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# Challenges Affecting the Implementation of Artificial Intelligence Technologies in Zambia's Commercial Banks: Evidence from Zambia National Commercial Bank Plc

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## Abstract

The integration of Artificial Intelligence technologies into banking industries has emerged as another transforming trend across different countries worldwide. The integration of Artificial Intelligence technologies into banking industries ensures enhanced bank efficiency and customer satisfaction through data analysis. In Zambia, different commercial banks have embraced Artificial Intelligence technologies. The process of integration, however, has emerged as another challenge. This research aims to identify different challenges affecting the process of Artificial Intelligence technology integration into different commercial banks in Zambia. The research has considered Zambia National Commercial Bank Plc (Zanaco) as a research case. The research applied a pragmatic research approach, collecting primary data from different employees and management of various commercial banks. After analyzing different research articles and conducted research, this research identified major challenges affecting Artificial Intelligence technology integration into Zambia commercial banks. Based on research findings, it can be concluded that different commercial banks and employees are considering limited digital infrastructures, implementation costs, security concerns, and skilled manpower as major problems that are adversely affecting Artificial Intelligence technology integration. Different research findings of this research have major implications for new and developing countries. Emerging countries are currently facing different technology integration challenges.

**Keywords:** Artificial Intelligence, Banking Operations, Implementation Challenges

## 1. Introduction

The uptake of Artificial Intelligence (AI) in the banking business has come out as a key factor contributing to digital transformation around the world. As noted by various authors, such as Russell & Norvig (2021) and Buxmann et al. (2019), AI tools such as machine learning, robotic automation, predictive analytics, and chatbots have significantly transformed the banking business by making it efficient and lowering costs while enhancing customer experience. Similarly, in Zambia, the banking business is increasingly using AI to transform service delivery and remain competitive in this ever-changing business world (Chisanga & Kabwe, 2022; Zambia National Commercial Bank, 2024). However, notwithstanding its numerous benefits, the use of AI faces several challenges.

Zambia National Commercial Bank Plc (Zanaco), one of the biggest commercial banks in Zambia, had spent heavily on technology, especially AI-based technology, in contexts like customer relations, threats of fraud, and risks of bad loan portfolios (Chibesakunda, 2021). But in their application, a host of issues have come to the fore, pertaining to technology, regulation, human capital, organizational readiness, and cybersecurity, respectively (Phiri & Mwila, 2021; Dlamini & Mthembu, 2022). It is important to understand these issues, as the application of AI technology is important in improving efficiency, consumer satisfaction, as well as enhancing financial inclusion.

The study is guided by the following research questions:

- What are the main technological, organizational, and regulatory challenges affecting AI implementation in Zambia's commercial banks?
- How do human-resource limitations and skill gaps impact the adoption and integration of AI in Zanaco?
- What strategies can be adopted to mitigate the identified challenges and enhance AI utilization in Zambian banking operations?

The purpose of this research is to explore the challenges that impede the efficient deployment of AI in Zambia's commercial banks, including Zanaco Bank. The research is important as it addresses a critical knowledge gap in exploring the challenges associated with AI in Zambia, a developing country in Africa, which has been understudied due to limited research in its financial sector. The research can be useful in identifying inefficiencies in AI adoption, which can help improve bank management.

This, in turn, would help banks overcome these challenges in order to harness the true transformative capabilities of AI in service delivery, the execution of complex and routine tasks, and deepening financial inclusion in Zambia and other emerging markets.

## 2. Literature Review

By drawing on evidence from global, regional (African), and local (Zambian) studies, the section highlights recurring barriers to effective AI implementation and identifies contextual gaps that justify the need for institution-specific research within Zambia's banking sector.

