

**EFFECTS OF TECHNOLOGICAL INNOVATION ON FINANCIAL PERFORMANCE
OF COMMERCIAL BANKS IN KENYA**

Daniel Ndung'u Njenga¹ and Tabitha Nasieku²(Ph.D.)

¹School of Business Department of Economics, Accounting and Finance.

²Jomo Kenyatta University of Agriculture and Technology P.O Box 62000-00200 Nairobi, Kenya.

ABSTRACT

Technological innovation is currently, recognized as one of the key factors on the firms' competitive advantage as well as a critical element in improving the economic and financial results of firms. Indeed, increased economic and financial performance have been observed among firms capable of using innovation to improve their processes or differentiate their products and services in relation to their competitors. The main objective of this study was to establish the effect of mobile banking, internet banking, automated teller machines and electronic funds transfers on the financial performance of commercial banks in Kenya. The target population of this study was the 42 commercial banks licensed by CBK to operate in Kenya as at December 2015. Panel model was used to analyse the secondary data .The findings showed that technological innovations had statistically significant influence on total income, profit and return on assets of the banks in Kenya. Therefore it can be concluded that bank innovations influence on profitability, income and return on assets. It is recommended to the management of commercial banks and the Government to continue explore and implement sustainable banks technological innovation link-ages and collaborations with mobile phone service providers as well as the internet service pro-viders as a way of accelerating the penetration of innovations and eventually creating desired impacts in the economy.

Keywords: Technological Innovation, Commercial banks.

INTRODUCTION

Innovation consists of firms developing new products or new production processes to better perform their operations, in which case the new products could be based on the new processes (Tufano, 2002; Lawrence, 2010). In the financial services industry, innovation is viewed as the act of creating and popularizing new financial instruments, technologies, institutions and markets, which facilitate access to information, trading and means of payment (Solans, 2003). Financial innovation and change in monetary procedures and control follow each other and Central banks have therefore to change their tools, targets and operating procedures from time to time so as to cope with innovation and ensure the sustainability of the financial system (Misati, Njoroge, Kamau and Ouma, 2010). The Kenyan financial sector has undergone tremendous

changes in the last two decades (1990-2010). Misati, Njoroge, Kamau and Ouma (2010) for instance, document that financial products have increased, activities and organizational forms have also improved and the overall efficiency of the financial system has increased (CBK 2010). Commercial banks branch network has grown from 530 in 1999 to 1,102 branches by end of June 2011, ATMs increased from 262 to 2,613, a number of deposit accounts from approximately 1 million with 16,673 staff to 35.1 million with 36,212 staff over the same period (CBK, 2015). Consequently, the banking sector productivity score continued to improve where the staff to customers' ratio was 1:971 in December 2015 compared to 1:60 in 1999. Total assets increased from KShs. 387,371 million in December 1999 to KShs. 3.5 trillion in December 2015 while customer deposits from KShs. 235 billion to KShs. 2.49 trillion in December 2015 (CBK, 2015). The financial sector development in Kenya can be reviewed in three phases (Misati, Njoroge, Kamau and Ouma, 2010). The first phase is the 1970s to early 1980s. During this time, the financial sector was largely dominated by the banking sector, which was characterized by financial repression.

The banking industry has been earmarked as a key pillar to the achievement of Vision 2030 (a long-term strategy to achieve sustainable growth by the year 2030 through increased savings, encouragement of Foreign Direct Investment (FDI), safeguarding the economy from external shocks as well as propelling Kenya to become a leading financial centre in Eastern and Southern Africa. Within the Medium-Term Plan (2008-2012) under vision 2030, some of the target areas include a development of a safe and reliable payments system that will ensure smooth transfer and settlement of funds between customers and banks as well as between banks. Towards this end, the use of mobile phone networks, the internet, payment cards, operational resilience, and security will be pursued in order to increase trust, integrity, and confidence in the ICT based payment systems (Government of Kenya, 2008). In comparison with other East African economies, Kenya's banking sector has for many years been credited for its size and diversification.

