Adoption of Technological Innovations on Organizational Performance: Case of Commercial Banks in Kenya

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Abstract

Internet banking (IB) allows functional banking activities online. Adoption of IB varies significantly across commercial banks. Banks with large size tend to adopt IB earlier. In 2006, 96 percent of banks with assets over Kshs 24 billion had a website, compared to only 51 percent with assets under Kshs 8 billion. These observations raise important questions: what explains these variations of diffusion rates across banking groups? This study reports the results of a descriptive survey on factors causing variations in adoption of IB. A structured questionnaire was administered to all financial managers in all 46 commercial banks with a response rate of 70%. The SPSS was used to run simultaneous-equation regressions on data collected. Factors driving adoption of IB include increase average bank assets, non adopters imitating early adopters and loan specialisation in consumer lending. Factors hindering IB adoption include competition among banks and average age of a bank. The study recommends that to enhance IB adoption, banks should; strive to increase their average assets size, non adaptors to carefully study early adaptors, specialize in consumer lending, feed off competition by forming strategic alliances finally new banks have the advantage of installing IB technology in a package with other computer facilities compared to old banks. The study is important because banks have been blamed for not initiating programmes that adequately satisfying demand for financial services. The research contributes to the debate on how to enhance access to financial services in Kenya.
Key word: Adoption of Technological Innovation, Organizational performance

1.0 Background to the Study

Banking technology is generally a bundle or package of different technological elements such as improved varieties of products and services (processes). Banking technology consists of the two components; a hardware aspect, consisting of the tool that embodies the technology as a material or physical object such as machines; and software aspects, consisting of the information base for the tool such as technical knowledge and skills about how to use the hardware aspect of technology (Rogers, 1995).

Advances in information and communication technologies and the emergence of the internet have revolutionized business activities enabling new ways of conducting business referred to as electronic commerce (Zwass, 2003; Turban et al., 2004). Electronic commerce innovation in banks describes the process of buying, selling, transferring, or exchanging products, services, and/or information especially through computer, (the internet) networks (Turban et al., 2004). Integrated banking technology can be defined as "that innovation that enables the sharing of business information, maintaining of business relationships, and conducting of business transactions by means of telecommunications networks" (Zwass, 2003).

Technological innovation activities include the inter-organizational processes of market-based sell-buy relationships and collaboration (and consumer-oriented activities (business-to-consumer and consumer-to-consumer), as well as the intra-organizational processes that support them (Zwass, 2003). Adoption of internet technologies as a way of doing business has significant advantages. Organizations are embracing e-commerce as a means of expanding markets, improving customer service, reducing costs, and enhancing productivity (Wenninger, 1999). Efficiencies are experienced in marketing and advertising; new technologies make disintermediation possible, eliminating the middleman (Turban et al., 2004). Other efficiencies include reduced inventory and round the clock access at no additional cost. Superior banking technologies enable higher customization (Choi & Whinston, 2000) allowing organizations to improve customer service. A vital benefit of an integrated banking technology is access to global markets which enables businesses to expand their reach. For instance, the internet allows for unconstrained awareness, visibility and opportunity for an organization to promote its products and services (Senn, 2000).

Technological innovation involves an improvement to something already existing. In the 20th century, innovations in semiconductor technology increased the performance and decreased the cost of electronic materials and devices by a factor of a million, an achievement unparalleled in the history of any technology (Rogers, 1981). The advances in

information telecommunication technologies (IT) in the past 25 years have had a profound impact on the nature of banking and the way banks and other financial institutions are organized (Rishi & Sweta, 2004).

Technology transfer is the process, by which a body of knowledge from research is tested, reviewed, and evaluated at various stages in terms of practical usage. Technology includes process innovations that are put in place to apply technology within the workplace, and resulting innovation in business strategy and financial products. Technology encompasses a wide range of phenomena. It is the translation of scientific laws into machines, tools, mechanical devices, instruments, innovation, procedures and techniques to accomplish tangible ends, attain specific needs, or manipulate the environment for practical purposes.

