Factors Influencing Utilization of Biometrics in Private Banks in Mombasa County

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Abstract

Purpose: The overall goal of the research was to analyze factors influencing utilization of biometrics in the private banks in Mombasa County.

Methodology: The study adopted a descriptive research design because it provided a clear outcome and the characteristics associated with it at a specific point in time. The target population for the study was 120 respondents from 20 private registered banks in Mombasa County. The study adopted stratified sampling method to select the respondents from the population. The study obtained primary data through a structured questionnaire. Responses in the questionnaires were tabulated, coded and processed using a computer Statistical Package for Social Science program. The relationship between the dependent variable and the independent variables were tested using multiple linear regression models. The data was analyzed and conclusions drawn. Descriptive and inferential statistics were used whereby the data was presented through tables

Findings: The findings of the study showed that legal systems holds a positive linear relationship (r=0.412; p<0.01) and significant association with utilization of biometrics in private banks. Moreover, the results indicates a p-value of 0.003 which is less than 0.01 implying that the association is highly significant. Based on the research and analysis, the study concludes that legal systems, technology maturity, demographic factors, and staff competency have a significant effect on utilization of biometrics in private banks within Mombasa County.

Unique Contribution to Theory, Practice and Policy: The research was anchored on technology acceptance model. To ensure efficient utilization of biometrics within private banks in Mombasa County, it is recommended that organizations follow established legislation. Subsequently, banks should update their staff on legislation surrounding biometrics use and security.

Keywords: *Factors, Biometrics, Utilization, Private Banks*

INTRODUCTION

Technological progress, changes in customer behavior, competition, regulations and the current COVID-19 pandemic have required financial institutions to step up, (Roselyn, 2021). Furthermore, Okwong (2020) highlighted that without biometric identification, companies still rely on manual methods of payroll calculation which are not only extremely time consuming, but also come with risk of errors. A study by Satija & Semester (2019) showed that in the developing nations Sixty-two percent of the major companies currently use biometrics for various security and business purposes such as employee access and data security, and an additional twenty four percent plan to use it by 2020.

Biometrics is defined as the usage of corporeal physiognomies of an individual so as to identify them, (Garza & Ricter, 2022). A positive identification shows that the individual is who they say they are. A false identification can prove that this individual is not who they claim they are. This can be in lieu of commercial or illegal matters. The Biometrics was developed in 1800 and used in lieu of body measurement called Bertillonage. The term Biometrics has two words, Bio is life and metrics means measure. Thakral et al (2020) eludes that in authentication system the biometric gen of individual offered compares with what already exists in the databank in lieu of each entry. The person then gives the system, some kind of biometric information. The system then chooses, if a match can be made conforming to a stored gen on the data base.

Globally, the application of biometrics for human identification and verification is not a new concept, it is believed that the first use of biometrics was for identification of children in China and Babylon, thousands of years ago whereby fingerprint and palm prints were used for that purpose, (Mayhew, 2020). Thakral, Rai & Thakral (2020) indicates that, Biometrics' is a technology applied to measure and evaluate both physical as well as behavioral physiognomies of a person. These physiognomies comprise finger print, voice patterns, hand measurements as well as iris. These are applied to ascertain the legitimacy of an individual. The biometrics is tightly associated to an individual. It cannot be forgotten, stolen or hacked effortlessly, (Thakral, et al 2020). Finger biometric is a fingers scanning technology. It is the oldest time tried technology. It is extremely precise biometric technology. The patterns as well as presentation of fingerprints are diverse in lieu of each person. They are unaffected with the development of the body as defined by Thakral, et al (2020).

In Africa, this scheme has extensively been applied to carry out elections as well as clinical studies. A case in point is the Centre in lieu of the AIDS Programme of Research in South Africa (CAPRISA) study carried out in South Africa in 2008 for 185 women were in desecration of the HIV segregation criteria. In this research, the Biometric Co-enrolment Prevention System (BCEPS) via digital finger printing was applied to avert co-registration in manifold clinical sites. The co-registration would present encounters of double reporting. "In using the BCEPS, we did real-time "flagging" of women who had already joined in another research as they entered a trial at an HPRU site and, where needed, omitted them from contribution on site. This scheme has an aptitude in plummeting co-registration in clinical trials and signifies a treasured tool in lieu of future execution by all groups carrying out trials. The MRC is presently organizing this exertion with clinical experimental locations countrywide", (Harichund, Harispersad, & Ramjee, 2019).