A study conducted by Davenport and Ronanki (2018), "Artificial Intelligence for the Real World," in the United States, which assessed the practical challenges organizations, including multinational banks, face in implementing AI technologies. The basis of this study was an analysis of 152 organizations across different industries, several of which were global banking institutions, through interviews with senior executives and the analysis of internal organizational documents. The study found that banks faced major challenges such as dependency on legacy IT systems, high implementation costs, poor data quality, and shortages of skilled AI professionals. It further indicated that while many banks succeed in launching AI pilot projects, they struggle to scale these initiatives across the organization due to resistance to change and/or undefined measures of return on investment. In my judgment, while this study offers profound insights into AI implementation challenges within advanced economies, it does not explain the unique constraints facing banks in developing countries. The research gap is that global studies often make assumptions about the availability of advanced digital infrastructure and financial means that could well not apply to the Zambian banking sector.

Similarly, another global study by Bughin et al., (2019) under the title "Artificial Intelligence: The Next Digital Frontier?" in Europe and North America explored the challenges faced by financial organizations in the adoption of AI technology. It involved 3,000 executives from diverse industries. Some of the major challenges identified in the implementation of AI technology in the financial industry include the lack of good quality data, security concerns, regulatory ambiguity, and lack of organizational readiness. As I perceive this study, it gives good insights into the challenges faced by financial institutions in implementing AI technology by citing some of the strategic challenges and barriers in the adoption of AI technology in the financial industry worldwide. However, it fails to focus on the socio-economic and infrastructural challenges faced by banks in developing countries like Zambia. Research Gap: Globally surveyed reports on AI technology face a major gap in revealing how AI technology faces challenges in developing countries like Zambia.

Another global study on data privacy and security concerns concerning AI adoption in the global banking industry was conducted by Ghandour (2021). According to the study, banks were faced with increased risks of reputational and legal implications concerning the high volume of customer-related data handled in AI adoption processes in the industry. According to my perspective on the study, though this study poses significant concerns on security challenges in AI adoption in the global industry, it seems as though the study relies on the existence of proper regulations in the banking industry in different countries, which may not be the case in developing countries like Kenya. Research Gap: From my perspective, the gap in this particular study lies in the fact that the researcher did not explore how banks and organizations in developing countries with poor regulations relate to AI adoption in the global industry.

A study by Dembo and Ali (2024) focused on the global level and investigated the availability of talent in AI in the banking sector. The results indicated that there were major challenges for banking institutions in terms of recruiting and retaining skilled professionals in the field of AI and data science. In my analysis, although this challenge exists on a global scale, I believe that this problem is much bigger in developing countries due to the scarcity of AI training. The gap that exists in the research is that training challenges are not investigated for developing countries.

In Africa at large, several studies have been conducted exploring issues related to the adoption of AI in banking, specific to Africa. Munyoka and Manzira (2022) carried out a research study on "Adoption of Artificial Intelligence in African Banking Systems" specific to Africa, with regard to challenges related to the implementation of AI. The research included data collection among banking professionals and IT professionals from prominent banks in South Africa, Kenya, and Nigeria. The study pointed out that challenges related to Africa included digital infrastructural issues, costs, expertise, and

regulatory issues, along with issues related to privacy, cybersecurity, and technological aspects among employees. In my opinion, although this survey gives a good regional assessment, it might not apply specifically to the Zambian banking industry because it faces special regulatory and infrastructural challenges. The research gap is that regional studies often aggregate African countries, disregarding country-specific differences shaping AI implementation.

Omondi (2020), in a research done on challenges that face commercial banks when they intend to adopt AI, did a study on how AI has been integrated in commercial banks across East Africa, focusing on Kenya. The target group included employees from six commercial banks across Kenya. The research indicated that cybersecurity threats, lack of skills, high costs, and inadequate support from regulatory authorities have remained big barriers facing commercial banks' adoption of AI. In my opinion, although this research was done in a context that is somewhat similar or related to our context, its applicability is limited by several discrepancies between our two contexts. The research gap, however, arises from the fact that while research conducted in East Africa may provide useful insights, one cannot generalize such research conducted in other countries to Zambia.

Research on the topic "Artificial Intelligence in African Financial Services: Opportunities and Challenges" by Mhlanga (2021) in Zimbabwe identified the challenges to the implementation of AI in financial services. According to the research, the implementation of AI in the financial sector has been limited by the weakness in ICT, the banks' lack of investment, absence of AI governance, and the cultural change in adopting technology. Should the implementation of AI in the financial sector face challenges, in my opinion, the challenges identified by the research are relevant to other African nations, but the economic conditions of Zimbabwe are different from Zambia's stable economic environment in the financial sector. The research gap is the empirical hurdle, as the unstable economic conditions cannot be generalized on the Zambia market without further empirical evidence.

