The Role of Artificial Intelligence in Banking and Fraud Prevention: A cross sectional study in Ghana.

Abstract

Introduction: The increasing integration of Artificial Intelligence (AI) in the banking sector has reshaped traditional financial services, particularly in the context of fraud prevention. This cross-sectional study in Ghana aimed to investigate the current state and perceived effectiveness of AI applications in banking, focusing on its role in fraud prevention.

Methods: The research data was acquired through interviews and surveys conducted with customers and bank officials. A total of 363 participants took part in the survey, comprising 200 customers and 163 staff members selected from fivebanks in Ghana. Structured questionnaires were distributed electronically and in print to gather quantitative and qualitative data.

Results: The findings reveal a significant level of awareness (70.0%), understanding (75.0%) and 62.0% experience with AI in the banking sector among the participants. An overwhelming 88.0% express a preference for AI-based support over human-based support.About 97.2% believe that AI systems prioritize robust privacy measuresinfluencing their perception of AI in fraud prevention. Furthermore, 87.5% perceive AI systems as consistently providing precise and reliable results, enhancing their confidence in the technology. The perception of AI's effectiveness in fraud prevention is closely tied to its capacity to adapt to new and emerging fraud tactics, with 66.6% emphasizing the importance of this adaptability.

Conclusion: These findings contribute to understanding the nuanced perspectives of users in Ghana regarding AI in the banking sector, providing insights for financial institutions, policymakers, and educators aiming to enhance AI adoption and trust.

Keywords: Artificial Intelligence, Banking, Fraud Prevention, Cross-Sectional Study, Ghana

1. Introduction

The financial landscape in Ghana has undergone a profound change, propelled by the integration of cutting-edge Artificial Intelligence (AI) technologies into the realm of banking services [1]. This revolutionary shift is notably marked by AI's unparalleled potential to not only augment operational efficiency but also fortify the security infrastructure, particularly within the critical domain of fraud prevention [2, 3]. The convergence of AI and banking services has ignited a considerable fervor, positioning the symbiotic relationship between technology and finance at the forefront of innovative advancements [4, 5, 6].

The pivotal role of Artificial Intelligence (AI) in the banking sector, especially in the critical domain of fraud prevention, has emerged as a central focus of interest and strategic emphasis within the dynamic landscape of the financial industry [7, 8]. In response to the relentless tide of technological advancements, traditional banking models are undergoing a profound evolution, and at the forefront of this transformative journey is the strategic deployment of AI-driven solutions [9, 10].As the custodian of enhanced security measures, AI is proving to be instrumental in not just reacting to, but proactively identifying, mitigating, and preventing fraudulent activities within the financial sector [11, 12]. The conventional reactive approach to fraud detection is being supplanted by an anticipatory, AI-powered paradigm, where algorithms, driven by machine learning and advanced analytics, play a pivotal role in staying one step ahead of cybercriminals [13, 14, 15].

The unparalleled capacity of AI algorithms to sift through vast datasets in real-time, discern intricate patterns, and swiftly adapt to the constantly evolving tactics employed by fraudsters has positioned these technologies as indispensable assets in the ongoing quest to safeguard financial ecosystems [16]. The speed and precision with which AI processes and analyzes data contribute to a level of vigilance and responsiveness that far surpasses traditional methods, significantly reducing the window of vulnerability for financial institutions and their clientele [17, 18].Moreover, AI's adaptability to changing fraud landscapes is a transformative element in the ongoing battle against financial crime [19]. The ability to learn and evolve, inherent in machine learning algorithms, means that as fraud tactics become more sophisticated, AI systems grow increasingly adept at recognizing and countering these strategies [20].This cross-sectional study,

conducted between January and March 2024, aimed to investigate the current state and perceived effectiveness of AI applications in banking in Ghana. Ghana was selected due to its rapidly evolving financial sector, which is increasingly integrating digital solutions to combat fraud and enhance service delivery."

