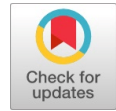


The Effects of Cost Implications in the Adoption of Biometric Application Banks in Eldoret Town, Kenya

Misoi K. Thomas, James Ogalo, Ben Maake



Abstract: *Biometric technology utilizes biological and behavioral characteristics to automatically identify individuals. The paper was guided by the question on how does cost implications affect for adoption of biometric application in authorization and identification in banks in Eldoret Town. Cost of implications does not influence for adoption of biometric application in authorization and identification in banks in Eldoret Town. Thus, this study will help government agencies, financial institutions and other corporate business in adopting biometric systems. The research indicated cost implications affects biometric application in authorization and identification in cyber security in banks where biometric applications in banks have insufficient technical infrastructure hence affecting inefficiency and ineffectiveness of bank operations. In conclusion, the research indicated that cost implications are a major indicator that influenced biometric application in authorization and identification in cyber security in commercial banks in Kenya.*

Keywords: *Biometric, Cost Implication, Security, Privacy*

I. INTRODUCTION

Biometric use in many platforms for authentication and authorization of access and systems login has gathered momentum since late 20th century up to date. Since its introduction, biometric has seen tremendous growth in the enhancement of security and other mechanisms deployed to tackle the menace of cyber security and unauthorized access to vital information of an individual (Glaser, 2016 [9]). Thus, this study seeks to find out determinants of biometric application for authorization and identification on cyber security in banks [1]. A 2003 survey by Richardson found that since 1997, the frequency of computer security incidents had grown rapidly, with around 90% of large firms reporting such occurrences every year (Richardson, 2013 [21]). Regarding security, biometrics is a term used to describe authentication methods that rely on the measurement of physical and behavioral characteristics (Spolaor et al., 2016).

Manuscript received on 16 June 2023 | Revised Manuscript received on 14 October 2023 | Manuscript Accepted on 15 October 2023 | Manuscript published on 30 October 2023.

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Biometric technology utilizes biological and behavioral characteristics to automatically identify individuals. This technology has been acknowledged as a tool for natural identity management that provides greater security and convenience when compared to traditional methods of personal identification (Wayman, 2008).

II. BIOMETRIC IN FINANCIAL INSTITUTIONS

As per Frost and Sullivan (2016 [10]), in today's world, enterprises and consumers are rapidly accepting the shift towards a social and mobile era. The adoption of a quicker and more effective method of doing business by many firms has resulted in an increase in the use of portable mobile devices like smartphones, tablets, and notebooks. These devices have become powerful tools for everyday business transactions for users who work in a multi-device and location-independent environment [6] [11].

A. The Research Question:

- i. How does cost implications affect for adoption of biometric application in authorization and identification in banks in Eldoret Town?

B. The Study Hypothesis

Cost of implications does not influence for adoption of biometric application in authorization and identification in banks in Eldoret Town.

Thus, this study will help government agencies, financial institutions and other corporate business in looking at the influencing of determinants of biometric for authorization and identification on cyber security in banks in Kenya.

III. REVIEW OF RELATED LITERATURE

In respect to the deployment of biometric technology in the healthcare and finance sectors, authors have looked at the cost element [3]. The authors have determined that in the early phases of integration, fingerprint technology could be a more economical option compared to other biometric technologies that are currently accessible [22]. The expense of maintaining the system is also a crucial consideration that could impact the acceptance of biometric technology. Furthermore, there is a necessity for biometric devices to be interoperable to ensure conformity with regulations and to lower the cost of updating the biometric system. According to Iqbal and Qadir (2012 [14]), the majority of people have a neutral response towards the cost of biometric technologies and consider them to be reasonably priced in terms of their outcomes.



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Chandra and Calderon (2005) state that financial feasibility is an important consideration when planning for the implementation of biometric authentication systems. While the direct costs of such systems are easily measurable, immediate, and tangible, the long-term benefits are often more qualitative and challenging to quantify in monetary terms. In 2014, Donos and Zorkadis conducted research on the elements influencing the security of biometric technologies in European commercial banks. They used a descriptive survey design to target 312 ICT experts from 93 banks and used the snowball sampling technique to select 104 respondents. The information was gathered using a survey consisting of questions, and the analysis was conducted using quantitative methods, which involved the use of descriptive statistics such as pie-charts, percentages, figures, tables, and bar graphs to present the findings. Donos and Zorkadis discovered that there is insufficient investment in smart cards, tokens, biometrics, and digital certificate technologies, which are often perceived as costly, unlike password techniques that require low initial costs. Liu and Silverman (2016 [16]) carried out a study to investigate the determinants affecting the uptake of electronic payments in Ghanaian banks. The study aimed to assess the influence of factors such as cost, information security, technology infrastructure, and top management on the acceptance of electronic payments in banks. A descriptive survey design was used, and 133 IT personnel from commercial banks in Ghana were selected using a census sampling technique. Data was collected using questionnaires and interviews.

