
TECHNOLOGICAL BANKING INNOVATIONS AND FINANCIAL INCLUSION BY COMMERCIAL BANKS IN NAIROBI COUNTY, KENYA

Njoki Grace Wanjiku¹, Jeremiah Koori², Gerald Atheru³

¹Student, Master of Science (Finance) Student, Kenyatta University, Kenya

²Department of Accounting and Finance, School of Business, Kenyatta University, Kenya

³Department of Accounting and Finance, School of Business, Kenyatta University, Kenya

ABSTRACT

Financial inclusion is the provision of financial services at affordable costs to sections of underprivileged and low-income segments of society. Failure to constantly redesign strategies that help the commercial banks adapt to changing business environment may lead to a strategic mismatch between what they offer and what markets demands. The study objective was to assess technological banking innovations and financial inclusion by commercial banks in Nairobi County Kenya. The study was anchored on the theory of financial intermediation, diffusion of innovation theory and Silber's Constraint theory of Innovation. A descriptive research design and a positivism philosophy were used because the conceptual hypotheses were drawn from existing theories and identified knowledge gaps as founded on the research design. Multiple regression model was employed in this study. For the purpose of this investigation, the target population included all the 42 registered commercial banks operating in Nairobi County, Kenya in the year 2016. Purposive sampling technique was used to determine the sample size. Thirteen (13) selected banks that had successfully implemented technological banking innovations in Nairobi County were purposively sampled for the study. Both primary and secondary data was used in this study. Primary data was collected using questionnaires. Secondary data on mobile bank transactions and mobile phone subscriptions in the banks for the period between 2011 and 2016 was obtained from Central Bank of Kenya, Kenya National Bureau of Statistics and the Banking survey manuals. Questionnaires were administered to randomly selected respondents. The confirmatory test for multicollinearity was done using the Variance Inflation Factor. Data was analyzed using correlation, Goodness of Fit, analysis of variance, F statistic/significance of the study variables and regression of coefficients which were used to draw inferences on the relationship between the study variables. Data was presented using tables and figures. Results of the study indicated that the predictor variables; mobile banking, agency banking, electronic banking outlets and internet banking have an influence on financial inclusion. Correlation results also indicated that mobile banking, agency banking, electronic banking outlets and internet banking were positively associated with financial inclusion. Additionally, the regression findings indicated that mobile banking, agency banking and electronic banking outlets were statistically significant predictors of financial inclusion. However, Internet banking had a significance level of 0.586 which is higher than the conventional threshold of 0.05 which rendered the variable as statistically insignificant in prediction of financial inclusion. The findings concluded that mobile banking, agency banking, electronic banking outlets and internet banking have an influence on financial inclusion with the technological innovations being well adopted by the customers in the respective banks. The study recommended that the banks' management should make use of these research findings to come up with innovative approaches of improving financial inclusion while maintaining the existing ones in the conduct of their business so as reach more clients with their products and services.

Key Words: *Technological Banking Innovations, Financial Inclusion, Mobile Banking, Agency Banking, Electronic Banking, Internet Banking, Commercial Banks in Kenya*

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1. Introduction

Two billion persons or 38 percent of adult in the world are currently living without a bank account, whereas 73 percent underprivileged persons are unbanked due to charges and the heavy necessities entailed in opening an account in a bank (World Bank, 2016). These ranks consist of over half of adult in the most underprivileged 40 percent of families in third world nations (World Bank, 2016). According to the Fin Access (2013) the proportion of adult population in Kenya that used formal financial services rose to about 67 percent in 2013 relative to 27 percent in 2006. In the same way, the number of the financially excluded adult inhabitants has dropped to 25 percent in 2013 from 39 percent in 2006 (Fin Access, 2013). In 2016, according to the Financial Access (2016) report, 75 percent of Kenyans are currently in access of financial services which is a 50 percent growth in the preceding 10 years. Financial exclusion, which has currently reduced to 17 percent, has more than halved from 2006 (Fin Access, 2016). According to Global Financial Index (2016) being financially excluded is associated with income levels. In the less developed economies, 20 percent of the wealthy adults are more than double probable to have an official account compared to the most underprivileged 20 percent. While the underprivileged people may not have access to monetary services as the wealthier people, their need for financial facilities and services may be even bigger. Evidence indicates that access to investments services and, specifically to “commitment” savings, in which persons limit their entitlement to draw finances till they have attained a self-specified objective – may have significant profits beyond only accumulating their quantity of savings. It can furthermore aid empowerment of women, raise profitable investment and utilization, increase output and earnings, and cut expenses on precautionary healthiness (World Bank, 2016).

Bhaskar (2013) highlights that the level of access of monetary services differ extensively by geographical location and earnings level. The portion of adult who possess an account varies from just more than 20 percent averagely in low-income republics to just about 90 percent in high-income countries. Concentrating on geographic locations in numerous emerging and developing countries, account possession is least in Africa, with merely about 20 percent of adult being financially incorporated. In the biggest emerging market economies (EMEs), study proposes that less than 40 percent of adult have an account in India, Mexico and Nigeria; while over 60 percent do so in China and Poland. One necessary constituent of access to formal finance is the availability of tools that permit for savings or credit or both (World Bank, 2015). The portion of adult that were described as saving at a prescribed monetary body in the course of 12 months prior to the investigation is substantially larger in nations with advanced revenue levels compared to states with lesser revenue (Mutsune, 2014). Dissimilarly, in term of fresh credit, the facts are additionally similar across the various income groups, and do not rise in lockstep with the extent in level of revenue. Businesses in emerging Europe have a tendency to have better access to formal finance compared to those in Africa and Asia. And, in nations in all three continents, significantly

less small businesses in general have entitlement to loans compared to medium-sized ones (Mehrotra & Yetman, 2015).

Progress has been made in increasing financial inclusion in Kenya to about 75.3 percent of the adult population which could be attributed to rapid innovations by the private sector in association with the public sector (CBK, 2016). According to Africa Development Bank (ADB) 2016 report, the latest financial inclusion surveys in the East Africa Countries (EAC) indicate that 24.7 percent of Kenyans in 2016, 15 percent of Ugandans in 2013, 73 percent of Burundians in 2012, 28 percent of Rwandans in 2012 and 56 percent of Tanzanians in 2009, were financially excluded. One can realize that EAC countries still face high rates of financial exclusion. However, these recent surveys noticed that from the previous financial inclusion surveys there has been a notable increase in financial inclusion through the formal financial sector (Fin Access Kenya, 2016). In spite of the achievements, the use of formal financial services in urban areas over the past 10 years has remained approximately double that of rural areas (Fin Access 2016).

According to Demirguc (2008) financial inclusion refers to the provision of financial services at an affordable cost to sections of disadvantaged and low-income parts of the general public, in contrast to financial exclusion where these services are not available or affordable. In order for a country to attain full inclusion the following are of great importance (Afande & Mbugua, 2015) Financial services should be accessible to all: this is the ultimate goal of financial inclusion. Financial services delivered should also be of quality: Quality monetary inclusion comprises of these characteristics: within the means of client, suitability, product-fit, security, dignity of handling, and customer protection. Monetary inclusion includes delivery of the full suite of basic financial services; this denotes to a group of vital monetary facilities that includes simple borrowings, savings, insurance and payment facilities (Gardeva & Rhyne, 2011). According to Gakure *et al* (2013) millions of people across the developing world do not have access to banking services. Faced with barriers related to cost, geography and education, these individuals have no way of securely transferring funds, saving money, insurance or accessing credit (BASA, 2003). These four services serve different needs that each household encounters, and ensuring access to this product range is an important goal of financial inclusion. Credit allows households to use future income to manage current vulnerabilities or to capitalize on investment opportunities. Savings provide a safe and value-retaining place where households can store funds, allowing them to tap into "past income" as needed. Insurance protects against vulnerability to shocks for instance death, illness, or disability in the family. Payments services allow people to carry out financial transactions without having to be face-to-face (Cohen, 2002).

