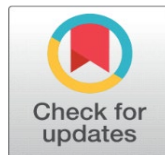
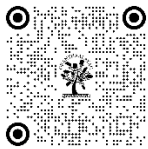


ASSESSING THE IMPACT OF CUSTOMER AWARENESS ON GREEN BANKING PRACTICES IN PUBLIC AND PRIVATE SECTOR BANKS IN KARNATAKA

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DOI

[10.29121/shodhkosh.v5.i6.2024.2132](https://doi.org/10.29121/shodhkosh.v5.i6.2024.2132)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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ABSTRACT

Green banking which integrates the environmental sustainability into financial services has gained prominence as a means for banks to contribute to sustainable development. The research employs a quantitative survey to assess how customer awareness influences the implementation of green banking initiatives. A sample of 400 customers and 40 bank managers from both public and private sector banks was selected to provide a comprehensive analysis. The findings indicate that customer awareness is a significant driver of green banking adoption across both sectors. Private sector banks characterized by higher technological innovation and customer-centric approaches and demonstrates a stronger correlation between customer awareness and the adoption of green practices associated to public sector banks. However, public sector banks with their broader reach the potentiality to lead the green banking movement, particularly in rural areas, despite facing challenges related to legacy systems and resource limitations. The study concludes that enhancing customer awareness and engagement is a crucial for advancing green banking practices. Banks that prioritize sustainability and effectively communicate the benefits of green banking to their customers are likely to gain a competitive advantage. The present study focuses on Assessing the Impact of Customer Awareness on Green Banking Practices in Public and Private Sector Banks in Karnataka to offers valuable insights for policymakers, banks, and stakeholders aiming to promote environmental sustainability within the financial sector.

Keywords: Green Banking, Customer Awareness, Public Sector Banks, Private Sector Banks, Sustainability

1. INTRODUCTION OVERVIEW OF GREEN BANKING

Green banking states to banking practices that prioritize environmental sustainability and social responsibility by promoting eco-friendly initiatives, reducing carbon footprints, and supporting projects that lead to environmental conservation. The concept of green banking has evolved as financial institutions recognize the role; they play in promoting sustainability. By incorporating environmental considerations into their operations and lending practices, banks can significantly influence the global sustainability agenda. Green banking originated from the broader concept of sustainable finance, which participates in environmental, social, and governance (ESG) factors in financial services. The idea is not only to ensure financial profitability but also to promote social welfare and environmental protection. In the

context of India, green banking has gained impetus in current years, determined by cumulative alertness to environmental issues & the need for sustainable development. The Reserve Bank of India (RBI) has encouraged banks to adopt green banking practices, recognizing their potential to mitigate environmental degradation and support the transition to a low-carbon economy (Naveenan, R.V., 2021).

2. IMPORTANCE OF CUSTOMER AWARENESS IN GREEN BANKING

Customer awareness plays a vital role in the acceptance and success of green banking practices. Awareness among customers about environmental issues and sustainable banking products can drive demand for such services, prompting banks to enhance their green banking initiatives. A well-informed customer base is more likely to support and engage with banks that prioritize sustainability, leading to a competitive advantage for those institutions. The concept of customer awareness in banking extends beyond mere knowledge of available products and services; it includes an understanding of the broader impact of their financial decisions on the environment. When customers are aware of the environmental implications of their banking picks, they are more likely to opt for eco-friendly banking options such as paperless banking, green loans, and investments in renewable energy projects (Chandran, et al., 2024). This shift in customer behaviour can drive banks to integrate more green products into their portfolios, thus fostering a culture of sustainability within the financial sector.

3. PUBLIC AND PRIVATE SECTOR BANKS IN INDIA

India's banking sector is broadly divided into public and private sector banks, each playing a noteworthy role in the country's economic development. Public sector banks (PSBs) are government-owned and have traditionally been the backbone of the Indian banking system, focusing on financial inclusion and socio-economic development. Private sector banks, on the other hand, are owned by private entities and are known for their customer-centric approach, technological innovation, and efficiency. The acceptance of green banking practices varies between public & private sector banks, influenced by their respective operational priorities, regulatory frameworks, and customer bases. Public sector banks, with their extensive reach and focus on social development, have the potential to lead the green banking movement by promoting sustainable practices among their vast rural and urban customer base. However, they often face challenges related to legacy systems, lower technological adoption, and limited financial resources (Vadrake, Kavita., 2016). Private sector banks, driven by profitability and market competition, are generally more agile in adopting new technologies and practices, including green banking initiatives. These banks have been quicker to offer green products and services, such as green bonds, eco-friendly loans, and sustainable investment options. Their focus on urban and high-net-worth customers also aligns with the growing demand for sustainable banking solutions (Sahoo & Nayak, 2008).