Technological efficiency can result in lower transaction costs and increased revenue for banks. For instance, technology can allow banks to cross-market new and existing products to customers. Technology can also generate a high rate of innovation in new financial products. Roger (1995) defines innovation as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. Diffusion is the process by which an innovation is communicated through certain channel over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas. Communication is a process in which participants create and share information with one another in order to reach a mutual understanding. This newness of the idea in the message content gives diffusion its special character. The newness means that some degree of uncertainty is involved in diffusion. Uncertainty is the degree to which a number of alternatives are perceived with respect to the occurrence of an event and the relative probability of these alternatives. Uncertainty implies a lack of predictability, of structure, of information. In fact, information is a means of reducing uncertainty. Information is a difference in matter-energy that affects uncertainty in a situation where a choice exists among a set of alternatives (Roger & Kincaid, 1981). Diffusion is a kind of a social change, defined as the process by which alteration occurs in the structure and function of social system. When new ideas are invented, diffused, and adopted or rejected, this leads to certain consequences and social change occurs.

A study of the technologies progress in the banking sector is important because banks play an important role in providing, financing and mobilising savings, especially in emerging markets as compared to mature markets (Rishi & Sweta, 2004). To be efficient and increase outreach, banks should adopt new ways of doing business. Innovation is widely proclaimed as being of vital importance to achieve and maintain competitive advantage. At the same time, successfully internalising new technology is seen as essential for maintaining competitive position and adapting to changes in the external environment.

Although there are advances in information telecommunication technologies not all countries have benefited from these. There is a big gap in internet and other technologies adoption between the developed and developing countries (Licker & Motts, 2000); thus creating a digital divide. Digital divide is defined as the 'differential capabilities of entire social (or region) groups to access and utilize electronic forms of knowledge' (Sraub, 2000), segregating the 'haves and have-nots' in the information society.

Mbarika et al., (2005), state that much of the discussion on digital divides has focused on that which occurs among different social groups; they note the existence of international digital divide between countries. According to them, this digital divide is abundantly clear when comparing Sub-Saharan Africa with countries of the west like US or UK. The main obstacles that prevent developing countries from leveraging the technology are lack of adequate communication infrastructure, technical know-how, and information processing about the economy and environment. The lack of adequate banking infrastructure is also considered as one of the problems faced by developing countries in building technological innovation solutions (Khalfan & Akbar, 2006).

2. Statement of the Problem

The internet era in the banking industry started in 2004 when Barclays Bank of Kenya Limited allowed its customers to access account balances online as the first internet-only bank. Ever since then, banks have steadily increased their presence on the web. A major driving force of adopting IB is the potential for productivity gains that it offers. On one hand, the internet has made it much easier for banks to reach and serve their consumers, even over long distances. On the other hand, it provides cost savings for banks to conduct standardized, low value- added transactions (e.g. bill payments, balance inquiries, account transfer) through the online channel, while focus their resources into specialized, high-value added transactions (e.g. small business lending, personal trust services, investment banking) through branches.

According to financial access study done in 2007, 35 percent of depository institutions reported a website address in 2002, rising to 75 percent in 2004. Moreover, 53 percent of depository institutions reported websites with

transactions capability in 2005, rising to 62 percent in 2006. However, the adoption of IB varies significantly across commercial banks. Banks with large size tend to adopt IB earlier. In 2006, 96 percent of banks with assets over Kshs 24 billion reported that they had a website, compared to only 51 percent of banks with assets under Kshs 8 billion. These observations raise an important question: what explains these variations of diffusion rates across banking groups?

Meanwhile, the diffusion of IB has taken place in a continuously changing environment of Kenyan banking industry. Over the past decade, several reforms of Kenyan banking regulatory framework have been introduced and are expected to affect the size distribution of banks. The CBK has allowed banks and bank-holding companies to freely establish branches across boundaries lines. This flexibility in   branching regulation has opened the door to the possibility of substantial geographical consolidation in the banking industry. As a result, there has been a strong trend towards higher average bank size. This suggests further interesting questions: if bank size is an important factor in the adoption of IB, then how much has banking deregulation affected IB adoption? At the same time, how much, if any, has adoption of IB influenced the increase of average bank size?