The study employed both qualitative and quantitative analyses using descriptive statistics. The findings indicated that the major obstacle to infrastructure technology is the cost incurred in purchasing equipment and networking, as well as developing and maintaining software and hardware.

The factors influencing the adoption of internet banking in Tanzanian banks were looked at in a study by Ozuru (2015). A descriptive survey design was utilized, and the targeted population were 206 IT staff from various banks. 93 respondents were chosen using a straightforward random sample procedure, and questionnaires and interview schedules were utilized to gather data. Descriptive statistics were used for both qualitative and quantitative data analysis. The findings revealed that most banks have not implemented internet banking due to insufficient working capital, poor infrastructure, and lack of expertise in its adoption and usage. Mbayo (2017) undertook a case study to explore the factors that influence the uptake of electronic payment systems in commercial banks in Kenya. The study targeted 137 ICT experts from 43 banks using a census sampling technique. Data was gathered using a questionnaire and analyzed quantitatively using descriptive statistics, which were presented in the form of pie-charts, percentages, figures, tables, and bar graphs. The results indicated that the cost of infrastructure technology, top management support, information security, and IT expertise are significant drivers of electronic payment system adoption in commercial banks in Kenya.

According to Donos and Zorkadis (2014 [7]), overcoming the difficulties of deploying biometric technology necessitates not only comprehension of the technical problems pertaining to the hardware and software utilized, but also taking into

account the format of the data held in legacy systems. Furthermore, integrating this technology should not be considered in isolation from the business processes and functions that depend heavily on the existing legacy systems.

A. The Technology, Organization and Environment (TOE) Theory

The TOE framework (Tornatzky and Fleischer, 1990), which defines three elements that affect how a corporation absorbs and implements a technology innovation, was introduced in 1990 by Tornatzky and Fleischer. These factors are the technological setting, the organizational setting, and the environmental setting.

The TOE framework includes three interrelated components that contribute to the adoption of technological innovations. The framework consists of several elements, one of which is the technological context that involves both internal and external technologies that are relevant to the organization. This encompasses the existing equipment and practices used within the company as well as the range of available technologies outside of the organization. The organizational context component of the framework pertains to various descriptive factors about the organization, such as its scope and managerial structure. Finally, the environmental context element refers to the larger sphere in which the company operates, including its industry, competitors, and interactions with the government. Tornatzky and Fleischer (1990) originally outlined these components.

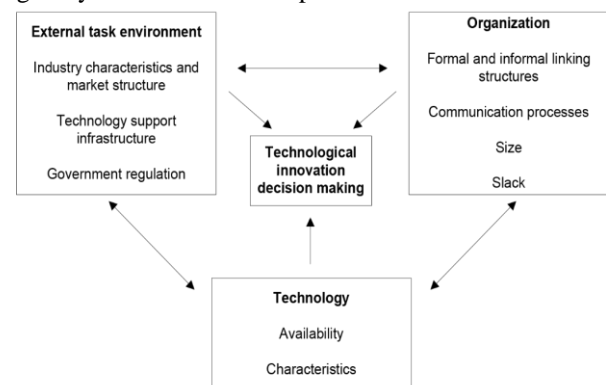


Figure: 1.6 Technology, Organization, and Environment Framework, TOE (Tornatzky and Fleischer 1990)

The TOE framework is consistent with Rogers' DOI theory (1995), which emphasizes that both individual traits and internal/external factors of an organization can drive innovation. These aspects fit with the TOE's framework technological and organizational context components. The environmental context, a crucial new addition to the TOE framework, presents opportunities and restrictions for technological innovation.

IV. RESEARCH DESIGN

The study in question focused on Kenyan commercial banks and used a descriptive survey design. According to McNabb's description from 2015, this research strategy is used when a certain situation's many elements need to be identified and summarized.

In this case, the researchers aimed to provide a comprehensive explanation and interpretation of the existing conditions surrounding the use of biometric applications for authorization and identification in cyber security within Kenyan banks.

town is home to 30 commercial banks. The study aimed to investigate a group of employees from various positions including bank managers, heads of departments, tellers, personal bankers, credit officers, and customer care employees. In total, the study included 528 participants from these roles.

