Indian Journal of Finance and Banking
Vol. 8, No. 1; 2021
ISSN 2574-6081 E-ISSN 2574-609X
Published by CRIBFB, USA

AN EMPIRICAL ASSESSMENT OF ADOPTION AND INNOVATION OF THE PORTABLE BANKING TECHNOLOGY IN KENYA

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Received: August 29, 2021 Accepted: September 17, 2021 Online Published: September 23, 2021

DOI: 10.46281/ijfb.v8i1.1351 URL: https://doi.org/10.46281/ijfb.v8i1.1351

ABSTRACT

The study investigated the appropriateness of innovation diffusion in understanding and explaining the adoption rate and acceptability of portable bank technology in Kenya through the assessment of the factors that influence the adoption of portable banking technology. The study employed a sample of 115 portable bank technology adopters based on a purposive sampling technique and tested the five attributes of innovations, namely relative advantage, compatibility, complexity, trialability, and observability. The study found that relative advantage, compatibility, Trialability, and observability positively impact adoption. Trialability and complexity were found to have a lesser significant effect on adoption. Complexity hurts adoption. More specifically, the regression model revealed that compatibility is the most significant determinant of adopting portable bank technology with t=4.21 and $p \leq 0.001$. Trialability has a significant positive impact on adoption with t= 4.27 and $p \leq 0.001$. Observability has a high explanatory value with t = 4.45 and $p \leq 0.001$. Relative advantage has returned a positive explanatory coefficient at t=4.50 and $p \leq 0.001$. Finally, Complexity had no significant impact on the adoption of portable banking technology. The study has uncovered useful trends in portable bank technology adoption in Kenya. The study recommended that future research should focus on broader variables and carry out comparative studies on both homogeneous and heterogeneous settings to gauge the net effect of technical attributes on technology adoption.

Keywords: Innovation Adoption, Portable Banking, Technology, Kenya.

JEL Classification Codes: D14, G21, G23, O13, O14, Q55.

INTRODUCTION

Technology-driven innovation in banking services is generally perceived as the one of the most critical forms of alteration that occurred in the banking industry in the last two decades(Rogers, 2003). One of the most recent changes that have completed the origination-diffusion-adoption lifecycle is the implementation of portable banking technology, which, in its purest forms, represents the use of I&CT, to carry out banking and financial transactions (Puschel, Mazzon, & Hernandez, 2010). Technological advancements in telecommunications have drastically changed the way banking and financial transactions are carried out. Nowadays, people queue less often at bank tellers to withdraw or deposit

money or make the mundane payments for utility bills and purchase of assets for home use. This revolutionary change, which started with the advent of smartphones (Laukkanen, 2017), has swept the banking industry in many countries and found semi-unanimous acceptability within a relatively brief time. This rate of diffusion and adoption deserved a closer investigation to understand its theoretical and empirical underpinnings. This phenomenon has been extensively researched in the last few years, with most studies relate the adoption rate to the five innovation attributes promoted by Rogers (2003): relative advantage, compatibility, complexity, Trialability, and observability.

Within the African context, many countries have achieved pioneering positions in portable banking technology. In East Africa in particular, Kenya is primarily viewed as a leading country in the adoption of portable bank technology, thanks to the prominent role of the country's telecommunication industry led by Safaricom, which successfully deployed the Mpesa platform as a pilot scheme in 2003 and later the mainstream mobile banking technology or M-bank, as popularly known in Kenya (Mbiti & Weil, 2015). The provision of portable bank technology has spread rapidly and found increasing acceptability from both the regulated banks and the public to the extent that the convenience provided using mobile phones in carrying out banking and financial transactions is perceived as an irreversible adoption so far as there are no significant setbacks in the system.

According to Pousttchi and Schurig (2004), electronic banking and finance are now part of most business-to-business, business-to-customer, and business-to-public applications. Electronic banking is a generic term used for mainstream online financial dealings. Online financial dealing has multiple facets and is not just limited to handset-based portable bank technology. It includes the use of physical and virtual teller machines (Wan, Luk, & Chow, 2005) and the use of internet banking as well (Barnes & Corbitt, 2003; Black, Lockett, Ennew, Winklhofer, & McKechnie, 2002; Jabri & Sohail, 2012). In the Kenyan context, the advancement in telecommunication technology, coupled with positive consumer behavior and general public awareness, has contributed to the rapid expansion of handsets in financial transactions (Mbiti & Weil, 2015).

This study is motivated by the rate of adoption of portable bank technology, and it aims to test the technical attributes of innovation diffusion and adoption and its likely impact on the use of portable bank technology in Kenya. Kenya is a developing nation with a rising middle-income, free economy, and reasonably developed public and private sector institutions, which provide a healthy environment for the proliferation of innovative ideas. This study investigates the factors that either inhibit or promote the proliferation of innovation within the Kenyan context. The study will relate the technical attributes that inhibit or promote the diffusion and adoption of innovation, namely the relative advantage, compatibility, complexity, Trialability, and observability, to the mainstream idea that a conducive environment is needed to accelerate the adoption rate of innovative ideas.

