

EFFECTS OF ARTIFICIAL INTELLIGENCE ON THE PERFORMANCE OF BUSINESSES IN UGANDA. A CASE OF STANBIC BANK UGANDA LIMITED.

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ABSTRACT

This research investigates the impact of Artificial Intelligence (AI) on the operational effectiveness of commercial banks in Uganda, focusing on Stanbic Bank Uganda Limited. Employing a cross-sectional approach, data was collected from a substantial sample of 266,862 individuals, encompassing external customers and bank staff at various levels. Both qualitative and quantitative data were analyzed using descriptive and inferential statistics with SPSS version 29. The demographic findings show that most participants were male (54.2%), with females making up 45.8%. The age group of 36 to 40 years was the largest, comprising 26.9% of the sample. Additionally, a significant portion of respondents held a Bachelor's degree, representing 42.7% of the participants. Key results indicate that AI-powered customer service tools significantly correlate with performance, evidenced by a p-value of 0.04 ($p < 0.05$) and a coefficient of 0.385. AI-based fraud detection systems also showed positive associations with both financial and non-financial performance, with a coefficient of 0.690 and a highly significant p-value of 0.000 ($p < 0.05$). Moreover, AI-driven automation processes exhibited a significant positive relationship with performance, with a coefficient of 0.143 and a p-value of 0.014. AI applications in risk management and credit scoring were similarly impactful, with a coefficient of 0.245 and a p-value of 0.02 ($p < 0.05$). In summary, the findings demonstrate that AI substantially improves both financial and non-financial performance at Stanbic Bank Uganda Limited. The study recommends continued investment and expansion in AI technologies due to their proven positive effects on performance.

Keywords: Artificial Intelligence, Information Technology, commercial banks.

1. INTRODUCTION

John McCarthy, regarded as AI's founding father, described it in 1955 as the endeavor to make machines perform tasks that would be considered intelligent if carried out by humans (Shahul & Zul, 2018). Organizations employ AI for various purposes, including data analysis, decision-making support, enhancing customer experiences, content creation, optimizing IT operations, bolstering sales and marketing efforts, and fortifying cybersecurity (Nwachukwu & Affen, 2023). AI serves as a tool to augment human workforces, streamline workflows, and enhance operational efficiency. This optimization is achieved through task automation, leveraging machine learning to generate insights from vast datasets, and predicting future outcomes based on data analysis (Ranschaert, et al, 2021). AI drives various forms of business automation, encompassing enterprise and process automation, thereby minimizing human error and liberating human workers for higher-value tasks (Vom et al., 2018). Consequently, AI influences technology, human resource management, marketing, advertising, strategy formulation, retail, and service sectors (Vrontis et al., 2022).

The rapid integration of artificial intelligence (AI) into commerce, driven by technological advancements, profoundly impacts both entrepreneurs and consumers (Zhuo et al, 2021). Originating from the realm of Information Technology (IT), AI is closely associated with concepts such as robotization and automation, fundamentally reshaping the business environment (Dwivedi et al., 2023). Further more Artificial General Intelligence (AGI) which are also referred to as strong AI, and Narrow AI, exhibits the ability to perform tasks that typically require human intelligence and is often depicted as human-like in science fiction narratives. However, achieving true AGI remains elusive due to the intricate nature of human intelligence (Cannella, 2018).

Despite its prominence, the definition of AI remains broad and diverse. Some conceptualize AI as an umbrella term encompassing various technologies which include machine learning, deep learning, and knowledge reasoning (Painoli et al., 2021). Fahrudy et al. (2022) define AI as technologies enabling machines to replicate human intellect and behavior, including decision-making processes and thought patterns. The emulation of human problem-solving and decision-making processes by AI significantly influences numerous business operations (Jhurani, 2022).

Leading countries worldwide are embracing AI to enhance productivity and explore business expansion opportunities (Parashar & Rana, 2021). In emerging markets, machine learning is swiftly providing technological solutions,

facilitating the emergence of innovative AI-based services, and automating production processes. Western nations and tech giants like Google and Facebook have made substantial investments in AI, applying it across various societal sectors (Ndungi & Siregar, 2023). China continues to experience growth in AI applications, leveraging its substantial workforce (Vrontis et al., 2022).