A. Target Population

According to data taken from the Central Bank of Kenya's Bank Supervision Department Annual Report (2017), Eldoret

Table 3. 1: Target Population

Banks	Managers	Heads of department	Tellers	Personal bankers	Credit officers	Customer care employees	Total
Kenya Commercial Bank	1	5	5	3	7	5	26
Equity Bank Limited	1	5	5	3	9	5	28
Standard Chartered Bank	1	5	3	1	3	3	16
Barclays Bank	1	5	7	3	6	5	27
Eco-bank Limited	1	5	3	2	3	3	16
National Bank	1	5	5	3	9	4	27
Bank of Africa	1	5	4	1	4	2	17
Prime Bank	1	5	3	1	3	2	15
Family Bank	1	5	5	3	8	4	26
Equatorial Commercial Bank	1	5	3	3	3	2	17
I & M Bank Ltd	1	5	3	1	3	2	15
Guardian Bank Ltd	1	5	3	1	3	2	15
Oriental Commercial Bank	1	5	3	2	3	2	16
Post Bank	1	5	5	3	7	4	25
Transnational Bank Ltd	1	5	5	3	7	5	26
Cooperative Bank	1	5	6	3	9	5	29
Chase Bank	1	5	3	1	3	2	15
African development Bank	1	5	3	1	3	2	15
African Banking Corporation Ltd(ABC)	1	5	3	1	3	2	15
Commercial Bank of Africa	1	5	4	2	3	2	17
NIC Bank	1	5	3	3	4	3	19
Fina Bank Ltd	1	5	3	2	3	2	16
Imperial Bank Ltd	1	5	4	1	3	2	16
EABS Bank	1	5	3	1	3	2	15
Reliance Bank Ltd	1	5	3	1	3	2	15
Housing Finance Company Limited	1	5	4	2	5	4	21
Bank of Baroda	1	5	4	2	3	2	17
Consolidated Bank of Kenya	1	5	5	3	7	5	26
Totals	28	140	110	56	130	84	548

Source: The Central Bank of Kenya Bank Supervision Department Annual Report (2018).

B. Sample technique

To conduct this research, 272 participants were chosen using a method called simple random sampling. This technique ensures that every member of the population has an equal chance of being selected for the study as a sample. The approach involves randomly selecting individuals from the population in a single step, without any prejudice or favoritism towards certain individuals.

C. Research results

The objective of the researcher was to examine the impacts of cost considerations regarding the use of biometric systems for authorization and identification in cyber security for banks located in Eldoret Town.

Table 4. 1: Effects of Cost Implications in Biometric Application in Authorization and Identification in Cyber Security in Banks

Statements		1	2	3	4	5	Total	Mean	Std
Biometric applications in banks have insufficient technical infrastructure	Freq	51	81	54	30	5	221	2.35	1.05
	%	23.1	36.7	24.4	13.6	2.3	100	47	
Biometric applications infrastructure is sufficient for banks to use	Freq	15	37	72	70	27	221	3.26	1.09
	%	6.8	16.7	32.6	31.7	12.2	100	65.2	
Biometric applications for authorization and identification in banks enhance service delivery	Freq	22	4	56	87	52	221	3.65	1.16
	%	10	1.8	25.3	39.4	23.5	100	73	
With the use of biometric technology solutions, banks can simply detect and monitor staff and customer behavior in the system to establish tangible audit trails.	Freq	26	25	35	67	68	221	3.57	1.34
	%	11.8	11.3	15.8	30.3	30.8	100	71.4	
Biometric applications have lowered the operation cost for authorization and identification process such as maintenance cost	Freq	13	24	39	82	63	221	3.71	1.16
	%	5.9	10.9	17.6	37.1	28.5	100	74.2	

The study's conclusions show that 23.1% of participants strongly disagreed, 36.7% disagreed, 24.4% were neutral, 13.6% agreed, and 2.3% strongly agreed that the technical infrastructure supporting biometric systems in banks was insufficient, adversely affecting the effectiveness and efficiency of banking operations. The data points were densely clustered around the mean and had a normal distribution because the mean was 2.82 and the standard deviation was 1.05.