According to Beck and Cull (2015) financial inclusion is particularly a concern in Africa as African banking structures are not as much inclusive compared to those which are not from Africa. Financial sector growth has led to the enhancement of development process; on the other hand the monetary facilities are grouped within main town areas and cities (Sahay, *et al.* 2015). There are on the other hand, present developments which could boost or as a minimum improve the state of monetary inclusion in Africa with the advancement of mobile banking and raising economic growth in numerous nations on the continent (Demirguc-kunt *et al.*, 2015).

Worldwide, there are two billion people currently living without a bank account because they have low or unstable incomes or have experienced a change in circumstances (IMF, 2016). Access is particularly low in rural areas because branches are mostly concentrated in urban centers (Mlachila, Park & Yabara, 2013). In Africa, there is a significant difference between rural and urban populations, with more than twice as many urban users taking up mobile bank

accounts as rural users (FinAccess, 2016). While it is difficult to estimate the exact size of the gap between the supply and demand for formal financial services for rural areas in Africa, recent surveys including IMF (2016) show that, across the continent, rural population are less banked (19 percent) than urban (34 percent). Available country-level data paint a bleak picture as well: in South Africa, a country with one of Africa's most developed financial sectors 65 percent of rural individuals were reported to be using formal banking facilities (ILO, 2016). Financial inclusion has gained recognition as one of the main pillars in South Africa and plays a vital role in the ongoing transformation and development of the society (Finscope South Africa, 2015)

In Kenya, access to formal financial services has grown more in the urban areas than in rural areas. For example between 2006 and 2015, those accessible to formal banking services in urban areas rose from 31 percent to 40 percent, while access in rural areas it increased only from 15 percent to 17 percent (FinAccess, 2016). In 2016, financial inclusion in the rural areas stood at 32.1 percent while in urban areas it stood at 59.9 percent. Over the past 10 years, the use of formal financial services in urban areas has remained roughly double that of rural areas. The rapid uptake of mobile financial services in Kenya has demonstrated the potential of reaching the poor using mobile technology and generated enthusiasm across the world about what is possible with these technologies (FinAccess, 2016). According to the Financial Access Household Survey (2016), financial inclusion stood at 32.1 percent in rural regions relative to 59.9 percent in urban context. Though the gap seems to be narrowing in Kenya, it still remains significant while been compared to other developing countries in Africa. In South Africa for example, access to formal financial services in rural areas stood at 65 percent while 80 percent of the urban adults were formally banked (ILO, 2016). The overall financial inclusion level in South Africa according to Fin scope South Africa, 2016 stands at 89 percent or 38.2 million adults. According to CBK (2016), the banking segment in the country has an aggregate of forty-two (42) commercial banks, one mortgage corporation and ten savings-taking microfinance establishments. Of all the 42 commercial banks, 30 are possessed by locals, and 12 are possessed by foreigners. Those that are owned by locals consist of 3 with substantial stake by the state and other state corporations. The Central Bank of Kenya (CBK) is tasked with observation, regulation and control of financial institutions in Kenya (CBK, 2016).

According to the Central Bank of Kenya (2016) Kenyan banks are classified into three levels founded on a weighted composite index of their net assets, capital and funds, client deposits, amount of credits and deposit accounts. Six big banks lead a market portion of 49.9 per cent, 16 medium banks govern a market portion of 41.7 per cent and 20 minor banks with a market stake of 8.4 per cent by December 2014 (Wahito, 2015). Higher tier lenders bear a weighted index of more than five per cent, while middle-tier banks have an index amid one and five per cent. Those with less than one per cent are categorized as small-tier lenders. Lenders in the middle tier increased their pooled market portion from 37.95 per cent in December 2013, forthcoming at a period when a lot of them increased extra capital to meet new-fangled CBK conditions as well as vigorously enlarge their procedures (CBK, 2016). According to Ngugi (2015) the policies created by the Central Bank have been reviewed quite a number of times, The Central Bank of Kenya works together with the practical procedures fashioned to guarantee there is satisfactory supervision responsibility by the CBK. The Banking Act in Kenya has been revisited so as to provide additional regulatory interests to the organization and to widen the tasks and scope of other banks (Waihenya, 2012). Commercial banks in Kenya have created a body known as Bankers Association of Kenya (BAK) which aids them to negotiate their concerns, and that of its participants. The Microfinance Act of 2006 was enforced in 2008. Its goal is to control the authorization of microfinance organizations, in

what way these bodies function and in what manner they are put in place in the nation. The Act empowers all the Deposit Taking Microfinance Institutions that are registered by the Central Bank of Kenya to rally for savings from the community giving raise to competition (CBK, 2015).

According to Waihenya (2012) coming up with a good banking structure is important for the country's trade and industry progress. In the 19th century, the accomplishment of comprehensive profitable banking structure enabled promising prospects for the industrial era to happen. A banking structure that is adequately established is necessary for the economic growth of a nation. The banking segment in Kenya contributes greatly in the state's monetary growth. Financial establishments are not merely the store houses of the nation's reserves but also the pools of capitals essential for economic growth. One of the major difficulties of an emerging state is the slow degree of capital creation. Financial institutions aid in wealth creation by reassuring individuals to save (Robinson, 2009). Commercial banks are a very significant basis of finance and loans for business. Loans/Credit is a focal point in expansion. Lending oils all trade and businesses. An immature economy is including being of a big non-monetized segment of the economy. The being of this non-monetized segments leads in decelerating or stopping economic growth and expansion in whichever state/nation. If some financial institutions unveil branches in the country sides, they can encourage monetization in entire nation (Aduda, 2011).

2. Statement of the Problem

Progress has been made in increasing financial inclusion in Kenya to about 75.3 percent of the adult population which could be attributed to rapid innovations by the private sector in association with the public sector (CBK 2016). In spite of the achievements, the use of formal financial services in urban areas over the past 10 years has remained approximately double that of rural areas (Fin Access 2016). In addition, dynamism and change of business environment has forced banks to innovatively redesign their strategies and redefine their business priorities to focus on delivery channels differentiation (Kleijnen, Ruyter & Wetzels, 2013). Failure to constantly redesign strategies that adapt the bank to its environment leads to a strategic mismatch between what an organization offers and what markets demand (Etim, 2014). This begs the question whether innovations in the banking sector do really lead to financial inclusion.

Technological inventions such as mobile money, agency banking, ATM and internet banking have caused great ease in receiving and transmission of cash as well as making payments (Kleijnen, Ruyter&Wetzels, 2013). Initially banks focused on native markets but currently they have stretched range in terms of markets and services to a national, multinational, and even global reach (Ngugi, 2015). Such dynamism of the environment has forced banks to redesign their strategies and redefine their business priorities to focus on delivery channels differentiation (Kleijnen, Ruyter & Wetzels, 2013). Failure to constantly redesign strategies that adapt the bank to its environment may lead to a strategic mismatch between what an organization offers and what markets demand (Etim, 2014). In addition, according to Ishengoma (2011) the delivery of banking services through technology calls for intensive information security. If such information security is not well put in place, it results in frauds that are likely to undermine public confidence in the use of electronic payment products (Ishengoma, 2011). The public might feel skeptical, may not trust such innovations, and consequently may not adopt such technological banking innovations in their services (Omwansa&Waema, 2014). This begs the question whether innovations in the banking sector do really lead to financial inclusion.