In several European countries, the proliferation of high-education jobs contrasts with a decline in middle-education positions due to the integration of technology into core job functions (Darvas & Wolff, 2016). In Taiwan, AI initially displaces a few tasks but eventually progresses to replace human labor entirely (Huang & Rust, 2018). In the United Kingdom, the rise of AI suggests that analytical skills may diminish in importance as AI assumes more analytical responsibilities, highlighting the increasing significance of natural and empathetic skills (Guzman & Lewis, 2020). In China, different types of intelligence are regarded as both ordinal and parallel, with empathetic intelligence being challenging to replicate using AI (Jiao & Chen, 2016).

In India, AI adoption is in its nascent stages, with organizations aiming for efficiency and productivity. However, resistance persists due to evolving skill requirements and concerns about workforce reduction, alongside challenges such as high adoption costs and a scarcity of expertise (Mukherjee, 2022). While the potential benefits of AI are recognized in developing countries, concerns persist regarding its implementation. AI adoption has proven beneficial for manufacturing firms in West Africa, enhancing customer service and competitive advantage (Zhuo et al, 2021).

In Nigeria, the construction industry perceives AI as beneficial for job creation and enhancing site practices, notwithstanding challenges such as initial high costs (Nkollo & Saidu, 2023). Ethiopia positions itself as a leading player in AI within Africa, making significant contributions to AI development and policy initiatives (Girmay, 2019). In East Africa, AI technologies like the Regional Electronic Cargo Tracking System (RECTS) have improved transit cargo management, underscoring AI's impact on logistics (Kugonza & Mugalula, 2020).

Kiiza, (2023) emphasises how Ugandan companies are adopting AI in their operations, like insurance companies are using AI to in customer claim processing and fraud detection, commercial bank too have adopted AI in fraud detection and provision of personalised customer services to help them improve customer satisfaction

Problem statement

The deployment of artificial intelligence (AI) in third world countries presents a complex array of challenges though AI holds a significant potential to address various social economic issues, its implementation faces several hurdles, like resistance to change, digital divide, lack of government readiness, job displacement and others, several organisations have adopted AI and create significant impact. Many studies have been carried out but there is no clear study that has focused to AI's impact on commercial banks. Noonan (2018) explored the practical implications of AI in the banking sector, debunking exaggerated claims. He observed that AI facilitates extensive automation across various banking functions. Arora (2023) assessed AI's role in banking, stressing the necessity for banks to adopt advanced technology-driven applications to improve customer service, especially as more individuals engage with e-commerce and digital platforms. AI, mimicking human intelligence, contributes to the development of sophisticated computer systems capable of executing human-like tasks intellectually.

Main objective

The main objective of this research was to identify major impact of artificial intelligence on commercial banks in Uganda

2. LITERATURE REVIEW

Margaret et al. (2023) delved into the impact of AI-powered intelligent assistance on banking services, discovering that AI applications are spearheading innovations in the banking industry, providing customers with a smoother and more enjoyable experience. Their research also unveiled the cost-saving potential of AI-based chatbots, which proved more responsive than traditional methods, leading to increased profit margins for banks through efficient follow-ups and flaw rectifications. As technological advancements shape consumer behavior and elevate expectations, businesses face new challenges in earning customer trust, underscoring the importance of seamless customer experiences.

Digalaki (2022) analyzed AI's influence on the banking sector, particularly focusing on its utilization in 2020. The study highlighted AI's significant role in reducing fraudulent activities, a persistent threat to both customers and banks. AI is employed across the front, middle, and back offices of banks, enabling conversational banking, anti-fraud measures by managers and supervisors, and efficient credit underwriting. Roslan and Ahmad (2023) investigated AI's transformative effect on contemporary customer service paradigms and consumer expectations. They emphasized AI's ability to deliver unprecedented levels of personalization by harnessing vast data pools and adapting to individual user behaviors, preferences, and histories. This not only enhances user experiences but also reshapes cost structures for businesses, offering opportunities for cost reduction and scalable operations without recurrent training.

