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Technological Innovations And Financial Performance In Zambian Commercial Banks: A Systematic Literature Review

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Abstract:
This Article evaluates the impact of technological innovations on the financial performance of commercial Banks, with particular reference to Zambia. Based on studies published between 2003 and 2024, the review finds that the adoption of mobile and internet banking is generally associated with improved profitability, operational efficiency, and cost effectiveness. It further demonstrates that regulatory frameworks and security protocols play a critical moderating role in shaping adoption outcomes. Despite these gains, constraints related to digital infrastructure, financial literacy, and limited access among unbanked populations continue to hinder the full realization of technology-driven benefits in developing economies. The review consolidates existing evidence and highlights key research gaps to inform banking practice, regulation, and policy formulation.
Background*: Technological innovation has become a critical factor in transforming the banking sector, particularly through the adoption of mobile and internet banking. These digital technologies enhance service efficiency, reduce operational costs, and improve Financial performance while expanding access to financial services. In developing economies such as Zambia, digital banking also addresses structural challenges including limited banking infrastructure and financial exclusion. Empirical studies associate technology adoption with improved profitability and operational efficiency ; however, outcomes vary due to differences in infrastructure, regulatory frameworks, and digital literacy. Despite growing global evidence, context-specific research on Zambia remains limited, highlighting the need for focused analysis to inform banking practice, regulation, and policy.*
Materials and Methods*: This study conducted a structured narrative literature review to explore the impact of technological innovation on the financial performance of Zambian commercial banks. Research published between 2003 and 2024 was sourced from Google Scholar, Scopus, World Bank repositories, African banking journals, and reports from the Bank of Zambia and UNCDF. Studies on digital banking, financial performance, regulation, and financial inclusion were included. Following screening for relevance and quality, 32 studies were analyzed using thematic synthesis to identify patterns in technology adoption, performance outcomes, regulatory effects, and financial inclusion.*
Results*: Adoption of mobile and internet banking in Zambian Banks improves financial performance and operational efficiency. Regulatory factors influenced adoption, while limited internet access and low digital literacy hinder financial inclusion. Overall, technology enhances banking outcomes but is constrained by infrastructural and regulatory challenges.*
Conclusion: *Digital banking enhances financial performance, but its effectiveness depends on regulation, infrastructure, and user skills. Addressing digital literacy, connectivity, and inclusion barriers is essential for sustainable and equitable banking outcomes.*
Key Word: *Technology Adoption; Mobile Banking; Financial Performance; Financial Inclusion; Banking Regulations; Digital Literacy.*

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I. Introduction

Technological innovation, particularly through mobile and internet banking, has profoundly transformed the banking sector worldwide, enhancing service delivery, operational efficiency, and customer accessibility. These digital platforms allow banks to streamline transactions, reduce costs, and reach previously underserved populations, thereby supporting financial inclusion and institutional sustainability. In developing countries such as Zambia, however, adoption remains uneven due to varying regulatory frameworks, infrastructural limitations, and socio-economic disparities, which influence both the uptake of technology and its impact on financial performance. Understanding the relationship between digital banking adoption, operational outcomes, and financial inclusion is therefore critical for banks, regulators, and policymakers seeking to leverage technology for

sustainable growth, improved efficiency, and broader access to financial services. This review synthesizes theoretical and empirical evidence to provide insights into the drivers, outcomes, and barriers of technology adoption in the banking sector, with implications for practice and policy.

II. Material And Methods

This study investigated the relationship between digital banking innovations and the financial performance of commercial banks in Zambia. It focused on the adoption of mobile and internet banking and automated customer services, examining their impact on profitability, operational efficiency, and financial inclusion while considering external factors such as regulatory frameworks and technological readiness.

Study Design: A quantitative correlational research design with a mixed-methods approach was employed to explore the effects of digital banking on financial performance.

Study Location: The study was conducted in selected commercial banks across urban and peri-urban areas in Zambia.