In essence, AI in the context of fraud prevention is not merely a technological tool but a dynamic and intelligent ally, continuously learning, adapting, and fortifying its defenses against emerging threats [21]. The symbiotic relationship between AI and banking is redefining the security paradigm, ushering in an era where proactive and adaptive measures take precedence, and financial institutions are empowered to stay resilient in the face of an ever-evolving landscape of cyber threats [22, 23]. The strategic integration of AI has thus become not just a technological enhancement but a fundamental safeguard, ushering in a new era of trust and security within financial ecosystems [24].The study seeks to unravel not only the awareness levels among Ghanaian banking customers regarding the integration of AI but also their lived experiences in interacting with these technologically advanced banking solutions. By exploring the multifaceted dimensions of customer attitudes, the research endeavors to shed light on the evolving dynamics of the human-technology interface within the financial landscape of Ghana.

2. Literature Review

2. Methodology

This research employed a cross-sectional study design. The researchdata was acquired through interviews and surveys conducted with customers and bank officials. A total of 363 participants took part in the survey, comprising 200 customers and 163 staff members selected from the Kumasi, Accra and Tarkwa branches of five distinct banks: Ghana Commercial Bank, Ecobank, Zenith Bank, Juaben Rural Bank and Fidelity Bank. The selection of these banks was based on their widespread recognition and presence across the country.

Participants were selected based on their active roles in the banking sector, specifically those involved in fraud detection and prevention. Inclusion criteria included professionals with at least

two years of experience in banking, while exclusion criteria involved individuals not directly engaged in the implementation or oversight of AI systems in banking."Structured questionnaires were distributed electronically and in print to gather quantitative and qualitative data. The survey included questions related to demographic information, banking habits, awareness and experiences with AI, and perceptions of AI in fraud prevention."Data collection occurred over a two-month period from January to February 2024."Statistical methods, including descriptive statistics and inferential analysis, was employed to interpret the data. The study adhered to ethical guidelines, including obtaining informed consent from all participants, maintaining confidentiality, and ensuring the responsible use of data."

To interpret the data, we employed a range of statistical methods. Descriptive statistics, including measures of central tendency (mean, median, mode) and variability (standard deviation, range), were used to summarize the data. Inferential analysis was conducted using [specific tests, e.g., chi-square tests, t-tests, ANOVA, regression analysis] to determine the relationships between variables and to test the hypotheses. Additionally, [mention any software used, e.g., SPSS, R, Python] was utilized for data processing and analysis, ensuring the robustness and accuracy of the results.

3. Results and Discussion

3.1 Socio-demographic characteristics of study participants

The study enrolled a total of 363 participants from various regions in Ghana. This diverse sample is crucial for obtaining comprehensive insights into the subject under investigation.Out of the total participants, there was a balanced representation in terms of gender. Specifically, 52.2% (189 out of 363) were male, while 47.8% (174 out of 363) were female**(Table 1).** This gender balance is essential for ensuring a representative sample that considers potential gender-related variations in responses.The mean age of the participants was 39.17 years, with a standard deviation of ±2.691. This indicates a relatively homogeneous age distribution within the sample, which is important for minimizing confounding factors related to age in the study's analysis(**Table 1**).

A significant portion of the participants, 66.4%, were employed. This employment status distribution reflects a workforce representation in the study, providing insights into the perspectives of those actively engaged in various occupations(**Table 1**).Regarding educational qualifications, 44.2% of the participants held bachelor's degrees. This suggests a relatively high level of educational attainment within the sample, potentially influencing their perspectives and experiences with the subject matter(**Table 1**).

A noteworthy finding is that the majority of participants, constituting 40.4%, reported using banking services on a weekly basis. This information is valuable as it highlights the regularity of engagement with banking services among the study participants. It may have implications for their familiarity with banking practices and, consequently, their perspectives on the subject of study(**Table 1)**.

