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The Emerging Role of Artificial Intelligence in Enhancing Operational Efficiency in Banking: A Review of Promising Literature

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Abstract: ***This research study lies in its exploration of how artificial intelligence (AI) is transforming banking operations. As the banking industry undergoes rapid digital transformation, AI-driven technologies such as chatbots, automated loan processing, fraud detection, and personalized customer services are reshaping operational efficiency and customer experience. This study aims to bridge the knowledge gap by analysing the extent of AI adoption, its benefits, challenges, and the effectiveness in the banking sector. Understanding these factors is crucial for policymakers, banking professionals, and researchers to develop strategic frameworks for AI integration, ensuring improved financial services, security, and operational excellence. Additionally, the review of earlier studies will provide insights into the impact of AI on employment, decision-making, and customer satisfaction, thereby contributing to the broader discourse on technology-driven banking reforms. Hence, the paper is an attempt to review the promising literature in this emerging area.***

Keywords: Artificial Intelligence, banking, literature, efficiency and bank operation

1. Introduction

The confidence envisages that human problem-solving and decision-making processes rely heavily on the availability of information in the recent past. However, a different perspective was introduced during eighties, proposing that if humans can analyse data to derive specific solutions. This manifest the inception of the concept of intelligent machines. At that time, however, this idea did not gain traction due to the absence of sophisticated computational commands (Huang and Rust, 2018), as computers before 1949 lacked sufficient intelligence. Over subsequent generations, as technology advanced, the concept of "Big Data" emerged. Today, big data is ubiquitous across a wide range of industries, including healthcare, banking, education, entertainment, marketing, and many others. The advent of big data necessitated the development of methods to analyse and extract valuable insights from vast datasets. This led to the increasing importance of analytics, which in turn brought Artificial Intelligence (AI) to the forefront (Kok et al., 2009). It became evident that the full potential of big data could only be harnessed through the application of machine learning algorithms.

Since the turn of the 21st century, AI, big data (Guerra et al., 2023), machine learning (Wang et al., 2023), cloud computing, and blockchain technologies have gained significant momentum due to advancements in computing systems (Ratia et al., 2018) and the proliferation of big data (Haenlein and Kaplan, 2019). AI has gained rapid traction because its application across various industries have delivered substantial benefits, such as cost reduction, enhanced customer satisfaction, mitigation of fraudulent activities, and more efficient resource utilization (McKinsey Global Institute's Report (2018). A comprehensive AI report published by Stanford University in 2023 (Nestor et al., 2023) underscored the global investments in AI and their subsequent growth. The United States leads AI investment with $248.9 billion, followed by China at $95.1 billion, and the United Kingdom in third place with $18.2 billion. Israel, Canada, and India follow, with India ranking sixth, investing $7.73 billion in AI. Further, India ranks sixth in the deployment of machine learning systems, according to the same report. In addition to AI investments, India's economic and financial development over the last five years attracted the authors' interest in exploring AI's role in the Indian banking sector. According to Forbes (2024), India's AI market is projected to grow at a rate of 33.28% between 2023 and 2028, signalling a promising trajectory for the sector.

In India, one of the biggest challenges facing banks today is poor data and customer segmentation. The emergence of payment technology companies such as Airtel Payments Bank and Paytm Payments Bank, emergence of neo banks and neo banking platforms, and emergence of NBFCs have made it difficult for banks to survive in the existing paradigm. In the new era, banks are using new technologies to further develop and improve their services to customers. AI is helping banks transform their entire business, from insurance to sales, contracts to cybersecurity. Banks are using analytics, blockchain, and machine learning to future-proof their products and services. AI in banking and finance improves the efficiency and competitiveness of banks and financial institutions (Pattanayak, 2021). Banks are using AI for a variety of purposes, including fraud detection, improving customer experience, monitoring customer

behaviour to provide better service, and checking the credit history of users' products to predict loan risk.

One of the main application areas of AI in the banking industry is AI based chatbot services. AI chatbots in banks can support customers and provide accurate answers to their questions. These chatbots provide users with a personalized experience. Therefore, AI chatbots for banking sectors help banks attract customers, improve service quality, and expand their brand's impact on the business. Smart mobile apps can track user behaviour and extract sensitive information based on user browsing trends. This information helps service providers offer personalized recommendations to customers thereby leading to improve the overall performance of banks.

