

Determinants of Technological Innovation Adoption and Banking Operations of Some Selected Commercial Banks in Somalia

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Abstracts: It's amazing to see how technology is transforming the financial industry. From accounting to management, technology has revolutionized all aspects of banking, and customers are benefiting from better and more streamlined services. The aim of this study is to explore the impact of technological innovations on the operations of commercial banks in Somalia. Through a cross-sectional survey of licensed bank employees, this study investigates the relationships between perceived ease of use, compatibility, and IT infrastructure in shaping banking operations. Employing the Yaro Yamane formula, a sample size of 196 was determined for the survey. Data was analyzed using SPSS and SmartPLS, revealing that IT infrastructure and perceived ease of use have a significantly positive influence on banking operations, while compatibility had insignificant relations with banking operations. These findings align with previous research, indicating that advanced technology enhances customer experience, interconnects banking systems, improves efficiency, and fortifies security measures. This study recommends collaborative efforts between the Somali government and the Central Bank to enhance security measures and combat fraud in electronic banking, thereby fostering investor confidence and facilitating economic growth. The research contributes to the ongoing transformation of the Somali banking sector through insightful determinants of technological innovation adoption.

Keywords: Ease of Use, Compatibility, ICT Infrastructure, Bank Operations, Somalia.

1. INTRODUCTION

Technological innovation is crucial in any contemporary economy by enabling companies to embrace improved business methods. Within financial services, especially the commercial banking sector, technology innovation is regarded as developing and promoting novel or refined financial tools, technologies, establishments, and markets that enhance the availability of information, trading, and payment mechanisms (Ngando, 2017).

Efficient banking operations are crucial in advancing the stability, sustainability, and promotion of financial inclusion by commercial Banks in Somalia. Despite the collaborative efforts of monetary authorities to bolster smooth banking processes through technological advancements within the banking industry, these banks still grapple with challenges in maintaining optimal operational efficiencies. These challenges stem from persistent issues like frequent network outages, system downtimes, limited financial awareness, instances of electronic fraud, and transactional inaccuracies.

Banking operations encompass the methods and protocols a financial institution utilizes to guarantee the accurate and proper execution of customer transactions. This encompasses the strategies employed by banks to maintain a reliable payment system consistently. Furthermore, banking operations involve the procedures established by the bank to safeguard its customers against potential risks to their financial assets. In essence, banking operations encompass the lawful activities conducted by a bank in its day-to-day operations, including services like lending, mortgages, and investments (Sahem, 2015).

Banks hold a paramount position among financial institutions, contributing significantly to the economic growth of nations (Adegbe & Dada, 2018). They act as intermediaries, procuring funds primarily from surplus sectors and channeling them into the deficit sectors of the economy, thus forming a crucial financial foundation. Previous research conducted by Ssekiziyivu et al. (2017); Bananuka et al. (2018); Nalukenge et al. (2018), and others, have explored the link between technological innovation and banking operations across various global

contexts. Notably, there remains a scarcity of studies delving into banking operations through the lens of technological innovation adoption.

In the 21st century, countries such as the United States of America, Japan, the United Kingdom, and various European nations experience a banking sector that functions within a multifaceted and competitive landscape. This environment is marked by fluid circumstances and an exceptionally volatile economic backdrop, where Information and Communication Technology (ICT) plays a central role in driving transformation. In a worldwide context, the fundamental operations of the banking industry necessitate digitization to offer inventive services to thrive in this ever-evolving business milieu.

As Yaw and Boachie (2018) noted, banks are actively capitalizing on information technology trends to seek technological innovation, encompassing product and process enhancements. This approach leads to advancements in the methods of service delivery, heightened operational efficiency, and reduced transaction processing time.

The relationship between technological innovation and banking operations becomes evident through several outcomes, including an increased customer base, higher transaction volumes, improved efficiency, enhanced quality, and heightened profitability (Ngugi & Karina, 2013). Similarly, Drucker (2013) highlighted that technological innovation imparts a competitive advantage by enabling banks to leverage technology for improved efficiency and quality. Additionally, Mohamed & Yonis (2012) emphasized the role of technology in operational management components like planning, scheduling, and service production.

The banking sector in Somalia has faced numerous challenges in recent decades due to political instability and conflict. However, in the past few years, efforts have been made to rebuild the banking system and adopt new technologies to improve financial inclusion. This study examines the determinants of technological innovation adoption on banking operations among selected commercial banks in Somalia and how it has impacted their operations.