Several studies have been conducted on technological innovations in the banking sector and their relationship with financial inclusion. Sukhbir and Yogita (2015); Mago and Chitokwindo (2014); Kandie (2013); Wambua and Datche (2013); Ishengoma (2011); Sionfou (2015); Suki (2010) studied technological innovations and financial inclusion in different contexts including India, Zimbabwe, Kenya, West African Economic and Monetary Union (WAEMU) states and Malaysia. However, though the mentioned studies have contributed in literature on financial inclusion, they suffer from a contextual gap as they either addressed only one individual bank in the Kenyan sector or were not conducted in the Kenyan sector. More so, they did not address technological innovations adopted by banks in Nairobi County, Kenya. This study focused on the banking industry in Nairobi capturing the forty-two registered commercial banks working in Nairobi city county addressing that paucity in literature in the Kenyan context by studying technological banking innovations and financial inclusion moderated by mobile phone services by commercial banks in Nairobi County, Kenya.

3. Research Hypotheses

The hypotheses of this study were:

H01: Mobile banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya.

H02: Agency banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya.

H03: Electronic banking outlets do not have an affect financial inclusion by commercial banks, in Nairobi County, Kenya.

H04: Internet banking does not have an effect on financial inclusion by commercial banks, in Nairobi County, Kenya.

H05: Mobile phone services do not have an effect the on the relationship between technological innovations and financial inclusion by commercial banks in Nairobi County, Kenya.

4. Literature Review

4.1 Theoretical Framework

This sub-section describes the models/theories that the research is anchored on pursuant to study predictor and response variables. The theories consist of: Innovation Diffusion Theory, Theory of financial intermediation and the Silber's Constraint Theory of Innovation.

4.1.1 Theory of Financial Intermediation

Financial intermediation is a practice, that encompasses elements with extra funds putting them with monetary establishments who then advance surplus them to elements with shortage units. Bisignano (1992) acknowledged that monetary middlemen can be renowned in four ways. One, their foremost categories of obligations or deposits are counted for a definite amount, which is not associated to how an assortment of investment performs. Second, the deposits are typically of a considerably smaller tenure compared to their assets. Third, a large part of their obligations is greatly liquid which can be removed on request and finally, their obligations and assets are generally not movable to other parties. The greatest noteworthy impact of monetary middlemen is a consistent movement of funds from excess to shortfall parts of the economy.

According to Scholtens and van Wensveen (2003) the function of the monetary middlemen is principally viewed as that of forming unique monetary products. This responsibility is accomplished each and every time a middlemen discovers that they can trade the monetary commodities at costs which are estimated to take into consideration every charge to the making of the commodity, comprising direct and forgone costs. Monetary mediators are in existence because of marketplace deficiencies. This is to say, in a 'perfect' market with no transaction or information costs, financial intermediaries would not exist. Various markets have informational dissimilarities amid purchasers and vendors. In monetary marketplaces, information unevenness is predominantly noticeable. Debtors naturally recognize their security, sincerity, and ethical honesty much greatly compared to the lenders. Contrary, businesspersons have access to privileged information in regard to their personal ventures for which they look for funding (Leland & Pyle, 1977). Ethical threats hinder the movement of info amid market contestants, which is an imperative feature for ventures of excellent worth to be funded.

Monetary intermediation is viewed as the extent to which monetary establishments pool shortfall and excess spending parts in one place (Ndebbio, 2004). A crucial problem that the model underpinning attempts to address is why do financiers principally advance to financial institutions who then advance to debtors, rather than advancing directly? Discussions indicate to the datum that financial institutions are capable to efficiently observe debtors and as a result conduct the character of vicarious monitoring (Diamond, 1984). Diamond demonstrates that abridged observing charges are a basis of this relative benefit. He illustrates that monetary mediators successfully utilize their character by giving secondary monetary assets to purchase primary monetary assets. If no facilities are given by monetary mediators, financiers who purchase the secondary instruments given by them might in addition acquire them straightforwardly and save the mediation charges. This theory is relevant to this study in that it captures financial inclusion, which is explained by financial intermediation. The underpinnings of this theory can be used to help to understand how financial intermediation interrelates to financial inclusion and thus how such inclusion is affected by financial innovations in the commercial banks. This theory also captures financial inclusion in the banking sector which is largely determined by inclusion for financial services in the institutions which is explained by financial intermediation. The underpinnings of this theory can be used to help to understand how financial inclusion in financial institutions interrelates to technological innovations which are mediums and avenues to increase inclusion and thus how such innovations in the select commercial banks affect financial inclusion.

4.1.2 Diffusion of innovation Theory

This concept was established by E.M Rogers in the year 1962 and it defends the position that organizations take part in the dissemination of innovation so as to acquire competitive benefit, minimize charges and safeguard their tactical spots. The philosophy as suggested by Rogers expounds on in what manner a novelty is dissolved amongst consumers over a specific period (Liu & Li, 2009). It furthermore aids to comprehend clients behavior in the acceptance and implementation of an invention (Vaugh & Schavione, 2010). The underpinning demonstrates that the adopters partakers of any advancement in technology assume a bell-shaped scatter curve which can be categorized into five portions to group consumers by way of innovativeness (Liu & Li, 2009). Rogers categorized clients as pacesetters, initial adopters, primary majority, late majority and dawdlers (Liu & Li, 2009).

This theory holds that organizations take part in the adoption of innovation so as to achieve comparative advantage, minimize costs and defend their positions strategically (Hannig & Jansen, 2010). The innovation diffusion theory presented by Rogers in 1962 is a recognized

and well respected theory that enlightens in what way an innovation is absorbed amongst consumers over a period of time (Liu & Li, 2009). It as well aids to comprehend purchaser's personality through acceptance and implementation or non-adoption of such an innovation (Vaugh & Schavione, 2010). The theory portrays that those that make use of any innovation assume a bell-shaped distribution curve which can be categorized into five portions in terms of innovativeness (Liu & Li, 2009). Rogers categorized users as innovators, early adopters, early majority, late majority and laggards (Liu & Li, 2009). This theory is relevant to the current study in that by embracing the old-fashioned technology taking theories, models and structures to the embracing of revolutionary monetary invention, this research attempts to take the debate to the conventional modernization of technology in literature. This concept is utilized to research how banking advancement in technology influences financial inclusion by commercial banks in Nairobi City County. It captures mobile banking, agency banking, electronic banking outlets, internet banking and even mobile phone services as they are all part of innovations in the banking industry.

4.1.3 Silber's Constraint Theory of Innovation

Silber (1975) links monetary inventions to efforts of organizations taking full advantage of revenues to lessen the influence of numerous kinds of limitations that causes profitability to reduce. The model opines that the goal of income maximization of monetary establishments is the main motive of monetary inventions. Silber records that there are specific limitations (counting external constraints and internal constraints such as administrative organization) in the course of chasing income maximization. Even though these constraints not only assure the steadiness of administration, they minimize the effectiveness of monetary establishments so the establishments endeavor to charge them off (Silber, 1975). Research works/studies have shown that organizations that are not as much profitable in their own area are unreasonably inventive. In addition, their reduction in profitability, which can be said to be as a result of outside competition or state regulation, has given these businesses with the required enthusiasm to revolutionize in an attempt to grow profitability. This is in agreement with the proposal of Silber that putting resources into innovation is a well thought off solution to a negative competition and thus leads to increased profitability and performance (Silber, 1983). This theory is relevant in this study as it captures technological banking innovations. All the independent variables; mobile banking, agency banking, electronic banking outlets and internet banking constitute banking innovations and as such the theoretical underpinnings of Silber's Constraint theory can be used to help understand the independent variables' and how they are likely to relate with financial inclusion.