2. AI and the Indian Banking Sector

India is depicting a robust pace of technological advancement amid the ongoing 3rd wave of the Internet, with an enormous investment in physical infrastructure, Unified payment interface and Digital public infrastructure. Each of these aspects has contributed significantly towards making India a "Digital India" (EMQQ, 2023). According to the World Bank and the IMF report of 2022 as quoted by Kharas (2023), the GDP growth rate of India stands at 7% and the consequent increase in middle-class consumers and the Gen Z populace is expected to prompt a hike in the consumption levels (Kharas, 2010). The Indian government's vision of fostering "Smart cities", with the objective of facilitating an optimal quality life for its citizens, and enabling sustainability and smart solutions, is an integral step towards the largescale integration of AI. India's deep inclination towards "Smart" technology and being digital are now positioning the nation as "The Smart- Emerging India". With the ongoing "Smart" revolution being witnessed in the country, the financial ecosystem of India has also grown and evolved (Schipke et al., 2023). The emergence of digital money has proven to be a catalyst for the Indian economy, enacting the role of financial intermediaries, remain the dominating leaders in the domestic financial milieu. In this evolving landscape, the referenced sources and studies showcase that the application of AI is gaining pace in India. A number of researchers have already specified and assessed the limited use of AI in the banking industry (Alfaro et al, 2019; Jadhav et al, 2016) and the attention is due to the fact that the banking sector is the backbone of the economy inspired the more authors to improve in on the sector as the focal area of research (Müller & Singh, 2024).

The Indian banking sector has witnessed a compound growth rate of 3.34% during 2016 to 2024, being dependent upon several factors like the emerging economy, an increase in disposable income, easy credit terms and documentation, increased consumerism and easy accessibility to banks (Haxby, 2024; Metu & Nwogwugwu, 2022). Since the last decade, the Indian banking sector is leveraging technology at an increasing pace and thereby providing error free services. The movement of "Digital India" can be considered a positive push towards being digital banking and a large number of payments, including those to local vendors, are now being performed digitally (Jain & Gabor, 2020; Olalere & Dorasamy, 2024). The recent trend of financial inclusion is a robust step towards financial literacy and is connected its payment system to the NEFT and RTGS payment system of banks. Indeed, digital banking has even penetrated the agricultural and rural sectors of India (Kumar & Gupta, 2023). The available literature in the recent reforms in the banking sector, pushed the researchers to work on the impact of AI on the financial performance of India's banking sector.

Implication of AI in the Banking Sector

The implications of Artificial Intelligence refer to the outcomes, effects and consequences that arise from the adoption and integration of AI technologies. These implications encompasses both positive outcomes such as operational efficiency (Fethi & Pasiouras, 2010; Jewandah, 2018), improved decision-making (Brachman, 2006 & Jiang et al., 2017) and high-quality customer experience (Zineldin, 2006) and negative consequences as job displacement (Chui et al., 2016), ethical dilemmas (O'Neil, 2016) and privacy concerns (Zuboff, 2019). In general, the term refers to how AI transforms process, systems, organizational strategies and human behaviour. Kalla (2023) examine the impact of AI in operations of public and private banking sector bank in India on the basis of employees' attitudes, awareness, and satisfaction with AI in the banking sector. The considered variables are "Understanding and Familiarity", "Implementation of AI-Driven Automation" (Kurode, 2018), "Transparency and Mechanism" and "Operational Impact" and the data was gathered using a structured questionnaire which was quantitative in nature and demonstrated that AI's application in banking benefitted the employees of the banks. Impact on Employment (Brynjolfsson & McAfee, 2017; Acemoglu & Restrepo, 2020); Training and Development (Rai, 2020; Davenport & Ronanki, 2018); Impact on customer services & Personal banking (Lee & Chung, 2009; Vedapradha, 2018) ; Automation of Administration (Muthukannan et al., 2021; Varian, 2019); Growth of AI (Iansiti & Lakhani, 2020 and Brynjolfsson et al., 2021); Cyber security and Fraud detection (Vijai, 2019; Mhlanga, 2020; Gupta & Mkittal, 2021; Dhingra, 2024 and Sebihi et al., 2024) are some of the variables considered for the implications of AI adoptions and integrations. Nevertheless, all these variables are not considered to draw any significant relationship with the bank performance. However existing literatures demonstrated that the AI adoptions and implementations (Naeem et al., 2024) contributed to improve the bank performances. Even so, no such literature was found on the impact of AI implementations on insights of the bank employees and bank performance. Hence, the present study will be attempted to determine the level of insights of the bank employees on AI implications and analyze it with the bank performance. Net profit margin, Return on Equity and Return on Assets were used as proxies to measure the bank performance (Fotheringham & Wiles, 2023; Lie et al., 2022a; Potapova et al., 2022; Mikalef & Gupta, 2021; Dubey et al., 2020; Miller et al., 2017; Alexandru & Laurentiu, 2008 and Oke et al., 2008).