4. GREEN BANKING INITIATIVES IN KARNATAKA

Karnataka, one of India's foremost states in terms of economic development, has a robust banking sector comprising both public & private sector banks. The state has been at the forefront of promoting green initiatives across various sectors, including banking. Karnataka's banks have implemented several green banking practices aimed at reducing environmental impact and promoting sustainability. Some of the key green banking initiatives in Karnataka include the adoption of paperless banking, energy-efficient branches, green loans for eco-friendly projects, and financing for renewable energy projects. Banks in Karnataka have also been involved in community-based environmental initiatives, such as tree plantation drives and awareness campaigns on the importance of sustainability. These initiatives not only contribute to environmental preservation but also enhance the reputation & brand value of the banks involved (Menon, et al., 2017). In Karnataka, public sector banks have focused on promoting green banking practices among rural customers, emphasizing the importance of sustainability in agriculture and rural development. Private sector banks, meanwhile, have targeted urban customers with innovative green banking products and services, leveraging technology to offer paperless transactions, online banking, and green investment options. The state government's policies and initiatives, such as subsidies for renewable energy projects and incentives for eco-friendly businesses, have further encouraged banks to adopt green practices (Karnataka State Action Plan on Climate Change, 2018).

5. RESEARCH OBJECTIVES AND SIGNIFICANCE

Despite the progress made in promoting green banking practices, there is a need for a comprehensive assessment of the impact of customer awareness on the adoption of these practices in Karnataka's public & private sector banks.

Understanding the role of customer awareness in driving green banking initiatives is crucial for developing strategies that can enhance the effectiveness of these practices and promote sustainable development in the state.

This research purposes to fill the research gap by investigating the extent to which customer awareness influences the adoption and implementation of green banking practices in Karnataka. It will explore the alterations in the approaches of public and private sector banks towards green banking and assess how customer awareness affects these approaches. The findings of this research will provide valuable insights for policymakers, banks, and customers, helping to promote a more sustainable banking sector in Karnataka. The implication of this research lies in its potential to contribute to the broader understanding of the role of customer awareness in promoting green banking practices. By focusing on Karnataka, a state with a diverse banking sector and a strong commitment to environmental sustainability, this study will highlight the challenges and opportunities accompanying green banking in India. It will also provide recommendations for enhancing customer awareness and encouraging greater adoption of green banking practices among banks in the state (Sahoo, et al., 2007).

6. MATERIALS AND METHODS:

1. RESEARCH DESIGN: This research work adopts a quantitative research method to estimate the effect of customer awareness on green banking in both the public & private sectors in Karnataka, India. The combination of quantitative and qualitative data collection and analysis serves as a strength in establishing the correlation between the level of awareness of the customers and the extent of the green banking practices.

2.SAMPLE SELECTION

A. Population and sampling

The target population is the customers and the bank managers of the public & private sector banks in Karnataka. The study employs a stratified random sampling technique to make sure that all the various sectors in banking are covered.

B. SAMPLE SIZE

A sample size of 400 customers and 40 bank managers is fixed to make the results statistically valid. The sample consists of 200 customers and 20 managers from the public sector banks and 200 customers and 20 managers from the private sector banks.

7. DATA COLLECTION

PRIMARY DATA

CUSTOMER SURVEY

A structured questionnaire is developed to measure the level of awareness of customers about green banking practices and their influence on banking decisions. The survey includes:

- Demographic Information: Age, sex, income, education level, employment.
- Awareness Levels: Familiarity with green banking terms, awareness of certain green banking practices, appreciation of the environmental impact.
- Perceptions and Attitudes: Green banking perceptions, perceived importance of environmental sustainability, perceived behavioural control towards green banking.
- Behavioural Aspects: Green banking services offered, the number of times the services are accessed and customers' perception of service delivery.

The questionnaire is administered online and face-to-face, to ensure that a wide range of customers is covered. Web-based surveys are administered through e-mail and social media sites while face-to-face surveys are administered at the bank branches. Often tailor these protocols to specific application scenarios and network characteristics.