Statement of Problem

The Central Bank of Kenya financial inclusion survey (CBK, 2018) estimates that 11.5 million persons use handset devices for financial transactions compared to 5.4 million persons who use physical banks regularly. The report indicates that the use of portable handsets in financial services more than doubled from 28% in 2009 to 62% in 2013 (CBK, 2018). The report further highlights that the use of portable bank technology has had a significant impact on traditional domestic remittance methods such as sending money physically via public transportation system or through post office. In 2006, over half (57%) of money transfers within Kenya were through family/friends, while in 2013 it dropped to a third because people opted to use portable bank technology instead of physical transfers (Odera, 2013).

Table 1. Kenya Banking Land-scape

Provider	Number	
Banking platform	5,430,644	22%
SACCOs	1,695,827	7%
Micro Finance	651,873	3%
Mobile phone financial services	11,465,438	47%
Informal Groups	5,161,573	21%
	24,405,355	100%

Source. CBK (2018)

In 2018, the active portable bank accounts are estimated at 371 million users who carry out 1.2 billion operations per annum with an estimated 2.9 trillion Kenya shillings in monetary terms (CBK, 2018). From 2014 until 2018, the total volume of transactions carried out using mobile technology reached six billion transactions and 15 trillion Kenya shillings **Error! Reference source not found.** highlights annual growth in the mobile payment system in Kenya.

Table 2. Annual Mobile Payment Method Growth

Year	Agents	Accounts (millions)	Transactions (millions)	Value (KSh billions)
2014	1,445,664	311	911	2,372
2015	1,607,424	321	1,114	2,816
2016	1,943,637	385	1,331	3,355
2017	1,989,624	418	1,543	3,638
2018	1,783,829	371	1,275	2,930

Source. CBK (2018)

The CBK report further highlights an important aspect related to the use of portable bank technology. By the end of 2013, 84% of urban citizens and 62% of rural citizens adopt portable bank technology. This high acceptability rate has been made possible by the adequacy of the requisite infrastructure as 65% of the population are able to access the internet from the comfort of their portable handsets (CBK, 2018) as highlighted in

Table 3.

Table 3. Access to and Use of Internet

Mode of Access	Percentage
On Mobile Phone	65%
At Home/computer	11%
At Internet Café	16%
At Office computer	7%
on a friend's computer	1%

Source. CBK (2018)

Research has established that diffusion and adoption of portable bank technology proliferate faster and receives greater acceptability than the traditional banking platform (Laukkanen, 2017). While literature has established this as a reality, the causation mechanism is still a work in progress. It appears

that the rate of adoption of new ideas depends on a complex set of cultural, social and psychological factors besides the technical attributes suggested by Rogers (2003). This study represents a continuation in this direction and aims to provide further evidence on the application of innovation adoption and diffusion theory into portable bank technology.

Most commercial banks in Nairobi enjoy niche customers with a specific clientele base, including public and private sector employees, self-employed persons, and expatriates in addition to public and commercial entities such as hotels, hospitals, and private corporations (Ongore & Kusa, 2013). The banks are generally keen to increase service convenience offered to their customers to sustain their operations, achieve acceptable growth rates, and increase value for their stakeholders (Ongore & Kusa, 2013). This research will provide evidence-based insight into customer satisfaction by analyzing customer needs and will enable the banks to serve their customers better. This research will determine the optimal strategies and actions that commercial banks managers should adopt to improve service delivery and achieve customer satisfaction.

The Kenyan banking industry has achieved tremendous strides toward automated and sophisticated banking service delivery based on information and communication technology. Kenya is considered the hub of the East African financial sector (Ongore & Kusa, 2013). Most local banks in Kenya fully adopted portable bank technology, and some banks are ahead of the queue regarding technology adoption (Mbiti & Weil, 2015). However, while this technology has been adopted seamlessly, it is unclear whether the adoption rate is driven by deliberate policies based on valid theoretical evidence or just adopted for convenience and in response to competitive pressure. This study will provide evidence-based reasoning and a clear roadmap toward creating adequate penetration and adoption strategy.

Objectives of the Study

The study aimed at achieving two sets of objectives: main objectives and specific objectives. The primary objective is to assess the factors influencing the adoption of portable bank technology by a sample of regular customers of local commercial banks who own and transaction on the online platform on a regular basis. The specific objectives are two-fold. First, to identify the depth of portable bank technology offered by some local commercial banks; and second, to establish factors influencing adoption of portable bank technology among commercial bank customers. The study draws a large sample from Trade and Development Bank and Kenya Commercial Bank Mililani Branch. The findings will help the two banks design policies that promote clientele and increase the volumes of their operations.

Research Questions

Two specific questions guide the research. First, what is the breadth and depth of portable bank technology offered by local commercial banks, and second, what are the factors driving the adoption of portable bank technology by local commercial banks?