3. Significance of the Study

The significance of this research study lies in its exploration of how AI is transforming banking operations. As the

banking industry undergoes rapid digital transformation, AI-driven technologies such as chatbots, automated loan processing, fraud detection, and personalized customer services are reshaping operational efficiency and customer experience. This study aims to bridge the knowledge gap by analysing the extent of AI adoption, its benefits, challenges, and the effectiveness in the banking sector. Understanding these factors is crucial for policymakers, banking professionals, and researchers to develop strategic frameworks for AI integration, ensuring improved financial services, security, and operational excellence. Additionally, the review of earlier studies will provide insights into the impact of AI on employment, decision-making, and customer satisfaction, thereby contributing to the broader discourse on technology-driven banking reforms.

4. Objectives of the Study

The objective of the study is to review the earlier literature to understand insight of the bank employees on the AI implication and the relationship between the implications of AI and bank's performance.

5. Methodology Adopted

The researchers strategically visited the various theories and models which are related to artificial intelligence and banks' efficiency. A thematic review of past research related to aforesaid subject has also been done in this modest attempt.

6. Review and Discussions

6.1 Review of Relevant Theories and Models

The following relevant theories and models have been reviewed keeping in view the aim and objectives of the study.

6.1.1. Triarchic Theory of Intelligence

Robert Sternberg's Triarchic Theory of Intelligence, proposed in 1985, comprises three components: Analytical, Creative, and Practical Intelligence (Sternberg, 1985). Analytical Intelligence involves analysing and evaluating information, identifying patterns, and solving problems, aligning with traditional views of intelligence. Creative Intelligence is the ability to generate new ideas and find innovative solutions, emphasizing imagination and adaptability (Sternberg, 1997). Practical Intelligence refers to applying knowledge in real-world situations and effectively navigating social contexts, requiring common sense and wisdom. This theory is relevant in understanding human intelligence and its connection to AI. AI has been transforming various industries, including banking, by enhancing decision-making and operational efficiency (Davenport & Ronanki, 2018). The adoption of AI in banking enables automation, risk assessment, and fraud detection, significantly improving performance (Kou et al., 2021). Additionally, AI-driven innovations in digital banking and FinTech have revolutionized financial services by offering personalized customer experiences and predictive analytics (Gomber, Koch, & Siering, 2017; Leong & Sung, 2018). However, AI also presents challenges, such as ethical concerns, data security, and regulatory issues (Wamba et al., 2020).

6.1.2. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) has gained attention and confirmation in a wide array of areas and applications to understand end-user's intention to use new technology and systems (Venkatesh et al, 2003). Although TAM has not been widely applied to examine adoption and acceptance of AI, TAM has been found to provide consistently superior explanations or predictions of behaviour (Taylor & Todd, 1995; Morris et al., 2003). This may be as a result of various factors that influence technology adoption, type of technology and users and the context (Chan & Auster, 2003). Many existing studies in the context of technology acceptance have shown that individual's attitude directly and significantly influences behavioural intention to use a particular technological application (Gribbins, Shaw, & Gebauer, 2003; George, 2002). Studies conducted are not directly related to AI but they are indirectly linked to AI because of the term technology involved. TAM has received much attention from researchers and practitioners as a parsimonious yet powerful model for explaining and predicting usage intention and acceptance behaviour. This can be a useful model to assessing the acceptance of AI.

6.1.3 Agency and Stakeholders Theory

According to Garcia et al. (2023), AI can help mitigate information asymmetries and ethical concerns in the banking industry. This capability is attributed to features such as transparency, precise dissemination of information, un-changeability, and computational reasoning, facilitated by technologies like smart contracts and automation. These are excellently fostered by the collaboration of the service areas offered by the manager and stakeholder. Consequently, theories from managerial or stakeholder perspectives provide insights into how AI shape the customer's service journey through provision of excellent service areas that has impact on their purchase decision cycle (Lakhchini et al., 2022; Leung et al., 2013). According to the agency theory coined in 1976 by Meckling, Michael and Jensen, AI technology has the potential to improve the accuracy of accounting data through features anchored on smart contracts and meticulous record-keeping (Sidorova & Rafiee, 2019). AI enhances the verification of data by establishing agreement among multiple stakeholders, making it harder for managers to alter information. Additionally, AI simplifies tasks such as account reconciliation by using shared block-chain ledgers in triple-entry accounting (Agerfalk, 2020). The integration of block-chain technology and AI is expected to enhance the management and oversight of accounting data, making financial fraud more difficult to conceal. This synergy allows for the automation of various tasks such as bill payments, expense tracking, audit sampling, and compliance processes through the use of smart contracts. AI-driven applications play a pivotal role in identifying patterns and predicting trends.