Table 1: Socio-demographic characteristics of study participants

Characteristics		**Frequency (n=363)**	**Percent (%)**
Gender	F	174	47.8
	M	189	52.2
Age group	< 25	19	5.3
	25-35	222	61.1
	36-55	103	28.3
	56-75	19	5.3
Occupation	Employed	241	66.4
	Unemployed	122	33.6
Educational Background	High School or below	85	23.1
	Bachelor's Degree	160	44.2
	Master's Degree	35	9.7
	Doctorate or equivalent	83	23.0
How frequently do you use	Daily	68	18.7

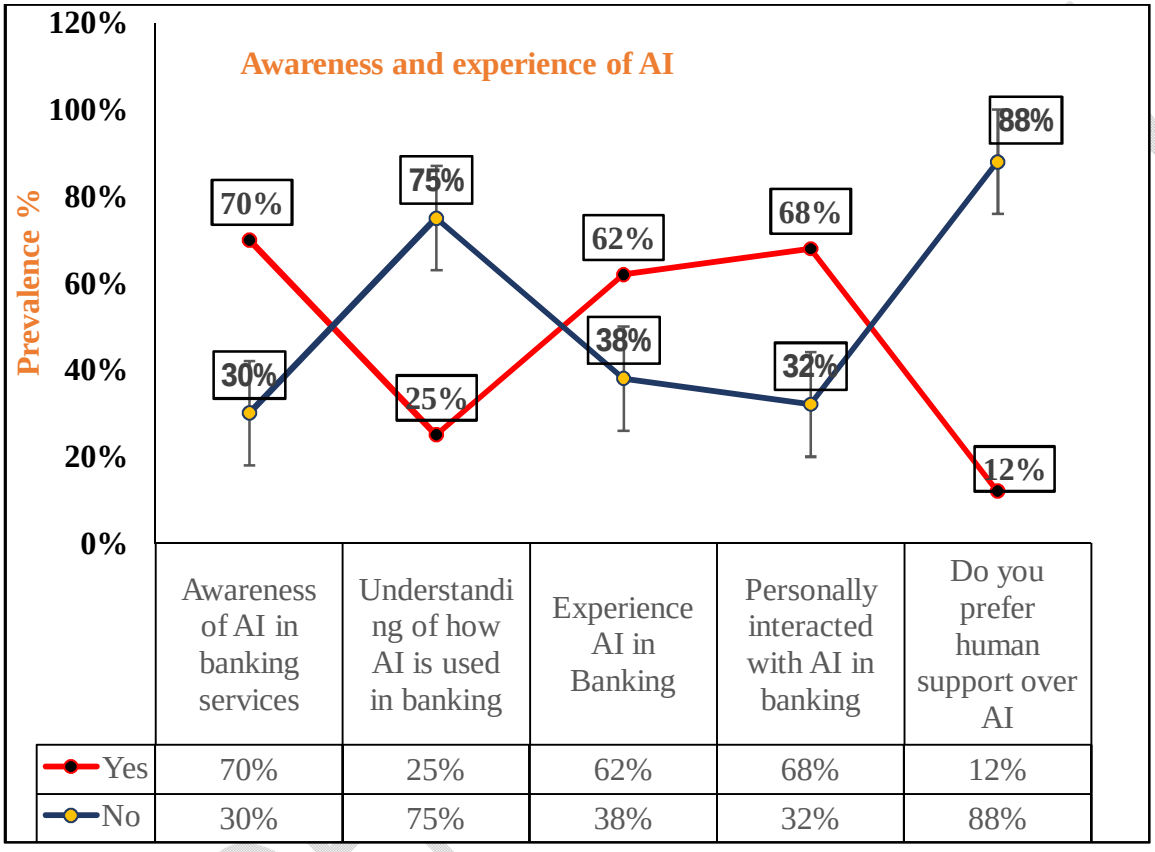
banking services?	Weekly	147	40.4
	Monthly	108	29.8
	Rarely	40	11.0

Awareness and Experiences of AI in Banking in Ghana

A significant majority, 70.0% of the participants, indicated that they are aware of the presence of Artificial Intelligence (AI) in the banking system in Ghana. This is a noteworthy finding as it suggests a substantial level of awareness among the study participants regarding the integration of AI technologies within the banking sector.Within the cohort of participants, almost 75.0% demonstrated an understanding of the utilization of AI in the banking domain. This high percentage suggests that a large portion of the participants has a comprehension of how AI functions within the context of banking services. This level of understanding is crucial for interpreting participants' responses and gauging the depth of their knowledge regarding AI in banking.