In comparison to manual methods, Debnath, Rahul, Farkhod, and Minkyu, (2019) discovered that biometric attendance system is error free, quick to install, user friendly and highly accurate and that it can help organizations transition towards becoming password less. According to Chau and Turner, (2021) passwords are vulnerable, where personnel very likely to jot down our passwords on a Post-It note and stick it in a drawer, where a determined person could find it and compromise the system. For the reason, companies are very concerned about losing proprietary information, and private communications getting out because of compromised security, (Saraswathi, Balasubramanian and Jayaram, 2021).

Biometric security technology has complex characteristics that often make the process of organizational adoption decisions difficult. Perceptions of a specific security technology, its effectiveness, reliability, and the need for the technology and its cost-effectiveness are important elements in the decision to recommend the technology to an organization, (Craig & Hamidi-Noori, 2019). Additionally, organizations are increasingly attentive to the cost of security and demand that IT security expenditures be proportionate to IT security risks, (Center for Digital Strategies, 2021). However, many if not most, major investments are subject to some form of cost-benefit and/or return on-investment analysis. This practice has been less common in IT investments in general and in IT security investments in particular because of inherent difficulties in applying traditional ROI analysis to IT and because of a lack of clear models, (Au & Kauffman, 2020).

The public sector is pursuing biometrics in the interests of national security as exemplified by the use of biometrics in government-issued documentation such as passports in Britain, Singapore, and Brunei, (Bala 2019). While the aspects of national security are a driving force behind governments rolling out biometrics, citizens may not be willing to participate due to the nature of the information they are being asked to provide. As such, for travelers that frequently cross the border between Canada and the United States, the Canadian and United States governments are leveraging the convenience aspect of being able to bypass customs and immigration by joining a program, known as NEXUS (Canadian Border Services Agency 2009) that uses iris scanning, (Sukhai, 2019).

Despite the usefulness of biometric technologies, most of the private banks in Mombasa County have been slow in adopting them. The existing literature on biometrics know-how acceptance discloses that little has been done in the espousal of the biometrics technologies in in Mombasa County. To the best of our knowledge, there has been no empirical research that has been carried out so far with respect to espousal of powered biometric ATM schemes in the private monitory firms in Mombasa County. Therefore, this research aims at examining the significance of monitory firms to adopt biometric system in banks in Mombasa County.

Consequently, Saraswathi *et al.,* (2021) highlighted that there are increasing concerns related to the security in authenticity and integrity of banking systems as the weakness of the current verification or authentication methods such as pin numbers and passwords contributes significantly towards information leakage stored in Automated Teller Machine (ATM) smartcard which results in loss of money in bank account. Pooe and Labuschagne, (2022) submitted that, perhaps the biggest driver towards a biometrics boom, though, might be password madness. According to Mohinder, Uppal and Kaur, (2019) poor password hygiene is responsible for as many as 81 percent of company data breaches. Given the importance of biometric technology system, the proposed

study endeavors to analyze the factors influencing adoption of biometrics in the private banking sector.

Statement of the Problem

Rapid permeation of technology into our daily lives, traditional way of verification as well as confirmation won't assist us that much any longer. Passwords as well as PINs are so frail nowadays that even rookie hackers can crack them and escape with our private, personal files. With the introduction of biometric safety schemes in the banking industry have changed all these. Perpetual Network security breakdowns as well as identity housebreaks acumens have now plunged evocatively & why not as biometric safety is the only method to show an individual's genuine identity. Biometric characters comprising fingerprints, finger veins, as well as iris are inimitable and intrinsic, and they are so distinctive that they cannot be copied or stolen by the duplicitous, (Matui, 2020).

Biometric safety schemes flourished because it is less vulnerable to hacking and cannot be counterfeited or stolen while passwords, pins, tokens have failed miserably. It is the most convenient as well as operative way of ascertaining one's identity. Many smartphones today are using biometric fingerprint technology to lock, unlock, make safe payments, etc. Similarly, companies are surrendering the benefits of biometric safety systems, by integrating into their server rooms, work computers, as well as other business assets to defend them from attacks. Distinguishing certified persons to unauthorized is one of the key motives firms are espousing biometric safety systems. This unauthorized persons can cause damage if they get access to safety systems, (Fox, 2020).

The rapid growth in technology has brought considerable benefits and, unfortunately, additional threats. As more and more data are converted to, and stored in, electronic formats, the greater the necessity to ensure the security of that information from unauthorized access, (Sukhai 2020). Traditionally, gaining access to sensitive information and/or secure areas has depended upon some artifact a person has, such as a card or token, or what they know, such as a password or Personal Identification Number (PIN).