2. LITERATURE REVIEW

The empirical studies investigating the effect of technological innovations on banking operations. The first section examines technological innovations such as perceived ease of use, compatibility, and ICT Infrastructure. The second sections explain variables of banking operations measured by operational efficiency and operational structure. The literature also highlights the study's theories, empirical review, and research model.

2.1. Technological Innovations

Technological innovations are new or improved software, systems, processes, or devices introduced into an organization (Rogers, 2016). In banking, common technological innovations include automated teller machines (ATMs), telephone banking, online banking, mobile banking, and agency banking (Ozili, 2018). These allow customers to access banking services outside the bank branch (Frame & White, 2016). Other back-office innovations aim at improving operations and minimizing costs. For instance, banks implement enterprise resource planning (ERP) systems, customer relationship management (CRM) systems, data analytics, and automation of processes (Ozili, 2021). These innovations enable banks to enhance efficiency in credit processing, risk management, and transaction processing (Hinson, 2011).

2.1.1. Perceived Ease of Use

Perceived ease of use (PEU) refers to the degree to which an individual believes that technological innovation would require minimal effort. Innovations that are complex and difficult to understand often have low adoption rates (Makanyeza, 2017). According to Davis (1989), users are more likely to accept and use new systems that they perceive to be easy to understand and operate. The perceived complexity of an innovation is

a key determinant of adoption in organizations. In banking, users (staff and customers) readily accept mobile banking and agency banking technologies because they are easy to understand and use (Aboelmaged & Gebba, 2013). However, complex back-office systems often require extensive training before successfully being adopted (Makanyeza, 2017).

2.1.2. Compatibility

Compatibility evaluates the degree to which an innovation fits with potential users' existing values, experiences, and current needs (Rogers, 2012). If the innovation is compatible, its adoption is easier since it does not require significant changes in processes or work routines. Studies show that the perceived compatibility of an e-banking system positively influences its adoption (Mujinga, 2012). Banks can enhance compatibility by implementing flexible systems that integrate well with legacy systems. Also, user training helps align innovations to daily banking tasks, enhancing compatibility.

2.1.3. ICT Infrastructure

ICT infrastructure plays a critical role in facilitating the adoption of e-banking systems, much like it does for other initiatives. When sufficient development and high-quality ICT infrastructure are in place, adopting and utilizing e-banking can thrive (Hinson, 2011).

2.2. Banking Operations

Banking operations entail the day-to-day activities and processes aimed at delivering services to customers. Examples include account opening, processing transactions, providing loans and credit, facilitating payments and transfers, and offering financial advice (Pedrotti & Böhme, 2020). Technology impacts these activities in several ways. First, manual paper-based processes transition to automated electronic processes, which enhances efficiency. Secondly, technology enables the expansion and personalization of services. Lastly, mobile/online banking innovations facilitate self-service, allowing customers to perform transactions remotely (Hinson, 2011).

2.2.1. Operational Efficiency

Operational efficiency refers to the ability of a bank to deliver products/services to customers at low costs and high speeds (Drigă & Isac, 2014). Technology adoption leads to higher operational efficiency in several ways. Automating repetitive back-office activities reduces labor costs and minimizes errors (Mutula & Wamukoya, 2007). Also, electronic delivery channels such as agency banking and mobile banking increase service access points at an affordable cost (Safeena et al., 2011). Moreover, computerized systems allow faster credit scoring, transaction processing, and decision-making. Overall, technological innovations in banking aim at cutting operational expenses and improving process efficiency.

2.3. Theoretical Framework

2.3.1. Diffusion of Innovations Theory (DOI)

DOI explains how new ideas and technologies spread within a social system over time (Rogers, 2003). According to DOI, adoption is influenced by innovation characteristics (relative advantage, compatibility, complexity, trialability, observability), type of decision (individual or collective), and environmental factors. Previous studies have applied DOI in information systems and e-banking adoption research (Hinson, 2011; Safeena et al., 2011).

2.3.2. Silber's Constraint Theory of Innovation

The Constraint Theory of Innovation, first proposed by Silber in 1975, provides a framework for understanding the drivers behind financial innovation in banks and financial institutions. The theory posits that financial innovation allows firms to optimize efficiency and bolster profitability by managing internal and external constraints. Technological innovation is viewed as a key enabler, allowing banks to reduce costs through more efficient service delivery, as Gakure & Ngumi (2013) noted. This cost-reduction effect is one function of financial innovation. The other is expanding markets and enabling new product development. So technological innovations in banking serve the dual purposes of streamlining internal processes to cut costs and providing tools for cultivating new markets and revenue streams. In short, the Constraint Theory sees financial innovation, enabled by technology, as a strategic response to constraints, with the twin benefits of operational efficiency and revenue growth through market expansion.

