpreted as ***'Temporarily Temporary.'***

RESEARCH PAPER LIMITATIONS

1. As the Research study for this Paper is based on Human Views, that is, Views of the Researcher, all the limitations of Human Views have direct and deep impact on various views formed and inferences arrived at by the Researcher in this Research Paper.

   (At the same time, it may, necessarily, not, at all, be out of place to point out, over here that those views and inferences are based on fully considered, well balanced and sound judgments of the prevailing organizational situations as regards the nature of the employees working in the Private Sector.)

2. Various views expressed in this Research Paper are partially the outcome of Organizational Observations of the Researcher and his Experiences during Social Interactions on a number of occasions with many employees working in Private Sector. As a result, full intellectual concurrence with all the personal views as well as personal opinions of the Researcher is certainly not possible.

SCOPE FOR FUTURE RESEARCH

During the course of the study of this Research Paper, the researcher found out that there is an ample scope and potential for research in future for the following topic.

1. Impact of Good Practices on Employees in Select Organizations in Private Sector– An Empirical Study

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WELFARE OF NATION THROUGH ECONOMIC DEVELOPMENT: AN ANALYTICAL STUDY FROM THE PERSPECTIVE OF KAUTILYA & GANDHI

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ABSTRACT
Kautilya, the Prime Minister of Mauryan empire around 4th century B.C and M K Gandhi, 19th century leader of dependent India. Both were the national hero and till relevant in 21st century's modern India. Kautilya was highly influenced by the procedures and in his work, Arthasastra he mentioned their views to establish his own views. He believed that without the economic strength development of a state could not be possible thus welfare of a nation is highly depended on its economic status. He also believed in the wellbeing and proper mental control of every individual so he starts his book by mentioning the utility of education for all except backward class as he was a strong supporter of classism. He tried throughout his life to guide for making a perfect sovereignty. He spent his whole life very simply in a torn-leaf-covered house but his one and only thought was how to increase strength of his monarchy. Similarly M K Gandhi, Father of the Nation spent his whole life wearing Khadi cloths but had strong believed in spiritualism. He promoted spiritual development and harmony through non-violence. This study tried to explore views of these two legends for the welfare of the nation keeping in view to increase socio-economic scenario of individual and its relevancy in modern India.

Keywords: Kautilya, M K Gandhi, Welfare, State, Nation, Economics.

INTRODUCTION
Kautilya, a contemporary of Aristotle, was from a North-Indian Brahmin family famous for his unique encyclopedic work – *Arthasastra*. He was also known as Chanakya or Bishnugupta. He was the Prime Minister of Chandragupta Maurya, around four century B.C. On the other hand M.K. Gandhi, the pioneer political leader of 19th century of the British-India explored his socio-economic thoughts based on the spirituality and the rejection of material-self interest. Kautilya, the writer of Arthasastra, primarily designed his views to maintain and increase the strength and control of the monarchy. But Gandhi's economic idea was to promote spiritual development and harmony. The term "Gandhian Economics" was coined by his one of the follower, supporter J.C. Kumarappa.

PURPOSE
Mohandas Karamchand Gandhi also known as Mahatma Gandhi is quite famous for his political thoughts, views towards life, ideas for development of spirituality etc., all these are quite cultured or discussed topic at present. But our forgotten hero or less discussed legend Kautilya's socio-political thoughts for every individuals as well as for the king and the ideas regarding the welfare of the state to promote to increase the strength of his monarchy are still highly relevant in modern India. He was quite discussed by the German and Westerners than Indians. Now it's time to rediscover the legendary thoughts of this ancient Brahmin to find its relevancy. This study tried to explore the glorious thoughts of Kautilya and Mahatma Gandhi with some comparative analysis.

METHODOLOGY
This study is purely based on the secondary sources. All primary data are collected from the original texts and edited books which are available in different libraries. Several internet links are also used to make the study more compact.

FINDINGS & ANALYSIS
Influence of The Procedures or Intellectuals
Kautilya was highly influenced by several great thinkers of ancient India's polity and administration like Manu, Parasara, Dronacharya, Pisuna, Brihaspati, Sukracharya, Vahudantiputra, Kaunapadanta etc. He noted down their valuable views in is work to establish his own ideas.