The explosion in technology has resulted in a proliferation of PINs and passwords across a plethora of applications that include access to one's bank accounts, home computer, work computer, web-based services, car, wireless devices, etc, (Coventry et al. 2022). Regrettably, the onus of having to remember so many passwords often becomes unmanageable such that individuals trade security for usability and memorability, (Adams and Sasse 2020). Regularly changing passwords, not using the same password across multiple applications, not using standard words, etc. are commonly cited methods of increasing security that are typically not employed by individuals due to the difficulty this creates in being able to remember them all. As such, criminals find passwords easy to guess and, once they have determined the one password a person uses, they get complete access.

Over the years in the banking sector, attention has been directed to digital banking as well as monetary technology with little or no attention given to biometric banking technology, (CBK, 2021). And in lieu of that motive, over the last few years, more researches have concentrated on digital banking, financial technology and other areas rather than adoption and the influence of biometrics within banking and retailing sector especially in the African continent, (Matui, 2020:

and CBK, 2021). The demand for more innovative, secured banking systems and the need for transformation within the banking sectors in the fourth Industrial Revolution (4IR) era and, technological advancement forms the pedestal for better opportunities for financial institutes to tap into biometrics technology. In contrast, many financial institutions have conformed to the traditional digital banking platforms as a mode of operation, (CBK, 2021). Biometric systems utilization among private banks is rampant but their nature of utilization and factors affecting them is less documented through academic research. The study therefore attempted to bridge this gap in knowledge by analyzing the key factors influencing adoption of biometrics in the private banking sector in Mombasa County.

Theoretical Framework

Technology Acceptance Model

Building upon the TRA and TPB models, the Technology Acceptance Model, was established, (Davis et al 1989). Whereas TRA and TPB are generic and consequently support cross-disciplinary application, TAM is precisely focused on scrutinizing behavioral intention to use information systems. Like TRA and TPB, TAM maintains that actual use is determined by behavioral imentions. However, TAM dropped social norms as an influence as it was argued that this factor is much less important in the realm of information system adoption, (Davis et al. 1989).
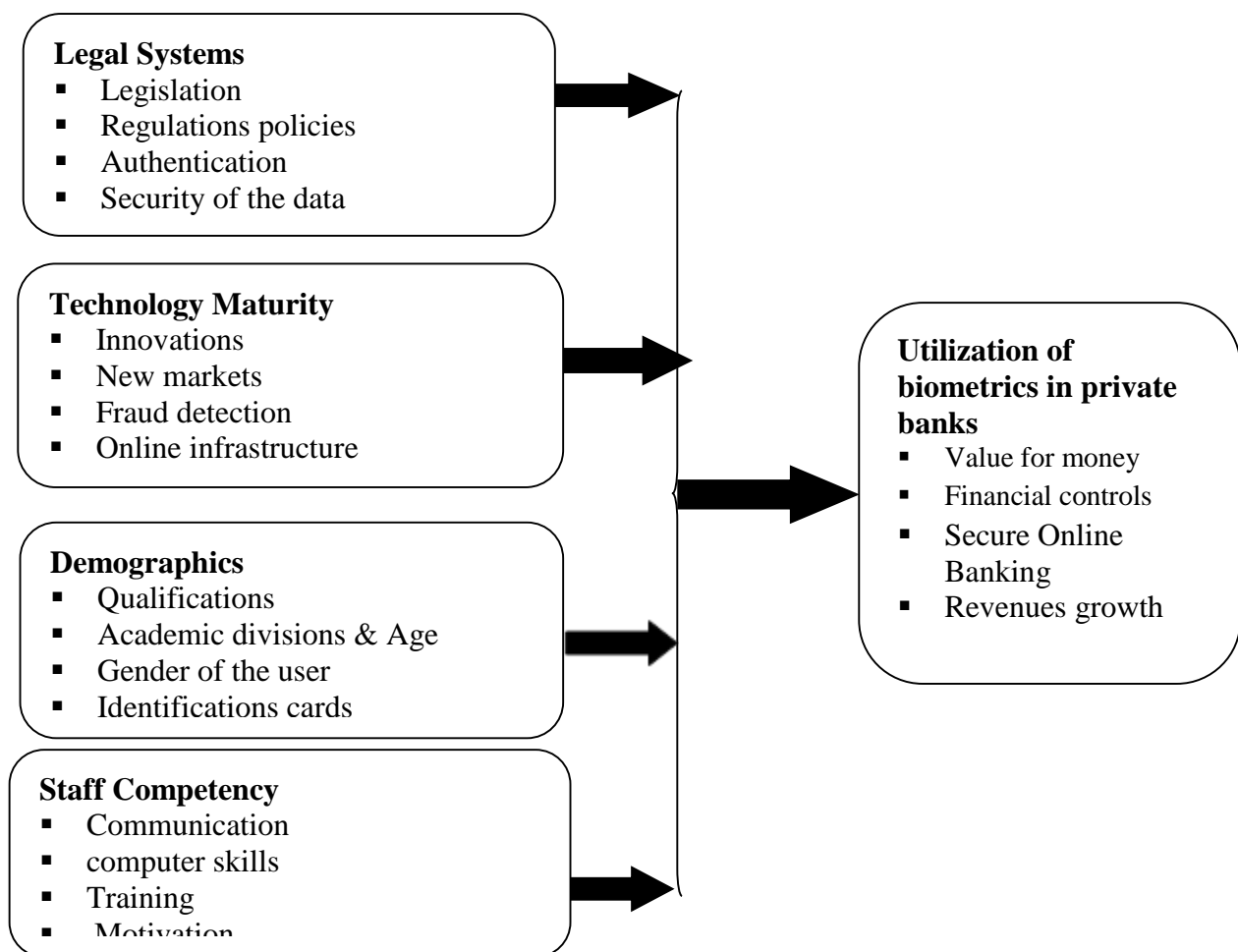
In addition, it would appear that whether or not attitude should be included as a factor influencing adoption intention is the subject of debate among researchers. Although attitude towards the behaviour was included in the original model (Davis et al. 1989) some subsequent studies dropped this factor due to its weak impact in predicting intention to adopt, or actual adoption of, an information system (Wu and Wang 2019; Venkatesh and Davis 2019), while other researches have proved otherwise, (Chen et al. 2019; Shih and Fang 2016; Venkatesh et al. 2018).