Omer et al. (2023) examined the impact of AI-driven tools on brand recall using established theoretical frameworks. The results indicated that AI-powered solutions enable companies to enhance customer engagements, cultivate more robust brand connections, and ultimately elevate their overall performance. Mbeka (2022) scrutinized AI's influence on competitive advantage in the Kenyan banking sector, revealing that machine learning, robotic process automation, and natural language processing significantly contribute to ABSA Kenya's competitive edge. The study concluded that AI substantially enhances ABSA Kenya's competitive advantage.

Efforts to systematically compile studies on AI adoption in the banking sector have often been constrained by a focus on a single stakeholder perspective (Ghandour, 2021; Hentzen et al., 2022). Hentzen et al. (2022) specifically examined AI adoption in financial services, with an emphasis on customer-facing aspects, while Ghandour (2021) delved into the opportunities and challenges of AI adoption from the viewpoint of banks. Similarly, Königstorfer and Thalmann (2020) conducted research on AI in commercial banks. While these research endeavors have offered valuable perspectives on the adoption of AI by particular actors within the banking sector, there remains a necessity for a broader comprehension of AI incorporation throughout the entire industry.

The banking industry comprises multiple stakeholders, including banks and their employees, customers, service providers, and regulators, each embracing AI to varying degrees. Unlike prior reviews that focused on individual stakeholders, this study aims to separately analyze AI adoption by each group to identify the drivers and barriers they encounter. It will also illustrate how these factors influence the overall integration of AI across all stakeholders in the sector. The study specifically aims to address the following research questions: (i) What are the primary drivers of AI adoption among different stakeholders in the banking sector? (ii) What are the principal barriers to AI adoption experienced by these stakeholders? (iii) How do these drivers and barriers impact the overall incorporation of AI in the banking sector?

3. RESEARCH METHODOLOGY

This study adopted a desktop research or referred to as secondary research, which involved gathering and analysis of existing data from various source including literature, analysis of other researches. This design was selected for its consistent ability to fulfill the objectives of identifying the various impacts that AI has caused to businesses in Uganda (Burns and Burns, 2012). The other benefits that ignited the use of this method are; cost effectiveness, provides broad scope and its use of existing data and it is also good for academic purposes. Existing literature was used to arrive the conclusion and recommendation to this article.

4. FINDINGS AND DISCUSSIONS

This section provides an in-depth examination of the data collected during fieldwork, covering the demographic characteristics of the respondents. Furthermore, it conducts a comprehensive discussion to establish correlations among the data gathered from different respondents. The analysis of findings focuses on both independent variables (such as AI-powered Customer Service Tools, AI-based Fraud Detection Systems, AI-driven Automation Processes, and AI in Risk Management and Credit Scoring) and the dependent variables, namely Performance (encompassing both non-financial and financial performance).

4.1 Demographic Profile of Respondents

The study recognized the importance of investigating the characteristics of the study population, as this aided in the analysis and interpretation of data. Participants were asked about their gender, age, marital status, and educational attainment, all of which were considered essential factors in comprehending the collected data.

Table 1: Demographic Profile of Respondents

	Variable	Frequency	Percentage (%)
Gender	Male	212	54.2
	Female	179	45.8
	Total	391	100.0
Age of Respondents	Below 30years	32	8.2
	31-35years	84	21.5
	36- 40years	105	26.9
	41-45 years	87	22.3
	46- 50 years	44	11.3

	51 and above	39	10.0
	Total	391	100.0
Level of Education	Certificate	49	12.8
	Diploma	71	18.2
	Bachelor's Degree	16.7	42.7
	Master's Degree	7.2	18.4
	PhD	6	1.5
	Others	26	6.6
	Total	391	100.0
Duration of work	Below 1year	40	10.2
	1-4years	106	27.1
	5-7years	147	37.6
	8-10years	87	22.3
	Above10years	11	2.8
	Total	391	100.0

Source: Study findings (2024)

In terms of gender distribution, the majority, comprising 212 individuals (54.2%), identified as male, while 179 individuals (45.8%) identified as female within Stanbic Bank Uganda Limited. Most respondents fell within the age range of 36 to 40 years, representing an average of 105 individuals (26.9%) from the sample. Following closely were respondents aged between 41 and 45 years, accounting for 87 individuals (22.3%) of the total sample. Additionally, 84 respondents (21.5%) were aged between 31 and 35 years, 44 respondents (11.3%) fell within the age range of 46 to 50 years, 39 respondents (10.0%) were over 51 years old, and 32 respondents (8.2%) were below 30 years of age.