Mahatma Gandhi was also influenced by La Rousseau and David Thoreau. His "non-violent civil disobedience" movement was highly influenced by Thoreau's ideas. Heterodox doctrine of Ruskin, writings of Tolstoy influenced Gandhi a lot. Exploitation of labour and egalitarianism, theories of Marxism also influenced Gandhi to some extent. Though Gandhi was influenced by different types of doctrines of the intellectuals but he incorporated them discerningly in his philosophy which was manifestly original where fundamental extracts of these theories are subsisted.

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Economic Thoughts of Kautilya

Kautilya's *Arthasastra* is about different aspects of governing a monarchy - administration, diplomacy, law, taxation, revenue, business trade etc. The word *Artha* is regarded as one of the *trivarga* (*Dharma-Artha-Kama*) or three goals of human existence but stands for material well-being. The word *Arthasastra* literally means the principles of money or wealth in any form and its endeavour for acquisition and preservation of *Artha* or wealth. According to Kautilya, the most important element of the state is the treasury or finance and without it the well being (Yogakshema) of the people may not be possible. Kautilya mentioned that a strong and wealthy monarchy would be in a position to protect the interest of the people against the invasion of other Kings similarly into day's context; a strong and wealthy company can protect the interest of the stake holders.

Kautilya admitted that some degree of corruption would always exist, and cannot be rooted out completely and at the same time the identification of this corruption becomes impossible. So, according to Kautilya, "Just as fish moving inside the water but couldn't know to drink the water, even so officers are appointed for carrying out works but couldn't know to appropriate money" (Arthasastra, Sec.27, Chapter 9). In the same text he mentioned that "Just as it is not possible not to taste lovely or poison placed on the surface of the tongue, even so it is not possible for one dealing with money of the king, not to taste the money in however small quantity "it may be possible to know even the path of birds flying in the sky, but not the ways of officers moving with their intentions concealed." So the officers frequently should have to transfer from one department to another. Kautilya imposed strict ethical guidelines and for every layer of society in order to create a strong public governance system. Kautilya also had given stress on both the fraud prevention and fraud detection.

Economic Thoughts of Gandhi

Mahatma Gandhi's economic thought purely outrivaled on technical aspects of traditional non-ethical finances, and became productive resources of an economy in spite of having any moral fiber of organizing. In an article of Young India (Oct 13, 1921) he bewildered that he did not draw a sharp line or make any distinction between economics and ethics. He repeated this position even more strongly in his later article. "True economics never militates against the highest ethical standards just as all true ethics, to be worth its name, must at the same time be also good economics…….. True economics stands for social justice; it promotes the good of all equally, including the fragile and is indispensable for decent life." (Harijan, Oct 9, 1937). For the modern generation it is very important to bear this orientation of Gandhian Economics in mind for appreciating his various theories.

The concept of Swadeshi as defined by Gandhi was "the spirit in us which restricts us to the use and service of our immediate surroundings to the exclusion of the more remote' (Unnithan, 1956, 54). The Swadeshi movement (1930) was the direct outcome of the visible decline of the handicrafts industry which he blamed as the root cause of Indian rural poverty. Through this movement Gandhi wanted to revive the demand of ancient crafts and village industries by boycotting European goods. Thus Swadeshi movement achieved its most explicit manifestation in the Khadi (home-spun cloth) struggle. Thus khadi became a propaganda weapon in the liberation movement with a strong moral appeal to Indian intellectuals, Western sympathizers as well as the rural masses. Gandhi's central economic concern is the protection of village crafts against further encroachment from foreign industry and the Swadeshi concept which embodied this concern which becomes the progenitor of his entire thinking on economic issues.