Arakpogun et al., (2021) conducted a regional study assessing the challenges of AI adoption in Africa and noted that weak structures of governance, a lack of policy frameworks, and low institutional capacity hinder the implementation of AI by as high as threefold. The study insisted that problem-driven AI policies were required in African contexts. In my opinion, although this research is significant at a policy level, it fails to indicate how these challenges have impacts on the governance of the individual banking institutions. There is a limited empirical linkage of the governance challenges to operational AI implementation in certain banks.

Moreover, based on the literature at the local level in Zambia, studies regarding the implementation of AI technologies in banks have revealed challenges. Mwansa (2021) completed a study titled "Digital Transformation and AI Adoption in Zambian Commercial Banks," which focused on the challenges banks face when adopting AI technologies. It was conducted by recruiting respondents from employees at four major commercial banks in Zambia; the study concluded that the challenges affecting the adoption of AI technology involve lack of investment in advanced technologies, lack of technical skills, poor management of data, and lack of regulatory guidance for banks. However, the study also suggested that employees generally do not want to see AI adopted since most are afraid of being replaced by such technology. In my opinion, although this study discusses the challenges banks face in Zambia regarding AI implementation, it does not highlight a particular bank such as ZANACO or the relation to the operation performance of banks. The research gap is that existing Zambian studies provide general overviews without institution-specific analysis.

The research by Chanda (2022) on the theme "Technological Innovation and Service Delivery in Zambian Banks" explores the challenges related to implementing digital technologies such as artificial intelligence. The research was conducted among managers of five commercial banks in Zambia and revealed that the hindrances to implementing technology lie in the costs of implementation, lack of expertise among the employees, cybersecurity concerns, and organizational readiness for innovation in technology. The research further reveals that the zambian legal frameworks are also not aligned to the latest technology of artificial intelligence, making it difficult for organizations to implement these technologies in the banking sector. However, according to me, this research shares valuable information on the challenges faced by implementing technology in Zambia but does not focus on artificial intelligence implementation and does not present quantitative data on how to measure these hindrances. The gap associated with this research is that this research is qualitative and does not present exact quantitative data on the challenges associated with artificial intelligence implementation.

On the state of digital infrastructure in Zambia, Mutati (2024) evaluated it and concluded that the banks experienced a limitation in accessing a constant source of high-speed internet and electricity, particularly in non-urban areas. In my view, the infirastructural state has a direct impact or influence on the implementability of AI in Zambian banks. Research gap: I have sought to establish a research gap based on the inability of the authors to discuss the role of individual banks in incorporating AI strategies.

Chibesakunda (2021) examined the financial impact associated with digital transformation in Zambia's financial institutions, revealing that the financial implications arising from the high cost of acquiring, maintaining, and upgrading AI technologies had a remarkable financial impact on Zambia's financial institutions. Malambo (2022) observed that system failures and low transactional processing rates resulted in dissatisfaction among customers accessing digital banking services. Babashahi et al., (2024) established that the shortage of AI and data science experts in Zambia forces financial institutions to rely heavily on costly consultants. I firmly believe that, from the highlighted challenges, it is evident that Zambia's financial institutions are facing unique challenges that are different from what the global and regional literature suggests. The research gap lies in the study, where little research focuses on the impact of the challenges highlighted in the Zambian context on the AI technology implementation in specific financial institutions such as ZANACO.

The reviewed literature at the global, regional, and local level indicates that whilst many researchers have identified the challenges facing AI implementation in the banking sector, many of them took general approaches in their examinations. In other words, very little specific research exists in the field for Zambia in general and specific institutions in particular, in addition to specific examinations linking AI implementation challenges with business operations in Zambia. The researcher attempted to fill the gap in knowledge in this specific field with in-depth and specific examinations at ZANACO in Lusaka Central Business District.