8. MANAGERIAL INTERVIEWS

The semi-structured interviews are conducted with the bank managers to understand the experience of the application of green banking practices and the effects of the same. The interviews cover:

- Institutional Policies: Present green banking measures, and measures for popularizing green banking.
- Customer Awareness: Views towards customer awareness and how it affects the banking industry.
- Challenges and Opportunities: Challenges faced in the process of adopting green banking strategies, possible advantages, and future directions.

All the interviews are conducted with the participants' permission recorded in audio format and later transcribed.

SECONDARY DATA

Secondary data is collected from:

- Bank Reports and Publications: Reports and any other documents that are filed annually, sustainability reports, and any report that is filed concerning green banking.
- Regulatory and Policy Documents: Various policies and guidelines have been set by the regulatory bodies concerning green banking.
- Academic and Industry Literature: Primary and secondary sources of information including past research papers, journals, and case studies on green banking.

DATA ANALYSIS

QUANTITATIVE ANALYSIS

The quantitative data from customer surveys are analyzed using statistical methods:

- Descriptive Statistics: Use of frequencies, percentages and means to present the demographic characteristics, awareness and attitude of the customers.
- Inferential Statistics: Descriptive analysis and inferential analysis are employed to compare the levels of customer consciousness and the extent of green banking practices between the public and private sector banks.
- Correlation Analysis: Pearson's correlation coefficient is used in assessing the level of relationship between the level of awareness of the customers and the extent of practice of green banking practices.
- Regression Analysis: Multiple regression analysis is used to establish the factors that affect the adoption of green banking practices.

Statistical analysis is done with the help of computer programs like SPSS or R.

9. RELIABILITY AND VALIDITY

RELIABILITY: To make the data as accurate as possible, the survey questionnaire is pilot-tested on a small sample before the main data collection. The internal consistency of the questionnaire is evaluated by the Cronbach's alpha coefficient.

VALIDITY: Content validity is maintained through the review of the questionnaire and interview guides by experts. In the case of construct validity, the results are compared with the literature review on green banking.

1. ETHICAL CONSIDERATIONS

The study follows ethical considerations by making sure that all the participants give their informed consent. The respondents' identity is kept anonymous and the data collected is kept secure. All participants are also told that they have a right to withdraw from the study at any given time.

2. LIMITATIONS

Some limitations that the study recognizes include the fact that the data is self-reported and therefore may be influenced by bias. However, the study is conducted only in Karnataka and hence the findings may not be generalized to other areas. This research will therefore use a strong mixed method research design that will help in establishing the effects of customer awareness on green banking practices among the public and private sector banks in Karnataka. The results of the study will help to reveal the contribution of customer awareness to the development of sustainable banking practices and will be useful for further research in the banking field.

10. DISCUSSION

Exploring the impact of machine learning-based routing protocols on Wireless Sensor Networks (WSNs) reveals promising prospects for overcoming persistent obstacles. With machine learning algorithms at their core, WSNs gain the capacity to dynamically optimize routing decisions in response to the ever-changing network landscape, thereby bolstering efficiency and extending network longevity. Additionally, the innate capability of machine learning models to sift through vast datasets facilitates the recognition of subtle patterns and relationships, fostering the development of more resilient and adaptable routing mechanisms.

Moreover, the incorporation of machine learning methodologies presents a transformative opportunity for WSNs to transcend traditional routing frameworks. Through continuous learning and adaptation, routing protocols stand to

enhance their ability to navigate the intricacies of diverse environmental contexts, all while curtailing energy consumption and alleviating network congestion. This evolution carries profound implications across various domains, ranging from environmental monitoring to industrial automation, where the seamless and energy-efficient transmission of data underpins informed decision-making and operational efficacy.

11. CONCLUSION

This comprehensive review sheds light on the pivotal role of machine learning-based routing protocols in enhancing data transmission efficiency within Wireless Sensor Networks (WSNs). The incorporation of machine learning techniques addresses significant challenges faced by traditional protocols, including energy consumption, network congestion, and dynamic environmental conditions. The analysis underscores the strengths and limitations of various machine learning-based protocols, emphasizing adaptability, scalability, and resource optimization.