2.3.3. Technology-Organization-Environment (TOE) Framework

Developed by Tornatzky and Fleischer (1990), the TOE framework explains the process of technological innovation adoption. It posits that adoption decisions are influenced by three factors: technological context, organizational context, and external environment context. Technological aspects include existing technologies, new technologies, and technology readiness. Organizational context covers the managerial structure, human resources, linkages between departments, and internal processes/resources. Lastly, the external environment encompasses industry characteristics, government regulation, technology support infrastructure, and market competition (Baker, 2012). The TOE framework provides a suitable lens for investigating technological innovation adoption in the banking sector.

2.4. Empirical Review and Research Model

In Kenyan banks, factors driving the adoption of agency banking included perceived benefits, government regulations, the bank's IT capability, and the availability of shared platforms (Mbugua, 2015). However, the lack of infrastructure in remote areas hinders wider adoption. In India, perceived ease of use, observability, demonstrability, internal/external pressure, and regulatory support influenced mobile banking adoption among managers of public sector banks (Kumar, A., Dhingra, S., Batra, V., & Purohit, H. (2020)). Security concerns and unfavorable internal resistance stifled adoption. Hinson (2011) found that innovation characteristics, individual attitudes, bank readiness, and enabling environment to determine the adoption of e-banking by Ghanaian banks. The main barriers are aging ICT infrastructure, resistance to change, and lack of integration with other systems. In Malaysia, Islamic bank managers considered perceived benefits, government regulation, and market forces the main determinants of e-business adoption (Chong, 2012). Lack of expertise and high costs hindered technology adoption. In Romania, bank type, availability of IT resources, and existing delivery channels impacted the adoption of Internet banking (Drigă & Isac, 2014).

3. METHODOLOGY

This study employs a descriptive research design because the study tried to obtain information concerning the effect of technological innovations on the bank operations of commercial banks in Somalia. A descriptive research design determines and reports how things are (Singh, 2014). This design was appropriate for this study since the samples were large, and much data was to be collected quickly and at one point.

The target population for the study of the employees of commercial banks in Somalia. The study adopted Yaro Yamane formula to determine the sample size. The sample size involved 196 respondents from the target population. The researcher also employs a random sampling technique was used.

Questionnaires were adapted and employed for the purpose of gathering and disseminating data. A Likert scale questionnaire was designed to elicit responses that address the research objectives. Descriptive statistics was used to describe study constructs, while inferential statistics is used to test the hypothesis of interest. In the study, the authors utilized SPSS and SmartPLS to evaluate the measurement and structural model proposed by (Hair et al., 2014).

The current research builds upon the work of Salami et al., (2022), who investigated the impact of technological innovations on banking operations within Nigeria. Adapting their framework to align with the research objectives, the authors have made modifications to the model presented in their study as follows:

$$BO = \alpha_1 + \beta_1 PER + \beta_2 COM + \beta_3 ITIF$$

BO = Banking Operations

PER = Perceived Ease of Use

COM = Compatibility

ITIF = ICT Infrastructure

α_1 = Banking Operation in the absence of ease of use, compatibility, and ICT infrastructure.

β_1 = The partial change in banking operation due to a one-unit change in ease of use while other things remain constant

β_2 = The partial change in banking operation due to a one-unit change in compatibility while other things remain constant.

β_3 = The partial change in banking operation due to a one-unit change in the ICT Infrastructure variable while other things remain constant.

4. RESULTS AND DISCUSSION

4.1 Descriptive Analysis

Table 1. Respondents profile

Demographic attributes		Frequency (No.)	Percent (%)
Gender	Male	106	54.1
	Female	90	45.9
Age	20-30	54	27.6
	31-40	60	30.6
	41-50	54	27.6
	Above 50	28	14.3
Educational Level	Secondary	37	18.9
	Degree	73	37.2
	Master	69	35.2
	PhD	17	8.7
Marital Status	Single	110	56.1
	Married	86	43.9
Experience	Less than 1 year	53	27
	1-5 years	62	31.6
	6-10 years	53	27
	10 years and above	28	14.4

Table 1 presents an overview of the demographic characteristics of the study participants, who consisted of 196 employees of commercial banks in Mogadishu, Somalia. The gender distribution reveals that among the total respondents, 106 were male, accounting for 54.1%, while the remaining 90 respondents were female, representing 45.9%. These findings indicate a prevalence of male employees within commercial banks in Mogadishu, Somalia.