TAM suggests that the two vital aspects that impact usage behaviour are professed usefulness and alleged ease of use. Perceived usefulness is defined as the degree to which a person believes that their job performance will be improved by using the detailed submission. Perceived ease of use is defined as the degree to which a person thinks that using the stated submission will be uncomplicated, (Davis et al. 1989). Moreover, TAM proposes that professed easiness of usage can influence perceived usefulness since the easier the system is to use, the more the individual is able to accomplish; conversely, the more cumbersome the system, the less work the individual is able to finish.

The original thrust of TAM was to explain behavior within an organizational context. However, as mentioned above, with modifications it has demonstrated its applicability to a variety of other information systems adoption contexts such as electronic toll collection (Chen et al. 2017), internet banking (Shih and Fang 2016), e-commerce (Pavlou 2016), and e-services, (Gefen and Straub, 2019). This theory enables the private banks management understand the relationship between technology maturity and espousal of biometrics in the organization. TAM proposes that professed easiness of application can influence perceived usefulness since the easier the system is to use, the more the individual is able to accomplish; conversely, the more cumbersome the system, the less work the individual is able to finish.

Conceptual Framework

Kothari (2019) defines conceptual framework as a short explanation of occurrence under study complemented by pictorial representation of the main variables of the research. Biometric technology habitually comprises a scanning device and connected software which can be used to collect gen that has been documented in digital form, (Bolle, 2019). Whereas biometrics can offer a high level of verification through ascertaining persons by their physical as well as behavioral physiognomies, there are also numerous negative features. According to research, older bank customers are found to have negative mentality towards innovation and new technology whereas the much younger customers are seen to be more interested in utilizing new innovations and technologies, like the Internet, to conduct activities - for example, purchasing products online, or searching for new items online and the item information in order to compare and access their many choices, (Fox, 2020). A conceptual framework displays the association amid independent and dependent variable, (Fig.1 below).

Legal Systems
- Legislation
- Regulations policies
- Authentication
- Security of the data

Technology Maturity
- Innovations
- New markets
- Fraud detection
- Online infrastructure

Demographics
- Qualifications
- Academic divisions & Age
- Gender of the user
- Identifications cards

Staff Competency
- Communication
- computer skills
- Training
- Motivation

Utilization of biometrics in private banks
- Value for money
- Financial controls
- Secure Online Banking
- Revenues growth

Independent Variables   **Dependent Variable**

Source: Researcher (2024)

Research Gap

A review of the recent literature on the adoption of biometric technologies in organizations revealed almost no research regarding the factors influencing the decision to implement biometric access technologies. Research into this area could help explain why organizations are reluctant to implement biometric authentication controls. It could also help IT and security decision makers to determine what aspects of biometric security technologies are of concern to them and accordingly recommend appropriate security solutions for their organizations.