Significance of the Study

Most commercial banks in Nairobi enjoy niche customers with specific clientele base including public and private sector employees, self-employed persons and expatriates in addition to public and commercial entities such as hotels, hospitals, and private corporations (Ongore & Kusa, 2013). The banks are generally keen to increase service convenience offered to their customers to sustain their operations and achieve acceptable growth rates and increase value for their stakeholders (Ongore & Kusa, 2013). This research will provide an evidence-based insight into customer satisfaction by analysing customer needs and will enable the banks to serve their customers better. This research will determine the optimal strategies and actions that commercial banks managers should adopt to improve service delivery and achieve customer satisfaction.

The Kenyan banking industry has achieved tremendous strides towards the accomplishment of automated and sophisticated banking service delivery based on information and communication

technology. Kenya is considered the hub of the East African financial sector (Ongore & Kusa, 2013). Most local banks in Kenya fully adopted portable bank technology and some banks, such as Equity, Coop bank, and Bank of Africa and Kenya Commercial Bank are ahead of the queue regarding technology adoption (Mbiti & Weil, 2015). However, while this technology has been adopted seamlessly, it is not clear whether the adoption rate is driven by deliberate policies based on valid theoretical evidence or whether it is just adopted for convenience and in response to competitive pressure. This study will provide the evidence-based reasoning and clear roadmap towards the creation of adequate penetration and adoption strategy.

LITERATURE REVIEW

The best way to analyze innovation and change is to conceptualize the whole idea within a dynamic frame where a transition from one stage of change into another takes a lifecycle format. The complete cycle of change is either gradual and aggregative or revolutionary (Velu, 2016). The gradual and aggregative change may be expressed in the following mathematical formulas:

(1) Gradual change:

$$\Delta t1 \geq \Delta t0,$$

(2) Aggregative Change: $\Delta t2 = \Delta t1 + \Delta t0$

$$\Delta t2 = \Delta t1 + \Delta t0$$

Where $\Delta t2$, $\Delta t1$ and $\Delta t0$ denote a change in time2, time1 and time0, respectively.

On the other hand, revolutionary change has no precedent, and therefore it is a non-cumulative change (Velu, 2016). Innovation is synonymous with newness (Rogers, 2003). Any innovative idea, product, or service is unknown before. However, an unknown idea does not mean that it has not existed before (Galavan, Murray, & Markides, 2008). Newness is, therefore, a context-based and perception-based phenomenon, and therefore, what is new in a specific setting or culture may have been already known in another setting or culture. Newness may be relative to the same setting or culture, and therefore it is not an absolute creation (Rogers, 2003). New ideas develop within the cultural and social context, flourish within the period, and are adopted or resisted by a specific group of receptors (Rogers, 2003). These three elements of innovation represent the lifecycle of change. The innovation theory highlights four critical stages of change lifecycle: innovation, diffusion, adoption, and social context.

Rogers (2003) defines innovation as "an idea, practice, or object that is perceived as new by an individual or another unit of adoption" (p. 49). Based on this definition, it is critical to highlight two aspects. First, innovation is "perceived"; second, it is "adopted by people." These two aspects form the foundations of innovation and explain two critical tenets of innovation: the relative importance of early adopters compared to late adopters and the technical attributes of innovation adoption (Rogers, 2003). Technical attributes include relative advantage, compatibility, complexity, Trialability, and observability. Technical attributes form one aspect of innovation that determines the speed of diffusions and the rate of adoption. Other aspects include how innovation is initiated, channels through which innovation is communicated, and social, organizational, and cultural settings. Given the scope, the study shall be limited to the technical aspects, introduced in detail in the following section.

Relative advantage measures the extent to which innovation is perceived to be superior to other available and comparative solutions. This is based on adopters' tastes and preferences and points to the importance of the demand side as adopters are the ultimate beneficiary of any product or service that is released into the market. Adopters' tastes and preferences determine the rate of adoption and whether the adopted product will sustain or disappear. Any organization that intends to develop a product or

service must model adopters' behavior because failure to do so will result in a high rate of adoption failure (Rogers, 2003).

Compatibility relates to product and service conformity with the adopters' cultures, social values, and ethical norms. Rogers (2003) notes that compatible innovations are adopted with relative ease while incompatible innovations are resisted or adopted slower. Incompatible innovations may require a change of social norms to make them compatible with the innovation (Rogers, 2003). The question is, in the event of a conflict between cultural norms and innovation, which one will prevail? This indeed depends on the relative importance of the innovation. If the adopters perceive innovation as critical, they may consider changing their pre-innovation norms to be compatible with the innovation (Rogers, 2003). Otherwise, the norms will remain, and the innovation will not be adopted (Christensen, 2013). One example that highlights this fact is what Rogers (2003) mentions the success rate of the HIV campaign in St. Lucia in the Caribbean. The campaign motto "after pleasure comes the pain" (p. 457) resonated well with the audience and accelerated the adoption rate by enforcing a change of cultures and attitudes. Complexity refers to the ease or difficulty in the adoption process. Complexity may relate positively or negatively to the degree of adoption, depending on the adopters' perception and attitudes toward risk (Rogers, 2003). Some adopters prefer to try harder and more complex experiences, particularly in technology. The steep learning curve that comes with adopting innovation may create a form of psychological excitement to some adopters and make them feel socially elevated or distinguished compared to other social groups. However, the mainstream reaction is that the more innovation is perceived as complex, the less appealing it becomes (Rogers, 2003).

