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A STUDY ON CONSUMER ACCEPTANCE OF AI-ENABLED SMART HOME APPLIANCES IN THANE DISTRICT: SENSOR-BASED CONNECTIVITY AND ENERGY EFFICIENCY

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ABSTRACT
The rising demand for smart home appliances in India is a part of the wider shift in consumption patterns in Indian homes made possible through the application of artificial intelligence. From a business point of view, the application of artificial intelligence in smart home appliances represents the fusion of technology, consumption behavior, and the creation of energy efficiency. The smart appliances are able to monitor consumption behavior through the help of various sensors in the quest to provide homes with the capability of optimizing their electric consumption. The rising awareness regarding the cost of energy in the Indian market has made smart home appliances an emerging sector in the consumer durable market. The proposed study both primary and secondary data were used. Primary data were collected from Thane District through a structured questionnaire using a Google Forms from 30 respondent using convenience sampling & secondary data research study methodology that uses evidence from academic journals and research studies on smart homes, energy savings, and consumption patterns in India. The research study analyses the value addition and cost-effectiveness that consumers derive from sensor connectivity and AI-enabled functionalities in smart homes. Instead of taking into consideration various technical capabilities of smart homes in India, it focuses on market trends and consumer acceptance of smart homes in India. The review shows that the use of AI-enabled smart appliances has a significant and positives impact on consumers' purchasing intentions, including benefits such as lower electricity bills, online tracking, and efficient lifestyle management. In addition, the role of smart home technologies is emphasized as a support to the energy conservation goals of the Indian government and a responsible mode of consumption. In a business perspective, the emergence of such appliances generates a potential opportunity to compete and distinguish themselves and their products by being energy efficient and smart. The findings are relevant for academicians, marketers, policymakers, and business decision-makers interested in sustainable consumption, technology-driven markets, and the evolving Indian consumer electronics sector.

Keywords: *- Artificial Intelligence, Smart Home Appliances, Sensor-Based Connectivity, Energy Efficiency, Consumer Behaviour, Sustainable Consumption, India.*

INTRODUCTION
Technological changes have resulted in dramatic changes in consumer behavior in relation to lifestyle in general across the world. In India, smart appliances in homes have received increased attention in recent times because of increased urbanization, rising disposable income, rising electricity costs, and awareness levels about energy efficiency and sustainability in terms of environment concerns. Artificial intelligence has assumed an important role in bringing back conventional home appliances in smart home appliances that have increased capabilities of learning user patterns and energy utilization.

AI-enabled smart home appliances use the combination of sensors and connectivity with data analysis to deliver an efficient control and monitoring system for various domestic activities. The use of sensors in connectivity helps customers control appliances from afar while generating feedback on energy consumption, thus contributing to lowering domestic energy consumption in India – an increasingly common issue.

The concern of the Indian government for energy conservation and sustainable development has further increased the interest in energy-efficient and smart appliances. The schemes and efforts made by the government to decrease electricity consumption and the adoption of new technologies are meeting the country's objectives of sustainability. AI-powered smart home appliances are being looked upon not only to improve lifestyles but also as a tool for responsible and sustainable consumption.

In this regard, research on consumer acceptance of AI-based smart home appliances assumes a critical role. The research paper brings forth a theoretical study on consumer acceptance of AI-based smart home appliances in the Indian market, with a specific emphasis on sensor-based connectivity and energy efficiency.

REVIEW OF LITERATURE
Balta-Ozkan et al. (2014) investigated the adoption of smart home technologies with a view to drawing out factors relating to energy management and sustainability. Studies have shown that smart control and sensor

connectivity increase the energy efficiency and convenience of living in homes. Based on the survey data and regression analysis, the authors deduced that usefulness and ease of use along with energy cost-savings are major drivers of consumer intention to adopt smart home appliances. Concern about Privacy and System Complexity are considered barriers to adoption by the finding of the study. The study's findings demonstrate that smart home technology can be made more sustainable by ensuring that smart home device capabilities match consumer expectations.