Study Duration: Four Months

Sample size: A total of 150 bank customers, 50 bank employees, and 50 unbanked community members participated in the study.

Sample size calculation: The sample size for this study was estimated using a single proportion design. The target population comprised approximately 15,000 bank customers across the selected commercial banks in Zambia. Assuming a confidence level of 95%, a confidence interval of 10%, and an estimated proportion of 50%, the minimum required sample size was calculated to be 96 participants per group. To account for potential non-response and dropouts, the sample size was increased by 4%, resulting in a final target of 100 participants per group. This ensured adequate representation across the three groups: bank customers, bank employees, and unbanked community members, facilitating reliable and statistically valid findings**.**

Subjects & selection method: The study population was drawn from bank customers, employees, and members of the unbanked community in selected commercial banks and surrounding areas in Zambia. Participants were selected based on their engagement with or experience of digital banking services. The total sample was divided into three groups: 100 bank customers, 50 bank employees, and 50 unbanked community members.

Bank customers and employees were directly approached and randomly selected to participate through structured questionnaires distributed at the banks. This approach ensured fair representation while maintaining the randomness of selection among those who consented to participate. Members of the unbanked community were purposively selected from urban and peri-urban areas to include individuals with limited or no access to formal banking services. This grouping allowed for a comprehensive assessment of digital banking adoption and its effects across different stakeholders within the Zambian financial sector.

Inclusion criteria:

1. Bank customers and employees actively engaged with commercial banking services
2. Adults aged 18 years and above
3. Members of the unbanked population not enrolled in formal banking systems.

Exclusion criteria:

1. Individuals unwilling to provide informed consent
2. Participants lacking adequate knowledge of banking services or digital platforms
3. Bank clients or employees unavailable during the study period

Procedure methodology

After obtaining ethical approval from the relevant review committee and written informed consent from all participants, data collection was conducted using structured questionnaires and interviews. Bank customers and employees were directly approached at their respective banks, while members of the unbanked community were recruited from urban and peri-urban areas through purposive sampling.

The questionnaire was designed to capture comprehensive information on socio-demographic characteristics (age, gender, education, occupation), engagement with banking services, frequency of digital banking use, types of digital platforms accessed (mobile banking, internet banking, automated customer services),

and overall satisfaction with banking services. For the unbanked population, additional questions addressed barriers to access, awareness of banking services, and reliance on alternative financial mechanisms.

Quantitative data regarding bank performance metrics, including Return on Assets (ROA), Return on Equity (ROE), loan-to-deposit ratios, and cost-to-income ratios, were obtained from internal bank records for the same period. Qualitative data were collected through semi-structured interviews with 50 selected stakeholders, including bank staff and community representatives, to explore challenges, regulatory influences, and perceptions of digital banking adoption.

All data were collected over a period of three months. Questionnaires were administered in person and responses were checked for completeness immediately to reduce missing data. For illiterate participants in the unbanked group, trained research assistants conducted the questionnaire orally to ensure accurate and consistent responses.

Biometric and financial metrics, where applicable (e.g., transaction frequency, mobile banking usage), were verified using self-reported data complemented by available bank records. Data on operational performance and financial outcomes were anonymized before analysis to maintain confidentiality.

The collected data were entered into a secure database, with access limited to the research team. Coding and categorization were performed to prepare the data for statistical analysis, ensuring accuracy and consistency across all participant groups. This methodology ensured a rigorous, ethical, and comprehensive approach to capturing the effects of digital banking adoption on financial performance and inclusion in Zambia.