Gandhi's opposition views to industrialization are an important and prominent feature of his economical thoughts. Here we also found the influences of Ruskin and Tolstoy. But there was also a Pastoral romanticism in this opposition which gets reflected in an exclusive emphasis on the village community as an idyllic form of social existence to be preserved in its immaculate form against all change. Gandhi opposed all forms of modern industrialization whether foreign or domestic. The last fifty years (1881-1931) of British-India, there was no substantial modern domestic industrial development occurred? Only increase of employment occurred in organized sector than traditional sector. We found Gandhi's antagonism to industrialization from his several writings. Gandhi's model of development was one in which every village produced all its necessities and a certain percentage in addition for the requirement of cities. He recognized that a moderate amount of industrialization may be necessary for a nation's survival. He therefore concedes the existence of heavy industry. Only caution that they should be "centralized and nationalized. But they will occupy the last past of the vast national activity which will be mainly in the villages." (Gandhian, 1941).

Gandhi's views of opposition to industrialization were highly criticized by his advisers like Mahadeo Govind Ranade and Gopal Krishna Gokhale. Their thought was the large scale of industrialization will help to wipe out mass poverty. In quintessence, supreme deliberation is to be given to man rather than to money. The first basic principle of Gandhi's economic thought is a special emphasis on "plain living" which helps in cutting down your wants and being self-reliant. Accordingly, increasing consumer craving is likened to animal appetite which

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goes the end of earth in search of their satisfaction. Thus a distinction is to be made between "Standard of living" and "Standard of life", where the former merely states the material and physical standard of food, cloth and housing. A higher standard of life, on the other hand could be attained only if, along with material advancement, there was a serious attempt to imbibe cultural and spiritual values and qualities.

Relevency of these Thoughts in Modern India

After discussing the views of the two eminent personalities according to Kautilya, we can say, that his ideas were primarily designed to maintain and increase the strength and control of a monarchy. But his object was to develop healthy and wealthy public governance. According to Mr. Narayana Murthy, the chief mentor of Infosys Technologies, the biggest problem faced by India today is poor quality of public governance. Effective public Governance is must for all-around development of a country. This leads to the downfall of the economy. This results in the emergence of many social evils, scams like Satyam, Commonwealth games, Sarada etc. In India, public governance is not being practiced to the fullest manner and this is the reason for all the social evils in India. In Arthasastra, Kautilya gave lots of priority, and importance to maintain the standard of public governance in the time of Mauryan Empire. Kautilya believed that the happiness of a king lied in the happiness of the subjects. If the subjects are unhappy, then the King could never be happy. According to Kautilya, attainment of good governance entails the objectives of the state be fulfilled and realized. This is possible through properly organized and guided administration. This principle is relevant even today. A government can function well with the help of good administrators. Kautilya recommended a strict code of conduct for all – administrators, ministers, public officers, traders, artisans and even the King himself. Kautilya has seriously considered the problem of corruption apprehended in every sphere of public life.

Similarly, Mohandas Karamchand Gandhi, whose views on economics have usually been termed as utopian by many socio-economic thinkers, and this characterization has tended to evoke two diametrically opposite reactions among policymakers and the general population – the majority respect his views in so far as they are reflection of his deep spirituality but tend to be extremely skeptical about their applicability to the real world. It would be unfair if we access Gandhi's view as complete denial of international trade and exchange. But his intellectual stance seems quite closer to the modern theory of "trade among unequal partners". Gandhi also promoted the notion of "trusteeship" which stands on denying material pursuits and coveting of wealth. His concept of social equality was uttered on the preservation of human dignity rather than material development. So many contrary of Indian socialists and communists there are many heavyweight industrialists, like Ghanashyamdas Birla, Ambalal Sarabhai, Jamunalal Bajaj, J.R.D. Tata etc., who were the closest supporters and admirers of Gandhi. They adopted several of Gandhi's progressive ideas for managing labour-problems.