Regarding age distribution, the study categorized participants into four age groups: 31 to 40 comprised the largest group, 60 individuals, or 30.6% of the total respondents. Additionally, 54 respondents fell within the 20 to

30 age brackets, constituting 27.6%. Similarly, another 54 respondents were between 41 and 50 years old, representing an equivalent percentage of 27.7%. Lastly, 28 respondents were aged above 50 years, accounting for 14.3% of the total. Notably, the dominant age group among commercial banking employees in Mogadishu, Somalia, is 31 to 40 years old, reflecting a significant presence of youthful employees.

Turning to educational backgrounds, the survey revealed that 37 respondents (18.9%) possessed a secondary education level, while a majority of the respondents, 73 respondents (37.2%), had completed a bachelor's degree. Specifically, 69 individuals (35.2%), held a master's degree, and 17 respondents (8.7%) had obtained a PhD. Consequently, the majority of participants possessed degree-level qualifications.

Analyzing marital status, the data demonstrates a higher number of single respondents than married ones. Specifically, 86 respondents (43.9%) were married, whereas 110 respondents (56.1%) were single.

Regarding organizational experience, the findings indicate that 27% of participants had less than one year of experience, while another 31.6% reported having 1-5 years of experience. Additionally, 27% of respondents had 6-10 years of experience, and a minor proportion, 14.4%, claimed to possess over 10 years of experience.

Overall, Table 1 provides insights into the demographic attributes of employees of commercial banks in Mogadishu, Somalia, highlighting aspects such as gender distribution, age composition, educational attainment, marital status, and organizational experience.

4.2. Inferential Statistics

4.2.1. Measurement Model

The authors utilized Partial Least Squares (PLS) software called Smart PLS 3 to evaluate this study's measurement and structural models, as Hair et al. (2011) suggested. PLS was chosen for two key reasons: First, PLS is well-suited for exploratory research like this study (Henseler et al, 2009). Second, PLS has recently gained wider acceptance in consumer and service research (Sarstedt, 2008).

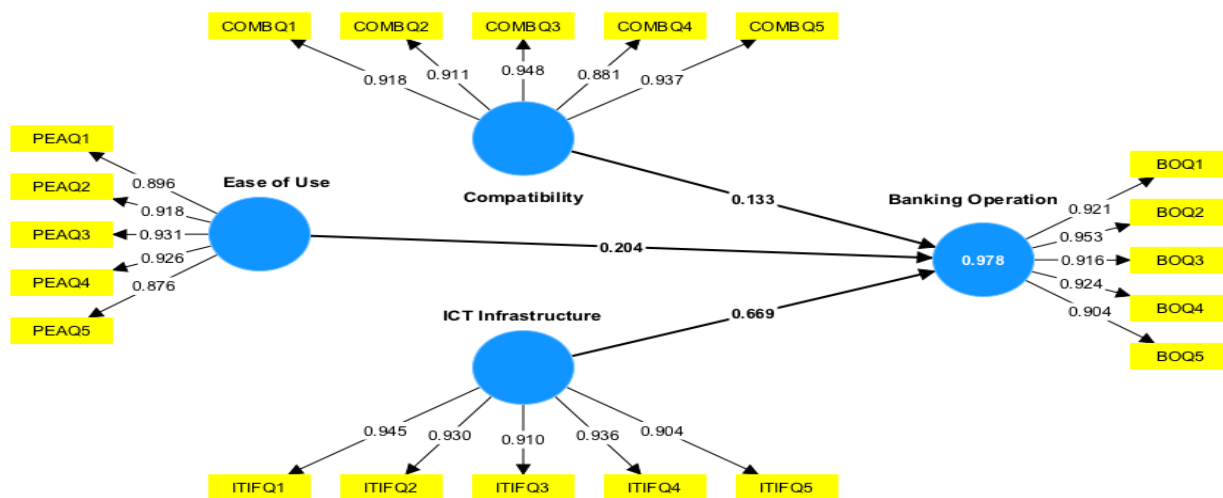


Figure 1. Measurement Model

The measurement model is used to assess the quality of the study's variables. Measurement models refer to the implicit or explicit models that relate the latent variable to its indicators. Examining the quality criteria starts with the factor loadings, and then the concept of validity and reliability is developed.