Statistical analysis

Data were analyzed using SPSS version 20. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were computed to summarize participant characteristics, digital banking adoption, and financial performance metrics (ROA, ROE, loan-to-deposit, cost-to-income ratios). Correlation analysis was conducted to assess the strength and direction of relationships between digital banking adoption and financial performance indicators. Multiple regression analysis examined the effect of digital banking adoption on financial outcomes while controlling for factors such as regulatory environment, technology readiness, and participant characteristics. For categorical variables, Chi-square tests were used to evaluate differences between groups, and t-tests were applied for comparisons of continuous variables where appropriate. Significance was set at $p < 0.05$. Qualitative interview data were analyzed thematically to identify barriers, facilitators, and perceptions of digital banking adoption among stakeholders.

III. Result

The study found that higher adoption of mobile and internet banking is linked to improved financial and operational performance in banks, including better ROA, ROE, and loan-to-deposit ratios.

Regulatory frameworks and security protocols influence the adoption of technological innovations, though their effect varies across institutions. Barriers such as limited digital literacy and poor internet access restrict financial inclusion for the unbanked population. Overall, technology adoption enhances bank performance but targeted interventions are needed to address access challenges.

Figure 1 shows the adoption rate of mobile banking among colleagues as perceived by respondents. The majority of respondents (45.45%) estimated that 51% to 75% of their colleagues use mobile banking services, while 39.39% indicated that more than 75% of their colleagues have adopted these services. A smaller portion, 15.15%, estimated adoption rates between 25% and 50%. These findings suggest that mobile banking is widely accepted and relied upon, with most respondents perceiving moderate to high levels of usage within the population under study.

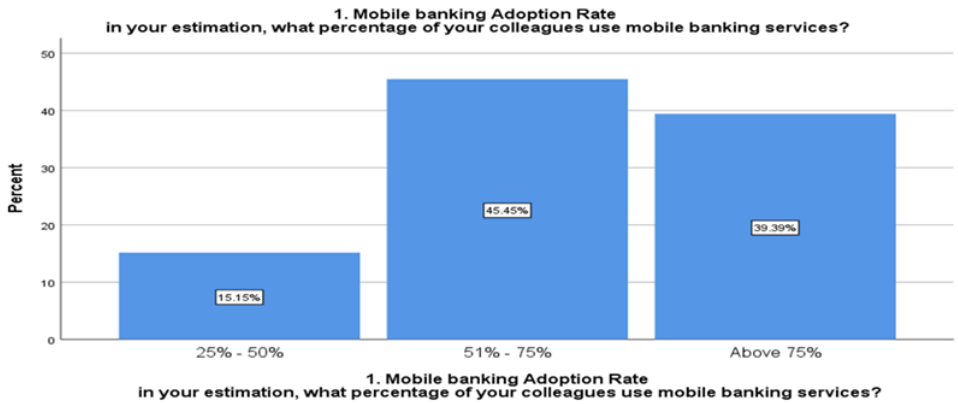

FIG 1

Figure 2 investigates the relationship between mobile banking adoption and Return on Assets (ROA) in commercial banks in Zambia for the year 2024. The analysis shows that banks with ROA greater than 2% are predominantly in the higher adoption categories of 51%-75% and above 75%, indicating that increased mobile banking usage is associated with better financial performance. Conversely, banks with ROA below 2% are mostly concentrated in the 25%-50% adoption range, suggesting a correlation between lower mobile banking adoption and lower profitability. These findings imply that greater adoption of mobile banking enhances operational efficiency and contributes to improved financial performance in the Zambian banking sector.