Trialability and observability are risk-mitigating aspects of adoption, and both relate to gradual adoption based on own assessment, as in the case of Trialability, or third-party assessment, as in the case of observability. Some innovations may not be compatible with Trialability, such as products and services that do not provide a sampling experience. However, most innovations are tried and tested by specialized parties before adoption (Rogers, 2003). Innovation's technical attributes have been extensively researched and applied in various disciplines, including technology, consumer products, education, the medical field, weaponry, and more. The theory has established a generalized causational direction between the technical attributes and the rate and speed of adoption.

Portable banking technology, or mobile banking, refers to accessing traditional banking and financial services on portable phones. The software used to access the services is third-party applications, developed either as the propriety of the specific banks and financial institutions or by independent developers (Laukkanen, 2017). The range of services accessed on the portable devices varies per the services available in the host institutions. The standard services include balance checks, credit and loans, mortgage, payment of utility bills, money transfer, online shopping, gaming, stock and security transactions, and tax payment (Puschel et al., 2010). In most countries, the services are delivered through a partnership between financial institutions and telecommunication service carriers. In Kenya, for instance, the major telecom service providers, including Safaricom, Airtel, and Orange, have partnered with local commercial banks to provide portable bank services to a broad spectrum of customers (Wamai & Kandiri, 2015). The portable bank technology in Kenya is mainly dominated by Safaricom's M-PESA service (Mbiti & Weil, 2015).

GLOBAL CONTEXT OF PORTABLE BANK TECHNOLOGY

The portable device technology adoption is considered one of the fastest adoption rates in the history of technology, particularly value-added and internet-based services in general. The most conservative estimates suggest that the use of portable devices for internet-based applications will increase at a rate of 200 to 300 times each year. Data from the International Telecommunications Union (ITU) suggests that global mobile data traffic is projected to increase by at least seven times between 2018 and 2021. The ITU statistics show that by January 2018, an estimated 3.7 million active users of portable device technology worldwide, 50% of whom use portable devices for internet access. Kenya is estimated to have the highest portable device-based internet traffic rate, followed by Nigeria, India, Singapore, Ghana, and Indonesia. On the other hand, the highest broadband subscription rates are recorded in

Europe and North America, representing 78.2 percent and 76.6 percent, respectively. Previous Studies within the Kenyan context

Kenya is considered one of the most advanced countries in East Africa regarding digitized banking and payment systems (Mbiti & Weil, 2015). Therefore, the Kenyan experience has received an elevated level of interest from all over the world. Since the introduction of the portable banking payment system in early 2003, several studies have been carried out to assess the rate of adoption and the influence of several theoretical and empirical factors in accelerating both the rate and magnitude of adoption (Mutindi, 2018). Given the scope of this study, a literature scan has been carried out to assess the commonality in research projects and findings of the Kenyan experience with diffusion and adoption. Most of the studies adopted the technical attributes and technology acceptance, consumer preferences, and institutional settings as independent variables, while the rate of adoption, acceptability and monetary impact were selected as dependent variables. Summary of the most recent studies is reported in . Some of the studies are reported in Table 4

Previous Studies within the Kenyan Context

Kenya is, by all means, viewed to be one of the most advanced countries in East Africa in terms of digitized banking and payment systems (Mbiti & Weil, 2015). Therefore, the Kenyan experience has received an elevated level of interest from all over the world. Since the introduction of the digital banking payment system in early 2003, several studies have been carried out to assess the rate of adoption and the influence of several theoretical and empirical factors in accelerating both the rate and magnitude of adoption (Mutindi, 2018). Most of the studies adopted quantitative methods with technical attributes, technology acceptance, consumer preferences, and institutional settings as independent variables while the rate of adoption, acceptability, and monetary impact were selected as dependent variables. Some of the studies are reported in Table 4

Table 4. Summary of Recent Relevant Studies on Digital banking Technology

Author/Authors and Date	Title	Concept	Findings
Jahan and Khan (2018)	Factors Influencing the Mobile Banking Adoption in Bangladesh	Exploring the relation between technical attributes of adoption and mobile banking adoption in the context of mobile banking service in Bangladesh	Trialability, observability, relative advantage, perceived risk, complexity, and compatibility have statistically significant relationships with mobile banking adoption
Mutindi (2018)	Factors influencing the adoption of mobile banking technology by bank customers in Machakos town	Identifying factors influencing customers decision to use mobile banking in Kenya with interest in Machakos town	The influence of bank factors, individual customer characteristics, and the availability of infrastructure have a significant positive impact on adoption of mobile banking technology