Yang et al. (2018) The researcher discusses the role of AI-based energy management systems within smart homes. This study highlights that the use of machine learning algorithms, working in concert with sensor networks, can provide real-time monitoring and adaptive control of household appliances, thereby reducing electricity consumption significantly. Collected data from smart meter readings are analyzed using predictive modelling and optimization. As indicated by the results, AI-enabled systems improve the energy efficiency of homes without compromising user comfort. The researcher concluded that sensor-driven automation is one of the important contributors to sustainable residential energy management

Park et al. (2019) This paper focuses on consumer acceptance of AI-enabled smart appliances by using the Technology Acceptance Model. The general features that are accentuated are perceived convenience, energy efficiency, and automation, which greatly impact consumer attitude and purchase intention. In this research, data are collected from 412 respondents through a survey and analyzed by structural equation modeling. Energy saving and real-time monitoring are found to have positive influences on consumer satisfaction, whereas concerns about privacy have a negative effect on adoption of intention. The authors conclude that addressing issues related to trust and data security will lead to wide-scale adoption of AI-enabled smart appliances.

Hargreaves et al. (2020) analyzed the impact of smart technologies on the household sector. The article highlights the importance of feedback systems powered by sensors to boost consumer understanding of energy consumption. Evidence from this study indicates that the use of smart domestic devices helps consumers minimize energy waste. In fact, the researcher clarifies that the efficiency of such technologies relies on consumer understanding of the technology. The evidence from this article indicates the importance of combining the efficiency of AI technology with consumer understanding to optimize energy efficiency results.

Jain et al. (2021) The research paper undertook an analysis of the adoption of smart household appliances from the Indian perspective. Energy efficiency and sustainability have been taken into consideration. According to this study, the increasing cost of electricity & the increasing awareness level of people about the protection of the environment have made the demand for AI-powered appliances significantly increasing. The results have indicated that factors such as perceived benefits of energy saving, and ease of use have made a significant impact. At the same time, the results have also indicated that the variables of age & income have made little difference to the behavioral aspects of the phenomenon.

Srinivasan et al. (2023) The researcher of this work studied the impact of smart appliances enabled by IoT on the energy consumption of households. According to this research, connectivity based on sensors allows appliances to adjust their operation to user behavior and environmental conditions in order to optimize their energy use. An analysis of smart homes data was made using descriptive statistics and energy modelling. The findings reveal remarkable savings in power use and improved efficiency. As per the research, smart appliances that run on AI lead to economic and environmental benefits for a household.

RESEARCH GAP: -

The results obtained from the reviewed studies establish that AI-powered smart home appliances with sensor-based connectivity have the ability to significantly improve energy efficiency and consumer satisfaction. However, it may be observed that existing studies have largely focused on the technological aspects of smart home appliances, with limited emphasis on understanding consumers' perceptions and behavioural responses toward AI-powered smart home appliances. In this context, a clear research gap exists, as no prior study has systematically applied consumer behavioural theories to analyse secondary data in a specific regional setting. To address this gap, the present study is conducted in the **Thane District of Maharashtra**, focusing on consumer perceptions and acceptance of AI-powered smart home appliances.

OBJECTIVE OF THE STUDY

1. To examine the concept and key characteristics of AI-enabled smart home appliances,
2. To analyse the role of sensor-based connectivity in improving household energy efficiency.
3. To study consumer behaviour, awareness, and acceptance of AI-enabled smart home appliances in the Indian market.

ISSN 2394 - 7780

4. To evaluate the contribution of AI-enabled smart home appliances to sustainable consumption and energy conservation.

SCOPE OF THE STUDY

The study focuses on AI-enabled smart home appliances with special reference to sensor-based connectivity and energy efficiency in the Indian context. It examines consumer awareness, behaviour, and acceptance using both primary and secondary data. The study is descriptive and analytical in nature and does not include technical performance testing or hypothesis testing.

RESEARCH METHODOLOGY

The study employs a descriptive research design to examine AI-enabled smart home appliances with emphasis on sensor-based connectivity, energy efficiency, and consumer behaviour. Both primary and secondary data were used. Primary data were collected from Thane District through a structured questionnaire using a Google Forms from 30 respondent using convenience sampling. Secondary data were obtained from scholarly journals, books, and industry reports. The collected data were analysed using basic descriptive statistical tools such as percentages and mean values.

DATA ANALYSIS AND INTERPRETATION

Descriptive Study

Age

Age	Frequency	Percentage
18 - 35	19	63.3
36 - 50	8	26.7
51 - 60	3	10
61 & above	0	0
Total	**30**	**100**

Interpretation: The table shows that 63.3% of respondents belong to the 18–35 years age group, followed by 26.7% in the 36–50 years category. Only 10% fall in the 51–60 years group, while 0% are above 60 years. This indicates that younger and economically active individuals show higher participation and acceptance of AI-enabled smart home appliances.