Motivated by the aforementioned observations and questions, this research tries to provide a general framework to study, the endogenous diffusion of internet banking.

3.   Literature Review

3.1 Introduction

Technology diffusion is an indispensable process through which technological potential of innovative activities can be actually turned into productivity. Various characteristics of the economic environment in which diffusion takes place may affect the pace of diffusion, while the diffusion itself may also have feedbacks on the environment. To better understand this process, many important questions have to be answered. Among them, experts are curious about the following: who are the early adopters of technological innovations, what factors determine the various diffusion rates across adopter groups, and what feedbacks, if any, the diffusion may have on the economic environment. The ongoing diffusion of Internet Banking (IB) provided a good opportunity to look closely at these questions.

Technological innovation can be considered as a package of innovations (Zwass, 2003; Molla, 2006); various authors have applied innovation theory to study adoption of IT innovations (Kamal et al). Rogers (1983) defines organizational innovation as the development and implementation of ideas, systems, products, or technologies that are new to the organization adopting it. The adoption of innovations is a process that includes the generation, development, and implementation of new ideas or behaviors (Rogers, 1983). The innovation does not necessarily have to be new in terms of discovery or invention; it only has to be perceived as new by the organization.

There are combinations of pressures operating on the industry, and some of these pressures challenge the very core of banking business: information and delivery. A dominant pressure derives from new technology with respect to information, trading and delivery of financial services. Industrial history shows that the development of new technology has a major impact on any industry and has often done so. Technology affects the core of the banking business of information processing and delivery. In this respect, banking is no different from other industries. It is largely innovation, and what follows from it, that will transform the banking and financial services industries (Cooper, 1998).

These trends are emerging in the context of major structural changes in financial systems: the relative growth of financial markets, the increasing institutionalization of   saving and investment business, the growing role of institutions in other functions of the financial system, the rise in the role of institutional funds managers in the financial system, diversification of financial firms and the steady erosion of traditional distinctions between different types of financial institutions; the entry of new types of supplier of financial services, a substantial growth in the variety of new and complex financial instruments, and the globalisation of financial markets (Channon, 1998).

3.2 Significance of Technological Innovation

A strong banking industry is important in every country and can have a significant affect in supporting economic development through efficient financial services (Van Horne, 2004). Kenyan banks, however, largely continue to conduct most of their banking transactions using traditional methods. In Kenya, the role of the banking industry thus needs to change, both at the procedural level and at the informational level. This change will include moving from traditional distribution channel banking to electronic distribution channel banking. Given the almost complete adoption of internet, SMS and other technologies by banks in developed countries, the reason for the lack of such adoption in developing countries like Kenya is an important research question that is addressed by this study.

Wang et al., (2005) claim that in the 1990s internet banking technology was under-utilized as business organizations used it only to market their products and services. Thornton and White (2001), who examined customer orientations and usage of financial distribution channels in the Australian financial industry, found that more recently most financial institutions, faced with competitive pressure after deregulation in 1983, have rethought their strategies to take full advantage of internet, cell phone and other modern methods of conducting business.

Singh (2004) examined internet technology in the South African banking industry and highlighted that internet market potential is significant because banks have the opportunity to target most segments in the industry both locally and internationally. The Cedar group consulting firm (2004) survey reported that the technological innovation could play a major role in transforming the workplace to enhance productivity by reducing operational cost and improving employee relationships through improved service delivery. The investigators noted that as the transformation progressed in the workplace, the level of sophisticated services also increased.

3.3 Responses to Change in Customer Needs

The most significant change in the economic environment that altered the demand for financial products in recent years has been the drastic increase in the volatility of interest rates. In the 1950s, the interest on three- month Treasury bill fluctuated between 1.0% and 3.5%, in the 1970s; it fluctuated between 4.0% and 11.5%. This volatility became even more pronounced in the 1980s, during which the three-month T-bill rate ranged from 5% to over 15% (Mushkin, 2001).