5. Empirical Review

Mago and Chitokwindo (2014) conducted an inquiry on the influence of cellular banking on monetary inclusion in Masvingo Province, Zimbabwe. The investigators assumed a qualitative approach in their survey design. The representative proportion of the population was made up of 270 participants from districts, informal sector and tertiary learners. The outcomes of the research exposed that the poor people were keen to embrace cellular banking and that there is an affirmative relationship amid cellular banking and monetary inclusion. The work was done in Zimbabwe, rendering scarcity in terms of context and this is the gap that the current study sets out to address. Etim (2014) studied mobile/cell phone banking and embracing mobile cash for monetary inclusion in West Africa through advancement in technology study in Nigeria. The work was focused on assessing the use of cell phones for banking and mobile financial facilities. The results revealed that cellular phones were extensively embraced and utilized principally for communication and were rarely utilized for performing great order responsibilities like mobile banking or mobile cash transmissions. The

findings also indicated that financial inclusion had increased as a result of mobile banking and mobile money adoption. The study incorporated only one variable, that is mobile banking, while the current study intends to incorporate more variables.

Ishengoma (2011) investigated the coverage of mobile banking system on financial inclusion in Tanzania. The study applied descriptive research design. The outcome of the findings showed that 79 percent of the populace was utilizing the technological system of mobile banking of which nearly 100 percent had aided in gain access to monetary facilities without difficulty and a positive association was established between mobile banking and financial inclusion. The study was not done in Kenya, which means limited research in that perspective, and rendering a gap in terms of context which is what the researcher in the current study aims to address. Ngugi (2015) empirically did an assessment of link of mobile banking and monetary inclusion in Kenya. The study revealed that facilities involved in mobile cash transmission have optimistic effect on monetary inclusion in Kenya. The research additionally exposed that mobile banking facilities have brought about a significant contribution towards deepening financial markets as a result of financial products developed related to mobile money. Cellular phone banking facilities were furthermore established to have a significant contribution towards financial access in Kenya. Though the study was done in Kenya, it focused on only one variable (mobile banking) and ignored the rest that the researcher has used in this study.

Mutsune (2014) studied financial inclusion through mobile banking in Kenya. The study examines Kenya's highly successful money transfer model Mpesa, in order to explore the nature and role of financial inclusiveness in stimulating economic activity. The study was focused towards exploring a framework that can be used to estimate how financial inclusion in Kenya through mobile banking has impacted economic dynamism. The ideas offered an inventive scrutiny that combines economic rationale with aspects of ordinary science with the aim of coming up with a framework that can be applied to suitable data. The study recommends flexibility in the application of this new form of technology by policy makers. The study considered mobile banking only and did not incorporate all other variables that the researcher used in the current study.

Ngendakuriyo (2014) in an empirical inquiry studies the influence of the mobile and agency banking on monetary inclusion in the East African Community region. After controlling for other factors known to be influencing the financial inclusion, the empirical results obtained by estimating a straight line fixed panel statistics with Least Square Dummy Factor (Variable) procedure indicate that agency banking monetary facilities affirmatively and importantly lead to monetary inclusion in the EAC area. Thus, agency banking industry fosters financial inclusion and increases the economic growth in the EAC countries. Despite the study being focused on the East African region, it ignored internet banking and electronic banking outlets which have been incorporated in the current study. Afande and Mbugua (2015) conducted an empirical study on agent banking facilities in promoting financial inclusion in Nyeri Town, Kenya. The banks included Equity bank, Co-operative bank and KCB. The study findings revealed that clients were eager to sacrifice the additional costs to acquire facilities of banking by way of agent banking channels. The study however took into consideration agency banking only and no other variables like mobile banking; electronic banking outlets and internet banking creating a conceptual gap that the researcher attempts to fill in this study.

Waihenya (2012) scrutinized the consequence of agency banking on monetary inclusion in Kenya. The researcher adopted secondary statistical sources as they were available with less difficulty, inexpensive and precise due to the guidelines about compliances by Central Bank

of Kenya. The study results indicated that agency banking leads significantly to increase in financial inclusion in the republic. The study identified small extent of monetary inclusion and a remarkable gap not addressed by official banking models. The researcher in addition highlights that banking through agency platforms encounters many hindrances from the swelling cellular phone diffusion in the republic with mobile cash transmissions swelling at a similar proportion. So much as the study was done in Kenya, it focused on agency banking only and ignored other variables that the researcher has used in the current study and this is the gap that the researcher attempts to fill. Jaabi (2015) studied monetary inclusion and growth by way of assessing latest proof of agency banking in Kenya. The research approach adopted the yearly quantity of monetary institutions making use of agency and mobile banking by means of Point of Sale terminal and mobile cellular phones in Kenya. The study outcomes exhibited that monetary inclusion by banking through agents has encouraged many sidelined societies and groups on the monetary platform by facilitation transaction time, minimizing susceptibilities, leveling intake trends and outreaching isolated zones/parts of Kenya. The study concentrated on agency banking only and did not take into consideration other variables used in the current study.

Muasya and Kerongo (2015) studied the effect of agency banking on access to financial services which was a survey of commercial banks in Kilindini District in Mombasa County, Kenya. By utilizing a sample size of 35 agency banking outlet operators in the district, the study established that costs associated with agency banking, bills payments via agency banking and financial services awareness among the rural population are positively correlated with access to financial services. Though the study was done in Kenya, it focused on only one variable (agency banking) and ignored the rest that the researcher has used in the current study. Chelagat (2013) studied the effect of agency banking on monetary inclusion in Kenya. The conclusion was that there is a strong and positive affiliation between financial inclusion and banking by way of agents. The checks performed indicated that there is a strong connection between the predictor variables and the dependent variable. The study focused on agency banking only and ignored mobile banking, electronic banking outlets and internet banking and this gap is what the researcher seeks to fill by undertaking this study.

Anil *et al.*, (2015) carried out an empirical inquiry on making monetary inclusion better through ATMs installation towards sectorial balance & sustainability in rural India. The study applied a descriptive methodology. The outcomes of the study were that there is a positive link between ATMs and financial inclusion in rural India. The study focused on electronic banking outlets only and ignored other variables used in the current study. Beck *et al.* (2007), Kiatchai Sophastienphong and Anoma Kulathunga (2009) and Satya R. Chakravarty and Rupayan Pal (2010) used demographic branch and ATM penetrations in their study to measure financial inclusion. Demographic branch and ATM penetrations are also considerably used as a proxy measure in the literature to measure financial inclusion. Demographic branch penetration denotes the number of bank branches per 100,000 persons while demographic ATM penetration refers to number of ATM branches per 100,000 persons. Penetration of demographic bank branches and ATMs measure availability of banking branches and ATMs to the people in terms of accessibility. Higher demographic branch and ATM penetrations indicate easier access because of fewer potential clients per outlet and vice versa. The study suffers from a contextual gap, which the current study attempts to fill.

Kamau and Oluoch (2016) studied monetary innovations and financial inclusion in Kenya. The study used secondary data on use of financial services. The data collected was analyzed using regression model. The analysis was presented in frequency and descriptive tables and

graphs. The study established that monetary inventions have an important affirmative consequence on monetary inclusion. Convenience to ATMs, mobile money inventions and mobile banking has an optimistic influence on monetary inclusion in Kenya. For that reason the growth in ATM and mobile cash dealings in addition to agency banking in Kenya have an important effect on monetary inclusion in Kenya. The study used secondary data while the current study intends to use both primary and secondary data and incorporate more variables that have been ignored.