Security technology companies can also benefit from this research by knowing what is important to their customer base while introducing new IT security products and/or technologies. Although there is a dearth of scholarly research regarding the factors influencing the decision to recommend or not recommend biometrics, there is a solid foundation of theories and previous studies on technology adoption in general. The next section of this literature review explores the decision making process and discusses the origins and development of the dependent variables used in this study.

Recent literature has shown that while biometric authentication systems promise cost savings and higher levels of security for businesses, they are not a panacea. Many different factors affect how well or how poorly biometric authentication controls will perform in any given organizational environment. Included among these factors are the users, the administration, the environment, the infrastructure, the budget, the communication system, and the existing security needs, (Harris & Yen, 2017; Kleist, Riley & Pearson, 2015).

While many biometric technologies are capable of operating as stand-alone systems, in reality their accuracy and performance levels would be greatly improved by combining them with more conventional authentication methods such as passwords and keys, (Callas, 2020). In selecting a biometric authentication system and preparing for its implementation, organizations should focus closely on the user-technology interface and the conditions in the organizational environment that may influence the technology's performance. For example, the healthcare industry's unreflective embrace of finger scan technology illustrates the dangers of failing to heed environmental realities.

It is important that organizations consider not only the practical impediments to effective implementation but also the potential psychological impediments such as user fears about the technology. Ethically, the organization also has the obligation to consider carefully the extent to which the implementation of biometric authentication compromises the privacy rights of users. In making this assessment, management must take into account the possibility that the organization may be compelled to release employees' biometric-related information to government authorities.

METHODOLOGY

Research Design

This study used a descriptive research design. There are 20 private banks which are registered in Mombasa County. The study targeted at least 2 respondents from the three departments which are Information Technology, Operations and Finance departments in the registered private banking sector in Mombasa County which gives a total of 120 respondents. From the projected target population, a purposive sampling technique was employed where 1 Respondent was from

Information Technology department, 2 respondents from operations department as well as 3 respondents from finance departments in every private bank constituting a total of 120 respondents. Both primary and secondary data were used. Primary data was collected through the use of questionnaires while Secondary data was collected from the websites of the commercial banks. The study used descriptive statistics and inferential statistics to establish the affiliation amid the independent variables as well as the dependent variable.

RESULTS

Descriptive Analysis

Utilization of Biometrics in the Private Banks

Descriptive analysis of the dependent variable was undertaken through mean and standard deviation parameters.

Table 1: Descriptive Analysis of 'Utilization of Biometrics in the Private Banks'

Folio		N	Mean	SD
a	Enhances security of online banking	50	4.02	0.721
b	Enhances return on investment	50	3.56	0.891
c	Enhances efficiency of customer care service	50	4.12	0.745
d	Enhances financial controls in the industry	50	3.89	0.882
	Mean Score	50	3.89	0.809

According to Table 1 the respondents were in agreement (Mean score=3.89; SD=0.809) with the questions presented regarding utilization of biometrics in the private banks. The respondents were in agreement with the statements: Utilization of biometrics enhances security of online banking (M=4.02; SD=0.721), enhances return on investment (M=3.56; SD=0.891), enhances efficiency of customer care service (M=4.12; SD=0.745), enhances financial controls in the industry.

Influence of Legal Systems on the Utilization of Biometrics in the Private Banks in Mombasa County.

Table 2: Descriptive Statistics on Legal Systems in Biometrics

Folio		N	Mean	SD
a	Fraud has been minimized drastically due to legislation in place	50	2.59	1.103
b	Biometrics utilization have observed regulations requirements	50	3.50	0.881
c	Biometrics follows DPA guidelines to enhance authentication of the system	50	3.87	0.846
d	The bank frequent monitor how procedures are adhered to so that security can be enhanced	50	3.91	0.834
	Mean Score	50	3.49	0.916

According to Table 2, the respondents generally agreed with the statements posed under the variable legal systems (M=3.49; SD=0.916). Moreover, the table shows that the respondents were in agreement with the statements 'biometrics utilization have observed regulations requirements (M=3.50; SD=0.881), 'biometrics follows DPA guidelines to enhance authentication of the system (M=3.87; SD=0.846), the bank frequent monitor how procedures are adhered to so that security can be enhanced (M=3.91; SD=0.834). Conversely, the respondents largely disagreed with the statement fraud has been minimized drastically due to legislation in place (M=2.59; SD=1.103).