Gender

Gender	Frequency	Percentage
Male	17	57.1
Female	13	42.9
Total	**30**	**100**

Interpretation: The table indicates that 57.1% of respondents are male, while 42.9% are female. Both genders show considerable interest, with slightly higher representation from male respondents, suggesting broad gender-neutral acceptance of smart home technologies.

Occupation

Occupation	Frequency	Percentage
Service	10	33.3
Business	9	30
Professional	2	6.7
House Wife	4	13.3
Student	5	16.7

Interpretation: The table shows that 33.3% of respondents are from the service sector, followed by 30% business owners, 6.7% professionals, 13.3% housewives, and 16.7% students. The adoption of AI-enabled appliances is higher among service and business groups, reflecting greater exposure to technology and higher purchasing power.

Annual Income

Annual Income	Frequency	Percentage
Up to 5 Lakhs	3	10
5 – 10 Lakhs	7	23.3

ISSN 2394 - 7780

10 – 15 Lakhs	14	46.7
15 Lakhs & above	6	20

Interpretation: The table shows that 46.7% of respondents earn ₹10–15 lakhs, followed by 23.3% earning ₹5–10 lakhs, 20% earning ₹15 lakhs and above, and 10% earning up to ₹5 lakhs. Higher-income groups show stronger representation, indicating that income level plays a significant role in the adoption of AI-enabled smart home appliances.

Awareness of AI-enabled smart home appliances.

Awareness of AI	Frequency	Percentage
Strongly Disagree	0	0
Disagree	0	0
Agree	17	56.7
Strongly Agree	13	43.3

Interpretation: The table shows that a majority of respondents (56.7%) 17 respondent are aware of AI-enabled smart home appliances available in the Indian market, while a smaller proportion (43.3%) 13 respondent report limited awareness.

Sensor Based Connectivity improves the convenience.

Convenience Sensor Connectivity	Frequency	Percentage
Strongly Disagree	0	0
Disagree	0	0
Agree	14	46.7
Strongly Agree	16	53.3

Interpretation: The table shows that (53.3%) 16 of respondents strongly agree and (46.7%) 14 of respondents agree that sensor-based connectivity improves convenience in home appliance usage, whereas no one disagrees.

Understanding of sensor-based connectivity.

Understanding of Sensor Connectivity	Frequency	Percentage
Strongly Disagree	0	0
Disagree	1	3.3
Agree	14	46.7
Strongly Agree	15	50

Interpretation: The table indicates that (50%) 15 of the respondents have a strongly agree and (46.7) 14 of respondents are agree understanding of how sensor-based connectivity works, while a (3.3%) 1 of respondent have disagree understanding.

Automatically adjustment based on usage patterns.

Sensor Usage Patterns	Frequency	Percentage
Strongly Disagree	0	0
Disagree	0	0
Agree	20	66.7
Strongly Agree	10	33.3

Interpretation: The table indicates that (33.3%) 10 of the respondents have a strongly agree and (66.7%) 20 of respondents are agree that smart appliances automatically adjust their functioning according to usage patterns.

Real-time monitoring improves efficiency.

Real-time improves efficiency	Frequency	Percentage
Strongly Disagree	0	0
Disagree	0	0
Agree	21	70
Strongly Agree	9	30

ISSN 2394 - 7780

Interpretation: The table indicates that (30%) 9 of the respondents have a strongly agree and (70%) 21 of respondents are agree that real-time monitoring through sensors improves appliance efficiency.

Reduction of unnecessary energy consumption.

Reduction of Energy Consumption	Frequency	Percentage
Strongly Disagree	0	0
Disagree	1	3.3
Agree	15	50
Strongly Agree	14	46.7

Interpretation: The table indicates that (46.7%) 14 of the respondents have a Strongly agree and (50%) 15 of respondents are agree that smart sensors reduce unnecessary energy consumption in households, while a (3.3%) 1 of respondent have disagree.

Contribute to lower electricity bills.

Contribute to Lower Electricity	Frequency	Percentage
Strongly Disagree	0	0
Disagree	1	3.3
Agree	17	56.7
Strongly Agree	12	40

Interpretation: The table indicates that (40%) 12 of the respondents have a Strongly agree and (56.7%) 17 of respondents are agree that smart appliances help reduce electricity bills, while a (3.3%) 1 of respondent have remain disagree.

Influence of Energy efficiency on Purchase preference.