## 3 Research Methodology

This study was therefore pragmatically conducted to explore both qualitative and quantitative methods of research on the challenges affecting AI technology implementation in Zambia's commercial banks, focusing on Zambia National Commercial Bank Plc, also known as Zanaco. Pragmatism as a research paradigm is characterized by combining both approaches into one in order to arrive at a comprehensive understanding of complex real-world problems, such as AI adoption in banking, where technical, organizational, and human factors meet. The choice of this approach in this study enables rich, context-specific data collection while also providing a measure for observable trends and relationships.

### 3.1 Research Design

For this study, it was essential to use a convergent parallel mixed design. The convergent parallel design was developed by Demir and Pismek (2018). According to these authors, this approach to design involves collecting qualitative and quantitative data, analyzing it, and combining it to obtain a better understanding of the phenomenon being studied. In this study, it helped to measure the prevalence and magnitude of perceived challenges with AI, while conducting qualitative research on experiences and perceptions concerning these challenges.

### 3.2 Population and Sampling

The target population included various categories of employees from Zambia National Commercial Bank Plc, particularly focusing on those working in various digital banking, IT, operations, and management-related fields within Lusaka, Zambia. About 350 officials fall under this category, according to Zanaco's internal staff directory. The stratified random sampling method was used. This was important to represent different levels and functional categories while conducting the research, thus providing diverse input from different departments, mid-management officials, senior officials, and executives (Bhandari, 2020). The target respondents were 120, while the total participants came out to be 108, out of them 90%.

For the qualitative research methodology, purposive sampling will be used, and 15 key informants, such as IT managers, AI project leads, and compliance officers, will be selected. They were selected because these individuals have direct links or are directly involved in AI projects, along with providing significant information about challenges with regard to operations and organizations.

### 3.3 Data Collection Methods

Data collection consisted of structured questionnaires for the quantitative part and semistructured interviews for the qualitative part. This questionnaire included statements in a 5-point Likert scale regarding major challenges to AI adoption, such as regulatory barriers, technological infrastructure, organizational readiness, employee skills, and cybersecurity concerns. Such statements were based on previously validated instruments from other studies dealing with AI implementation in the banking industry.

The semi-structured interviews explored participants' experiences of AI deployment, perceived obstacles in deploying the technology, strategies for overcoming such challenges, and how organizational culture and leadership may impact adoption. The interviews were performed both face-to-face and by video calls; each lasted around 45-60 minutes. With participants' consent, all interviews were audio-recorded and then transcribed verbatim for analysis.

### 3.4 Data Analysis Techniques

#### Quantitative data analysis

Quantitative data analysis techniques were also applied. Descriptive statistics, such as measures of central tendency (mean, median, mode) and measures of variability (standard deviation), were computed for characterizing the prevalence and severity of AI adoption challenge. Besides, cross-tabulation and chi-square tests were performed to establish relationships between different demographic factors, such as job position and job experience, and AI adoption challenge perceptions (Hayes, 2024).

#### Statistical tools for data

All statistical tests were computed using IBM SPSS 28. Qualitative data analysis involved the application of thematic analysis, which is a six-step process according to Naeem et al. (2023). The steps include familiarization, coding, thematic development, reviewing themes, definition, naming, and reporting. Additionally, the findings of both qualitative and quantitative data were integrated in the discussion section. The findings were integrated as a way of providing a more holistic understanding of the research problem. Themes were also categorized using a conceptual framework.

### 3.5 Ethical Considerations

Ethical approval was sought from the University of Zambia Ethics Review Board, and participants were given information on what this research was all about, that they were participating voluntarily, and that their confidentiality was upheld through informed consent at the start of this research. Data was kept secure so that only the research team could access it, and its privacy was upheld by anonymizing data at analysis level (Dembo & Ali, 2024).

Accordingly, in brief summary, it has been the pragmatic use of the mixed methodological approach which has enabled the current research to cultivate a breadth and depth of understanding pertaining to the challenges involved in the AI uptake at Zanaco.