A notable finding is that 62.0% of the participants reported having actual experience with AI in the banking sector. This experiential aspect is crucial as it moves beyond mere awareness and understanding, indicating that a significant portion of the participants has interacted with AI-powered banking services. This firsthand experience can significantly shape participants' perceptions and attitudes toward AI in the banking context.

A strikingly high percentage, 88.0% of the participants, expressed a preference for AI-based support over human-based support within the banking system. This overwhelming preference indicates a positive inclination toward the use of AI in providing assistance and services within the banking sector. Understanding this preference is essential for financial institutions looking to optimize their customer service strategies.These are summarized in **figure 1**.



	Awareness of AI in banking services	Understanding of how AI is used in banking	Experience AI in Banking	Personally interacted with AI in banking	Do you prefer human support over AI
Yes	70%	25%	62%	68%	12%
No	30%	75%	38%	32%	88%

Figure1. Awareness and experiences of AI in banking system in Ghana

Perception of AI in Fraud Prevention and Its Associated Factors

A noteworthy finding is that 40% of the study participants actively agree that AI algorithms play a crucial role in detecting and preventing fraudulent activities within the banking sector. This indicates a substantial portion of the participants recognizing the significance of AI in bolstering security measures and combating fraud(**Figure 2**).

On the other hand, 30% of participants maintained a neutral stance on the perception of AI in fraud prevention. This neutral response could stem from a lack of strong conviction or a limited understanding of the specific role AI plays in this context. It may also suggest a need for further clarification or education on the capabilities of AI in fraud prevention**(Figure 2).**A smaller percentage, 7% of participants, expressed disagreement with the notion that AI can effectively prevent fraud in banking. This dissenting view is essential to consider as it may indicate skepticism or concerns among a minority of participants regarding the capabilities of AI in mitigating fraudulent activities.The varying responses suggest that there may be opportunities for educational initiatives to enhance participants' understanding of AI's capabilities in fraud prevention. Addressing any misconceptions or uncertainties could contribute to a more informed and nuanced perspective**(Figure 2).**