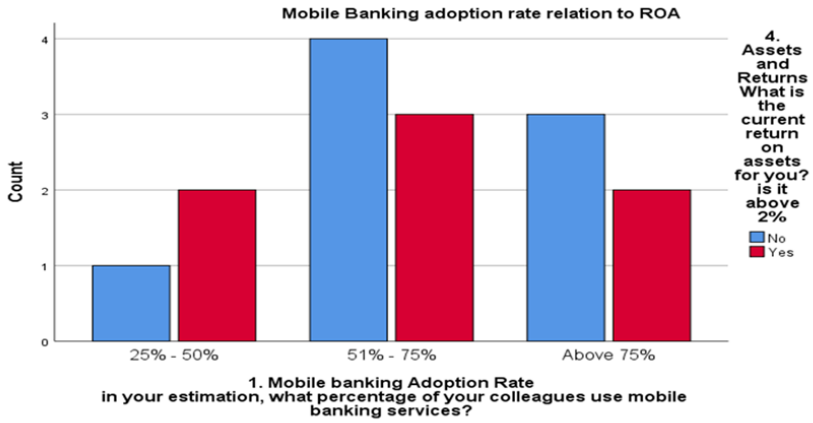

FIG 2

Figure 3 shows the relationship between mobile banking adoption and Return on Equity (ROE) in commercial banks in Zambia. The analysis indicates that banks with ROE above 10% generally have high adoption rates of mobile banking, predominantly within the 51%-75% and above 75% categories. In contrast, banks with lower adoption rates of 25%-50% mostly reported ROE below 10%. These findings suggest that increased mobile banking adoption is linked to higher operational efficiency and profitability, highlighting its positive impact on financial performance in the Zambian banking sector.

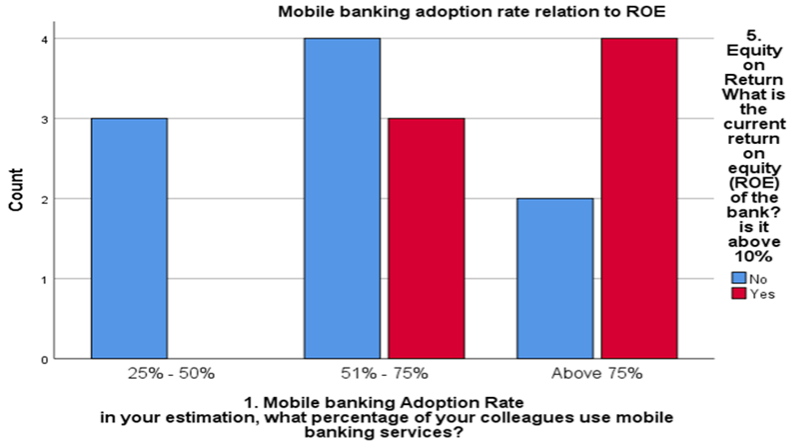

FIG 3

Figure 4 shows the relationship between the effectiveness of Internet banking systems and the loan-to-deposit ratio in selected banks. Banks with loan-to-deposit ratios above 80% were found to offer a higher degree of automated banking services, indicating that greater use of automation is associated with better operational performance. In contrast, banks with loan-to-deposit ratios between 5% and 10% showed mixed levels of automated service adoption, suggesting that the performance benefits of Internet banking are less consistent in banks with lower ratios. Overall, the findings indicate that while higher automation tends to support better operational performance, this relationship is more pronounced in banks with higher loan-to-deposit ratios.