6.1.4 Technological Diffusion Theory

Technological Diffusion Theory argues that technological advances contribute to the development of digital finance in three ways: (i) increasing financial inclusion through

intermediation, (ii) reducing workload and save staff through the application of new technologies, and (iii) increasing efficiency and productivity as a result of these two ways. The literature indicates that digital financial services increase financial inclusion through financial intermediation; however, they also introduce the possibility of systematic risk (Acemoglu, 2002). In this regard, the widespread use of AI applications by customers in the banking sector could improve digital banking, and their implementation within the framework of specific policies could contribute to this success**.** The emergence of policy uncertainties in the sector could hurt the progress of digital banking. In this sense, this theory addresses this gap by formulating policy recommendations that can contribute to reducing policy uncertainties in AI applications (Guerra et al., 2023).

6.1.5 Diffusion Theory of Innovation

Diffusion Theory of Innovation argues and clarifies that individuals and societies tend to adopt or reject innovation. The theory defines novelty as practices and objects the individual has not used before (Hubbard & Sandmann, 2007). In this framework, AI applications that have become widespread in the sector can be adopted or rejected by customers. Rejection of AI applications by individuals may harm the diffusion of digital banking, while adoption may have a positive impact (Haxby, 2024). The rejection of the innovation is motivated by legal gaps regarding the violation of personal data and the responsibility for the legal consequences of the actions carried out by AI.

Having a general perusal of forgoing theories and models and considering the necessity of AI in the banking sector, the Technology Acceptance Model seems fit to the proposed study because it emphasises the dissemination of technology and innovation.

6.2. Review of Previous literature

This review is aimed to appraise and evaluate the available literature on cases of Artificial intelligence technology in service industries with reference to the banking sector. A thematic review of related literature has been presented in the following paragraphs to highlight the gap of the proposed study

6.2.1. Role of Artificial Intelligence in Banking Sector

AI has revolutionized customer experience by providing personalized banking services and seamless interactions. Pfoertsch & Sulaj (2023) highlight the role of AI-driven chatbots and virtual assistants in improving customer service through empathetic interactions. Fernandes & Oliveira (2021) emphasize AI's role in offering 24/7 services, financial advice, and efficient portfolio management. Mithra et al. (2023) further discuss AI applications in enhancing customer interactions and addressing fraud detection concerns. According to Sardana & Singhania (2018), while digital banking is transforming customer experiences worldwide, India still relies on traditional banking due to customer preferences for in-person interactions. The study suggests that collaboration between traditional banks and fintech firms can create a balanced approach to digital banking adoption.

Veerla (2021) in the novel approach to study the impact of AI as predictive model in banking sector pointed out the survey report conducted by Infosys on 1600 business executives in decision making roles, where 75% executives regarded AI as fundamental to the success of organization's strategy. Forbes magazine claimed that application of AI can reduce the operational cost of organizations up to 22 per cent. Further asserted that AI serves as transformative predictive model in the banking sector and concluded on emphasizing the impact of AI on strategy implementation, customer service enhancement, fraud detection, compliance assurance and credit assessment. Adeyemo & Okoronkwo (2024) examine the effect AI on the operational efficiency of deposit money banks in Lagos State, Nigeria. Survey research design was adopted covering a randomly selected 450 regular employees across five banks and concluded that AI significantly contributed to the operational efficiency such as Service Innovation, Cost reduction, Service quality and Customer satisfaction. Kurode (2018) evaluated the strategies of adoption and implementations of AI in International banks and financial services industry in Indian context using the secondary source of information and concluded that AI's automation capabilities help banks eliminate unproductive and repetitive tasks that require human labour, allowing human employees to focus on more strategic and creative roles, which can ultimately enhance business efficiency.