Rogers (1995) made an attempt to measure the relationship between firm size, market structure and the propensity to adopt specific ICTs. Hannan and McDowell's (1984) study of the adoption of automatic teller machines (ATMs) by retail banks in the United States leads them to conclude that larger banks, operating in more concentrated local banking markets show a higher probability of installing ATMs than smaller banks operating in less concentrated markets. The result, they claim, provides evidence for the Schumpeterian hypothesis. The 'Schumpeterian hypothesis' referred to in studies on ICT diffusion relates to the relationship between firm size, market structure and the adoption of specific ICTs. The hypothesis emerges from Schumpeter's 1942 work, *Capitalism, socialism and democracy* in which he argues that the dominant firms in an oligopolistic market have greater incentives to invest in innovative activities due to the appropriateness of their investments. Although Schumpeter was referring to large industrial firms and their R&D laboratories, the hypothesis of a positive correlation between firm size, a concentrated market structure and a propensity to innovate has been extended to firms operating in the services sector regarding their investments in ICTs.

Cox et al., (2002), while undertaking studies on the patterns of innovation in UK- based industries; found that most firms engaging in innovation were concerned with economic factors. Direct costs of innovation and the costs of finance were the strongest perceived innovation constraints. This was followed by the excessive perceived economic risk of innovation. An enterprise's internal capabilities were regarded as less problematic. However, Khangati (2006) while undertaking studies on the patterns of innovation in Kenyan-based industries found that most firms engaging in innovation were concerned with economic and organization factors. Direct costs of innovation, costs of finance and enterprise's internal capabilities were the strongest perceived innovation constraints. Omondi's (2003) study of the adoption of automatic teller machines (ATMs) by retail banks in Kenya led him to conclude that larger banks, operating in local banking markets show a higher probability of installing ATMs than smaller banks.

4. Research Methodology

4.0 Research Design

To answer the research questions, an empirical study of banks adopting technological innovation was conducted. The study applied a descriptive survey design. The research purpose and questions of this thesis was to establish factors significantly affecting the adoption of IB. According to Onwuegbuzie and Tedlie (2003), descriptive survey is important when studying small number of units that are exposed to the same environment. Commercial banks in Kenya made up the population of the study. All the forty- six banks formed the target population. The reason for the choice of the years 2007 and 2008 is because 2007 is the first year when depository institutions were required to report their transactional websites.

4.1 Simultaneous Equations

The diffusion impact of IB can be characterized by a simultaneous equation system, which includes an adoption equation and a size equation as follows (Wang, 2005).

Recall Equation 1

$$F = 1 - G(y_0^*) = \frac{1}{1 + (\eta y_0^* / E(y_0))^{1/g}}.$$

It can be rewritten into a log-linear form:

$$gIn(\frac{1}{F} - 1) = In\eta + In\frac{\beta}{\beta - 1} + Ink - InP - In(\gamma^{\frac{1}{\beta-1}} - 1) - InE(y_0). \qquad (1)$$

Recall Equation 2

$$E(y) = E(y_0\{1 + [\gamma^{\frac{1}{\beta-1}} - 1][1 - \beta(1 + g, 1 - g; 1 - F)]\},$$

$$a_0 = (In\eta + In\frac{\beta}{\beta - 1}) / (1 + b_1); a_1 = 1 / (1 + b_1).$$

An empirical approximation of Equation 2 can be written as

$$InE(y) = InE(y_0) - b_1[gIn(\frac{1}{F} - 1)] + b_2In(\gamma^{\frac{1}{\beta-1}} - 1). \qquad (2)$$

Therefore, Equations 8 and 9 imply:

$$gIn(\frac{1}{F} - 1) = a_0 - a_1InE(y) + a_1[(b_2In(\gamma^{\frac{1}{\beta-1}} - 1) - InP + Ink] \qquad (3)$$

where

$$a_0 = (In\eta + In\frac{\beta}{\beta - 1}) / (1 + b_1); a_1 = 1 / (1 + b_1).$$

Also, Equation 1 suggests

$$y_0 = (\frac{P}{\propto \beta})^{\frac{1}{\beta-1}} \Rightarrow InE(y_0) = \frac{1}{\beta - 1}InP - \frac{1}{\beta - 1}In\beta + InE(\propto^{\frac{1}{1-\beta}})$$