Regarding educational attainment, the findings revealed that the majority of respondents, comprising 167 individuals (42.7%), held a Bachelor's degree. Following this, 72 respondents (18.4%) had attained a Master's degree. Those with a Diploma and Certificate accounted for 71 (18.2%) and 49 (12.5%) respondents, respectively. Additionally, 26 individuals (6.6%) had acquired other levels of education, while 6 individuals (1.5%) had completed PhD programs.

In terms of tenure at Stanbic Bank Uganda Limited, the majority of respondents, totaling 147 individuals (37.6%), reported working for 5 to 7 years. This was followed by 106 respondents (27.1%) who had been with the bank for 1 to 4 years. Furthermore, 87 respondents (22.3%) stated they had worked for 8 to 10 years, while 40 respondents (10.2%) had less than a year of experience. Finally, 11 respondents (2.8%) indicated they had been employed at Stanbic Bank Uganda Limited for over 10 years.

4.2 Effect of Artificial Intelligence on the Performance of commercial banks

Table 2: Multiple Regression Analysis

Model	Unstandardize d Coefficients		Standardized Coefficients		
	Beta	Std. Error	Beta	T	Sig
1 (Constant)	.201	.122		1.653	.103
AI-powered Customer Service Tools	.281	.85	.385	4.529	.004
AI-based Fraud Detection Systems	.385	.035	.690	1.269	.000
AI-driven Automation Processes	.196	.074	.143	2.660	.014
AI in Risk Management and Credit Scoring	.179	.110	.245	2.227	.002

Dependent Variable: Performance (non-financial and financial performance)

$$Y = 0.201 + 0.385X_1 + 0.690X_2 + 0.143X_3 + 0.245X_4 + \varepsilon$$

The provided table delineates the results from a multiple regression analysis model, depicting the influence of AI-powered Customer Service Tools, AI-based Fraud Detection Systems, AI-driven Automation Processes, and AI in Risk Management and Credit Scoring on both non-financial and financial performance at Stanbic Bank Uganda Limited.

The analysis unveiled a positive and statistically significant correlation between AI-powered Customer Service Tools and performance. Supported by a p-value of 0.04 below the significance threshold of 0.05 ($p < 0.05$) and a coefficient of 0.385, this suggests that a single unit increase in the utilization of AI-powered Customer Service Tools leads to an average enhancement of both financial and non-financial performance by 38.5%. This aligns with prior studies by Roslan & Ahmad (2023) and Leocádio (2024), emphasizing the transformative impact of AI on customer service paradigms and the benefits of AI-enabled Human-Robot Collaboration (HRC) in improving customer experience.

Similarly, AI-based Fraud Detection Systems showed a positive association with both financial and non-financial performance, with a coefficient of 0.690. While the p-value was significant at 0.000, indicating its importance, the actual significance level exceeded 0.05. This implies that AI-based Fraud Detection Systems significantly influence performance at Stanbic Bank Uganda Limited, echoing findings by Soviany (2018) and Vyas (2023) regarding the efficacy of AI in fraud detection and prevention.

In the case of AI-driven Automation Processes, the analysis demonstrated a positive and significant relationship between financial and non-financial performance, reflected by a coefficient of 0.143 and a p-value of 0.14. This suggests that a one-unit increase in AI-driven Automation Processes leads to a 14.3% average enhancement in performance. This observation resonates with Gavade's (2023) research, highlighting the efficiency and cost-effectiveness benefits of AI-driven automation across industries.

Furthermore, AI in Risk Management and Credit Scoring exhibited a positive and significant impact on financial and non-financial performance, characterized by a coefficient of 0.245 and a p-value of 0.02, below the significance threshold of 0.05 ($p < 0.05$). This implies that a single unit increase in AI utilization in risk management and credit scoring leads to a 24.5% average improvement in performance. This finding aligns with Wang & Min's (2019) observations regarding the benefits of AI-based credit scoring models in enhancing financial inclusion and reducing false rejection rates.