Efremidou *et al.* (2014) examined the factors that drive customers to use e-banking services through a survey of 150 Greek bank customers. Their results show that the factors affecting the Greek client of a bank to utilize e-banking facilities is the safety of the deal and the satisfaction of the user. They also found that trust is a very important factor and has an important effect on clients' choices concerning the utilization of e-banking facilities. Sionfou (2015) using Auto Regressive Distributed Lag (ARDL) studied the impact of ICT on financial inclusion: evidence from West African Economic and Monetary Union (WAEMU) states. The study outcomes revealed that there is a statistically significant positive relationship between internet banking and financial inclusion. The study focused on ICT and did not incorporate the rest of the variables used in the current study.

Aduda and Kangoo (2012) tested the association of e-banking and the performance of Kenyan banking structure by means of statistics gotten from annual reports of target banks and the Central Bank of Kenya. The independent variables included banking, the amount of ATMs and the amount of debit cards given to clients measured against performance. By basing their study on an analysis of descriptive and inferential statistics, they found that in general, e banking has a robust and important peripheral relationship on the lucrateness in the Kenyan banking sector. In the same way, an optimistic connection was proven amid e-banking services and the institution's performance. The study focused e- banking only and did not capture the other variables that the researcher has used in the latter study. So as to increase monetary inclusion through internet banking in Bangladesh, Side *et al.* (2014) conducted an analysis using a combination innovation diffusion theory and decomposed theory of planned behavior. Then, they added the variable of the perceived financial cost to the combined model to identify and examine the factors that influence the behavioral motive to embrace (or carry on to utilize) banking by way of internet platform. Their results through a structural equation modeling (SEM) disclosed that the viewed monetary charges, apparent threat and idiosyncratic standards are the greatest important issues that affect people' purpose to embrace banking via internet. The study focused on internet banking only and ignored the rest of the variables that the researcher has used in the current study.

Suki (2010) examined the issues that affect internet banking acceptance amongst Malaysian clients, by means of a representation of 100 participants and a multiple regression methodology. The research outcomes indicated that the hedonic leaning banking locations, the viewed position of banking via internet to banking wants and compatibility all meaningfully influence the acceptance of the platform by Malaysian consumers. The study suffers from a geographical gap and ignored mobile banking, agency banking and electronic banking outlets, which have been incorporated in the current study. Saliu (2015) assessed the impact of mobile money transfer service on the socioeconomic status of the mobile money vendors (MM) in Kumasi Metropolis, Ghana. The population of the study was MM vendors in Kumasi Metropolis of which a sample size of one hundred and four respondents was chosen for the analysis with the aid of SPSS software. The responses revealed that there is a significant effect of income levels, employment characteristics and standards of living on the socio-economic status of the MM vendors in the study area. The study revealed a positive and

a statistically significant association between mobile banking and financial inclusion in Ghana.

Achieng (2014) studied the strategic responses of Kenya Commercial Bank to mobile money transfer in Kenya and found out that the money transfer service industry could be described as emerging, rapidly growing or a high velocity market in Kenya and any developing country. The study indicated that with the strategic positioning of the mobile telecommunications providers and the need for banking institutions to partner and integrate with the Mobile money transfer provides in order to remain relevant and share in the huge potential offered to mobile subscribers. Kathuria, Uppal and Mamta (2014) study the impact of mobile penetration on economic growth across Indian states. They estimated a structural model with three equations for 19 Indian states from 2000 to 2008. They specifically examined the links through which mobile phones affect growth and the constraints, if any, that limit their impact. They found that Indian states with higher mobile penetration rates can be expected to grow faster, and that there is a critical mass, at a penetration rate of 25 percent, beyond which the impact of mobile phones on growth is amplified by network effects. Telecom networks, more than any other infrastructure, are subject to network effects: the growth impact is larger when a significant threshold network size is achieved.

According to Aker and Mbiti (2010), there is a robust connection amid mobile cellphone coverage, the forms of facilities offered, the charge of such facility, and organization performance. In areas with restricted rivalry, income-maximizing businesses give additional restricted facilities at greater rates. Rayhan *et al* (2012) in their research on mobile cellphone banking in Bangladesh resolved that, banking using cellphone gives the possibility to spread less charges on simulated bank accounts to a great quantity of presently un-banked people. Cell phones boost the capability of electronic banking answers to propose to clients an improved variety of facilities and amenities at lower charges (World Bank, 2009). Mbilo (2012) did a study on mobile banking and its effect on financial performance of commercial banks in Uganda. The unit of analysis was Standard Chartered Bank (Uganda) Limited. A correlational design was employed by the researcher in this study. The data collected was analyzed qualitatively and quantitatively. The introduction of m-banking in Uganda has contributed to customer loyalty, convenience and also has influenced the financial performance of the banking sector in Uganda positively. Correlational results from the research findings indicated that there is a positive relationship between m-banking and financial performance of a bank.

Mobile banking is actual time virtual banking, obtainable anyplace, anytime all over the state and for that reason it is greatly beneficial in growing savings lifestyles and thus causing growth in bank deposits (Aker, 2010). Cellular phones furthermore augment availability of banking and progressive compensation of dealings at inexpensive charges. Furthermore, cellular phones have an affirmative influence because mobile systems can be in touch with isolated regions at less charges both to the client and the financial institution (Ngumi, 2013). It has been argued that mobile banking can be contributory variable of enduring overall financial inclusion (Aker, 2008). Individually, but all the more-so collectively, when their effects are mutually re-enforcing and are not at variance, mobile phone service can have a powerful influence on the relationship between innovations and financial inclusion (Klonner and Nolen, 2008).