Wamai and Kandiri (2015)	Determinants of Mobile Banking Adoption by Customers of Microfinance Institutions in Nairobi County in Kenya	To investigate the effects of important factors that affect the adoption of mobile banking technology by customers of Microfinance Institutions in Nairobi County	The the study found that both perceived usefulness and perceived ease of use positively correlate and affects the adoption of mobile banking technology positively
Addai, Ameyaw, Ashalley, and Quaye (2015)	Digital Banking and Customer Satisfaction: Empirical Evidence from Ghana	To determine a set of attributes that influence the adoption of mobile banking innovation among university students in Ghana	Relative advantage, compatibility, observability, complexity, perceived risk, trialability and service satisfaction as critical factors influencing the adoption of mobile banking in Ghana
Yunus (2014)	Diffusion of Innovation, Consumer Attitudes, and Intentions to use Mobile Banking	Discusses the effect of diffusion of innovation (relative advantage, compatibility, and trial-ability) toward the intention to use mobile banking through consumer attitudes	The results found that relative advantage, compatibility, and trial-ability directly had a significant effect on consumer attitudes in a positive way
Mbiti and Weil (2015)	Mobile banking: The Impact of Mpesa in Kenya	The impact of the proliferation of Mpesa on the rate of technology adoption	A positive correlation between technology acceptance and the rate of adoption.
Gikandi and Bloor (2010)	Adoption and effectiveness of digital banking in Kenya	To establish the factors affecting the adoption of mobile banking services among bank customers in the Kenyan banking industry	Positive and robust correlation between technical attributes and adoption rate
Ngugi, Pelowski, and Ogembo (2010)	Case Study of Early Adopters' Role in the Rapid Adoption of Mobile Banking in Kenya	An exploratory and empirical study of Early Adopters	A statistically significant impact of early adoption rate and technical attributes

Compiled by Author

METHODOLOGY AND DESIGN

The section below describes the research methodology and covers research design, conceptual framework, population space, and sampling techniques used in the paper. The research was conducted

using a quantitative method and was designed as a descriptive cross-sectional study in which information was gathered from a sample of respondents who adopted portable bank technology. The data was gathered through an interviewer-administered questionnaire.

The research aimed to apply technical attributes of adoption to assess portable bank adoption rates in various locations within Nairobi. The explanatory variables are Relative Advantage, Compatibility, Complexity, Trialability, and observability. The dependent variable is the adoption of portable bank technology. The conceptual framework that maps the causational space between the explanatory variables and the dependent variable is depicted in **Error! Reference source not found.**

The target population is defined as customers of local commercial banks which offer mobile banking services. The customer base includes regular account holders and customers who do not have an account with local banks. Because of the integrated account management system, not all customers visiting local commercial banks hold physical accounts with those banks because of the integrated account. Some customers hold banking accounts in various branches within Nairobi and across the country, while others use the convenience of online banking, which does not require users to travel to specific branches to carry out banking and financial transactions. Respondents included businesspeople, personal account holders, and corporate customers.

According to Bernard (2017), a random sampling technique that satisfies up to 25% of the base population is considered adequate for social science research. Creswell and Creswell (2017) suggest that a 20% selection rate could still give unbiased results. The study chose respondents based on open and purposive sampling. The population parameters were unknown as the sample was picked from various locations.

DATA ANALYSIS

Data was entered for completeness, comprehensibility, and reliability before coding. Data was entered and analyzed on the SPSS platform, and the data analysis used frequencies and proportions for the descriptive statistics. A regression method was used where the explanatory variables were regressed on the dependent variable. The regressors were Relative Advantage, Compatibility, Complexity, Trialability, and Observability, while the dependent variable was the adoption of portable bank technology. The response rate is considered critical in determining the statistical significance of the study, and a higher response rate is better as it provides more robust explanatory power and dilutes data bias (Creswell & Creswell, 2017). Out of the 130 questionnaires distributed, 115 were returned filled, representing a response rate of 88.46%. This response rate was deemed sufficient to provide reliable statistics.

Respondents' Background

Respondent's background is essential in research findings as it provides critical information about the relevance of the population to the study. In the adoption of innovation, the background of the sample informs whether adequate and subject-specific responses and results will be obtained or not. The background covered the respondents' gender, age, education level, social status, income, and professional status.

Out of the total sample size of 115, people who responded that they were male were 70 (61%) while those who said they were female were 45 (39%). While the dominance of male percentage might not have a significant impact, it might inform broader gender aspects concerning the sample and study field that may warrant further investigation using a larger cross-section. However, this is out of the scope of this study.