Table 2. Internal Consistency, Rhea, composite reliability, and AVE

Construct	Indicator	Standardize loading	Cronbach's alpha (>0.70)	Composite Reliability- CR (>0.70)	Average Variance Extracted - AVE (>0.50)
Banking operations	BOQ1	0.921	0.957	0.957	0.915
	BOQ2	0.953			
	BOQ3	0.916			
	BOQ4	0.924			
	BOQ5	0.904			
Compatibility	COMBQ1	0.918	0.954	0.955	0.931
	COMBQ2	0.911			
	COMBQ3	0.948			
	COMBQ4	0.881			
	COMBQ5	0.937			
ICT infrastructure	ITIFQ1	0.945	0.958	0.959	0.924
	ITIFQ2	0.930			
	ITIFQ3	0.910			
	ITIFQ4	0.936			
	ITIFQ5	0.904			
Ease of use	PEAQ1	0.896	0.948	0.951	0.943
	PEAQ2	0.918			
	PEAQ3	0.931			
	PEAQ4	0.926			
	PEAQ5	0.876			

In the above table shows how validity and reliability indicate how well a technique, approach, or test evaluates something. They demonstrate that the measurement model assessment is used to evaluate the quality of the constructs in the study. The consistency of a measure is referred to as its reliability, whereas the accuracy of a measure is referred to as its validity. Table 2 provides the reliability and validity analysis, which reveals that all variables have strong reliability (Cronbach's alpha, Composite reliability (rho a), and Composite reliability (rho c)) that is more than 0.7 thresholds. Regarding validity, the numbers in the column Average Variance Extracted are all more than 0.5, indicating that the model is good.

Table 3. Discriminate Validity test based on Fornell-larcker Criterion

Construct	Banking operations	Compatibility	Financial incentives	Ease of use
Banking operations	0.924			
Compatibility	0.967	0.919		
Financial incentives	0.982	0.958	0.925	
Ease of use	0.940	0.945	0.912	0.910

The above table shows that the Fornel-Larcker criterion is fulfilled, and no cross-loadings are higher than the respective loadings, indicating that discriminant validity is superior in this paper.

4.2.2. Structural Model

The structural model was studied once the measurement model had been evaluated. The structural model represents the link between the model's exogenous and endogenous variables. This part emphasizes model fit and a structural (inner) model.