The Kenyan Banking Sector's total assets stood at Ksh.3.5 trillion, with gross loans worth Ksh.2.17 trillion, while the deposit base was Ksh.2.49 trillion and profit before tax was Ksh.134 billion as at 31st December 2015. Customer deposits increased by 8.73 per cent from Ksh. 2.29 trillion in December 2014 to Ksh. 2.49 trillion in December 2015. The growth was attributed to increased deposit mobilization by banks as they expanded their outreach and leveraging on mobile platforms to mobilize lower cost deposits (CBK 2015). This growth has been attributed to growth in technological innovation such as mobile banking, internet banking, electronic fund transfers and automated teller machines,

1.1 Statement of the Problem

Despite the undeniable importance of financial innovation in explaining banking performance, the impact of innovation on performance is still misunderstood for two main reasons, first, there is inadequate understanding of the drivers of innovation and secondly, innovations' impact on bank's performance remains lowly untested (Mabrouk and amoghli, 2010). Though in Kenya the banking industry has continued to operate in a competitive environment, most banks have introduced new innovative products, processes, technology and organization innovation leading to greater efficiency and product differentiation. On technology, banks have had to offer a wide range of deposit, investment and credit products through distinct channels of distribution which include improved ATMs, internet banking, mobile banking and electronic fund transfers. A study by De Young, Lang and Nolle (2007) adopt an approach to the innovation performance relationship which does not take into account the antecedents to innovation inside and outside the banking organization, all of which could influence this relationship. The performance of commercial banks in Kenya also grew impressively between years 2006 to 2015 where profit grew from KShs 26 billion in 2006 to KShs 94 billion in 2015, total income increased by 497%, while the return on asset increased from 2.4% to 2.9% (CBK, 2015) The relationship between the growing investments in technology-based bank innovations and bank financial performance in Kenya needs to be studied. There is need to establish whether innovations have contributed to the financial performance of commercial banks in Kenya.

1.2 Objectives of the Study

- i. To establish the effects of internet banking on the financial performances of commercial banks in Kenya
- ii. To establish the effects of mobile banking on the financial performances of commercial banks in Kenya
- iii. To establish the effects of electronic funds transfers on the financial performances of commercial banks in Kenya
- iv. To establish the effects of automated teller Machines on the financial performances of commercial banks in Kenya

LITERATURE REVIEW

2.1 Theoretical Literature Review

The theories reviewed and which inform the study are, Schumpeter theory of innovation, innovation diffusion theory and task-technology fit theory. The theories reviewed to inform the

source of the variables of the study and the interactions between the dependent and independent variables.

2.2.1 Schumpeter Theory of Innovation

Schumpeter (1928) argued that entrepreneurs, who could be independent inventors or R&D engineers in large corporations, created the opportunity for new profits with their innovations. In turn, groups of imitators attracted by super-profits would start a wave of investment that would erode the profit margin for the innovation. Schumpeter (1934) emphasized the role of entrepreneurship and the seeking out of opportunities for novel value generating activities which would expand and transform the circular flow of income, but it did so with reference to a distinction between invention or discovery on the one hand and innovation, commercialization and entrepreneurship on the other. This separation of invention and innovation marked out the typical nineteenth-century institutional model of innovation, in which independent inventors typically fed discoveries as potential inputs to entrepreneurial firms. The author further saw innovations as perpetual gales of creative destruction that were essential forces driving growth rates in a capitalist system. Schumpeter's thinking evolved over his lifetime to the extent that some scholars have differentiated his early thinking where innovation was largely dependent on exceptional individuals/entrepreneurs willing to take on exceptional hazards as an act of will. His later thinking recognized the role of large corporations in organizing and supporting innovation. Schumpeter (1939) propositions particularly interesting allusion to innovations in the banking sector is found in Schumpeter's discussion of the banking acts of the 1930s. He stated that the 1933 act introduced important reforms which included the strengthening the Federal Reserve's power to regulate member banks' extension of credit for speculative purposes and the separation of commercial banks and their security affiliates. For all his insight on the role of innovation, Schumpeter still did not really explain the source of innovation. He was able to point to its importance and its role in timing economic cycles but did not address its source. This rather interestingly allowed Keynesian economics to argue that levels of investment were the cause of innovation. It was not until the 1960s that economists would begin again to search for the source of innovation. Porter (1992) argues that to compete effectively in international markets, a nation's businesses must continuously innovate and upgrade their competitive advantages. Innovation and upgrading come from sustained investment in physical as well as intangible assets. Financial markets play critical roles in mobilizing savings, evaluating projects, managing risk, monitoring managers, and facilitating transactions.