Table 5. Sample Demographics: Gender

Gender	Frequencies	Percent
Male	70	61%
Female	45	39%
Total	115	100%

Regarding the age question, although all respondents responded positively to the age question, it is challenging to verify the accuracy of responses since age is generally perceived as part of a person's privacy and personal data, and some respondents may not be freely willing to provide the accurate response, particularly with the female gender. Nonetheless, age is an important characteristic as it relates to maturity, experience, and consumer preferences. The age categorization was reported as follows: 30 respondents (26%) aged 18-24 years, 42 respondents (37%) aged 25-34, 35 respondents (30%) aged 35-44, and 8 respondents (7%) aged above 45.

Table 6. Sample Demographics: Age

Age	Frequencies	Percent
18-24	30	26%
25-34	42	37%
35-44	35	30%
Above 45	8	7%
Total	115	100%

Education level is a critical factor in both the response rate and technology adoption level because educated persons are easier to convince to provide questionnaire responses. Educated persons are also able to express themselves and their inclinations freely without fear. Of the 115 respondents, the majority were a university and tertiary-educated, representing 60 (52%) and 38 (33%), respectively, while 17 (15%) were secondary education. The primary education category returned zero responses.

Table 7. Sample Demographics: Education

Education Level	Frequencies	Percent
Primary	0	0%
Secondary	17	15%
Tertiary	38	33%
University	60	52%
Total	115	100%

Social status was another critical factor added to the questionnaire based on the perception that married persons and single mums have higher societal responsivities and are more likely to use portable bank technology to carry out various household-related transactions. The study sample included 21 (18%) single, 71 (62%) married, and 23 (20%) divorced. Again, while the questions were quickly answered, it was challenging to ascertain the veracity of responses as some people tend to conceal their social identity, marital status, and age due to the sensitivity of the responses.

Table 8. Sample Demographics: Social Status

Income Level per Month	Frequencies	Percent
Under Kshs 50,000	20	17%
Kshs. 50,000-99,999	32	28%
Kshs. 100,000-249,000	27	23%
Kshs. 250,000-499,000	23	20%
Over Kshs.500,000	13	11%
Total	115	100%

Table 9. Sample Demographics: Income Level

Social Status	Frequencies	Percent
Single	21	18%
Married	71	62%
Divorced	23	20%
Total	115	100%

In terms of income level, the majority, 51%, fall within the income bracket of kshs. 50,000 – kshs. 249,000, which corresponds to the middle-income class. Further, 20% of respondents earn above kshs. 250,000 and below kshs. 500,000 while only 11% earn above kshs. 500,000.

Finally, employment status or professional status is another crucial factor because it relates to financial status, income level, and the possibility of owning a smartphone and transacting on a bank platform. Out of the 115 respondents issued with questionnaires and interviewed, 62 (54%) were employed, 30 (26%) were self-employed, 13 (11%) were not employed, and 10 (9%) were students.

Table 10. Sample Demographics: Professional Status

Professional Status	Frequencies	Percent
Employed	62	54%
Self-employed	30	26%
Not employed	13	11%
Others (student)	10	9%
Total	115	100%

BREADTH AND DEPTH OF PORTABLE BANK TECHNOLOGY

The study's first objective was to assess the breadth and depth of portable bank technology adopted by customers of local commercial banks. This was measured by several variables, including smartphone ownership, adoption of the portable bank, adoption frequency or frequency of use, services enjoyed from the smartphone, reasons for using the portable bank, and reasons for not using the portable bank. The first and second questions are the structural questions expected to auto-correlate with the remaining three questions. The study did not use techniques to deal with autocorrelation as it was limited to simple descriptive statistics.

Out of the total respondents, 97% had smartphones, 95%% had subscribed to Portable Bank, 60% never frequently used Portable Bank, 25.3% used Portable Bank for balance inquiry, 34.0% used Portable Bank because it provided cashless convenience, and 34.2% did not use Portable Bank because of fear of loss. Despite the limited scope and sample, these statistics tell underlying stories related to

people's perception of dealing with cash and portable bank. The motives could be broader than what has been captured in this limited questionnaire, and therefore, broader research may be worthwhile to understand the underlying motives of people dealing with cash or cashless systems in Kenya. The following were the findings of the study

NATURE AND MAGNITUDE OF ADOPTION OF MOBILE BANKING SERVICES

Table 11. Smartphone Ownership

	Frequencies	Percent
Have a Smartphone	112	97%
No Smartphone	3	3%
Total	115	100%

Table 12. Adopted Portable Bank

	Frequencies	Percent
Subscribed	109	95%
Unsubscribed	6	5%
Total	115	100%

Table 13. Adoption Frequency

	Frequencies	Percent
Never	6	5%
Rarely	3	3%
Sometimes	18	16%
Often	21	18%
Very Often	67	58%
Total	115	100%

Table 14. Services Used on Portable Bank

	Frequencies	Per cent
Balance Check	109	19%
Money Transfer	88	16%
Loans	18	3%
Bill Payment	109	19%
Airtime Purchase	42	7%
Cash Withdrawal	109	19%
Cash Deposit	91	16%
Total	566*	100%

FACTORS INFLUENCING THE ADOPTION OF PORTABLE BANK TECHNOLOGY

The study's second objective was to investigate factors influencing the adoption of portable bank technology among commercial bank customers. This was measured by looking at 5 (t5 variables). The

questions were spread on a Likert scale from 1 to 5, with one denoting strongly disagree, two disagree, three neutral, four agree, and five strongly agree. The mean was used to analyze the questions and identify the rank of each technical attribute.