Hence Equation 9 can be written as:

$$InE(y) = b_0 - b_1[gIn\frac{1}{F} - 1)] + b_2In(\gamma^{\frac{1}{\beta-1}} - 1) + \frac{1}{\beta - 1}InP + InE(\propto^{\frac{1}{1-\beta}}) \qquad (4)$$

Where $b_0 = \frac{1}{1-\beta}In\beta.$

The two Equations 10 and 11 are determined simultaneously and have to be estimated with simultaneous-equations regressions. Since the variable k is in Equation 10 but not Equation 11, and $E(\propto^{1-\beta})$ is in Equation 11 but not Equation 10, they can be used to define exclusion restrictions and identify structural parameters (Wang, 2005; Olmstead & Rhode , 2001).

4.4 Empirical Specifications

The empirical study, estimated the following simultaneous equations based on Equations 10 and 11 using commercial banks in Kenya panel data 2007-2008, where each bank is indexed by j and each year is indexed by t:

$$g_{j,t} In(\frac{1-F_{j,t)}}{F_{j,t}}) = a_0 + a_1 In(E(y)_{j,t}) + \sum_i a_i In(X_{i,j,t}) + \sum_l a_1 In(I_{l,j,t}) + \varepsilon_{j,t}, \text{ (Adoption)}$$

$$In(E(y)_{j,t}) = b_0 + b_1[g_{j,t} In(\frac{1-F_{j,t}}{F_{j,t}})] + \sum_i b_1 In(S_{l,j,t}) + \mu_{j,t} \text{ (Size)}$$

- F is bank-level adoption of IB (All websites and transactional websites separately); g is the Gini coefficient of bank size distribution;

- E (y) is a measure of average bank size;

- X are variables shared in both equations, e.g. variables affecting k only.

- I are variables only in the adoption equation, e.g. variables affecting k only;
- S are variables only in the size equation, e.g. variables affecting $E(\propto^{1-\beta})$ only.

The dependent variables in the two equations are as follows (Detailed explanations and sources of empirical variables are summarized in table 1 in the Appendix).
(1)   Log odds ratio for IB adoption adjusted by the Gini coefficient, constructed using the following variables. TRANSACT – Adoption rate for Transactional Websites; WEBAVE – Adoption rate for All Websites (informational and transactional); GINIASST – Gini coefficient for bank assets;
(2)   Average Bank Size, constructed by ASSTAVE – Bank assets.

As it is seen in the theory, there are three groups of exogenous variables: mean bank productivity $E(\propto^{\frac{1}{1-\beta}})$ IB cost saving and IB adoption cost k. The following relevant empirical variables were found to proxy them.
(1)   Mean Bank Productivity $E(\propto^{1-\beta})$; AGEAVE – Average age of banks;
(2)   IB Cost Saving γ: INETADOPT – Household access rate for the internet;
(3)   IB Adoption cost k; IMITATE – Years since the first bank adopted transactional Website; WAGERATIO – wage ratio of computer analyst to teller.

5. Data Collection Procedures

Data were collected by means of survey questionnaires. The survey questionnaires were administered to all financial managers at the headquarters of all the 46 commercial banks. The questionnaires were hand delivered and collected later between the months of August 2008 to May 2009 with a response rate of 70%.

5.0 Data Analysis and Presentation

The study used SPSS to run a simultaneous equation system regression. The results of the analysis were presented in tables. The independent sample T tests was used to analyze data. The T test assessed the statistical significance of the difference between two independent sample means. The T test was used to test the null hypothesis that the means of two populations are the same. An alternate hypothesis meant that the two groups are significantly different.

5. Analysis Results And Discussions

5.1 Introduction

A simultaneous- equation regression was run on a sample dataset. The sample consists of all commercials banks in Kenya as at 2007. As theory suggests the Gini-adjusted log-odds ratio was used as the independent variable. For most empirical variables used in the estimation, log transformation was used and prefix the variables with "In" in the notation. To get robust estimates, a regression using various definitions of dependent variables was conducted as well as different model setups.