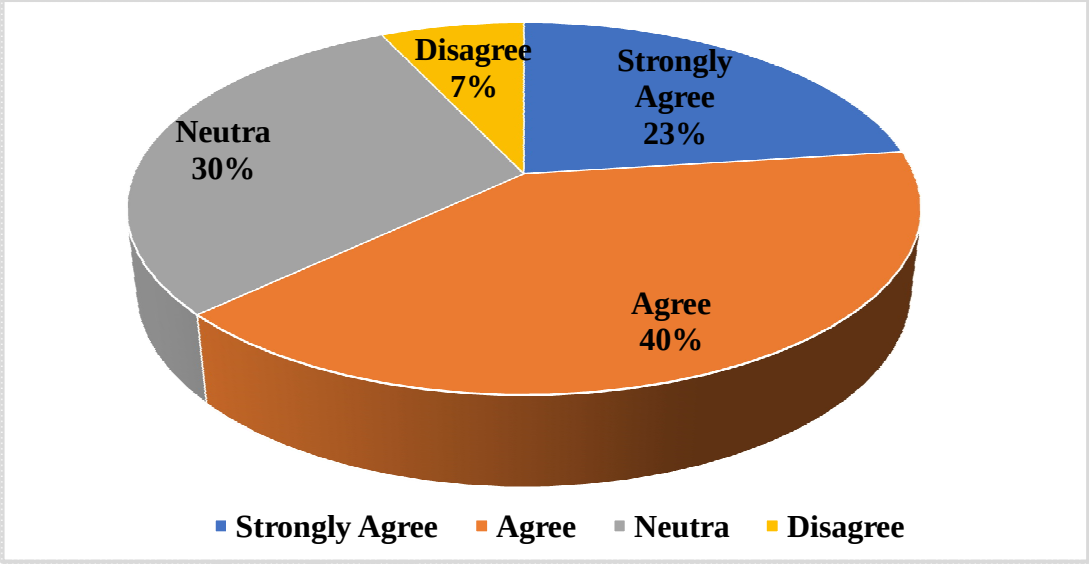


Figure 2: Perception of AI in Fraud Prevention

Factors contributing to the perception AI's effectiveness in fraud prevention

Majority of the participants (97.2%) believe that AI systems are designed with robust privacy measures and adhere to stringent data protection standards, it positively influences their perception of AI in fraud prevention (Figure 3). About 87.5% of individuals in this study perceive that AI systems consistently provide precise and reliable results, and it enhances their confidence in the technology.The perception of AI's effectiveness is often influenced by its capacity to adapt to new and emerging fraud tactics.

A total of (84.7%) of the participants believe that AI systems are proactive in learning and evolving to counter evolving threats (**Figure 3**). It is important to note that, about 83.3% of them also believe that the ability of AI to analyze data in real-time is a significant factor which allows for swift identification and response to anomalous patterns or suspicious activities, contributing to the perception of AI as an effective tool in preventing fraud(**Figure 3**).Understanding how AI arrives at its decisions is crucial. According to 81.9% of the participants, transparent and explainable algorithms of AI contribute to the perception of trustworthiness. If individuals can comprehend how AI identifies and prevents fraud, it fosters a sense of confidence in the technology.

About 66.6% of the participants reported that the perception of AI's effectiveness is often influenced by its capacity to adapt to new and emerging fraud tactics. If individuals believe that AI systems are proactive in learning and evolving to counter evolving threats, it enhances their confidence in the technology**(Figure 3)**.A total of 61.1% of the study participants indicated that, the level of education and awareness among users regarding how AI operates in the context of fraud prevention is a key factor. A well-informed user base is more likely to appreciate and trust AI's role in securing their financial transactions**(Figure 3**).Again, 38.3% of the participants reported that compliance with regulatory standards and industry best practices contributes to the credibility of AI systems**(Figure 3).** Users are more likely to trust AI if it adheres to established regulations and guidelines for data protection and security.