6.2.2. Issues and Challenges of Artificial Intelligence in Banking Sector

Despite the benefits of AI and digital banking, several challenges persist. Mithra et al. (2023) discuss ethical dilemmas, data security concerns, and regulatory issues associated with AI implementation in banking. El-Gohary et al. (2021) note that neobanks have struggled to gain traction due to consumer knowledge gaps, highlighting the need for AI-driven customer education. Revathi (2019) identifies online banking challenges such as security concerns, transaction convenience, and technical issues. Jain & Tiwari (2011) emphasize that while internet banking enhances operational efficiency, security, privacy, and trust remain major concerns for consumers. Tapas (2023) highlights the emerging challenges of digital banking in the post-COVID era, including cybersecurity risks and the digital divide. Kaur & Budhiraja (2017) discuss infrastructural limitations, lack of consumer awareness, and the need for employee training as barriers to e-banking adoption in India.

AI and digital technologies play a crucial role in risk management within the banking industry. Doumpos et al. (2023) identify risk assessment as one of the primary areas where AI and OR techniques have been utilized effectively. Mithra et al. (2023) discuss fraud detection as a key benefit of AI in banking, helping financial institutions mitigate security threats. Manser Payne et al. (2018) highlight AI's capability to interpret external data accurately and achieve banking objectives while maintaining flexibility. Mohammed & Shariq (2011) found that ATMs were the most widely adopted e-banking technology, helping banks manage operational risks efficiently. Malhotra & Singh (2009) argue that internet banking has led to better asset quality and management, reducing the risks associated with traditional banking models. Ahmed et al. (2024) examine the

standard of cyber security in online banking focusing in two major banks in the UAE –a technologically advanced region in the Middle East and explored the factors influencing consumer trust and cyber security perceptions using a descriptive survey and established a strong positive correlation between cyber security perceptions and consumer trust contributing a significant implications for the UAE banking industry by guiding strategies to enhance security measures and foster customer trust.

6.2.3. Artificial Intelligence, Operational Efficiency and Banks' Performance:

The banking industry has increasingly leveraged artificial intelligence (AI) and operational research (OR) techniques to enhance efficiency. Noreen et al. (2023) suggest that AI-based technologies can significantly improve banking operations and profitability. Doumpos et al. (2023) provide a comprehensive review of AI and OR in banking, highlighting key areas such as bank efficiency, risk assessment, and performance improvement. Naeem et al. (2024) studied the impact of AI Investment on Bank performance in Pakistan from the year 2011 to 2022 covering 18 banks and a total of 216 observations using the bank's annual reports on the Pakistan Stock Exchange. Net Profit Margin, Return on Equity and Return on Assets were used as proxies to measure the bank performance and concluded that AI investment positively contributed to bank performance. This remark has been found to have been in same directions with Fotheringham & Wiles (2023); Lie et al. (2022a); Mikalef & Gupta (2021); Miller et al. (2017) and Oke et al. (2008). Dubey et al. (2020); Potapova et al. (2022) and Alexandru and Laurentiu (2008) asserted that ROA, ROE, EPS and ROS are the important indicators for business performances while Biker (2010) regarded Return on Assets, Return on Capital and Net Interest Margin as Indirect performance indicators for Financial Institutions.

Uppal (2010) emphasizes the importance of full automation in banking to maintain competitiveness, improve services, and enhance operational efficiency. Mobile banking, as discussed by Ahmad (2011), is a crucial development in this regard, allowing fast and accurate services anytime and anywhere. Moreover, Sharma & Joshi (2011) discuss how automation and digital initiatives have led to significant improvements in both public and private sector banks. The advent of AI in the corporate world holds the potential to significantly impact the economy and employment, much like the industrial and digital revolutions of the past (Bock et al., 2020). This type of automation affects not just manual tasks but also those that require analytical, intuitive, and empathetic abilities (Huang & Rust, 2021). Automation is being used to directly various industries, including banking and finance (Belanche et al., 2019), travel and tourism (Akdim et al., 2021; Byrd et al., 2021; Romero & Lado, 2021), service operations (Ivanov & Webster, 2021), and healthcare (Wirtz et al., 2021).

7. Research Breach and Conclusion

Despite the growing integration of AI in banking operations, a significant research gap exists in understanding its consistent impact on the banking sector. While numerous studies explore AI adoption in banking at a national and global level, limited research specifically examines its implementation, effectiveness within the unique economic and infrastructural landscape. There is also less study conducted on Indian context. Additionally, existing literature pay little focus on employee experience and fraud detection, overlooking operational efficiencies, risk management, and decision-making improvements enabled by AI in banks. This study aims to analyse the implications of AI adoption in banking operations to bridge this gap. Addressing these unexplored areas will provide valuable insights into optimizing AI strategies for enhanced banking performance.

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