6. Conceptual Framework

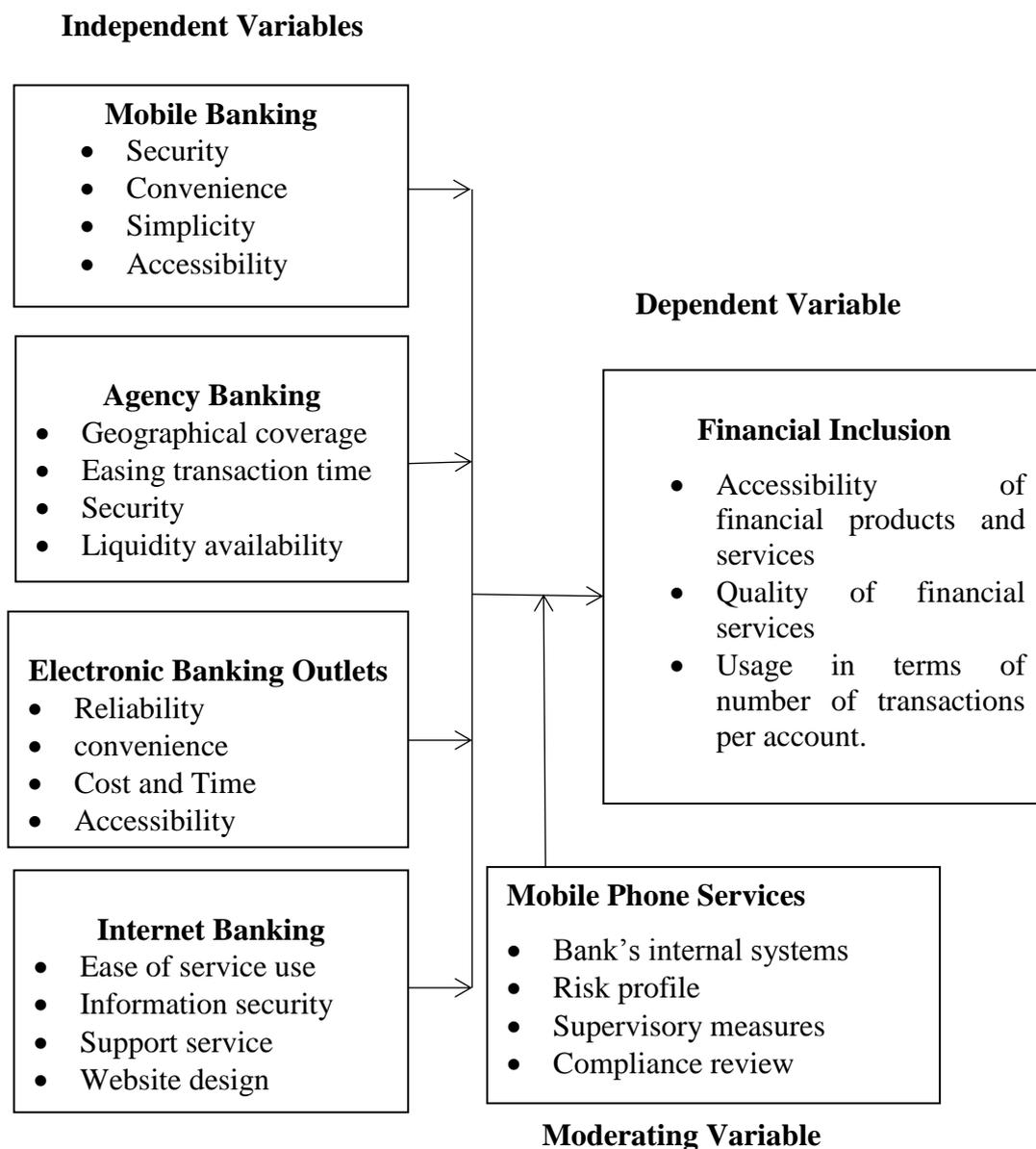


Figure 1: Conceptual Framework

Source: Survey Study (2020)

The independent variables are mobile banking, agency banking, electronic banking outlets and internet banking. The dependent variable in the study is financial inclusion with mobile phone services being the mediator variable. Mobile banking will be measured using security, convenience, simplicity and accessibility. Agency banking will be measured by geographical coverage, easing transaction time, security and liquidity availability. Electronic banking outlets will be measured by reliability, convenience, cost/time and accessibility. Internet banking will be measured by ease of service use, information security, support service and website design. The dependent variable (financial inclusion) will be measured by Accessibility in terms of the number of deposit bank accounts from 2011 to 2016. Financial inclusion will also be measured by accessibility of financial products and services, quality of financial services and usage in terms of number of transactions per account.

7. Research Methodology

This study adopted positivism philosophy because the conceptual hypotheses are drawn from existing theories and identified knowledge gaps. The study hypotheses were tested with the aim of either rejecting or failing to reject the null hypotheses, thus refuting or supporting theoretical postulations. This research made use of a descriptive design. The study adopted this design as the investigation was aimed at identifying the characteristics, trends, correlations and categories as descriptive research focuses to accurately and systematically describe a population, situation or phenomenon. In addition, the researcher did not control or manipulate any of the variables, but only observed and measured them. To be able to successfully measure the influence of technological innovations on financial inclusion, the investigator came up with a composite index for financial inclusion. Three steps were taken in developing the index. First, identification and selection of financial inclusion as the dependent variable in development of the composite index for as it had both primary and secondary data. Secondly, combining the variables into an index by examining the empirical relationships of variables. This was done by running a principle component analysis on SPSS and got a value of 0.453 as the index. The third step was validating the index by examining it across the item responses with both the primary and secondary data. This provided a means of testing for internal validation.

Target population in a study is the precise elements about which inferences are anticipated (Sekaran, 2010). For purposes of this research, the target elements consisted of all the 42 licensed commercial banks operating in Nairobi County, Kenya in the year 2016 (CBK, 2016). Purposive sampling design was used in arriving at the sample size. According to Creswell (2003) purposive sampling is ideal in cases where the population where a sample size of 78 respondents were studied. Both primary and secondary data was used in this study. Questionnaires were used in collecting the primary data. A likert calibrated questionnaire was done for excellent gathering of facts from the marked study participants. According to Mugenda and Mugenda (2003), questionnaires bear the benefit of time saving, suitability, in addition to safeguarding confidentiality. Hair, Bush & Ortinau (2010) identified questionnaires as the chief tools utilized in producing information in an investigation as they safeguard time and resources and furthermore enable an easier scrutiny as they are in a direct usable condition. Secondary statistics on mobile bank transactions and mobile phone subscriptions in the banks for the period between 2011 and 2016 were gotten from Central Bank of Kenya, Kenya National Bureau of Statistics and the Banking survey manuals. The leaning of the relationship to zero implies a weak affiliation. Numerical statistics were examined using Statistical Package for Social Sciences (SPSS) version 21 so as to assess the association and strength of research factors in correlation analysis.

SPSS was also used to analyse the multiple regression by testing the Goodness of Fit, ANOVA, F statistic/significance of the study variables and regression of coefficients amid the response and predictor variables. Correlation coefficient (R square) was utilized to assess the goodness of fit by explaining the extent to which the predictor variables inform the response variable. The 0.05 conventional level of significance was used to rate the level of significance. If the significance level is below 0.05, at that moment the model is considered to be statistically significant. The beta coefficient was employed to give details on the regression outcome of the predictor factors to the response variable. Tables, figures and graphs were utilized in presentation of results and findings.

8. Data Analysis and Discussion

Results on Pearson Correlation Analysis were presented indicating the strength and association of the relationship between financial inclusion and technological innovations. Regression results on the study variables were then presented capturing the model summary, ANOVA and regression of coefficients.

8.1 Pearson's Correlation Analysis

Pearson's bivariate correlation indicates the relationship between two variables. It ranges from 1 to -1 where 1 indicates a strong positive correlation and a -1 indicates a strong negative correlation and a zero indicates lack of relationship between the two variables. The closer the correlation tends to zero the weaker it becomes. The findings were presented in Table 4.15. The correlation between mobile banking, agency banking, electronic banking outlets, internet banking and financial inclusion was strong and positive (0.652, 0.694, 0.698 and 0.674 respectively). The findings indicate that all the independent variables were all positively associated with the response variable. The findings indicate that all the predictor variables: mobile banking, agency banking, electronic banking outlets, and internet banking were important determinants of financial inclusion as they all had a 0.000 significance level which is lower than the conventional level of 0.05.

Table 1: Pearson's Correlation Analysis

Variable		Financial Inclusion	Mobile Banking	Agency Banking	Electronic Banking	Internet Banking
Financial Inclusion	Pearson Correlation	1				
Mobile Banking	Pearson Correlation	0.652	1			
	Sig. (2-tailed)	0.000				
Agency Banking	Pearson Correlation	0.694	0.544	1		
	Sig. (2-tailed)	0.000	0.000			
Electronic Banking	Pearson Correlation	0.698	0.616	0.586	1	
	Sig. (2-tailed)	0.000	0.000	0.000		
Internet Banking	Pearson Correlation	0.674	0.682	0.691	0.685	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	

Source: Survey Study (2018)

8.2 Regression Analysis without Moderating Variable

Table 2 below shows the fitness of the regression model in explaining the variables under study. The results indicate that the variables: mobile banking, agency banking, electronic banking outlets, and internet banking were satisfactorily explaining financial inclusion. This conclusion is supported by the R square of 0.648. The results indicate that the predictor variables jointly explain 64.8% of financial inclusion.