CONCLUSION

After the long discussion of the two different viewers of the totally different centuries, we may conclude that though there was a gap of several centuries and in these days socio-economic and political scenario of India was completely changed but above all these two old ancient economic thinkers primary concept of economics was same. Both of them gave a deep trace on spirituality on the basis of moral ethics more than the development. Kautilya, the prime-minister of the Maurya Empire, had a keen in sight to develop a healthy-wealthy monarchy. His ideas on accounting system, trade and marketing systems, code of conduct and many others are still relevant in today's India. He begins with the welfare of the society and then comes to the individual. It can be said that Arthasastra of Kautilya starts with macro and comes down to micro. Therefore in the present age Kautilya's ideas about economics and many others are highly appreciable by the modern readers. Present academicians couldn't be able to comment on Kautilya and his ideas, a "utopian ideology". Similarly, Gandhiji also started with the uplift of the society but come down to individual spirituality by establishing several 'Asrams'. Where every inhabitants would seek to produce their own food, clothing and other means of living while promoting a life style of self-sufficiency, personal and spiritual development and working for wider social development. His economic ideas were also totally lied down on the basis of spiritual thoughts. But modern India has travelled after from the direction of the views of the Father of the Nation, would have advocated. In the first phase of planning (1947 – 1965) post-independence, there were some sincere well-intentioned efforts to incorporate some Gandhian elements within the policy frame-work. Later, during the second phase (1966 – 1984) realizing their potential for mass mobilization, attempts were made to apply some of the Gandhian ideas, more after than not, with clandestine motives to produce results quite contrary to Gandhi's original vision. By the 1990s however even the lip service to Gandhian values was abandoned. In the last two decades the nation has now been taken to a stage where it is impossible to retrace the steps; in the contemporary Indian milieu it is one in which Mohandas Karamchand Gandhi, Father of the Nation, would have felt hopelessly lost. Now Gandhi becomes excelled by the politicians at Rajghat on October 2. This auspicious annual pilgrimage now becomes an empty, heartless, elaborate ritual.

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TALENT MANAGEMENT- A NEW TOOL FOR EMPLOYEE RETENTION

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ABSTRACT

Talent management is the new mantra of the Human Resources. The pressures and challenges faced by the companies are global mobility of workforce, lack of requisite talent at relevant levels, lack of creative thinking amongst the personnel. This puts demands upon personnel management to offer challenging jobs and a better work life balance and a changed and charged definition of the term 'loyalty'. Now companies need to look at talent management with a newer and better perspective.

This is a tall order that calls upon the organization to inculcate the virtues of good leadership, create an environment that sustains and nurtures talent and offers good training and development programs in a challenging work atmosphere that also includes other normal aspects like remuneration packages and the perks. The first step is to recognize that people are the biggest asset an organization acquires and this asset needs retention, nurture, and development and coaching; the maintenance of this precious asset will result in buying commitment from them.

Hence a hiring on the basis of competency would ensure , better customer satisfaction which in turn would ensure employee satisfaction, application of better HRIS, better succession planning. This would help better talent management than the mindset for short term gains with minimal collaboration and less talent sharing between business units. In such environment there is a lack of clarity about the role of HR in planning and management of talent. This short term attitude acts as a huge deterrent for true talent development.

A descriptive research needs to be undertaken. An attempt would be made to understand the aspects and issues at stake in the retention of talent and its management.

Keywords: Talent management, employee retention, work culture, women employees, diverse workforce.

INTRODUCTION

Talent is said to be innate. But if Organizations of today wait for talent to recognized, developed and then implemented in their organizations, they have already lost the race. Organisations have realized that if they have to succeed they have to recognize and 'harness' their talent force.

Talent management is the new mantra. We are at a new stage in globalization where talent and brainpower are becoming the new currency. (Peter Cheese, Robert J Thomas, Elizabeth Craig. The Talent Powered Organization, Kogan Page Ltd., ch 1, pg 7) . In the new economy, having talented employees is a key differentiator.

The pressures and/or challenges companies face like global mobility of workforce, lack of requisite talent at relevant levels, lack of creativity in thinking amongst personnel, demand from personnel w.r.t challenging jobs and a better work life balance and a changing definition of the term loyalty has demanded that companies look at talent management with a newer and better perspective. Unfortunately corporate have a big gap in understanding the importance of talent management and putting such programs into action. Also there is a gap in understanding that HR is not just about Talent Management and neither is Talent Management the objective of only the HR department.