Relationship between Technology Maturity and Utilization of Biometrics in the Private Banks in Mombasa County

Table 3: Descriptive Analysis for Technology Maturity

Folio		N	Mean	SD
a	Biometric technologies have considerable cost savings over traditional IT security methods where Innovation has been prioritized	50	3.56	0.818
b	The cost of maintenance is lower with biometric technologies than with traditional IT security methods and that has allowed the banks to explore new markets	50	4.15	0.889
c	My organization needs to improve the security of its IT assets to detect fraud before they occur.	50	4.42	0.945
d	Online infrastructure has enhanced through biometric technologies	50	3.65	0.959
	Mean Score	50	3.95	0.903

According to Table 3 the respondents were in agreement (M=3.95; SD=0.903) with the statements posed in the technology maturity variable. The respondents were in agreement with the statements 'Biometric technologies have considerable cost savings over traditional IT security methods where Innovation has been prioritized' (M=3.56; SD=0.818), 'The cost of maintenance is lower with biometric technologies than with traditional IT security methods and that has allowed the banks to explore new markets' (M=4.15; SD=0.889), 'My organization needs to improve the security of its IT assets to detect fraud before they occur'(M=4.42; SD=0.945), 'Online infrastructure has enhanced through biometric technologies (M=3.65; SD=0.959).

Influence of Demographic Factors on the Utilization of Biometrics in the Private Banks in Mombasa County

Table 4: Descriptive Statistics of Demographic Factors

Folio		N	Mean	SD
a	Academic qualifications matters a lot in utilization of biometrics	50	2.70	1.108
b	The age of the biometrics user is a factor to consider in private banks	50	3.52	0.803
c	The gender of the user is not a factor to consider in utilization of biometrics in the private banks	50	4.30	0.753
d	Biometric technologies easily identify the users through identification cards	50	4.10	0.781
	Mean Score	50	3.65	0.861

According to Table 4 the majority of the respondents were in agreement (M=3.65; SD=0.861) with the influence of demographic factors on the utilization of biometrics in the private banks in Mombasa County. Besides, the respondents were in agreement with the statements 'the age of the biometrics user is a factor to consider in private banks' (M=3.52; SD= 0.803), 'the gender of the user is not a factor to consider in utilization of biometrics in the private banks' (M=4.30; SD=0.753), 'biometric technologies easily identify the users through identification cards' (M=4.10; SD= 0.781). On the other hand, the respondents disagreed with the statement 'academic qualifications matters a lot in utilization of biometrics' (M=2.70; SD=1.108).

Effect of Staff Competency on the Utilization of Biometrics in the Private Banks in Mombasa County

Table 5: Descriptive Statistics on Staff Competency

Folio		N	Mean	SD
a	The users of the new BVR payment system are trained and competent to use the system	50	4.30	0.753
b	My current computer skills enable me to access and use this service	50	3.70	0.883
c	All staff are competent and are using this system and there is proper communication strategy in the organization	50	3.78	0.923
d	A manual is already in place for employees to refer which motivate employees	50	3.45	0.934
	Mean Score	50	3.80	0.873

According to Table 5 the respondents were in agreement (M=3.80; SD=0.873) with the statements on effect of staff competency on the utilization of biometrics. Moreover, the respondents were in agreement with the statements 'The users of the new BVR payment system are trained and competent to use the system' (M=4.30; SD=0.753), 'My current computer skills enable me to access and use this service' (M=3.70; SD=0.883), 'All staff are competent and are using this system and there is proper communication strategy in the organization' (M=3.78; SD=0.923), 'A manual is already in place for employees to refer which motivate employees' (M=3.45; SD=0.934).

Relationship between Legal Systems and the Utilization of Biometrics in the Private Banks in Mombasa County

Table 6: Pearson Coefficient Results for Legal Systems and Utilization of Biometrics

Correlations		Utilization of biometrics in private banks	Legal systems
Utilization of biometrics in private banks	Pearson Correlation	1	.412[**]
	Sig. (2-tailed)		.003
	N	50	50
Legal systems	Pearson Correlation	.412[**]	1
	Sig. (2-tailed)	.003	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

According to Table 6 Legal systems independent variable holds a positive linear relationship (r=0.412; p<0.01) and significant association with utilization of biometrics in private banks. Moreover, the table indicates a p-value of 0.003 which is less than 0.01 implying that the association is highly significant. Subsequently, the researcher found a positive correlation between legal systems and utilization of biometrics in private banks supporting the findings by Barney and Jay (2021).