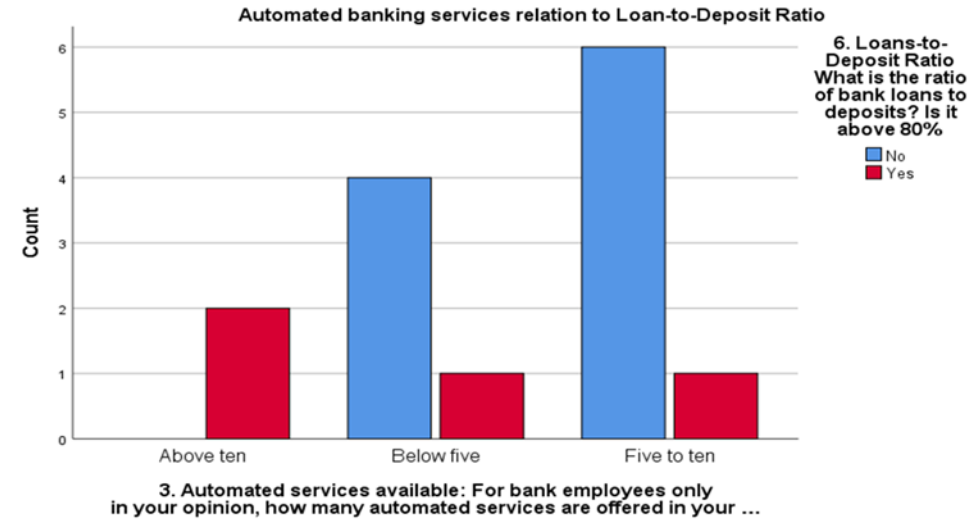

FIG 4

Figure 5 shows the relationship between automated banking services and the cost-to-income ratio in selected banks. The analysis reveals that banks with a cost-to-income ratio below 50% tend to offer more automated services, indicating better cost efficiencies. In contrast, banks with ratios above 50% displayed mixed adoption of automated services, with some offering them and others not. These findings suggest that while higher automation may contribute to lower operational costs, the relationship is not uniform across all banks, and other factors may influence cost efficiency.

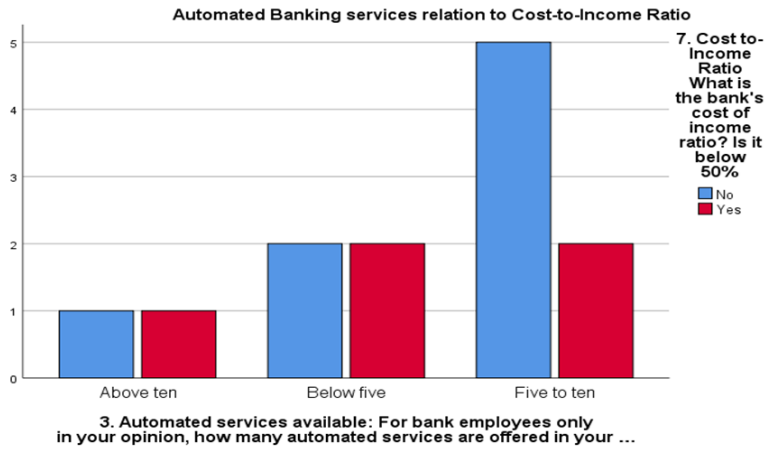

FIG 5

Figure 6 shows the presence of security protocols in banks and their relationship to the regulatory environment for technological changes. Interviews with practitioners indicate that banks implement security measures to varying degrees. Data encryption was used by 20% of banks, while 46.6% had some form of multifactor authentication and conducted intermittent security assessments. Additionally, 13.33% reported other security measures, 6.67% used only multifactor authentication, and another 13.33% performed periodic security audits. These findings highlight that while most banks have some security protocols in place, the level of implementation varies, with many relying primarily on periodic evaluations.