## 4 Results

This section presents the findings from the research on the challenges affecting the implementation of Artificial Intelligence (AI) technologies by Zambia National Commercial Bank Plc (Zanaco). This will be presented by two main components: the quantitative findings from the structured questionnaire and the qualitative findings from the interview schedules. An overview of the integration of the findings will also be presented to provide a holistic understanding of the major challenges.

### 4.1 Quantitative Findings

The survey sample consisted of 108 respondents. Table 1 summarizes the demographic characteristics of the participants.

Table 1: Demographic Characteristics of Respondents

| Demographic Variable | Frequency | Percentage (%) |
|---|---|---|
| Gender | | |
| Male | 68 | 63.0 |
| Female | 40 | 37.0 |
| Age Group | | |
| 21–30 | 25 | 23.1 |
| 31–40 | 50 | 46.3 |
| 41–50 | 23 | 21.3 |
| 51+ | 10 | 9.3 |
| Job Level | | |
| Operational Staff | 40 | 37.0 |
| Mid-level Management | 45 | 41.7 |
| Senior Management | 23 | 21.3 |
| Work Experience | | |
| Less than 5 years | 22 | 20.4 |
| 5–10 years | 38 | 35.2 |
| 11–20 years | 32 | 29.6 |
| Over 20 years | 16 | 14.8 |

The demographic distribution indicates that the majority of respondents were between 31–40 years of age and primarily occupied mid-level management roles, suggesting a strong representation from personnel involved in operational and strategic decision-making related to AI deployment.

#### Challenges of AI Implementation

Participants were asked to rate the significance of various challenges affecting AI adoption on a 5-point Likert scale (1 = Not Significant, 5 = Highly Significant). Table 2 presents the mean scores and standard deviations.

Table 2: Key Challenges Affecting AI Implementation

| Challenge | Mean Score | Standard Deviation |
|---|---|---|
| Regulatory and Compliance Barriers | 4.32 | 0.72 |
| Inadequate Technological Infrastructure | 4.18 | 0.80 |
| High Cost of Implementation | 4.05 | 0.85 |
| Skills and Expertise Gaps | 4.21 | 0.78 |
| Employee Resistance to Change | 3.85 | 0.92 |
| Cybersecurity Concerns | 4.10 | 0.77 |
| Lack of Leadership Support | 3.68 | 0.95 |

The results indicate that regulatory and compliance barriers were perceived as the most significant challenge, followed closely by technological infrastructure gaps and skills shortages. Employee resistance and lack of leadership support were moderately rated but still relevant challenges.

#### Association Between Demographics and Perceived Challenges

A chi-square analysis revealed that employees with longer work experience perceived regulatory and technological

challenges as more significant compared to less experienced staff ($\chi^2 = 12.45$, $p < 0.05$). Mid-level and senior management were more likely to emphasize strategic and compliance-related challenges, while operational staff highlighted technological and skills-related issues. These findings suggest that perceptions of challenges vary according to organizational role and experience level.

## 4.2 Qualitative Findings

Thematic analysis of the 15 semi-structured interviews generated four main themes aligned with the study's conceptual framework: regulatory barriers, technological challenges, human-resource constraints, and organizational culture.

### Regulatory and Compliance Barriers

Participants highlighted that navigating Zambia's financial regulations was a major obstacle to AI implementation. Respondents cited the lack of clear guidelines on AI deployment in banking, concerns over data privacy, and uncertainty about liability for AI-driven decisions. One IT manager noted:

"*We are hesitant to fully deploy AI systems because regulatory clarity is missing. If an AI model makes an incorrect decision, the bank could face legal repercussions*."

This theme aligns with the quantitative finding that regulatory barriers had the highest mean score.

### Technological Infrastructure Challenges

Respondents indicated that AI adoption requires robust IT infrastructure, including high-speed networks, cloud computing, and secure databases. Several participants noted that existing legacy systems were incompatible with modern AI tools, creating integration challenges. A mid-level manager explained:

"*Most of our core banking systems are outdated, which makes it difficult to implement AI effectively without significant upgrades*."

This confirms the quantitative finding where technological infrastructure was identified as a critical challenge.