According to the findings, 6.8% of respondents strongly disagreed, 16.7% disagreed, 32.6% were neutral, 31.7% agreed, and 12.2% strongly agreed that banks could use the biometric system infrastructure to increase the efficiency and effectiveness of banking operations. The data were distributed normally and the mean was 3.26 with a standard deviation of 1.09, indicating that the data points were closely clustered around the mean.

According to Table 4.8, 10% of respondents strongly disagreed with the statement that using biometric systems for authorization and identification in banks improves service delivery, 1.8% strongly disagreed, 25.3% were neutral, 39.4% agreed, and 23.5% strongly agreed. The data points were densely clustered around the mean, suggesting a normal distribution of the data, and the mean was 3.65 with a standard deviation of 1.16.

The findings show that 30.3% agreed and 30.8% strongly agreed that biometric technology solutions enable banks to track and monitor employee and customer activity in the system to produce reliable audit trails, while 11.8% of participants strongly disagreed, 11.3% disagreed, 15.8% were neutral, and 30.3% agreed. The data points were dispersed across a wide range of values, with a mean of 3.57 and a high standard deviation of 1.34, but the mean was still higher than 2.5, indicating a normal distribution of the data.

In addition, the study found that 28.5% strongly agreed, 5.9% strongly disagreed, 10.9% disagreed, 17.6% were neutral, 37.1% agreed, and 28.1% agreed that biometric applications have decreased operational costs for authorization and identification processes like maintenance costs, thereby lowering bank operation costs. The data points were densely clustered around the mean, suggesting a normal distribution

of the data, and the mean was 3.71 with a standard deviation of 1.16.

The results are in line with Donos and Zorkadis' (2014 [7]) research, which contends that the perceived cost of smart cards, tokens, biometrics, and digital certificate technologies prevents a large amount of investment in these technologies. The initial cost of password approaches is cheaper, however. These findings are also supported by Liu and Silverman's (2016) study, which found that infrastructure technological hurdles, such as the price of networking and equipment purchases, the development and maintenance of software, and hardware, can prevent the adoption of biometric technology.

D. Hypothesis analysis

H₀₃ . There is no statistically significant influence of cost implications on biometric application in authorization and identification in cyber security in banks in Eldoret Town.	P=0.000<0.05	Reject H ₀₃
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A probability value of (p=0.000 0.05) was calculated from table 4.15, indicating that the hypothesis (there is no significant influence of cost implications on biometric application in authorization and identification in cyber security in banks) is false and indicating the existence of a significant relationship between cost implications and organizational biometric application in authorization and identification in cyber security in Kenyan banks).

Ozuru (2015 [2]) concurred with the results where he indicated that most of the banks have not adopt internet banking due to lack of working capital, poor infrastructure and lack of expertise in adoption and usage. Also, the findings was supported by Mbayo (2017) where he found out that cost of infrastructure technology, top management support, information security and IT expertise affect positively adoption of electronic payments in commercial banks in Kenya.



V. DISCUSSION

The research indicated cost implications affects biometric application in authorization and identification in cyber security in banks where biometric applications in banks have insufficient technical infrastructure hence affecting inefficiency and ineffectiveness of bank operations; biometric applications infrastructure is sufficient for banks to use hence increasing effectiveness and efficiency of bank operations; biometric applications for authorization and identification in banks enhance service delivery hence increasing financial institution performance; With the use of biometric technology solutions, banks have the ability to effectively track and monitor the activities of both employees and customers within the system. This creates a clear and definitive audit trail that can be used to ensure transparency and accountability in the banking system and biometric applications have lowered the operation cost for authorization and identification process such as maintenance cost hence reducing bank operations costs.

VI. CONCLUSION

In conclusion, the research indicated that cost implications are a major indicator that influenced biometric application in authorization and identification in cyber security in commercial banks in Kenya. The Unified Theory of Acceptance and Use of Technology proposes that the factors influencing the acceptance of computer technology are general and applicable to a wide range of user populations and computing technologies. The theory seeks to be both parsimonious and theoretically grounded, offering a comprehensive explanation for user behavior towards technology adoption. Therefore, cost implications affects biometric application in authorization and identification in cyber security in commercial banks in Kenya where biometric applications have lowered the operation cost for authorization and identification process such as maintenance cost hence reducing bank operations costs.

DECLARATION STATEMENT

Funding	No, I did not receive.
Conflicts of Interest/ Competing Interests	No conflicts of interest to the best of our knowledge.
Ethical Approval and Consent to Participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of Data and Material/ Data Access Statement	Not relevant.
Authors Contributions	All authors have individual partnerships in this article.

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