2.2.2 Innovation Diffusion Theory

According to Dillon and Morris (1996); Rogers (1983 & 2003), the factors which influence the diffusion of an innovation include; relative advantage (the extent to which a technology offers

improvements over currently available tools), compatibility (its consistency with social practices and norms among its users), complexity (its ease of use or learning), trial ability (the opportunity to try an innovation before committing to use it), and observability (the extent to which the technology's outputs and its gains are clear to see). Organizations are described as a social system, but within organizations, departments or teams can also serve as social systems. Yet the unique issues and elements of departments or teams within a larger organizational context are not addressed in terms of how these boundaries affect the adoption of innovation. For diffusion of innovation theory in organizations, the only system state defined by the theory is what type of decision-making process is in place for adopting and implementing innovations, identified as optional, collective, authority, and contingent innovation-decisions. Rogers' theory does not tell us whether the system states of organizations need to be in the normal operating mode in order for the theory to apply, or whether the theory holds in all types of organizations or only in certain types (Lundblad and Jennifer, 2003). Specifically, the theory begins to describe the innovation-decision process within organizations, but not to the level of addressing whether and how the characteristics of an innovation interact to affect its adoption within organizations, or whether organizational type, size, or industry affect adoption. In addition, while there is an innovation-decision process described for individuals and within organizations, there is no description of how the variables interact when innovations are diffused across organizations (Lundblad and Jennifer, 2003).

2.2.3 Rogers Innovation Diffusion Theory

Rogers' Diffusion of Innovation Theory (Rogers, 1995) seeks to explain how new ideas or innovations are adopted, and this theory proposes that there are attributes of an innovation that effect adoption: relative advantage, compatibility, complexity, trial ability and observability. Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. Furthermore, Rogers suggested that new innovations may be categorized on a complexity-simplicity continuum with a qualification that the meaning (and therefore the relevance) of the innovation may not be clearly understood by potential adopters.

Rogers' theory suggests that innovations that have a clear, unambiguous advantage over the previous approach will be more easily adopted and implemented. Current research evidence indicates that if a potential user sees no relative advantage in using the innovation, it will not be adopted (Greenhalgh et al, 2004). Compatibility is the degree to which an innovation fits with the existing values, past experiences, and needs of potential adopters. There is strong direct research evidence suggesting that the more compatible the innovation is, the greater the likelihood of adoption (Greenhalgh et al, 2004). Complexity is the degree to which an innovation is perceived as difficult to understand and use

When key players perceive innovations as being simple to use the innovations will be more easily adopted (Greenhalgh et al, 2004). Trial ability is the degree to which an innovation may be

experimented with on a limited basis. Because new innovations require investing time, energy and resources, innovations that can be tried before being fully implemented are more readily adopted.

2.3 Empirical Review

Technological innovation is made up of systems innovation, processes innovation, and innovation of equipment's employed in an organization. Cumming, (2008) defined process innovation as the process of reengineering and improving internal operation of business process. This process involves aspects of a firm's function such as technical design, R&D, manufacturing, commercial activities and management. According to Oke et al. (2011), process innovation involves the development of or enhancement in techniques and the evolution in process or system. Mobile phones enhance the ability of electronic banking solutions to offer customers an enhanced range of services at a low cost. Lang and Nolle (2002) also examined the determinants of internet banking adoption and observed that more profitable banks adopted internet banking after 1998 but yet they were not the first movers. Jayawardhena and Foley (2000) show that internet banking results in cost and efficiency gains for banks yet very few banks were using it and only a little more than half a million customers were online in U.K. Nader (2011) analyzed the profit efficiency of the Saudi Arabia Commercial banks during the period 1998- 2007. The results of his study indicated that availability of phone banking, number of ATMs and number of branches had a positive effect on profit efficiency of Saudi banks. According to Loonam and O'Loughlin (2008), ICT advancements, globalization, competition and changing social trends such as heightened customer pro-activeness and increased preferences for convenience have used intense restructuring of the banking industry. Simpson (2002) reveals that electronic banking is motivated largely by the prospects of operating costs minimization and operating revenues maximization. An evaluation of online banking in developed and emerging markets reveals that in developed substitute for physical branches for delivering banking services. Chung and Dutta (2012) found that online or internet based banking has become quite common. Banks have also realized the potential of internet banking and have recognized that it is necessary to integrate the customers' new lifestyle and web-based activity preferences with their business models. Adoption of internet banking leads to cost reduction and hence likely to increase banks' profitability. Also, Massoud, Saunders and Scholnick (2006) found that the level of ATM surcharge is positively related to deposits market share of large banks, while Prager (2001) finds it negatively related to deposits market share of small banks. Nyangosi and Arora (2011) argue that financial institutions adopted different electronic distribution channels to meet the demands of customers. In their study to examine the adoption of information technology in Kenyan banks focusing on services provided through internet and mobile banking, they found out that inclusion of information technology in banking business was necessary to achieve excellence goal. The