### Skills and Expertise Gaps

A recurrent theme was the shortage of personnel with AI expertise. Participants reported that both technical and managerial staff often lack the necessary training to leverage AI effectively. One AI project lead commented:

"*We have the software, but not enough staff who understand how to use AI tools strategically, which slows down implementation*."

This aligns with prior research emphasizing the importance of human capital in AI adoption (Ghandour, 2021; Dhashanamoorthi, 2023).

### Organizational Culture and Change Management

Several respondents highlighted resistance to change as a significant barrier. Employees accustomed to traditional banking processes were reluctant to adopt AI-driven workflows. Senior management acknowledged that fostering a culture of innovation and providing continuous training is critical for AI success. A senior executive stated:

"*Change management is essential. Without staff buy-in and leadership support, even the best AI technologies cannot succeed*."

This theme reinforces the moderate quantitative scores for employee resistance and leadership challenges.

### Integration of Findings

Therefore, this combination of quantitative and qualitative research findings shows the convergence of information indicating the major challenges affecting the adoption of AI at Zanaco Bank. As found by the quantitative study, the challenges to the adoption of AI by Zanaco Bank varied; however, information from the qualitative part also adds depth to understanding the implications for banking operations.

To summarize, it may be said that the results have shown that not only is it technology-related, but the successful implementation of AI in commercial banks in Zambia is also impeded by aspects such as regulation and HR, as well as organizational aspects. So, it is important that it is worked upon at every level.

## 4.3 Discussion

Significantly, the findings of this study offer important insights into some of the challenges facing the implementation of Artificial Intelligence (AI) technologies at Zambia National Commercial Bank Plc (Zanaco). For instance, by using both qualitative and quantitative findings, this study concludes that, just like in other African countries (Buxmann, Diefenbach & Hess, 2019; Dlamini & Mthembu, 2022), some of these challenges include regulatory, infrastructural, skill, and cultural issues.

### Regulatory and Compliance Barriers

Regulatory and compliance issues were identified as the biggest hindrance to the adoption of AI technology at Zanaco, which might have been a source of concern for its legal liability and issues of privacy. This is attributable to a lack of clear guidelines covering the application of this technology in Zambia's banking environment. It is, therefore, no surprise that other researchers, such as Crisanto et al. (2024) and Forlenza (2023), have cited analogous issues in developing economies as major factors hindering the adoption of technology in financial services. There is a dire need for banks to have clear policies covering issues and operations in AI technology in order to encourage its adoption.

### Technological Infrastructure Challenges

The findings from this study showed that there was a poor technology infrastructure, which consisted of legacy systems, poor computing resources, and poor integration capabilities, which hampered the implementation of AI. The interviewees also claimed that modern technology, which is used to implement AI, needs well-integrated systems and cloud computing systems (Arakpogun et al., 2021; Fares, Butt & Lee, 2022). The use of outdated technology not only hampers the implementation of AI systems but also exposes banks to potential risk because outdated systems may, in turn, affect system efficiency.

### Skills and Expertise Gaps

Another persistent factor in all results presented was the lack of personnel with adequate knowledge about AI, which is also an ongoing challenge for banking industries in Sub-Saharan Africa (Maree & Dlamini, 2022; Iluba & Phiri, 2021). Despite the existence of AI technologies, banks lack adequate personnel to effectively implement and interpret results from these technologies. Such results affirm the point made in the arguments of Brix & McAfee (2017), which asserts that human capital is as important as investment in technology in the effective utilization of AI technologies. Therefore, it is anticipated that banks invest in training and other capacity-building programs, such as workshops and interactions with educational institutions, to build sufficient human capital.

### Organizational Culture and Change Management

The study revealed employee resistance and limited support from the leadership as major cultural barriers. According to Rogers' theory of diffusion of innovations (2003), successful adoption of new technologies relates directly to the conditions of organizational readiness and acceptance by employees. Respondents reiterated that resistance usually emanates from the fear of losing one's job or inability to use AI tools, hence the need for an appropriate change management approach. Leadership should be at the forefront to create a culture of innovation that includes clear communication on the benefits of AI, along with incentive mechanisms for its adoption. This view has been supported by Venigandla & Vemuri, 2022.