Table 15. Factors Influencing Adoption of Mobile Banking

Factor ID	No of Item	Mean	STD	ALPHA
Compatibility	5	4.25	1.46	0.833
Trialability	5	4.19	1.33	0.839
Observability	5	4.03	1.21	0.783
Relative Advantage	5	4.03	1.89	0.908
Complexity	5	3.97	1.34	0.843

As expected and in conformity with the theory, compatibility was ranked as the highest factor influencing the adoption of portable bank technology, followed by Trialability, observability, and relative advantage, while complexity had the least explanatory power. The means of four and above correspond to the answers obtained based on the Likert scale, where four denotes "agree," as explained above. A simple regression analysis was carried out to understand the explanatory power and the direction of causation, and the results are reported in the following table.

Table 16. The Regression Model

Independent Variable	**B**	**S.E**	**T**	**P-VALUE**	**Collinearity Statistics**	
					Tolerance	**VIF**
Compatibility	0.24	0.051	4.21	0	0.54	1.701
Trialability	0.28	0.056	4.27	0	0.551	1.705
Observability	0.31	0.06	4.45	0	0.509	1.964
Relative Advantage	0.32	0.064	4.5	0	0.513	1.968
Complexity	-0.141	0.043	-3.333	0.001	0.71	1.408

The above results indicate that compatibility is the most significant determinant of adopting portable bank technology ($t=4.21$, $p \leq 0.001$) is similar to findings of previous studies (Koenig-Lewis, Palmer, & Moll, 2010; Odera, 2013). Both studies found that compatibility has a robust positive influence on the adoption rate of portable bank technology. Rogers (2003) asserts that "Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (p. 52). Compatibility, therefore, represents the degree of familiarity and acceptance by the adapters, and the more innovation is perceived to be compatible with adopters' beliefs, convenience, and ways of life, the faster the innovation is adopted. In portable bank technology, most respondents perceive it as compatible with their way of life and help them conveniently conduct their various businesses. Hence, the variable provided a robust and higher explanation. The regression results have also shown that Trialability has a significant positive impact on adoption with $t= 4.27$, $p \leq 0.001$. This is as expected and is supported by the theoretical foundation. According to Rogers (2003), Trialability represents an inherent possibility of trying the innovation on a sample basis. The reasoning behind the positive impact of Trialability on the adoption rate is that innovation that offers adopters the chance to try it on a small-scale basis will generate confidence and accelerate the adoption rate. Innovation is always risky because it represents an untested change and tends to drag adopters away from their traditional comfort zones (Norman & Verganti, 2014). Hence, a gradual change is always preferred over revolutionary change because the former allows for reversal. The regression has also found that observability has a high explanatory value with $t = 4.45$, $p \leq 0.001$. This conforms with the

theoretical foundation because observability is similar to Trialability. After all, it allows late adopters to observe the success of innovation by observing the experience with the early adopters. This provides both comfort and confidence and therefore accelerates the rate of adoption by late adopters. Relative advantage has returned a positive explanatory coefficient at $t=4.50$, $p \leq 0.001$. Again, this result conforms to the theoretical foundation. Relative or comparative advantage accelerates the adoption rate because it reflects consumer preference over other available competing products (Bessant, 2003). Finally, Complexity harms mobile banking adoption. This contradicts earlier findings by Jahangir and Begum (2008), who assert that complexity makes innovation appealing, and adopters tend to try challenging experiences. However, the finding is consistent with other studies (Jabri & Sohail, 2012; Odera, 2013; Wang, Wang, Lin, & Tang, 2003). The finding in this study suggests low significance of complexity on the adoption rate.

CONCLUSION

This study concluded that the technical attributes represent statistically significant explanatory variables of portable bank technology adoption rate in the Kenyan contexts. The findings also align with the causational relations stipulated in the adoption theory (Rogers, 2003). This is also broadly in conformity with several other previous studies in the Kenyan context (Gikandi & Bloor, 2010; Mbiti & Weil, 2015; Mutindi, 2018; Ngugi et al., 2010; Wamai & Kandiri, 2015). It could be observed that people adopt portable banking mainly because of the convenience it provides them in terms of time-saving and reduction in transitional costs. For instance, the mobile banking charges are considered minimal compared to the convenience it provides to the users (Mbiti & Weil, 2015). Before the diffusion and adoption of mobile banking services, people used traditional means of dealing with money and conducting business, resulting in higher transaction costs and longer delays in transaction conclusion. It is evident that the portable bank service offered in Kenya is mostly in line with clientele expectations and conforms to the social and cultural inclinations of the adopters. The reliability of the core banking technology and the absence of significant incidents and setbacks such as large-scale fraud and non-honoring of payment obligations contributed to the speedy adoption of portable bank technology (Odera, 2013).