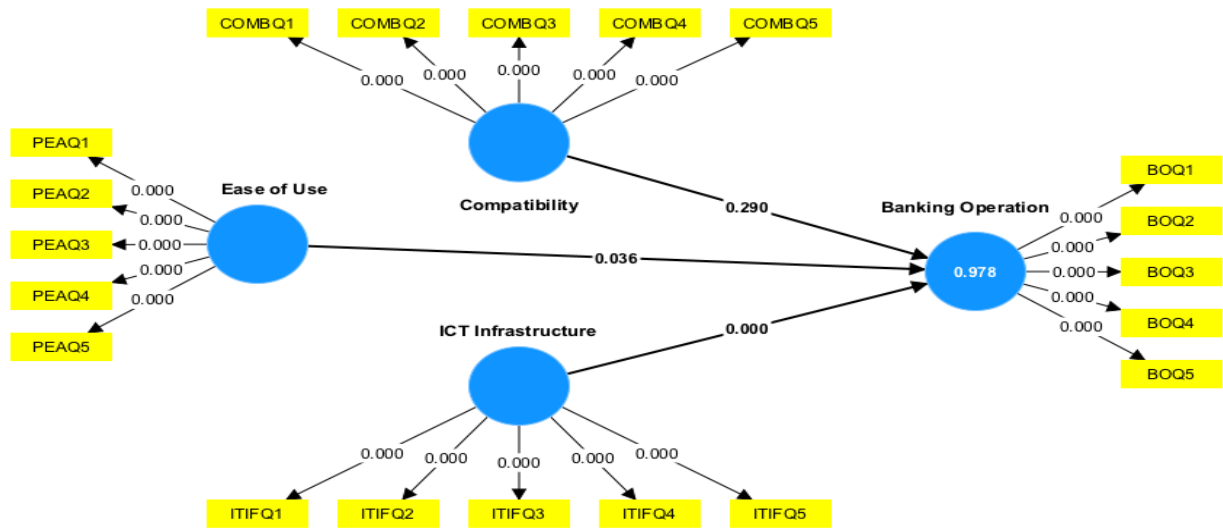


Figure 2. Structural Model

Table 4 R-square and adjusted R-square

	R-square	R-square adjusted
BOQ	0.978	0.977

The above table reports the strength of the relationship between the model-independent variables and model-predicted dependent variable values. The value (0.978%) indicates a strong relationship R2, the coefficient of determination is the squared value of the multiple correlation coefficient. It shows that the independent variables explain more than half (0.978%) of the variation in Banking Operations.

Table 5 Path Coefficient

	Hypothesis	Path Coefficient	T Statistics	P Values	Level of Sing.	Decision
Compatibility-> Banking Operations	H1	0.133	1.058	0.290	Insignificant	Not Supported
ICT Infrastructure -> Banking Operations	H2	0.669	10.164	0.000	Significant	Supported
Ease of Use-> Banking Operations	H3	0.204	2.095	0.036	Significant	Supported

The correlation table provided above displays the path coefficients and p-values, tested at a significance level of 0.05. The results indicate that ICT infrastructure and ease of use significantly influence banking operations. However, compatibility does not appear to influence banking operations significantly.

Table 6 Model Fit Summary

Construct	Saturated model	Estimated model
SRMR	0.072	0.072
d_ULS	0.619	0.619
d_G	0.945	0.945
Chi-square	700.532	700.532
NFI	0.764	0.764
SRMR	0.072	0.072

Model fit summary, in other words, a model is deemed to fit well if the sampling error alone can explain the full difference between the correlation matrix suggested by your model and the empirical correlation matrix. As a result, the difference between the correlation matrix predicted by your model and the empirical correlation

matrix should be non-significant ($p > 0.05$). Otherwise, the model fit is not established if the difference is significant ($p < 0.05$). The table above demonstrates that the model is insignificant, indicating that the model fits.

5. DISCUSSIONS

This study intended to investigate the determinants of technological innovation adoption and banking operations. The study's findings indicate a noteworthy and positive influence of IT infrastructure, Perceived ease of use, while compatibility has insignificant on the banking operations of selected commercial banks in Somalia. This significance was established based on the p-value falling below the alpha threshold. Consequently, it was determined that IT infrastructure and ease of use statistically impact technological innovation on the efficiency and structure of banking operations.

These results align with previous empirical studies. The positive effects of IT infrastructure and ease of use in Somali banking operations can be concluded as follows: They improve customer experience, support integrating and communicating between banking systems, encourage financial stability, boost efficiency and lower expenses, offer advanced safety precautions, enable data analytics and business insights, and deliver these benefits. These elements work together to improve Somali banks' overall performance and reputation while also increasing customer satisfaction, extending access to banking services, streamlining operations, enhancing security, and improving decision-making. The findings of this study are consistent with the study of Adesola, Moradeyo and Oyeniyi (2013), who concluded that the ease of use of technological innovations has a positive and significant effect on the banking operations of deposit money banks. In 2016, Akinyele examined 202 bank customers in Nigeria, revealing a significant effect of adopting transactional websites on financial performance.

CONCLUSION

Hence, this study offers a valuable understanding of how technological innovations impact the banking operations of specific financial institutions in Somalia. Additionally, it confirms the degree to which changes in the outcome variable can be attributed to the independent variables included in the models, as indicated by the R-squared and adjusted R-squared values.

Recent technological innovations have improved the operations of commercial banks and increased employee confidence in the Somali banking industry. Responses from bank employees and customers indicate that technological innovations like POS terminals and Internet banking have positively affected bank operations by improving services and increasing customer loyalty. The research concluded that adopting new technologies has significantly impacted the operations of commercial banks in Somalia by enhancing services, improving efficiency, and boosting customer satisfaction and retention.

The findings suggest that Somali banks should provide consistent training to their staff members, who can then educate customers about electronic banking systems and associated products. This proactive approach will lead to a deeper comprehension of the products and their usage, ultimately attracting more customers and deposits.

Somali Banks should arrange seminars, workshops, symposia, and public lectures aimed at both their employees and the general public, focusing on the practical utilization of information technology and e-banking systems. Such initiatives will contribute to a rise in adopting diverse e-banking products within Somalia, particularly during this era of promoting a cashless economy.

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