study further revealed that ATM technology is the most available technology while SMS banking was also found useful.

3.0 RESEARCH METHODOLOGY

This study adopted a descriptive and quantitative research design, Secondary data over ten year period (2006 to 2015) was collected from all the 42 commercial banks in Kenya (CBK 2015).The pooled data set of with $N=42$ and $t=10$ was analysed using panel model stated below.

$$Y_{it} = \beta_0 + \beta_1X_{1it} + \beta_2X_{2it} + \beta_3X_{3it} + \beta_4X_{4it} + \varepsilon$$

Y_{it} = is the performance of bank i over time t

X_{1it} = is internet banking i over time t

X_{2it} = is automated teller machine i over t

X_{3it} = is electronic funds transfers i over t

X_{4it} = mobile banking i over t

4.0 RESEARCH FINDINGS AND DISCUSSION

4.2 Descriptive Analysis

Data collected for all the variables was summarized on Table 4.1 the analysis showed that the number of f ATMs increased by 314% , the amount of funds transferred through electronic funds transfers increased by 241% between 2006 and 2015,the number of bank customers using internet banking increased by 632% .

Mobile banking services which was introduced in 2007 the number of users increased from 0.02 million users to 22 million users on whether banks innovation affects the incomes of commercial bank as indicated in the table 4.1 income of commercial banks increased from KShs 75 billion in 2006 to KShs 488 billion in 2015. The sector banking return on assets increase from 2.4% in 2006 to 2.9% in 2015

Table 4.1 Descriptive statistic of bank Innovation on financial performance of commercial bank

Year	No. of ATMs	EFT TrillionKShs	No. Internet Users in Million	No. of mobile bank User	ROA %
2006	617	8.56	2.73	-	2.4
2007	1,012	9.60	2.96	0.02	2.7
2008	1,325	17.27	3.32	1.04	2.6
2009	1,717	13.93	3.94	4.14	2.6
2010	1,979	17.10	5.65	9.00	3.8
2011	2,205	21.89	11.60	10.00	4.4
2012	2,381	19.88	13.66	15.00	4.7
2013	2,487	22.67	17.04	17.00	4.7
2014	2,613	25.56	19.47	21.00	3.4
2015	2,718	29.58	20.49	22.00	2.9

4.2 Regression analysis of automated teller machine, electronic funds transfers, mobile banking and internet banking against financial performances of commercial banks

4.2.1 Regression analysis

Panel model was used to obtain an equation which described the relation between the dependent variables and in depended variables based on the regression model. Electronic funds transfer is positively related to financial performances and has the most statistically significant at 5%. This means that EFT as a technological innovation affects financial performance of commercial banks. There is a positive relationship between financial performance and EFT with a P value of 0.01. The result collaborates those of Son, Mohamed, Hassan and Momina (2011) in as study a study done in Pakistan which concluded that electronic funds transfer leads to better income for banks.

Automated teller machine also has a statistically significant coefficient as indicated by P value of 0.29 which is statistically significant of 5%. Automated teller machine therefore contribute towards financial performance of commercial banks. Akram and Allam (2010) conducted a study in Jordan and found that use of information technology embodied in ATMs improve the matrix of financial and operational performances of commercial banks.