In recent times, companies have been so focused on downsizing that they neglect a looming threat to their competitiveness: a severe shortage of talented workers. (Ken Dychtwald, Tamara J.Erickson, Robert Morison. It's time to retire retirement, . Harvard Business Review on Talent Management, pg 155)An ageing population and increased diversity through migration (both local and global) will constrain living standards unless ways are found to keep older workers in the workforce longer and manage diversity.(Brenda Scott-Ladd, Antonio Travaglione, Chris Perryer, David Pick. Attracting and retaining Talent: Social organizational support as an emergent concept. Research and Practice in Human Resource Management,18(2),1-14.)

The objectives of talent management would be – talent attraction, talent engagement, Talent development and talent retention.

It is not as easy as it sounds, as the organization has to sell 'virtues 'like a good leadership program, an environment which sustains and nurtures talent, good training and development programs and a challenging work environment apart from the normal aspects like salary packages and the rest. People are the biggest asset

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an organization has and this asset has to be retained, nurtured, developed and coached to attain commitment from them.

Unfortunately corporates have a big gap in understanding the importance of talent management and putting such programs into action. The demand and supply gap of talent also depends on external factors along with mindsets of people. Hence the challenge to reduce this gap exists and is a big challenge in todays diverse, multigeneration workforce.

Another challenge is gender bias. Hence when there would be an exodus of women from the workforce, assumptions were 'social factors' like family, children. Work culture was also not women friendly. Top management never considered women employees as 'contributors' and no one questioned their leaving.

Today women have broken the glass ceiling in many organizations across the world. Organizations have understood the true worth of a woman employee and HR is bending backwards by providing flexi timings, better work culture, top management support and encouraging pro-women policies .

Therefore competency based hiring, better customer satisfaction which in turn translates to employee satisfaction, application of better HRIS, better succession planning all help in talent management whereas short termist mindsets, minimal collaboration and talent sharing between business units and a lack in clarity in the role of HR in talent planning and management of talent are huge deterrents for the same.

OBJECTIVES

This paper will engage in the

1) Role of talent management towards retention of employees keeping in mind an ageing, diverse, mobile and multicultural (local and global) workforce and
2) The impact of talent management in India.

HYPOTHESIS

Talent management in a company can help retain employees.

Similar programs of talent management can be applied across diverse workforce.

LITERATURE REVIEW

Before we go forward, we must understand what is talent management and why this 'war for talent' exists?

Talent management has been defined as the conscious and deliberate attempt to engage, develop and retain people with the aptitude and ability to meet the current and future organizational needs.(.Pande Sharon, Basak Swapnalekha. Human resource Management text and cases,Pearson Education.)

Organisations *can* win the war for talent, but first they must elevate talent management to a burning corporate priority. Then, to attract and retain the required people , organizations must create and perpetually refine an employee value proposition: senior management's answer to why a smart, energetic, ambitious individual would want to come and work with you rather than with the competitor. And then develop, develop, develop…the current talent! (Elizabeth G. Chambers, Mark Foulon, Helen Handfield-Jones, Steven M. Hankin, and Edward G. Michaels III. The war for talent -Tell me again: Why would someone really good want to join your company? And how will you keep them for more than a few years? Yes, money does matter. e- Mc Kinsey Quarterly.com . August 1998 .)

The current crop of employees, the Gen Y, is technology oriented, don't really believe in rules, work hard, play harder, i.e. do not mind working hard but need to be rewarded handsomely, they are global travelers, entrepreneurs in their own right and are not afraid of change, they are confident and are enthusiastic about questioning and changing methods and methodologies . They are interested in completion of work. Their work ethics are a huge contrast to the older generation, who have had their enthusiasm checked, who were scared of questioning the status quo at workplaces. This means that as Gen Y moves in and are appreciated, acknowledged and rewarded, the older generation does feel left out and unwanted. But they have experience and they are talented in their own way. The merger of both has to be there in every organization. Leadership lays a very important role as the older generation followed the leadership imposed on them whereas Gen Y would prefer to follow a chosen one, chosen by them i.e. This is one challenge- a multigeneration workforce.