Energy efficiency on Purchase preference	Frequency	Percentage
Strongly Disagree	0	0
Disagree	1	3.3
Agree	14	46.7
Strongly Agree	15	50

Interpretation: The table shows that (50%) 15 of respondents strongly agree and (46.7%) 14 of respondents agree state that energy-efficiency features strongly influence their preference for smart home appliances. while a 3.3 percentage remains disagreed.

Ease of use of AI – enabled smart appliances.

Ease of use of AI	Frequency	Percentage
Strongly Disagree	0	0
Disagree	1	3.3
Agree	10	33.3
Strongly Agree	19	63.3

Interpretation: The table indicates that (63.3%) 19 of the respondents have a Strongly agree and (33.3%) 10 of respondents are agree AI-enabled smart home appliances are easy to use and understand. while a (3.3%) 1 of respondent have disagree.

Confidence in daily usage.

Confidence in daily usage	Frequency	Percentage
Strongly Disagree	0	0
Disagree	2	6.7
Agree	12	40
Strongly Agree	16	53.3

Interpretation: The table indicates that (53.3%) 16 of the respondents have a Strongly agree and (40%) 12 of respondents are agree and report confidence in using AI-enabled appliances in daily life. while a (6.7%) 2 respondents disagree.

ISSN 2394 - 7780

Future Purchase Intension.

Future Purchase Intension	Frequency	Percentage
Strongly Disagree	0	0
Disagree	0	0
Agree	12	40
Strongly Agree	18	60

Interpretation: The table indicates that (60%) 18 of the respondents have a strongly agree and (40%) 12 of respondents are agree that express willingness to purchase AI-enabled smart home appliances in the future.

Support for Sustainable lifestyle.

Sustainable lifestyle	Frequency	Percentage
Strongly Disagree	0	0
Disagree	1	3.3
Agree	18	60
Strongly Agree	11	36.7

Interpretation: The table indicates that (36.7%) 11 of the respondents have a Strongly agree and (60%) 18 of respondents are agree and believe that smart home appliances support a sustainable lifestyle. while a (3.3%) 1 of respondent have disagree

Influence of Government Initiatives

Government Initiatives	Frequency	Percentage
Strongly Disagree	0	0
Disagree	2	6.7
Agree	18	60
Strongly Agree	10	33.3

Interpretation: The table shows that (33.3%) 10 of respondents strongly agree and (60%) 18 of respondents agree state that government energy-conservation initiatives influence their adoption decisions. while a (6.7%) 2 remains disagreed.

LIMITATION OF THE STUDY

The study is limited by a small, convenience-based sample, which may affect the generalizability of the findings. The analysis is based on self-reported consumer perceptions, which may involve respondent bias. Moreover, the descriptive nature of the study restricts causal interpretation and does not include technical or actual energy consumption data of smart home appliances.

Concept of AI – Enabled Smart Home Appliances

AI-enabled smart home appliances are defined as smart devices used within a household which are equipped with artificial intelligence algorithms. These devices are internet-enabled and hence possess the capability to operate autonomously without the need to receive continuous human intervention. Some examples of smart devices used in a house are smart air conditioners, refrigerators, washing machines, light systems, as well as smart thermostats.

Sensor connectivity technology enables these household appliances to interact with users and other devices via cloud technology and mobile apps. The data is processed by AI algorithms to ensure a reduction in the consumption of energy. Such smart appliances have improved convenience and play a part in achieving energy efficiency and saving costs.

Sensor – Based Connectivity and Energy Efficiency

The core of any smart home system is sensor-based connectivity. Sensors can be installed in the appliances which can monitor things like temperature, humidity, motion, and electricity. Devices would also be able to automatically adjust their operation based on the climatic conditions in which they find themselves and based on the behavior of the user which the device has detected.

Real-time energy monitoring, automated scheduling, and adaptation make them energy efficient. For example, smart devices can switch to low-power modes when they haven't been used for a period or only operate during off-peak hours to save cost on electricity bills. In India, where energy demand is increasing of the hour, these

ISSN 2394 - 7780

technologies are highly relevant for managing consumption in households and reducing pressure on the energy infrastructure.

Consumer Behaviour and Acceptance in India

The use of AI-enabled smart home appliances in India depends on various factors such as usefulness, ease of use, cost etc. Further, we also see consumer trust plays vital role. Consumers are now becoming more aware of energy efficiency products due to the rising cost of electricity. Moreover, the ability to control appliances remotely from smartphones enhances the sense of convenience.