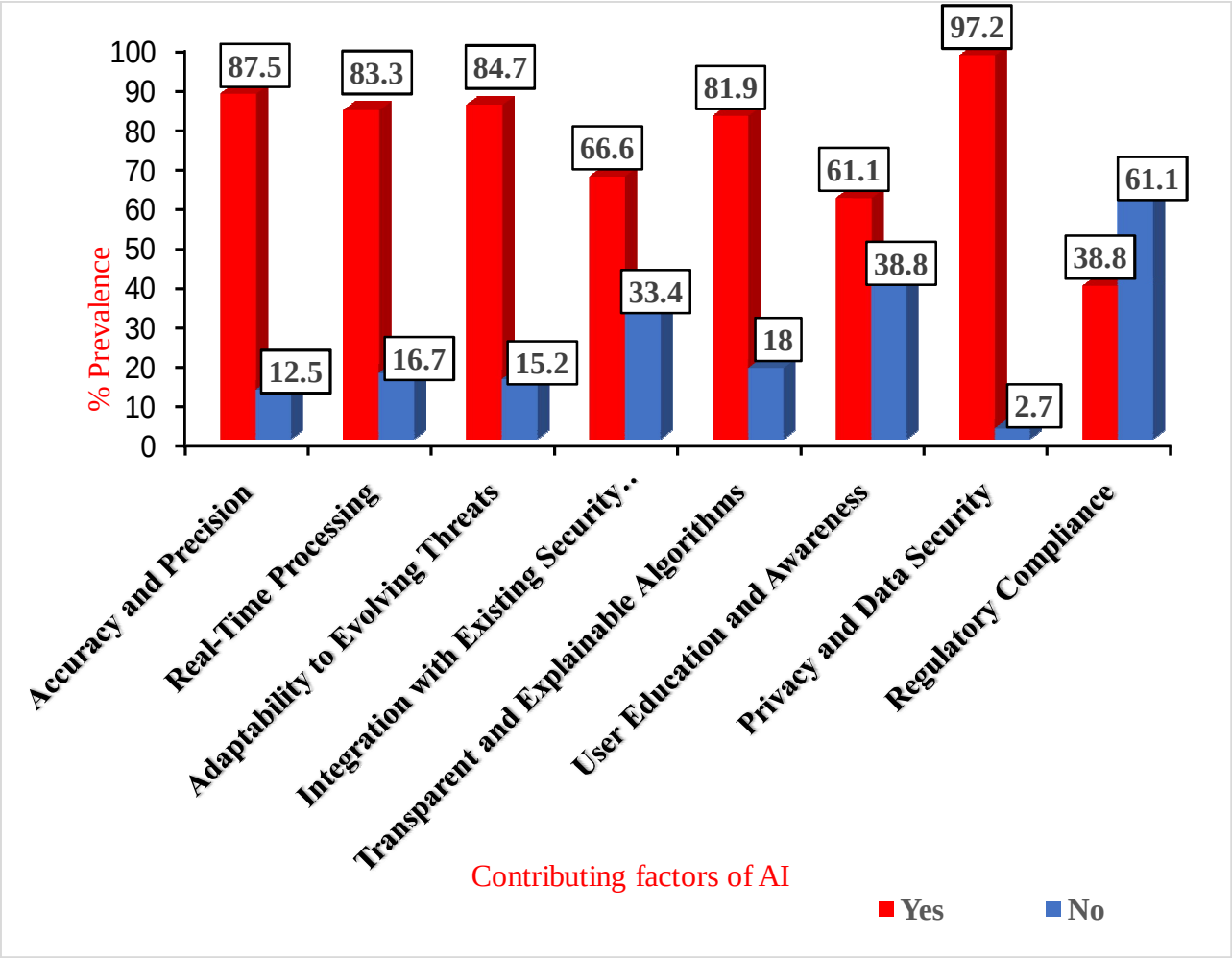


Figure 3: Factors contributing to the perception of AI's effectiveness in fraud prevention

Conclusion

The study reveals a significant level of awareness, understanding, and positive perceptions regarding the integration of Artificial Intelligence (AI) in the banking sector in Ghana. A majority of participants are not only aware of the presence of AI but also demonstrate a nuanced understanding of its utilization in banking services. The findings emphasize the importance of experiential knowledge, as a substantial portion of participants reported having actual interactions with AI-powered banking services. Participants' acknowledgment of the crucial role played by AI in detecting and preventing fraudulent activities is a key highlight, with a majority expressing trust in the robust privacy measures and stringent data protection standards associated

with AI systems. The positive perception of AI's effectiveness, especially in its capacity to adapt to new and emerging fraud tactics, indicates confidence in the technology's dynamic capabilities.However, there are nuanced perspectives on AI in fraud prevention, with a minority expressing skepticism or maintaining a neutral stance. This suggests opportunities for educational initiatives to address misconceptions and enhance participants' understanding of AI's capabilities in fraud prevention.The study also highlights key factors influencing participants' perceptions, including the transparent and explainable algorithms of AI, real-time data analysis, and compliance with regulatory standards. Moreover, the role of education and awareness among users emerges as a critical factor influencing the perception of AI's effectiveness in securing financial transactions.

The findings suggest that while there is a high awareness and positive perception of AI's role in fraud prevention, the banking sector must address concerns about AI biases and data privacy. These insights can guide policymakers in creating frameworks that support ethical AI adoption."The study found that 78.5% of participants perceived AI as effective in fraud prevention. However, concerns about AI system biases and data privacy were raised by 35.2% of respondents. Addressing these challenges through continuous monitoring and regulatory frameworks is critical to ensuring the responsible use of AI in banking."