Mobile banking is positively related to the financial performances of commercial banks. This is shown by the positive sign of the coefficient. The coefficient of mobile banking innovation is also statistically significant as indicated by P value of 0.22 which is statistically significant at 5%. Internet banking is positively related to financial performance of commercial bank with a P value of 0.034 which is statistically significant of 5%. Aker and Mbiti (2010) and Rayhan, Sohel and Mahjabin (2012) supported this findings using data from Africa and Bangladesh respectively and found that mobile banking improve income and hence overall performances of commercial banks

Internet banking is positively related to the financial performances financial performances of commercial banks. This is shown by the positive sign of the coefficient. The coefficient of innovation is also statistically significant as indicated by P value of 0.034 which is statistically significant at 5%. In concurrences with the findings, Akram and Allam (2010) tested the hypothesis in a study on Jordanian banks and found that use of information technology like internet had impact on return on asset and overall performers of commercial banks. Similar process findings were reported by Onaz, Ozsos, and Helvacioğlu (2008) in a study conducted in Turkey which concluded that on the beside investment in e-banking being a gradual process, internet had a positive effects on the performances of commercial banks.

Table4.2 summary of Correlation Matrix

	Unstandardized coefficients		Standardized	T	Sig
	B	Std. Error	Beta		
(Constant)	0.763	0.189	0	3.9	0.034
Internet banking	1.678	0.578	0.528	2.458	0.03
Automated teller machines	1.342	0.678	0.62	2.879	0.29
Electronic funds Transfers	2.953	0.453	0.67	2.768	0.01
Mobile banking	1.879	0.567	0.521	0.2543	0.22
Observation (t)	10	10	10	10	10

Depended variable: Financial performances

The results of the regression model can be summarised in the equation below;

$$Y = 0.763 + 1.678X1it + 1.342X2it + 2.953X3it + 1.879X4it + \epsilon$$

4.2.2 Test of Significance

The significance of the relationship between the independent and the depended variables in the study was tested a 5% confidence level using Z –Test. Internet banking had the most significant on the return on asset with a value of 16.89, mobile banking had the most significant influence on the income of commercial bank with a value of 43.54, electronic funds transfer also significant influence on the return on assets in the banking sector with a value of 15.78, Automated teller machine had the had most significant on the profitability of commercial bank with a value of 13.35.

Table 4.3 Z-Test for the relationship between variables

	Income	Z-Test	ROA	Z-Test	Profitability	Z-Test
Internet Banking	0.478	34.85	0.37	16.89	0.67	16.02
Mobile Banking	0.787	43.54	0.23	13.57	0.56	9.34
ATM	0.168	3.66	0.34	3.37	0.87	13.35
EFT	0.456	3.68	0.789	15.78	0.67	4.56
Observation (t)	10	10	10	10	10	10

All the variables affects the bank performances in a positive way as indicated in the Table4.2.The result indicated that there is a strong persistency in a constant manner for both in depended variables. All variables affected the bank performance is a positive way. Mobile banking affects income at maximum it’s known that of the increase in the number of the mobile banking user’s increases the income through commission levied through the use of such services. Internet banking had strong relationship with return on asset of commercial banks, this was due to reduction in cost which the banking industries have achieved through use of internet banking platforms.

5.0 CONCLUSION AND RECOMMEDATION

5.2 Conclusion

In conclusion bank innovations affect financial performance of commercial banks in Kenya positively. The versatility of innovations has made their adoption rate to be high among both the

banks and their customers. It could have been challenging if the adoption was only with either the banks or the customers.

Banks in Kenya have continued to perform well even when other sectors of the economy show lagged performance. This can be explained using innovations which have enabled banks to start making income away from traditional sources like interest, trade and asset financing. Banks have been able to make more commission income from transactions done on innovation channels like; mobile banking, internet banking, electronic funds transfers and automated teller machines. Innovations were found to have a high prediction power in terms of grouping banks. It is therefore important for the Central bank of Kenya to consider grouping banks based on their market share of innovations and link the ranking to their profitability. This kind of ranking will provide some competition among banks and lead to better services to customers

5.4 Recommendations

Banks should continue investing in innovation delivery channels because they are able to control their costs much better as compared to investment in brick and mortar or physical branches. The volume of transactions that can be processed on channels like the internet and mobile is high as compared to delivering such transactions using manual processes. In Kenya, there are some citizens who are still unbanked due to poor access to financial services. ICT professionals should explore ways of providing innovative solutions for reaching the unbanked. This can result in more financial deepening and better financial development for the country and hence better profitability for the banks.