5.2 Estimation Results and Discussions

The analysis presented mainly refers to results which used transactional websites and bank assets as dependent variables. For regressions, three different setups including a simultaneous-equation model on a pooled cross-section and time-series data, a random-effect simultaneous-equation panel model, and simple OLS regression on two

structural equations were estimated. The results of analysis show coefficients of IB adoption (InTRANODDS*GINIAVE) of (-0.5603) and bank size (InASSTAVE) of (-0.13439) in table 1.

The coefficients of IB adoption and bank size are both found to be statistically significant. It confirms the hypothesis that IB adoption and bank size are simultaneously determined, and suggests that OLS estimates may be inconsistent (Furst, Lang and Nolle, 2000). To obtain consistent estimates, simultaneous-equation techniques were used and the overall structural models indicate a fit with an R-square of 72% for adoption equation and 78% for the size equation.

Table1.

Single Equation Model of Adoption of Transactional Websites and Average Bank Assets

Ordinary Least Squares Estimates

Dependent variable:	InTRANODDS*GINIAVE	InASSTAVE
InASSTAVE	-0.13439** (0.0555)	
InTRANODDS*GINIAVE		-0.5603** (0.2537)
InMITATE	-0.4850** (0.2310)	
InWAGERATIO	0.0962 (0.4221)	
InASST98		0.6491*** (0.1810)
InDEPINTST		-0.1778** (0.0823)
InMETROAVE	-0.1987 (0.1899)	0.0434 (0.4182)
InLNSPECAVE	0.4143*** (0.1864)	0.7114* (0.4038)
InAGEAVE	0.4143*** (0.1208)	0.7114*** (0.2340)
InPOPDEN	0.1292* (0.0659)	0.3213* (0.1358)
InINETADPT	-1.6011*** (0.5312) (0.0843)	-3.5946*** (1.2315) (0.1576)
Constant	127.46 (169.87)	-452.36 (316.69)
Observations	32	32
R-squared	0.72	0.78

Robust standard errors in parentheses. See Table3 for variable definitions.

*significant at 10%; ** significant at 5%; ***significant at 1%.

First, the research sought to find the relationship between an increase in a bank's average assets and odds ratio for adoption of transactional websites. The results of analysis on the structural equation for IB adoption shows the coefficient on fitted value of InASSTAVE of (-0.1445). Most of the signs of estimated coefficients, and all of those that are statistically significant, are consistent with theoretical predictions. On the relationship between banks' average assets and adoption rate of transactional websites. The results of estimation on the structural equation for IB adoption indicate a coefficient on the fitted value of InASSTAVE of (- 0.1445).

The research sought to find out if competition between banks had an influence on IB adoption. Estimate of In DEPINTST shows a negative coefficient. However, when adopter rates are measured using all websites (Transactional and Informational), a coefficient of (-0.2444) was reported. Estimates suggest that competition among banks has a negative influence on IB adoption. Although the effect is not statistically significant, it turns significant when adoption rates are measured using all websites (informational or transactional).

Furthermore, the research sought to find the relationship between the average age of a bank and website adoption and asset size. The results of analysis indicate a positive coefficient on InAGEAVE. The average age of a bank is significantly related to both website adoption and asset size. The positive coefficient on website adoption equation implies that as the average age of a bank rises then the adoption rate falls. This result is consistent with previous findings that denovo banks were more likely to adopt internet banking than other banks (Furst, Lang & Nolle, 2000); Sullivan, 2000)). New banks may find it cheaper to install internet banking technology in a package with other computer facilities compared to older banks who must add internet banking to legacy computer system. Many new banks may also pursue consumers with demographics that favour internet banking and therefore, adopt appropriate technology (Wang, 2005)

Table 2: Mean Values of Selected Variables across Commercial Bank Groups

Variable*	Definitions	Effects on IB	Big Banks	Small Banks
OBS.	No. of banks		14	18
TRANSAVE	% of Trans Web		0.768	0.399
WEBAVE	% of Website		0.882	0.539
GINIASST	Gini of Bank Size		0.561	0.567
ASSTAVE	Mean Bank Asset	+	Ksh. 1,336.7	Ksh. 106.7
LNSPAVE	Loan Specialization	+	0.208	0.287
IMITATE	Years since 1st T-Web	+	5.83	6.71
POPDEN	Customer Population Base	+	95.7	39.2
DEPINST	% of Interbank Comp.	-	0.319	0.164
AGEAVE	Average Bank Age	-	36.46	25.18

The data in table 1 show that in 2007 the average IB adoption rate in the small banks have a smaller mean bank size and smaller average age of banks. All these factors appear to have contributed to slow diffusion of internet banking.