Table 2: Model Summary

Model	Coefficient
R	0.805
R Square	0.648
Adjusted R Square	0.624
Std. Error of the Estimate	0.46969

Source: Survey Study (2018)

ANOVA statistics were presented on Table 3. The results for the study outcome indicate that the degrees of freedom associated with the sources of variance. The total variance has N-1 degrees of freedom. In this case, there were N=62 respondents, so the DF for total is 61. The model degree of freedom corresponds to the number of predictors minus 1 (K-1). That is, 4-1 (since there were 4 independent variables in the model, mobile banking, agency banking, electronic banking outlets and internet banking). But, the intercept (financial inclusion) is automatically included in the model. Including the intercept, there are 5 predictors, so the model has 5-1=4 degrees of freedom. The Residual degree of freedom is the DF total minus the DF model, 61 – 4 is 57.

The findings indicate that the model was statistically significant. This was supported by a probability (p) value of 0.000. The reported p value was more than the conventional probability of 0.05 significance level and thus significant in the study. These results indicate that the joint model with the independent variables; mobile banking, agency banking, electronic banking outlets and internet banking, is a good predictor of financial inclusion.

Table 3: Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	23.194	4	5.799	26.284	0.000
Residual	12.575	57	0.221		
Total	35.769	61			

Source: Researcher (2020)

Regression of coefficients results were presented in Table 4. The results show that there is a positive relationship between mobile banking, agency banking, electronic banking outlets, and internet banking and financial inclusion and whose beta coefficients are 0.314, 0.435, 0.373 and 0.074 respectively. The results indicate that; an increase in mobile banking by one unit leads to an increase in financial inclusion by 0.314 units; an increase in agency banking by one unit leads to an increase in financial inclusion by 0.435 units; an increase in electronic banking outlets by one unit leads to an increase in financial inclusion by 0.373 units; an increase in the internet banking by one unit leads to an increase in financial inclusion by 0.074 units.

Mobile banking, agency banking, and electronic banking outlets were statistically significant as they were less than the significance level of 0.05 which included 0.048, 0.004 and 0.009, respectively. These results indicate that financial inclusion is predicted by mobile banking, agency banking and electronic banking outlet. However, internet banking had a significance level of 0.586 which is higher than the conventional threshold of 0.05 which renders the variable as statistically insignificant in prediction financial inclusion. This implies that internet banking is not an important predictor of financial inclusion.

Table 4: Regression of Coefficients

Variable	Unstandardized Coefficients	Std. Error	t	Sig.
Constant	-0.850	0.5	-1.699	0.095
Mobile Banking	0.314	0.155	2.022	0.048
Agency Banking	0.435	0.144	3.031	0.004
Electronic Banking Outlets	0.373	0.137	2.715	0.009
Internet Banking	0.074	0.136	0.548	0.586

Source: Researcher (2020)

8.3 Moderating Effect Analysis

The study sought to determine the effect of the moderating variable on the relationship between technological innovations and financial inclusion.

ANOVA statistics were presented on Table 4. The results for the study outcome indicate that the degrees of freedom associated with the sources of variance. The total variance has N-1 degrees of freedom. In this case, there were N=62 respondents, so the DF for total is 61. The model degree of freedom corresponds to the number of predictor variables minus 1 (K-1). That is, 4-1 (since there were 4 independent variables in the model, mobile banking, agency banking, electronic banking outlets and internet banking). But, the intercept (financial inclusion) is automatically included in the model. Including the intercept, there are 5 predictors, so the model has 5-1=4 degrees of freedom. The Residual degree of freedom is the DF total minus the DF model, 61 – 4 is 57.

The findings indicate that the model was statistically significant. This was supported by a probability (p) value of 0.024. The reported p value was less than the conventional probability of 0.05 significance level and thus significant in the study. These results indicate that when mobile phone service as a moderating variable is introduced into the joint model with the independent variables; mobile banking, agency banking, electronic banking outlets and internet banking, then it is a good predictor of financial inclusion.

Table 5: ANOVA for Moderating Variable

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	22.204	4	4.992	24.266	0.024
Residual	13.556	57	0.241		
Total	35.760	61			

Source: Researcher (2020)

Table 6 below shows the fitness of the multiple regression model in explaining the variables under study. When mobile phone service is introduced in the model the R square is 0.782. The results indicate that the predictor variables jointly with mobile phone service explain 78.2% of financial inclusion.

Table 7: Multiple Regression for Full Model Summary

Model	Coefficient
R	0.884
R Square	0.782
Adjusted R Square	0.756
Std. Error of the Estimate	0.0119

Source: Researcher (2020)

8.4 Regression of Coefficients on Full Model

Regression of coefficients results were presented in Table 8. The results show that there is a positive relationship between mobile banking, agency banking, electronic banking outlets, and internet banking, mobile phone services and financial inclusion and whose beta coefficients are 0.294, 0.534, 0.411, 0.102 and 0.445 respectively. The results indicate that; an increase in mobile banking by one unit leads to an increase in financial inclusion by 0.294 units; an increase in agency banking by one unit leads to an increase in financial inclusion by 0.534 units; an increase in electronic banking outlets by one unit leads to an increase in financial inclusion by 0.411 units; an increase in the internet banking by one unit leads to an increase in financial inclusion by 0.102 units; an increase in the mobile phone services by one unit leads to an increase in financial inclusion by 0.445 units.

Mobile banking, agency banking, electronic banking outlets and mobile phone services were statistically significant as they were less than the significance level of 0.05 which included 0.032, 0.012, 0.024 and 0.006, respectively. These results indicate that mobile phone service has a moderating effect on financial inclusion. However, with the introduction of mobile phone services in the model, internet banking had a significance level of 0.586 which is higher than the conventional threshold of 0.05 which renders the variable as statistically insignificant in prediction financial inclusion.

Table 8: Regression of Coefficients

Variable	Unstandardized Coefficients	Std. Error	t	Sig.
Constant	0.241	0.601	2.499	0.095
Mobile Banking	0.294	0.135	2.017	0.032
Agency Banking	0.534	0.141	3.048	0.012
Electronic Banking Outlets	0.411	0.147	2.774	0.024
Internet Banking	0.102	0.127	0.768	0.676
Mobile Phone Service	0.445	0.134	2.767	0.006

Source: Researcher (2020)

The first null hypothesis was mobile banking does not have an effect on financial inclusion by commercial banks in Nairobi county, Kenya. Its alternative hypothesis is mobile banking does have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. The alpha level (α) is set at the conventional probability of 0.05 significance level. From the study findings, mobile banking had a P Value of 0.032 which was less than the conventional probability of 0.05 significance level. Since the $p = 0.032 < 0.05$, the study rejects the null hypothesis that mobile banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. These findings are consistent with those of Mago and

Chitokwindo (2014) who conducted an inquiry on the influence of mobile banking on monetary inclusion in Masvingo Province, Zimbabwe and found a positive association between the variables. In addition they agree with Ishengoma (2011) investigated the coverage of mobile banking system on financial inclusion in Tanzania and found a positive association was established between mobile banking and financial inclusion. Furthermore, Mutsune (2014) studied monetary inclusion by way of mobile banking in Kenya and established a positive association between the variables.

The second null hypothesis was agency banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. Its alternative hypothesis is agency banking have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. The alpha level (α) is set at the conventional probability of 0.05 which was less than the conventional probability of 0.05 significance level. Since the $p = 0.012 < 0.05$, the study rejects the null hypothesis that agency banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. The findings are consistent with those of Ngendakuriyo (2014) who did an empirical inquiry on the influence of mobile and agency banking on monetary inclusion in the East African Community region and found that agency banking financial facilities positively and significantly lead to financial inclusion. The result findings also agree with Afande and Mbugua (2015) who conducted an empirical study on agent banking facilities in promoting of financial inclusion in Nyeri Town, Kenya and the findings revealed that clients were eager to sacrifice the additional costs to acquire facilities of banking by way of agent banking channels. Further, Muasya and Kerongo (2015) studied the effect of banking via agents on availability to financial services which was an assessment of commercial banks in Mombasa County, Kenya and found that agency banking was an important predictor of financial inclusion.