### Comparison with Other Studies

The results of this study confirm earlier findings reported in other African countries, namely South Africa and Nigeria, where regulatory ambiguity, technological limitations, and skills shortages were identified as the main binding constraints to AI adoption in banking in those countries (Ogunleye & Adeyemi, 2021; Moyo, 2022; Pretorius, 2024). Unlike studies in more developed markets where technological readiness is often the only major obstacle, this study emphasizes the multifaceted nature of challenges in Zambia, where regulatory, human, and cultural issues are juxtaposed with technological limitations.

## 5 Conclusions, Implications and Limitations

### 5.1 Conclusion

This study aims to identify challenges to implementation, specifically in the context of Artificial Intelligence-based technology at Zambia National Commercial Bank Plc. (Zanaco). Challenges have been categorized along regulatory, technological, skill-based, and cultural dimensions. Results revealed that regulatory uncertainty and a lack of effective governance structure in the implementation of AI-based technology are major challenges to implementation, which corroborates earlier works on implementing financial technology in the context of developing economies (Crisanto et al., 2024; Forlenza, 2023). Secondly, in terms of technology itself, older infrastructure and a lack of effective IT infrastructure were revealed as major challenges to implementing AI-based technology, which canvasses views from earlier works on banks in sub-Saharan African economies (Dlamini & Mthembu, 2022; Arakpogun et al., 2021). Skills and trained manpower are also key challenges in implementing AI-based technology in Zanaco along with effective change management.

There are many ramifications from these findings. Investments in IT infrastructure, human capital, and training programs need to be a priority for banks to accommodate the effective use of AI applications. Policymakers at large, including the Bank of Zambia and ZICTA, must develop clear regulatory frameworks and standards that support legal certainty with relevant consumer protection interest. Organizational leaders should promote an innovative culture; transparent communication together with incentive mechanisms will facilitate greater staff buy-in and lower resistance.

While the present research has immensely contributed to the understanding of some key issues in the implementation of AI, there exist certain gaps in the research, which other researchers could focus on in the future. For example, the use of a single commercial bank can be expanded to other banks in Zambia and other countries in southern Africa. Additionally, a longitudinal study would be recommended to assess the consulting challenges as capacities and technological advancements increase in the future. Comparative studies would also help in understanding the challenges and implementation of AI in other banks in developed and developing nations.

Finally, it is crucial to note that for there to be success regarding the implementation of AI within the commercial banks in Zambia, various aspects have to be considered. Accordingly, it is critical that various factors are addressed at once to ensure that banks such as Zanaco reap the full advantage of AI, hence promoting its inherent utility.

### 5.2 Implications for Policy and Practice

The study provides several practical implications for banking practitioners and policymakers:

- Regulatory Reform: Clear AI governance frameworks are needed to provide banks with legal certainty while ensuring consumer protection.
- Technological Investment: Banks must upgrade legacy systems, adopt cloud infrastructure, and ensure data security to support AI applications.
- Skills Development: Investment in human capital is essential, including hiring AI specialists and providing continuous training for existing staff.
- Change Management: Leadership must actively promote a culture of innovation, address employee concerns, and incentivize AI adoption.

### 5.3 Limitations of the Study

This study shows some invaluable insights, although there are some limitations that should be recognised, including: The investigation was restricted to Zambia National Commercial Bank Plc only, which limits the scope of generalisation of findings to other banks in Zambia or within the region. Also, the data collected from surveys and interviews may be subject to respondents' bias, whereby the challenges would be overemphasized by those who answered the questionnaires and are thus interviewed. Because AI technology is so rapidly evolving, the need may very well be different if new tools are implemented and new regulations and training programs start to be put into place. The sample could be taken from multiple banks, and the studies could follow a longitudinal study design to realize changes over time.

**Declaration of Competing Interests**

The authors declare that they are not aware of any competing financial interests or personal relationships that may have influenced the work described in this document.

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**Ethical considerations**

The article followed all ethical standards appropriate for this kind of research.

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