At the same time, the data reject several alternatives explanations of slow IB diffusion in smaller banks. In particular, it is not caused by the imitation of early adopters, competition from big banks or customer base. In fact, all these factors work in favor of adoption of in internet banking in small banks. In similar way, a comparison on variation of IB diffusion rate between big and small banks can be done.

6. Conclusions and Recommendations
6.1 Conclusions
The main objective of the study was to describe factors that affect adoption of internet banking across commercial banks in Kenya. The study concludes:

i. On effect of average assets size on adoption of internet banking. Results of the study indicate that an increase in the average bank assets has a positive influence on the adoption of internet banking.
ii. On the influence of early adopters on non adopters to adopt internet banking. The results of the study implies the longer the early adopters have had a transactional website, the higher the non- adopters internet adoption rate.
iii. On whether loan specialisation in consumer lending has an impact on internet adoption. Loan specialisation in consumer lending is associated with a higher rate of interne adoption.
iv. On the influence of competition among banks on the adoption of internet banking. Estimate results suggest that competition among banks has a negative influence on the assets size of the bank and internet adoption rates.
v. Finally, on the effect of average age of a bank on the adoption of internet banking. The study found out that, as the average age of the bank rises then the adoption rate falls.

6.2 Recommendations
i. The average assets size of a bank has a positive influence on the adoption of internet banking. The study therefore recommends that non adopter banks should strive to increase their average assets size in order to enhance their chances of taking full advantage of internet banking.
ii. The longer the early adopters have had a transactional website, the higher the non- adopters' internet

adoption rate. The study recommends that leadership of early adopters help prepare other banks and customers to use IB through lowering the adoption cost, financially or perceptions.

iii. Bank loan specialisation in consumer lending is associated with a higher rate of IB adoption. The study recommends that banks wishing to successfully adopt IB should specialize in consumer lending.

iv. Competition among banks has a negative influence on the assets size of the bank and internet adoption rates. The study recommends that commercial banks can feed off competition by merging or forming strategic alliances to spur IB adoption.

v. As the average age of the bank rises then the IB adoption rate falls. The study recommends that it's cheaper and convenient for new banks to install internet banking technology in a package with other computer facilities compared to older banks which must add IB to a legacy system. Also new banks may pursue consumers with demographics that favour internet banking and therefore, adopt appropriate technology.

Further Research

The main objective of the study was to find out factors affecting internet adoption by commercial banks in Kenya. This study focused only on the endogenous diffusion of internet banking in commercial banks. Thus, areas of further research are:

i. The replication of the study in other industries.

ii. A study should be done on performance characteristics, including costs and profitability, of early adopters of IB to find any differences from non-adopters.

iii. A study should be carried out to analyze the reverse effect of technology on banks performance.

Such studies could help in generalizations about internet and related technologies adoption in Kenya.

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Appendix 1 Data Table

Table 3
Empirical Variables Definitions

Variable name	Definition
TRANSAVE	Adoption rate for transaction web sites
TRANODDS	Odds ratio for adoption of transactional web sites
WEBAVE	Adoption rate informational & transactional web sites
WEBODDS	Odds ratio for adoption of information and transactional web sites
GINIASST	Gini coefficient for banks assets
ASSTAVE	Bank assets
METROAVE	Ratio of banks with concentration in metropolitan areas
LNSPAVE	Specialisation of lending to consumer customers
POPDEN	Bank customer base
IMITATE	Years since the first adopted a transactional web site
AGEAVE	Age of banks
INETADOPT	Household access rate for internet
WAGERATIO	Ratio of computer analyst to teller wage
DEPINTST	Ratio of bank deposits
ASST98	Bank assets in 1998
YEAR	Year

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