By providing valuable insights into the current state-of-the-art, this review aims to guide researchers, practitioners, and stakeholders in leveraging machine learning for WSNs. The outlined challenges in energy-efficient routing underscore the need for innovative solutions, especially in the integration of machine learning algorithms. As WSNs continue to evolve, future research directions should focus on refining these protocols to meet the demands of dynamic network conditions and contribute to the sustainable development of sensor networks. This review contributes to the ongoing discourse on the intersection of machine learning and WSNs, paving the way for advancements in efficient data transmission protocols.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

REFERENCES

- Abbas, G.; Mehmood, A.; Carsten, M.; Epiphaniou, G.; Lloret, J. Safety, Security and Privacy in Machine Learning Based Internet of Things. *J. Sens. Actuator Netw.* 2022, 11, 38.
- Bajaj, K.; Sharma, B.; Singh, R. Integration of WSN with IoT applications: A vision, architecture, and future challenges. In *Integration of WSN and IoT for Smart Cities*; Springer: Berlin/Heidelberg, Germany, 2020; pp. 79–102.
- Pavithran, D.; Shaalan, K.; Al-Karaki, J.N.; Gawanmeh, A. Towards building a blockchain framework for IoT. *Clust. Comput.* 2020, 23, 2089–2103.
- Sinha, P.; Jha, V.K.; Rai, A.K.; Bhushan, B. Security vulnerabilities, attacks and countermeasures in wireless sensor networks at various layers of OSI reference model: A survey. In *Proceedings of the 2017 International Conference on Signal Processing and Communication (ICSPC)*, Coimbatore, India, 28–29 July 2017; pp. 288–293.
- Panda, M. Security in wireless sensor networks using cryptographic techniques. *Am. J. Eng. Res. (AJER)* 2014, 3, 50–56.
- Hussain, F.; Hussain, R.; Hassan, S.A.; Hossain, E. Machine learning in IoT security: Current solutions and future challenges. *IEEE Commun. Surv. Tutor.* 2020, 22, 1686–1721.
- Xu, L.D.; Lu, Y.; Li, L. Embedding Blockchain Technology Into IoT for Security: A Survey. *IEEE Internet Things J.* 2021, 8, 10452–10473.
- Kumar, D.P.; Amgoth, T.; Annavarapu, C.S.R. Machine learning algorithms for wireless sensor networks: A survey. *Inf. Fusion* 2019, 49, 1–25.
- Alsheikh, M.A.; Lin, S.; Niyato, D.; Tan, H.P. Machine Learning in Wireless Sensor Networks: Algorithms, Strategies, and Applications. *IEEE Commun. Surv. Tutor.* 2014, 16, 1996–2018.
- Bout, E.; Loscri, V.; Gallais, A. How Machine Learning Changes the Nature of Cyberattacks on IoT Networks: A Survey. *IEEE Commun. Surv. Tutor.* 2022, 24, 248–279.
- Tahsien, S.M.; Karimipour, H.; Spachos, P. Machine learning based solutions for the security of Internet of Things (IoT): A survey. *J. Netw. Comput. Appl.* 2020, 161.
- da Costa, K.A.P.; Papa, J.P.; Lisboa, C.O.; Munoz, R.; de Albuquerque, V.H.C. Internet of Things: A survey on machine learning-based intrusion detection approaches. *Comput. Netw.* 2019, 151, 147–157.