In order to fully understand the retention issues in an organization, there is a critical need to understand why people leave. There are 'push' and 'pull' factors for the same- the push factors being- lower levels of pay, nature of supervision, limited growth opportunities, less flexibility, lack of relevant training programs etc whereas the pull factors could be a good work environment, geographical location, benefits, flexibility, growth

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opportunities etc. the aim is to enhance the pull factors and decrease the push factors. Exit interviews allow the organisation to identify what are the push factors in their organization. (Stephen Pilbeam and Marjorie Corbridge. People resourcing and Talent planning. Prentice hall. 4th edition. Pg 109.) Hence the second challenge- to find what which factors are attractive enough for employees to remain behind.

This is an issue which is pertinent across the globe. Across all countries, talent management is becoming an emerging issue . The intergenerational report, commissioned by the Australian government, highlights that Australia faces real challenges for maintaining its work force in the future and halting declining productivity in Australia. (Brenda Scott-Ladd, Antonio Travaglione, Chris Perryer, David Pick. Attracting and retaining Talent: Social organizational support as an emergent concept. Research and Practice in Human Resource Management,18(2),1-14.)

India and China are experiencing the reverse brain drain syndrome, which the Chinese call the 'hai gui' or sea turtle, wherein the people who have gone abroad to study/work now prefer swimming back home. In China, there are acute shortages of management and leadership talent which has sparked off the sea turtle trend. A 2006 economist survey said that 2/3rds of companies in China faced a talent shortage whereas in India , the IT growth is phenomenal but has resulted in a projection of a shortage of 1.00.000 employees by 2010. The central European countries, after the fall of the iron curtain also have shown a growth spurt that has resulted in foreign investment of us $37 billion , which places it 2nd to china and above India! (Business Week, 2006) (Peter Cheese, Robert J Thomas, Elizabeth Craig. The Talent Powered Organization, Kogan Page Ltd.)

The impact is widespread- a fierce battle for English speaking graduates who are fresh out of school, wage and salary inflation, multiple lucrative spot offers and a fierce attempt to retain their people. Organizations may not have current projects in hand but still keep their people around' on the bench'. Many companies fear that deep differences in pay will create cultural problems, but the issue is too important to ignore.

RESEARCH METHODOLOGY

Research is descriptive in nature and relies on secondary data.

THE RETENTION ISSUE

There are two main factors that define retention in today's scenario-organization's image and candidates' initial impressions. The importance of firm image to applicant attraction and subsequent job choice decisions are the first steps towards image building. The longer term effect of bad impressions has an impact on later decisions to leave or stay. Thus, first impressions and experiences have a major impact on both the acceptance and retention decisions of employees. Initial impressions can affect not only the decision to accept a job but ongoing job satisfaction and the decision to stay with or leave an employer. (Cynthia A. Birk , Betty J. Cossitt and Jeanne H. Yamamura . Attracting and retaining talent: the importance of first impressions. The CPA Journal. 80.4 (Apr. 2010): p58.)

There are many examples which were spoken about- e.g the interview panel being uninterested, it seemed as if the decision about the candidate had already been made, the people in the panel were know-alls, they had a condescending attitude….all the factors show the organization in a poor light. The positive impressions include a sense of joviality amongst panel members which candidates have read as good team spirit, a well lit room, an interested panel and if there was an office tour- the tour was well conducted with 'difficult' questions well answered. On introspection , one realizes that the outward behavior of the employees are just a reflection of the internal environment of the organization, which the candidate has instinctively sensed.

Hence the organizations have to manage First Impressions

Firms should give careful consideration to the image they project to potential recruits and new employees. They have to identify and train staff who will be involved in recruiting. A short training or meeting provides an opportunity to discuss and ensure that everyone understands the image that the firm wants to present. The requirements for recruitment also to be made clear so that there is not much elimination during the selection process.

Each firm member who meets a potential recruit is an ambassador representing the firm. Providing training to staff helps ensure that they understand how to conduct an interview, the key part that they play in appealing to recruits, and, perhaps most important, the negative effect of bad impressions. (Cynthia A. Birk , Betty J. Cossitt and Jeanne H. Yamamura . Attracting and retaining talent: the importance of first impressions. The CPA Journal. 80.4 (Apr. 2010): p58.)