Relationship between Technology Maturity and Utilization of Biometrics in the Private Banks in Mombasa County

Table 7: Pearson Coefficient Result for Technology Maturity and Utilization of Biometrics

Correlations		Utilization of biometrics	Technology maturity
Utilization of biometrics	Pearson Correlation	1	.350**
	Sig. (2-tailed)		.001
	N	50	50
Technology maturity	Pearson Correlation	.350**	1
	Sig. (2-tailed)	.001	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

According to Table 7 there is a positive linear (r=0.350; p<0.01) and significant relationship between technology maturity and utilization of biometrics within private banks. Besides, a p-value (0.001) is less than 0.01 indicating that the association between the two variables is significant. The association between technology maturity and utilization of biometrics is highlighted by Agarwal and Prasad (2019).

Relationship between Demographic Factors and the Utilization of Biometrics in the Private Banks in Mombasa County

Table 8: Pearson Coefficient Result Demographic Factors and Utilization of Biometrics

Correlations		Utilization of biometrics in private banks	Demographic factors
Utilization of biometrics in private banks	Pearson Correlation	1	.354**
	Sig. (2-tailed)		<.001
	N	50	50
Demographic factors	Pearson Correlation	.354**	1
	Sig. (2-tailed)	<.001	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

According to Table 8 there is a positive linear and significant relationship (r=0.354; p<0.01) between demographic factors and utilization of biometrics in private banks. Besides, a p-value (<0.001) is less than 0.01 which implies that data is highly significant. Besides, the results support the research by Davies (2019) asserting that demographic factors influence technology usage.

Relationship between Staff Competency and the Utilization of Biometrics in the Private Banks in Mombasa County

Table 9: Pearson Coefficient Results for Staff Competency

Correlations		Utilization of biometrics in private banks	Staff competency
Utilization of biometrics in private banks	Pearson Correlation	1	.458**
	Sig. (2-tailed)		.003
	N	50	50
Staff Competency	Pearson Correlation	.458**	1
	Sig. (2-tailed)	.003	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

According to Table 9 there is a strong positive relationship (r=0.458; p<0.01) between staff competency and utilization of biometrics in private banks. The p-value reading of 0.003 is less than 0.01 hence indicating that the data collected by the researcher is highly significant. The findings are consistent with the work of Garvey (2019) which expounded on the positive association between technology usage and staff skillset.

Model Summary

Table 10: Model Summary

Model Summary[b]					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.562[a]	.316	.272	.72820	.316	7.095	4	45	<.001
a. Predictors: (Constant), Legal systems, Technology maturity, Demographics, Staff competency									
b. Dependent Variable: Utilization of biometrics in private banks									

According to Table 10, the R-value is 0.562 that indicates the level of correlation between the observed and predicted scores for the dependent variable 'Utilization of biometrics in private banks'. Besides, a Coefficient of determination (r2=0.316) indicates that 31.6% of the dependent variable is associated with the study independent variables legal systems, technology maturity, demographics, staff competency.

Table 11: Summary of the ANOVA Results

ANOVA[a]		Sum of Squares	df	Mean Square	F	Sig.
Model						
1	Regression	11.287	4	2.821	7.095	<.001[b]
	Residual	24.393	45	.530		
	Total	**35.680**	**49**			
a. Dependent Variable: Utilization of Biometrics in Private Banks						
b. Predictors: (Constant), Legal systems, Technology maturity, Demographics, Staff competency						

According to Table 11 analysis of variance, Legal systems, Technology maturity, Demographics, Staff competency hold a significant association with the 'Utilization of Biometrics in Private

Banks'. Besides, the p-value is lower than the derived level of significance (0.05). In this regard, the null hypothesis should be rejected by the researcher and the developed model accepted as it accounts for a significant variance.

Table 12: Coefficients

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.419	.575		2.469	.017
	Legal Systems	.033	.150	.031	.220	.001
	Technology Maturity	.193	.168	.142	.147	.001
	Demographic Factors	.336	.114	.310	1.163	.005
	Staff Competency	.525	.135	.539	3.886	<.001
a. Dependent Variable: Utilization of Biometrics in Private Banks.						

According to Table 12, the independent variables Legal systems, Technology maturity, Demographic factors, Staff competency fit the model considering the p-values generated. Besides, the multiple regressions model with the four predictors produced R=0.562, F=7.095, p<0.001. Subsequently the deduction made by the researcher posits a model as provided:

Utilization of Biometrics in Private Banks=$1.419+0.033X_1+0.193X_2+0.336X_3+0.525X_4$

Where:

Y is the dependent variable and X_1, X_2 and X_3 are independent variables.

E(Y) is the expected value of Y for given values of X_1, X_2 and X_3

β_0, β_1, β_2 and β_3 are the coefficients of the multiple linear regression model

β_0 = Constant

$\beta_1 - \beta_3$= Measure of sensitivity of variable X to changes in BTAU

Y= Utilization of biometrics in Private Banks in Mombasa County

X_1 = Legal Systems (LS);

X_2 = Technology Maturity (TM) and

X_3= Demographic Factors (DF)

X_4= Staff Competency

ε = Error Term.