- Ahmad, R.; Alsmadi, I. Machine learning approaches to IoT security: A systematic literature review. *Internet Things* 2021, 14, 100365.
- Haji, S.H.; Ameen, S.Y. Attack and Anomaly Detection in IoT Networks using Machine Learning Techniques: A Review. *Asian J. Res. Comput. Sci.* 2021, 9, 30–46.
- Faraj, O.; Megias, D.; Ahmad, A.M.; Garcia-Alfaro, J. Taxonomy and challenges in machine learning-based approaches to detect attacks in the Internet of things. In *Proceedings of the 15th International Conference on Availability, Reliability and Security, Virtual*, 25–28 August 2020; pp. 1–10.
- Mamdouh, M.; Elrukhsi, M.A.I.; Khattab, A. Securing the Internet of things and wireless sensor networks via machine learning: A survey. In *Proceedings of the 2018 International Conference on Computer and Applications (ICCA)*, Beirut, Lebanon, 25–26 August 2018; pp. 215–218.
- Mehta, A.; Sandhu, J.K.; Sapra, L. Machine Learning in Wireless Sensor Networks: A Retrospective. In *Proceedings of the 2020 Sixth International Conference on Parallel, Distributed and Grid Computing (PDGC)*, Solan, India, 6–8 November 2020; pp. 328–331.
- Baraneetharan, E. Role of machine learning algorithms intrusion detection in WSNs: A survey. *J. Inf. Technol.* 2020, 2, 161–173.
- Dener, M.; Al, S.; Orman, A. STLGBM-DDS: An Efficient Data Balanced DoS Detection System for Wireless Sensor Networks on Big Data Environment. *IEEE Access* 2022, 10, 92931–92945.
- Kim, T.; Vecchietti, L.F.; Choi, K.; Lee, S.; Har, D. Machine Learning for Advanced Wireless Sensor Networks: A Review. *IEEE Sens. J.* 2021, 21, 12379–12397.
- Ramotsoela, D.; Abu-Mahfouz, A.; Hancke, G. A survey of anomaly detection in industrial wireless sensor networks with critical water system infrastructure as a case study. *Sensors* 2018, 18, 2491. [PubMed] *Future Internet* 2023, 15, 200 40 of 45
- Ahmad, R.; Wazirali, R.; Abu-Ain, T. Machine Learning for Wireless Sensor Networks Security: An Overview of Challenges and Issues. *Sensors* 2022, 22, 4730.
- Jesus, E.F.; Chicarino, V.R.; De Albuquerque, C.V.; Rocha, A.A.A. A Survey of How to Use Blockchain to Secure Internet of Things and the Stalker Attack. *Secur. Commun. Netw.* 2018, 2018, 9675050.
- Liao, Z.; Pang, X.; Zhang, J.; Xiong, B.; Wang, J. Blockchain on Security and Forensics Management in Edge Computing for IoT: A Comprehensive Survey. *IEEE Trans. Netw. Serv. Manag.* 2021, 19, 1159–1175.
- Sengupta, J.; Ruj, S.; Das Bit, S. A Comprehensive Survey on Attacks, Security Issues and Blockchain Solutions for IoT and IIoT. *J. Netw. Comput. Appl.* 2020, 149, 102481.
- Khan, M.A.; Salah, K. IoT security: Review, blockchain solutions, and open challenges. *Future Gener. Comput. Syst.* 2018, 82, 395–411.
- Darla, S.; Naveena, C. Survey on Securing Internet of Things through Blockchain Technology. In *Proceedings of the 2022 International Conference on Electronics and Renewable Systems (ICEARS)*, Tuticorin, India, 16–18 March 2022; pp. 836–844.
- Uddin, M.A.; Stranieri, A.; Gondal, I.; Balasubramanian, V. A survey on the adoption of blockchain in IoT: Challenges and solutions. *Blockchain Res. Appl.* 2021, 2, 100006.
- Pohrmen, F.H.; Das, R.K.; Saha, G. Blockchain-based security aspects in heterogeneous Internet-of-Things networks: a survey. *Trans. Emerg. Telecommun. Technol.* 2019, 30, e3741.
- Miglani, A.; Kumar, N. Blockchain management and machine learning adaptation for IoT environment in 5G and beyond networks: A systematic review. *Comput. Commun.* 2021, 178, 37–63.
- Ifzarne, S.; Tabbaa, H.; Hafidi, I.; Lamghari, N. Anomaly detection using machine learning techniques in wireless sensor networks. *J. Phys. Conf. Ser.* 2021, 1743, 012021.
- Tiberti, W.; Carmenini, A.; Pomante, L.; Cassioli, D. A Lightweight Blockchain-based Technique for Anti-Tampering in Wireless Sensor Networks. In *Proceedings of the 2020 23rd Euromicro Conference on Digital System Design (DSD)*, Kranj, Slovenia, 26–28 August 2020; pp. 577–582.
- Ismail, S.; Khoei, T.T.; Marsh, R.; Kaabouch, N. A Comparative Study of Machine Learning Models for Cyber-attacks Detection in Wireless Sensor Networks. In *Proceedings of the 2021 IEEE 12th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON)*, New York, NY, USA, 1–4 December 2021; pp. 1–5.
- Kaur, R.; Kaur Sandhu, J. A Study on Security Attacks in Wireless Sensor Network. In *Proceedings of the 2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)*, Greater Noida, India, 4–5 March 2021; pp. 850–855.

- Patel, N.R.; Kumar, S. Wireless Sensor Networks' Challenges and Future Prospects. In Proceedings of the 2018 International Conference on System Modeling & Advancement in Research Trends (SMART), Moradabad, India, 23–24 November 2018; pp. 60–65.
- Sharma S; Wao AA., (2023) An efficient machine learning technique for prediction of consumer behaviour with high accuracy, International Journal of Computing and Artificial Intelligence 2023; 4(1): 12-15, DOI: <https://doi.org/10.33545/27076571.2023.v4.i1a.59>