The third null hypothesis was electronic banking outlets do not have an affect financial inclusion by commercial banks, in Nairobi city county, Kenya. Its alternative hypothesis was electronic banking outlets have an affect financial inclusion by commercial banks, in Nairobi County, Kenya. The alpha level (α) is set at the conventional probability of 0.05 significance level. From the study findings, electronic banking outlets had a P Value of 0.024 which was less than the conventional probability of 0.05 significance level. Since the $p = 0.024 < 0.05$, the study rejects the null hypothesis that electronic banking outlets have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. Results indicated that electronic banking outlets have an influence on financial inclusion. The findings are consistent with those of Anil *et al* (2015) who carried out an empirical inquiry on promoting financial inclusion better through ATM installation in rural India and found there is a positive link between ATMs and financial inclusion in rural India. Furthermore, Chakravarty and Rupayan Pal (2010) employed demographic channels and ATM diffusions in their research to assess monetary inclusion and found that ATMs do contribute positively to financial inclusion.

The forth null hypothesis was internet banking does not have an effect on financial inclusion by commercial banks, in Nairobi County, Kenya. Its alternative hypothesis is internet banking does not have an effect on financial inclusion by commercial banks, in Nairobi County, Kenya. The alpha level (α) is set at the conventional probability of 0.05 significance level. From the study findings, internet banking had a P Value of 0.676 which is greater than the conventional probability of 0.05 significance level. Since the $p = 0.676 > 0.05$, the study accepts the null hypothesis that internet banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. Results indicated that internet banking had an influence on financial inclusion. However, the findings indicated that internet banking was not a statistically significant predictor of financial inclusion. The findings agree

with those of Sionfou (2015) who studied the impact of ICT on financial inclusion and found a positive link between internet banking and financial inclusion. In addition, Aduda and Kangoo (2012) tested the association of e-banking and the performance of Kenyan banking structure and found that e banking has a positive robust relationship on the lucrativeness in the Kenyan banking sector.

The fifth null hypothesis was mobile phone services do not have an effect the on the relationship between technological innovations and financial inclusion by commercial banks in Nairobi County, Kenya. Its alternative hypothesis is mobile phone services do not have an effect the on the relationship between technological innovations and financial inclusion by commercial banks in Nairobi County, Kenya. The alpha level (α) is set at the conventional probability of 0.05 significance level. From the study findings, mobile phone services banking had a P Value of 0.006 which was less than the conventional probability of 0.05 significance level. Since the $p = 0.006 < 0.05$, the study rejects the null hypothesis that mobile phone services banking does not have an effect on financial inclusion by commercial banks in Nairobi County, Kenya. Results indicated that mobile phone services have an influence on financial inclusion. The findings agree with those of Saliu (2015) assessed the impact of mobile money transfer service on the socioeconomic status of the mobile money vendors in Kumasi Metropolis, Ghana and found a positive and a statistically significant association between mobile phone services and financial inclusion in Ghana. They also agree with those of Achieng (2014) who studied the strategic responses of Kenya Commercial Bank to mobile money transfer in Kenya and found out that the money transfer service industry could be described as emerging, rapidly growing or a high velocity market in Kenya and any developing country. The findings are also consistent with those of Kathuria, Uppal and Mamta (2014) who studied the impact of mobile penetration on economic growth across Indian states and found that Indian states with higher mobile penetration rates can be expected to grow faster, and that there is a critical mass, at a penetration rate of 25 percent, beyond which the impact of mobile phones on growth is amplified by network effects.

9. Conclusion

The first objective was to establish the effect of mobile banking on financial inclusion by commercial banks in Nairobi County, Kenya. Mobile banking has an influence on financial inclusion with the technological innovation being well adopted by the customers in the respective banks and that mobile banking was an important determinant of financial inclusion. Furthermore, mobile banking was positively associated and was a statistically significant predictor of financial inclusion. The second objective was to assess the effect of agency banking on financial inclusion by commercial banks in Nairobi city county, Kenya. Agency banking has an influence on financial inclusion with the technological innovation being well adopted by the customers in the respective banks and that agency banking was an important determinant of financial inclusion. Furthermore, agency banking was positively associated and a statistically significant predictor of financial inclusion.

The third objective was to determine the effect of electronic banking outlets on financial inclusion by commercial banks in Nairobi city county, Kenya. Electronic banking outlets did have an influence on financial inclusion with the technological innovation being well adopted by the customers in the respective banks and that electronic banking outlet was an important determinant of financial inclusion. Furthermore, electronic banking outlets are positively associated and are statistically significant predictor of financial inclusion. The fourth objective was to establish the effect of internet banking on financial inclusion by commercial banks in Nairobi city county, Kenya. Internet banking did have an influence on financial inclusion with the technological innovation being well adopted by the customers in the

respective banks and that internet banking was not considered an important determinant of financial inclusion. However, internet banking was positively associated but was not a statistically significant predictor of financial inclusion. The fifth objective was to ascertain the moderating effect of mobile phone services on technological banking innovations and financial inclusion by commercial banks in Nairobi City County, Kenya. Mobile phone services have a moderating effect on technological banking innovations and financial inclusion and is an important moderating factor on the influence of technological innovations on financial inclusion

10. Recommendations

The study recommends that banking institutions come up with measures to enhance security in mobile banking platform as more customers embrace mobile banking. Further, the study recommends that these platforms be made simple and easy to use so as to draw more customers in to the service. In addition, the banks should ensure that they facilitate mobile banking services by applying mobile phone usage as one of their innovation as mobile banking has an influence on financial inclusion. On agency banking study recommends that banking institutions come up with measures to enhance outreach the remotest areas increasing geographical coverage via agency banking outlets. The study also recommends that then banking institution put in places measures to enhance security of banking platforms hence more confidence to the customers. In addition, the management of the banks should increase awareness of the platforms by way of marketing and promotion as agency banking does have an influence on financial inclusion.

On electronic banking outlets, the management should put in promotion measures to communicate the reliability electronic banking outlet services as technological innovations to customers. The banks should also put in place measures to enhance the convenience of outlets as this boosts interest in banking, helps saving on time and cost encouraging more customers to adopt the service and thus increase usage. The banks should also ensure that these outlets are conveniently placed as this has a direct relationship with how more people get to interact with the service. On internet banking, the banks should have in place measures to ensure ease of service use of internet banking when the customers are interacting with the platform. In addition they should ensure information security is well in place so that the customers are confident with use of the system and personal details/information. Further there should be in place a dedicated team of support service of the platform to respond promptly in case of queries and support issues. The website design should also be simple to use and user friendly which could be a tool to attract more customers.

In addition, the banks' management should make use of these research findings in assessing the how better to come up with innovative approaches and maintain the existing ones in the conduct of their business so as reach more clients with their products and services. Academicians and scholars should use the findings of this study as a basis for their literature and support of gaps in terms of concept, context or even contradictory findings. The methodology used in this study would be used by the scholars as a model for their study in the event that the respective study assumes the same study discipline. The government should use the findings of this study to come up with better ways to enhance financial inclusion in the country by creating a favorable environment for the technological innovations to be introduced, formulated, implemented, monitored and evaluated in a stable environment. Policymakers should use the findings of this study in coming up with better and robust policies to enhance the relationship between technological innovations and financial inclusion as to enhance better banking service delivery to the public. Researchers in financial inclusion

could use this study as a basis for their literature. They could also use the findings in this study to understand how different technological innovations influence financial inclusion.

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