Despite the findings of this study and similar studies conducted previously that indicate robust predictive power of technical attributes over the rate of technology adoption, Kenyan portable bank technology is still relatively nascent and may be far from being considered mature and established practice. It may require several years of uninterruptible performance to gauge the effectiveness of the system. Additionally, it is an oversimplification to assume that adoption is solely explained by the technical attributes as many other structural, social, cultural, and geopolitical assumptions need to be considered to arrive at a more realistic and broader explanation. It is also expected that expanding the variable base allows for more complex and natural relations to be modeled.

Another shortcoming of the findings, besides the limited population and the sample size, is that it does not differentiate between the impact of the adoption rate in early adopters and late adoptions. According to Rogers (2003), part of the adoption velocity in late adopters may be explained by the success rate achieved by early adopters. This explains the acceleration rate in late adoption. In a practical sense, people tend to follow a copy-and-paste attitude, and they generally feel more comfortable with a technology that has been tested by a neighbor, a friend, or a relative. As they say, good messages tend to spread through word of mouth and increase adoption rate at an increasing rate.

Kenya is an emerging market and a middle-income economy. Kenya also hosts several international organizations and is the only UN office in East Africa. The country is therefore poised to play a critical role in the African economic and financial landscape. The success of deploying portable banking technology in Kenya has already been copied in all the East African countries (Hellstrom & Troften, 2010). This cross-border adoption represents a positive promotion for portable bank technology. However, it appears that the East African Community is yet to produce effective legislation to pave the way for financial integration, particularly concerning online banking technology (Hellstrom & Troften,

2010). Currently, the integration is limited to cross-border branches of commercial banks that have a presence in other countries.

The study has uncovered useful trends in portable bank technology adoption in Kenya. The questionnaire feedback and the findings could be used as a basis for policy design and implementation by local banks and financial institutions and invest more resources in attracting more transaction traffic into the online platform. The benefit of online banking is that it is a one-time investment by the banks and will continue to accrue net revenues at relatively low operating expenses.

Future research should focus on broader variables and carry out comparative studies on both homogeneous and heterogeneous settings to gauge the net effect of technical attributes on technology adoption. The relationship between complexity and adoption is one area that needs further investigation to assess whether this is only specific to digital technology or may apply to all forms of innovation. One might expect that complex innovation considered superior in the social ladder may be adopted at a higher pace by middle and high-income nations while lower classes adopt simple innovations at a higher pace and complex innovations at a slower pace.

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APPENDICES

Appendix: Questionnaire

Use of Mobile Banking Technology

Dear Participant

This short questionnaire is intended to collect ANONYMOUS data about access to banking services on mobile devices. This questionnaire is for research purposes and is not designed to inform or affect any policy that may negatively impact the consumers.

I would appreciate it if you could take ONLY five minutes of your time to fill this questionnaire with accurate information to the best of your knowledge.

1. Are you Male or Female?

Male	**Female**	

2. What is your age Bracket?

18-24	25-34	35-44	Above 45

3. What is your education level?

Primary	**Secondary**	**Tertiary**	**University**

4. What is your social status?

Single	
Married	
Divorced	

5. Where do you place your income category?

Under 50,000	**50,000-99,999**	**100,000 249,000**	**250,000-499,000**	**Above 500,000**

6. What is your professional status?

Employed	**Self-employed**	**Not employed**	**Others (student)**

7. Do you have a Smartphone?

Yes	**No**

8. Are you subscribed to any form of mobile banking?

Subscribed	**Unsubscribed**

9. How often do you use this service?

	1	2	3	4	5
Balance Check					
Money Transfer					
Loans					
Bill payment					
Airtime purchase					
Cash withdrawal					
Cash deposit					

10. Which of the following factors you think have influenced your decision to use portable bank service?

	1	2	3	4	5
Convenience					
Tested and reliable					
Security					
Better than going to the bank					
Comfort					
Knowledge					
1q2`1	A				

11. Which of the following factors you think might influence your decision not to use the portable bank service?

	1	2	3	4	5
Costly					
Reliability					
It can get lost					
Difficult to use					
Restrictive					

12. Do you think portable bank services are better than going to the bank? Yes No

13. Do you find the service expensive compared to other services? Yes No

14. Do you find any technical challenges dealing with this service? Yes No

15. Do you think that buying a smartphone is a nightmare? Yes No

16. Would you recommend this service to others? Yes No

17. Do you have any security concerns using the services? Yes No