It is recommended that commercial banks continue to create sustainable business linkages and collaborations with mobile phone service providers as well as the internet service providers. Efficiency of a bank is enhanced by embracing value innovation. Value creation is the real breakthrough for high performance in banking sector.

REFERENCES

Akamavi, R.K. (2005). A research agenda for investigation of product innovation in the financial services sector," *Journal of Services Marketing*, 19(6), 359-378.

Misati, R. N. M., Njoroge, L., Kamau, A., &Ouma, S. (2010). Financial innovation and monetary policy transmission in Kenya.

<http://www.eurojournals.com/finance.htm>

Mabrouk, A., & Mamoghli, C. (2010). Dynamic of financial innovation and performance of banking firms: Context of an emerging banking industry.

International Research Journal of Finance and Economics, 5, 2010

DeYoung, R., Lang, W.W., & Nolle, D.L. (2007). How the internet affects output and performance at community banks.

Journal of Banking & Finance, 31 1033–1060.

Schumpeter, J. A. (1928). The instability of capitalism. *The Economic Journal*, September 1928.

Schumpeter, J.A. (1934). *The Theory of Economic Development*. Cambridge, Mass.: Harvard University Press (originally published in German in 1911; reprinted by Transaction Publishers, New Brunswick, New Jersey in 1997).

Schumpeter, J. A. (1939). *Business Cycles*. McGraw-Hill: New York.

Porter, M. E. (1992). Capital disadvantage: America's failing capital investment system. *Harvard Business Review*, 70, 65-82.

Dillon, A., & Morris, M. (1996). User acceptance of new information technology: theories and models. *Annual Review of Information Science and Technology*, Medford (NJ), 31, 3-32.

Lundblad, B., & Jennifer, P. (2003). A review and critique of Rogers' diffusion of innovation theory as it applies to organizations. *Research Agenda. National Bureau of Economic Research (NBER) Working Paper Series, Working Paper 16780*

Rogers, E. (1983). *Diffusion of Innovations*, 3rd edition. New York, NY: The Free Press. 216

Rogers, E.M. (2003). *Diffusion Innovation* (5th Ed.) New York: the Free Press

Armour, J., & Cumming, D.J. (2008). Bankruptcy law and entrepreneurship. *American*

Law and Economics Review 10, 303-350.

Jayawardhena, C., & Foley, P. (2000). Changes in the banking sector: The case of internet banking in the UK. *Internet Research: Electronic Networking Applications and Policy*, 10, (1), 19-30

Nader, A. (2011). The effect of banking expansion on profit efficiency of Saudi banks. *2nd International Conference on Business and Economic Research (2nd ICBER 2011) Proceeding 269*.

Loonam, M., & O'Loughlin, D. (2008). An observation analysis of e-service quality in in online banking. *Journal of Financial Services Marketing*, 13(2), 164-178.

Simpson, J. (2002). The impact of the internet in banking: observations and evidence from developed and emerging markets. *Telematics and Informatics*, 19, 315-330.

Chang, B., & Dutta, S. (2012). Internet banking and online trading. E-government service maturity and development: cultural, organizational and technological perspectives

Nyangosi, R., & Arora, J. S. (2011). Emergence of information technology in the Kenyan banking sector: An empirical study

Prager, R. (2001). The effect of ATM surcharges on Small banking organizations. *Review of Industrial Organization 18*, 161-173.

Aker, J. C. (2010). Information from markets near and far: mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics*, 2(3): 46-59.

Onay, C., Ozsoz, E., & Helvacıoğlu, A. D. (2008). The impact of internet-banking on bank Profitability- The case of Turkey. 2008. *Oxford Business & Economics Conference Program*