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Mentoring also plays an important role to a newly selected candidate as he meanders his way through the organization. A mentor can slowly ease the candidate's way into the organization. Also the mentor can resolve any issues and can make the candidate understand and imbibe the organizational climate. This role of a mentor is critical in an organization especially when you consider a Gen Y candidate adjusting to an environment which is predominantly Gen X or even a woman candidate in a male dominated work environment.

Onboarding is another tool which can be used. Onboarding includes recruiting, hiring, and orienting employees so that they become fully productive as quickly as possible. It begins with an employee's first exposure to the firm and continues through the last day of work. Management of first impressions is a big part of onboarding because of the major impact that it has on subsequent employment decisions and job satisfaction.(Cynthia A. Birk , Betty J. Cossitt and Jeanne H. Yamamura . Attracting and retaining talent: the importance of first impressions.The CPA Journal. 80.4 (Apr. 2010): p58.)

Apart from the above, the other key factors recognized for retention are- exciting work and challenge , career growth, learning and development , fair pay and benefits , relationships and working with great people , supportive management, a great boss , pride in the organization, its mission, and its product , great work environment or culture , being recognized, valued, and respected , meaningful work, making a difference and autonomy. This means that along with the internal environment which has to be nurtured towards talent retention, a good leadership program has to be developed and followed in the organization. Though it is said that leaders are born, it must be noted that all leaders are not effective at all times and in all scenarios. Therefore an environment which supports the development of effective leaders, who are effective most of the times have to be developed and nurtured. This calls for an ongoing HR initiative towards the same. Retention isn't a quick fix. Talent development, engagement, and retention have been elevated in many enterprises to the top tier of objectives, on a par with generating revenues and managing costs. Cutting-edge organizations recruit executive champions and talent-management experts to lead a variety of initiatives intended to blend retention efforts seamlessly into the company culture. (Sharon Jordan-Evans and Beverly Kaye . Retention in tough times: Here's what 25 global talent leaders say about keeping good people--especially now. T+D**.** 56.1 (Jan. 2002): p32.). This becomes feasible if the communication channel in the organization is transparent and clearly defined.

The above factors are applicable to the Indian organizations too, but where India is concerned there are other problems. India is a growing superpower and has quite the enviable talent pool especially among the engineering and management cadre. The rate of growth of India's growing youth population which is employable is also healthy specially when we compare with other society's which have a far more ageing population. Then what shows India in a poor light?

Unfortunately, India is also a country with the largest number of poor and destitutes in the world. India also accounts for the largest number of illiterates; and the largest number of unemployed. Economic development and social development are mutually reinforcing. The economic gains will help them to further horn up their social skills which in turn will enable them to gain even more from the economic opportunities.

In India, regional disparities abound. Then the rural urban divide makes sure that the rural people have lesser access to skill development as compared to the urban populace. But the biggest two problems are those set in the mindset of Indians-social discrimination and gender discrimination

Apart from these, the educated talented Indians look for intrinsic rewards not just monetary ones. They look for future career opportunities, a good structured compensation plan in place, job and interest alignment, a positive impact of the job in the organization and finally managerial quality. One factor which emerged more often was that there was no structural compensations for high potential or 'talented' people in organizations in India.

CONCLUSION

The search for talent is going global. Lateral recruiting is the order of the day. Overall face of workforce has changed and out of the box thinking is required.

For talent retention, a good talent culture and environment, an attractive employment package and integrity of a strong management performance are required. Work, opportunities for personal growth, work environment, leadership and opportunities are other drivers for retention of managerial talent.

HR processes that can increase the impressions candidates have on the organization are recruitment, onboarding, mentoring, recognition and rewards of good performance and a sound communication system within the organization.

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However, this is not as easy as it sounds as these factors consist of quite a few intangible parameters and also include employee's behavior and expectations . Hence understanding and keeping internal customers motivated so that they provide the correct picture of a vibrant and growing organization to the future candidates go a long way towards managing talent and retaining one's own.

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