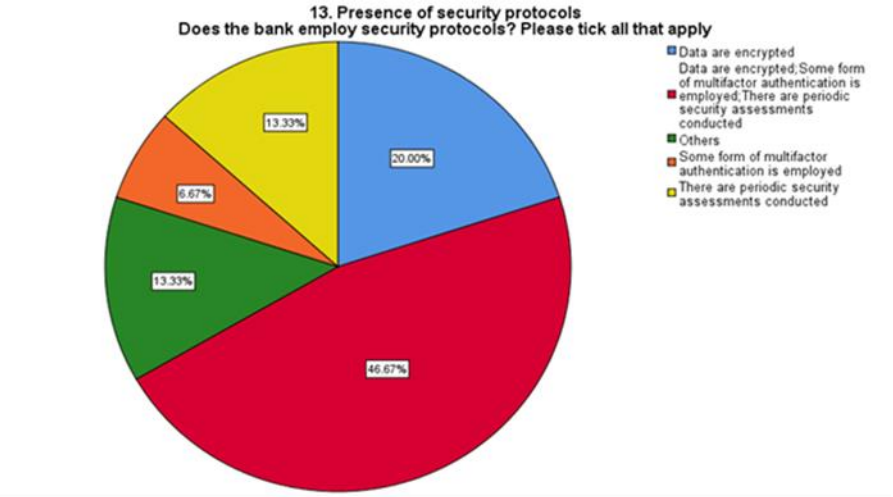

FIG 6

Figure 7 shows the effects of regulation on technological innovation in banks. The analysis indicates that 20–50% of respondents believed regulations had little or no impact on innovation, suggesting that regulatory frameworks may provide minimal incentive or constraint. Responses in the 51–75% range were mixed, reflecting varied perceptions of regulatory influence from low to high. In banks where more than 75% of respondents provided input, regulations were seen as ranging from a barrier to a strong driver of innovation. Comparisons with mobile banking adoption revealed that banks perceiving high regulatory influence tended to have higher adoption rates, although other factors also affected mobile banking uptake. (10)

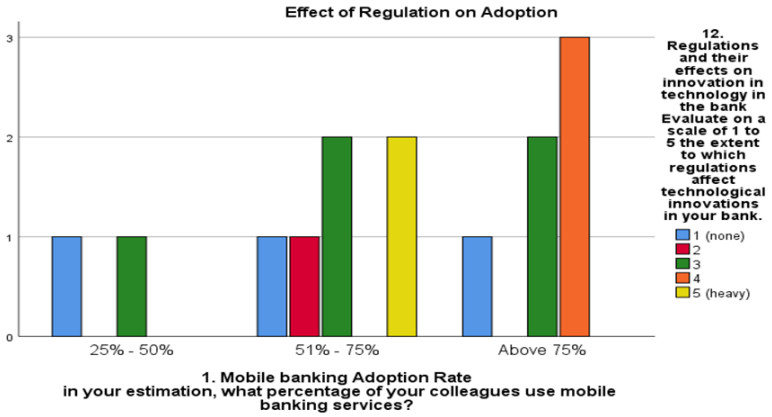

FIG 7

Figure 8 shows the technological factors that inhibit financial access for the unbanked population in Zambia. The analysis indicates that over 20% of the population in some areas remains unbanked, highlighting a significant challenge for financial inclusion. Respondents who conducted bank-related transactions less than three times a month showed mixed responses regarding access barriers, while those using online banking more than five times a month generally reported fewer challenges. Participants using online banking up to five times a month indicated partial engagement, suggesting that barriers such as limited internet access, low digital literacy, and restricted online banking services contribute to financial exclusion. These findings underscore the need for further community-level investigations to address technology-related obstacles to financial access.