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

Reference

1. Arslanian, Henri, and Fabrice Fischer. The future of finance: The impact of FinTech, AI, and crypto on financial services. Springer, 2019.
2. Musch, Sean, Michael Borrelli, and Charles Kerrigan. "The Impact of the European Union Artificial Intelligence Act on the Banking Sector: Individuals' Fundamental Rights, Conflicts of Laws and Brexit." Conflicts of Laws and Brexit (August 23, 2023) (2023).
3. Aziz, Layla Abdel-Rahman, and Yuli Andriansyah. "The Role Artificial Intelligence in Modern Banking: An Exploration of AI-Driven Approaches for Enhanced Fraud Prevention, Risk Management, and Regulatory Compliance." Reviews of Contemporary Business Analytics 6.1 (2023): 110-132.
4. Boobier, Tony. AI and the Future of Banking. John Wiley & Sons, 2020.
5. Dwivedi, Yogesh K., et al. "Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy." International Journal of Information Management 57 (2021): 101994.
6. Dicce, Ryan P. Constructing Pillars of Islamic Banking: Creating and Sustaining Specialized Financial Centers in Bahrain and the United States. Diss. 2015.
7. Eubanks, Ben. Artificial intelligence for HR: Use AI to support and develop a successful workforce. Kogan Page Publishers, 2022.
8. Przegalinska, Aleksandra, and Dariusz Jemielniak. "Strategizing AI in Business and Education: Emerging Technologies and Business Strategy." (2023).
9. Khan, Habib Ullah, et al. "Transforming the Capabilities of Artificial Intelligence in GCC Financial Sector: A Systematic Literature Review." Wireless Communications and Mobile Computing 2022 (2022).
10. Cedersund, Michel. "Artificial Intelligence in banking: the future of the banking work environment." (2023).

11. McKendrick, Kathleen. "Artificial intelligence prediction and counterterrorism." London: The Royal Institute of International Affairs-Chatham House 9 (2019).
12. Buckley, Ross P., et al. "The dark side of digital financial transformation: The new risks of fintech and the rise of techrisk." UNSW Law Research Paper 19-89 (2019).
13. Martino, Pierluigi. Blockchain and banking: How technological innovations are shaping the banking industry. Springer Nature, 2021.
14. Kinyua, Loise W. Strategic response of equity bank to fraud related risks. Diss. University of Nairobi, Kenya, 2011.
15. Ghanem, Mohamed Gaber, and Ghina Awad. "The Impact of Internal Control Systems on Minimizing Fraud: The Case of Lebanon." European Journal of Business and Management Research 8.5 (2023): 69-75.
16. Kunduru, Arjun Reddy. "Artificial intelligence advantages in cloud Fintech application security." Central Asian Journal of Mathematical Theory and Computer Sciences 4.8 (2023): 48-53.
17. Thisarani, Moksha, and Subha Fernando. "Artificial intelligence for futuristic banking." 2021 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC). IEEE, 2021.
18. Lila, Serxho. "Applications of Artificial Intelligence." (2021).
19. Mohanty, Birajit, and Shweta Mishra. "Role of Artificial Intelligence in Financial Fraud Detection." Academy of Marketing Studies Journal 27.S4 (2023).
20. Firdaus, Raheela, et al. "Artificial intelligence and human psychology in online transaction fraud." Frontiers in Psychology 13 (2022): 947234.
21. Kayode-Ajala, Olaolu. "Applications of Cyber Threat Intelligence (CTI) in Financial Institutions and Challenges in Its Adoption." Applied Research in Artificial Intelligence and Cloud Computing 6.8 (2023): 1-21.
22. Allioui, Hanane, and Youssef Mourdi. "Exploring the Full Potentials of IoT for Better Financial Growth and Stability: A Comprehensive Survey." Sensors 23.19 (2023): 8015.
23. Mhlanga, David. Responsible Industry 4.0: A Framework for Human-Centered Artificial Intelligence. Taylor & Francis, 2023.

24. George, A. Shaji. "Securing the Future of Finance: How AI, Blockchain, and Machine Learning Safeguard Emerging Neobank Technology Against Evolving Cyber Threats." Partners Universal Innovative Research Publication 1.1 (2023): 54-66.