Subsequently, the equation interprets to Utilization of Biometrics in Private Banks=1.419+0.033Legal systems+0.193Technology Maturity+0.336Demographics Factors+0.525Staff Competency. In addition, the multiple regressions can assist in testing for the significance of the individual independent variables through the p-values generated. The independent variables p-values Legal systems (0.001), Technology maturity (0.001), Demographic factors (0.005), Staff competency<0.001) indicate that the variables are significant in the model.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

According to the researcher, the main objective for the study was to analyze factors influencing utilization of biometrics in the private banks in Mombasa County. The comprehensive data collection and analysis established that the independent variables Legal systems, Technology maturity, Demographics, and Staff competency have significant effects on the Utilization of biometrics in private banks. First off the independent variable Legal system (r=0.412; p<0.01) has a significant positive impact on the Utilization of biometrics in private banks. In addition, a unit increase in Legal systems leads to a 0.033 unit change in the utilization of biometrics in private banks.

Furthermore, the study established that Technology maturity (r=0.350; p=0.001) has a positive relationship with the utilization of biometrics in private banks. The findings show that a unit change in Technology maturity among stakeholders can lead towards a 0.193 change in the utilization of biometrics in private banks. On the other hand, the research established that the independent variable Demographic factors has a positive relationship with the dependent variable (r=0.458). The results indicate a strong positive relationship between Demographic factors and Utilization of biometrics in private banks.

Finally, Staff competency was found to have a positive relationship with the utilization of biometrics in private banks within Mombasa County. The Pearson coefficient indicates (r=0.458; p<0.003).a positive relationship with the dependent variable 'Utilization of biometrics in private banks'. In addition, the multiple regressions analysis shows that a unit change in Staff competency is associated with a 0.525 unit change in Utilization of biometrics by private banks.

Conclusion

The researcher's main objective in this study was to analyze factors that influence utilization of biometrics in the private banks in Mombasa County. Subsequently, based on the research and analysis the study concludes that Legal Systems, Technology Maturity, Demographic Factors, and Staff Competency have a significant effect on utilization of biometrics in private banks within Mombasa County.

The study has come to the conclusion that legal systems have a significant and positive influence on the utilization of biometrics in private banks. Ensuring that biometric samples are well protected through legislation will ensure increased usage of biometrics in private banks. Legal systems provide safety nets during operations for different stakeholders in the biometrics segment.

In addition the study has come to the conclusion that Technology Maturity is essential as there is a positive association with utilization of biometrics. Technology maturation arises through continuous skills development for the stakeholders within the organization leading to better acceptance of the biometric technology.

Furthermore, demographic factors were found to exert a positive influence on the utilization of biometrics within the private banks. Gender is an essential factor for the usage of technological devices and platforms coupled with sustained usage. Demographic factors influence the utilization of biometrics within private banks.

Finally, staff competency was found to have a positive association and influence on the utilization of biometrics within the private banks in Mombasa County. The capability of the staff to manage the biometric system is essential in adopting efficiency and superiority over competitors.

Recommendations

To ensure efficient utilization of biometrics within private banks in Mombasa County, it is recommended that organizations follow established legislation. Subsequently, banks should update their staff on legislation surrounding biometrics use and security.

Significant resources should be dedicated towards staff competency on biometrics. The staff need to skilled and competent in regards to biometrics platforms as they run daily operations in the banking hall.

Recommend the development of specific security protocols and best practices for the integration of biometric technologies in banks. This includes secure data storage, encryption methods, and regular audits to prevent breaches. Develop comprehensive education programs for customers focusing on the benefits and risks of biometric technologies. This can include information sessions, pamphlets, and interactive kiosks in bank branches. Emphasize the importance of training bank employees not only in the technical aspects of biometric systems but also in handling privacy concerns and customer queries effectively.

Advocate for the creation or enhancement of regulatory frameworks that govern the use of biometric data. This could include guidelines on data retention, consent protocols, and cross-border data transfer which are particularly relevant for the diverse and international demographic of Mombasa County. Encourage the development of partnerships between private banks and government bodies to foster trust in biometric systems. These partnerships could help in standardizing biometric solutions and ensuring they meet both commercial and civic needs. Recommend policies that ensure the inclusivity of biometric solutions. This means making sure that the systems are equally accessible and equitable to all parts of the population, including addressing potential biases in biometric recognition.

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