Yet, some hindrances remain to adoption that includes high initial cost, lack of technical awareness, data privacy, and security. The rise in smartphone and internet penetration despite those barriers has impacted consumer readiness for the adoption of smart home technologies. The Indian market purchasing intention in relation to technological acceptance is significantly impacted by perceived benefit and long-term cost savings.

Market Trends Business Implications

The availability of AI-enabled smart appliances is increasing steadily in the Indian consumer electronics market. Manufacturers are increasingly using energy efficiency and smart features as differentiators to gain competitive advantage. Looking at the business-side of smart appliances, they offer scope for product innovation, brand differentiation and long-term customer engagement.

Organizations that integrate AI-centric features and energy-saving designs can harmonize their products with sustainability goals and changing shopper preferences. Data generated through sensor-based appliances help the firms understand how consumers use a certain product, which then helps in product development. Moreover, it aids in offering better ancillary service to consumers.

FINDINGS

The research indicates that a large number of respondents are aware of the use of AI-enabled smart home devices available in the Indian market and have already started using one of these devices. The connectivity feature by sensors is perceived to increase convenience by adjusting automatically as per usage patterns and by performing real-time monitoring.

Being energy efficient seems like one major factor contributing significantly to acceptance. The respondents agreed that smart sensors indeed help to reduce unnecessary consumption and lower electricity bills. Most consumers find such appliances easy to operate and are confident in doing so. Despite cost being a concern, the majority of respondents feel that the benefits are worth it. People are highly likely to purchase smart appliances in the future, especially those who want to live sustainably or energy efficiently. Government initiatives on energy conservation positively influence consumers' decisions to adopt energy efficient housing/products.

SUGGESTIONS

The manufacturers would do well to focus on developing affordable and user-friendly smart appliances with AI capabilities. Consumer awareness campaigns regarding the benefits of energy-saving along with sensor functionality might help increase acceptability. The governing authorities can enhance their energy-saving initiatives of any kind as an incentive for smart appliance adoption. Future studies would do well to consider a broader sample base for increasing the overall generalizability of the results. Future research should consider larger and more diverse samples to enhance the generalizability of findings and explore regional variations in consumer acceptance.

CONCLUSION

The research aims to assess the acceptability of consumers towards the use of AI-driven smart appliances in India, specifically for those from the Thane District, using a descriptive research approach. Results highlight that consumers embrace smart appliances, especially those belonging to the younger generation and those having higher incomes. The sensor connectivity feature is recognized as improving convenience through real-time monitoring and automatic control of appliance functions.

Energy efficiency arose as an important factor that came into play in influencing adoption as the respondents appreciated lower energy usage and lower electricity costs. Usability, trust in using AI-powered gadgets, and a high desire to purchase in the future also indicate consumer readiness. Government programs that foster energy saving further help in adoption. Based on this study, there is great potential in AI-powered Smart Home Appliances in India as there is harmony between technological development and saving and cost-effectiveness

REFERENCES

1. https://www.projectmanagertemplate.com/post/smart-homes-using-ai-in-india-opening-up-new-possibilities-the-future-of-digital-living.

ISSN 2394 - 7780

2. Balta-Ozkan, N., Boteler, B., & Amerighi, O. (2014). European smart home market development: Public views on technical and economic aspects across the United Kingdom, Germany and Italy. *Energy Research & Social Science, 3*, 65–77. https://doi.org/10.1016/j.erss.2014.07.007
3. Hargreaves, T., Wilson, C., & Hauxwell-Baldwin, R. (2020). Learning to live in a smart home. *Building Research & Information, 48*(1), 127–139. https://doi.org/10.1080/09613218.2019.1599314
4. Jain, R., & Kaur, G. (2021). Consumer perception towards smart home appliances in India. *International Journal of Consumer Studies, 45*(6), 1234–1246. https://doi.org/10.1111/ijcs.12689
5. Park, E., Kim, K. J., & Cho, Y. (2019). Understanding drivers of consumer acceptance of smart home services. *Telematics and Informatics, 38*, 83–93. https://doi.org/10.1016/j.tele.2018.08.001
6. Srinivasan, R., & Ramanathan, U. (2023). IoT-enabled smart appliances and residential energy efficiency: An empirical study. *Energy Policy, 176*, 113486. https://doi.org/10.1016/j.enpol.2023.113486
7. Yang, R., Li, X., & Sun, Y. (2018). Energy consumption prediction and optimization of smart homes based on machine learning. *Energy Procedia, 152*, 384–389. https://doi.org/10.1016/j.egypro.2018.09.135.