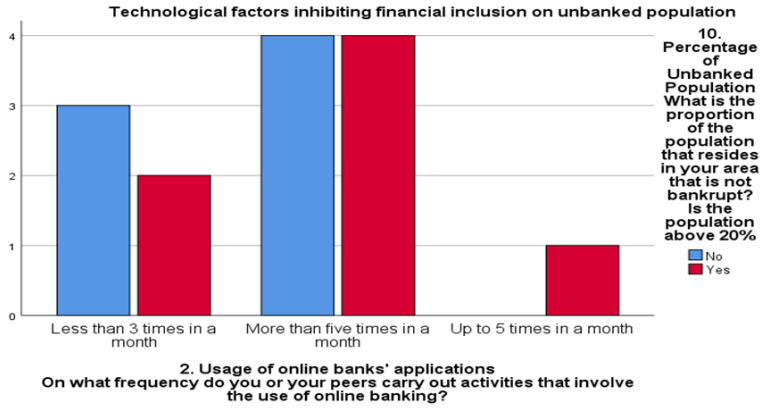

FIG 8

IV. Discussion

The findings from this research indicate that technological adoption, mainly mobile and internet banking, affects considerably Zambian commercial banks' financial and operational performance. The study of mobile banking adoption indicated that banks with over 50 percent of higher usage rates were constant in reporting financial performance which was good, as shown by Return on Equity (ROE) and Return on Assets (ROA) improved. The technology-driven banking service window has created and continues to create strategic Value for both the banks by way of being able to take a competitive and efficient stance in the market and customers by way of convenience; in other words, the transformation or conversion of old banking habits into new technology-based ones is now a must for every bank, and through using mobile banking, for example, the banks will be in a position to enhance their operational efficiency, cut transaction costs, and generate more Revenue. Mobile banking usage and performance metrics relationship is consistent with current research that spots online money transfers and other digital services as the main factors of profitability and permanence of the banking industry.

Internet banking and automated banking services were also found to be significant drivers of operational efficiency. Banks that had a higher loan-to-deposit ratio and a lower cost-to-income ratio were found to adopt more automated services, thus improving their financial performance. On the other hand, the aforementioned relationship was less strong in the case of the institutions with lower operational metrics, which indicates that the adoption of technology is not always accompanied by performance improvement. Rather, the realization of the full benefits of automation requires blending the technology with complementary strategies such as employee training, process re-engineering, and customer education. Our results are consistent with studies conducted earlier which also concluded that the technological impact on the banking sector is strongest when it is backed by good management practices and a corporate culture that encourages innovation.

Furthermore, the research investigated to what extent the regulatory framework and security measures impacted the adoption of new technologies. The results pointed to banks that implemented the most robust security methods like multifactor authentication and data encryption as being the ones that were most inclined to take up new digital banking services. Just as it turned out that the institutions that regarded regulations as supportive drivers were commonly linked to the higher adoption of mobile and internet banking. In contrast, the influence of regulations was different for each bank, with some banking institutions not seeing any significant impact of regulations on their innovative spirit. This mixed effect is a reflection of the complex interaction among compliance, security, and innovation in the banking sector. Therefore, regulatory frameworks have to find a middle ground between protecting the financial systems and promoting technological innovation in order not only to create but also to reap the benefits of adoption and performance gains.

An important detail from the research is related to the factors that hinder the unbanked people from getting into the financial system. Technological problems such as limited internet access, low digital literacy, and insufficient online banking features were pointed out as the major reasons why digital financial services were not more widely used. People living in areas where banking activities were done seldomly and mostly through digital were more prone to come across these barriers. These results correspond to the literature on financial exclusion, which asserts that merely adopting technology will not guarantee inclusive access unless infrastructural and socio-economic problems are tackled as well. It is still very important to deal with these barriers through financial literacy programs, better internet infrastructure, and more user-friendly digital platforms as interventions to make the technologically adopting people benefit from it.

The discoveries of the research have also pointed out some policies and management implications that are no less important. Creating an environment that allows technology adoption to flourish can be done by providing support for digital infrastructure development and setting up the regulatory frameworks that are

innovation-friendly and clear to the innovators. The banks will gain full benefits of both profitability and operational efficiency if they make mobile and internet banking services their top investment area, and at the same time apply good staff training and customer engagement techniques. Moreover, by conducting community outreach programs and launching campaigns to train the public digitally, support for financial inclusion will be granted and through this, the population that was previously unbanked will be reached and the entire society will enjoy the technological adoption benefits.

V. Conclusion

To sum up, the research has shown that the adoption of new technology is a major factor in the financial and operational success of Zambian banks, leading to better performance, and hence, more customers. Nonetheless, the impact of technology is subject to the presence of good operational practices, regulations, security measures, and accessibility. Although mobile and internet banking can significantly raise performance levels, their effect on the overall financial inclusion will still need to be addressed through specific measures that target technological, infrastructural, and literacy-related barriers. The results of this study not only deepen the comprehension of digital banking's role in the sustainable growth of the banking sector but also point to areas of future research and policy that need to be focused on, especially in terms of improving access for the unbanked population.

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