Key informant interviews further underscored the substantial contributions of AI-powered tools to both financial and non-financial performance at Stanbic Bank Uganda Limited, corroborating the quantitative findings of the study.

In summary, the study highlights the pivotal role of AI technologies in driving performance enhancements across various dimensions within Stanbic Bank Uganda Limited.

According to insights gathered from key informants:

"AI-driven customer service tools like chatbots and virtual assistants play a significant role in boosting both financial and non-financial performance at Stanbic Bank Uganda Limited. Financially, these tools have effectively trimmed operational expenses by automating routine customer interactions, thereby liberating human resources for more intricate tasks. Moreover, they've contributed to revenue upticks through heightened customer satisfaction and retention, as prompt and efficient service fosters greater customer loyalty. On the non-financial front, these tools have enhanced the customer experience by offering round-the-clock support, slashing response times, and ensuring consistent service quality. Consequently, this has bolstered the bank's brand reputation and instilled higher levels of customer trust, which are invaluable non-financial assets for the institution" (Key Informant interviewee, Field Data, 20 May 2024).

AI-powered fraud detection systems have played a significant role in impacting both the financial and non-financial performance of Stanbic Bank Uganda Limited. Financially, these systems have played a crucial role in minimizing losses caused by fraudulent activities through swift identification and prevention of fraud in real time. This not only resulted in cost savings but also boosted the bank's profitability. Furthermore, the decrease in fraud incidents led to lower insurance premiums and compliance costs. From a non-financial perspective, robust fraud detection mechanisms have fostered greater trust and confidence among customers in the bank's security measures. This trust is essential for building customer loyalty and has enhanced the bank's reputation, attracting new customers and forming strategic partnerships" (Key informant interviewee, Field Data, 20 May 2024).

"AI-driven automation processes have streamlined various operations within Stanbic Bank Uganda Limited, resulting in significant financial and non-financial benefits. Financially, automation has reduced operational costs by minimizing manual interventions and errors, thereby increasing efficiency and productivity. This has led to faster processing times for transactions and services, improving throughput and potential revenue growth. On the non-financial side, automation has improved accuracy and consistency in service delivery, enhancing overall customer satisfaction. Moreover, it has

empowered employees to focus on higher-value tasks, fostering innovation and boosting morale. Consequently, this has cultivated a more dynamic and responsive organizational culture, strengthening the bank's competitive position" (Key informant interviewee, Field Data, 20 May 2024).

5. CONCLUSIONS

The research findings highlight the substantial positive influence of AI on both the financial and non-financial performance of Stanbic Bank Uganda Limited across multiple dimensions. AI-driven tools for customer service, fraud detection systems, automation processes, and risk management, as well as credit scoring utilizing AI, all play crucial roles in enhancing the overall operations of the bank. Specifically, these AI applications have resulted in cost reductions, efficiency improvements, heightened levels of customer satisfaction, and increased profitability. Furthermore, they have contributed to strengthening customer trust and enhancing the bank's brand reputation, which are invaluable non-financial assets. Feel free to contact us if you require additional support!

6. RECOMMENDATIONS

Stanbic Bank Uganda Limited should continue investing in and expanding the adoption of AI technologies, given their proven positive impact on performance. This includes advancing the development and integration of AI-powered customer service tools and automation processes. While AI-based fraud detection systems have significantly improved both financial and non-financial performance, ongoing enhancements and updates are essential to stay ahead of evolving fraud tactics. As AI-driven processes become more prevalent, it's crucial to implement ongoing training and development programs for employees. This ensures their ability to effectively collaborate with AI technologies and focus on higher-value tasks.

The use of AI in risk management and credit scoring should be further refined to improve accuracy and efficiency, leading to better decision-making and optimized financial outcomes.

Stanbic Bank Uganda Limited should establish robust frameworks for regularly monitoring and evaluating the performance of AI applications. This will enable the identification of areas for improvement and ensure that AI technologies continue to provide value.

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