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Adoption of E-commerce Payment Systems by Commercial Banks in Kenya

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Abstract

E-commerce, which is combination of traditional commerce and Internet, has brought dramatic changes of the way business transactions are conducted prompting banks, as the intermediary financial instruments, to adopt and adapt electronic payment systems (EPS). These e-payment systems which include debit and credit cards, electronic fund transfer, mobile payments platforms and internet banking are already in use in Kenya market. Importantly to note is the fact that electornic payment instruments are not used with equal intensity even in developed countries due to various reasons. The research thus is focused on identifying key drivers for adoption of EPS in Kenya market by banks.

The researcher identified major variables affecting adoption of EPS which included security status, perceived level of trust, infrastructure capability to handle the system, marginal cost reduction and perceived associated benefits. A descriptive census survey of all the 43 banks was then done through a structured questionnaire. With aid of technology acceptance model and DeLone & McLean Information System Success model, the data collected was empirically analysed and results presented.

With different intensity, the findings of the study revealed that many banks in Kenya are implementing EPS platforms. The driving forces for the adoption are the factors identified in the conceptual framework of this study. Bank respondents successfully did the rating of these factors. Therefore, the study recommends for a concerted effort amongst EPS key players to streamline operations in their area of concern. They should establish policies and legal framework good for electronic transactions as well as building sound telecommunication infrastructure countrywide. Again, this study is just but a stepping-stone to a better analysis that will unlock the potential of e-payment systems. The researcher encourages both academicians and practitioners to critique the study findings.

Indexing Terms/Keywords

E-commerce, Electronic payment systems, Information Technology in banks, Electronic Money, Systems Acceptance

Academic Disciplines

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I. INTRODUCTION

The birth of information and communication technology (ICT) as a result of merging of computer science and telecommunication engineering, brought dramatic changes of the way business is conducted to compete in the market place and spread throughout the globe (Schneider, 2011). The combination of traditional commerce and Internet, providing opportunities for business or organizations to develop new business models to take advantages of globalization is known as electronic commerce or e-commerce.

Chaffey, (2009) describes e-commerce as all electronically mediated information exchanges between an organisation and its external stakeholders. That means e-commerce includes other activities, “such as businesses trading with other businesses and internal processes that companies use to support their buying, selling, hiring, planning, and other activities” (Schneider, 2011; Zwass, 2003). Therefore e-commerce involves digitally enabled commercial transactions between and among organizations and individuals with exchange of value across boundaries while e-business is the digital enablement of transactions and processes within a firm (Chaffey & Wood, 2005).

Kalakota and Whinston (1997) cited by Chaffey & Wood (2005) structures e-commerce into three categories, i.e., business-to-consumer (B2C) such as Amazon.com and travelocity.com offering online shop where products/ services are sold from company to end user; business-to-business (B2B) such as PerfectCommerce.com and Grainger.com where products and services are sold from one company/ organisations to another, and consumer-to-consumer (C2C) such as Half.com and eBay.com where products and services are sold by consumers to fellow consumers through a third party who charges a flat rate. However, not all products and services can be sold on the internet a part from those that take advantage of the convenience of internet such as computer software, online books, travel and hotel bookings, among others.

ICT has made it possible to have electronic payment systems like debit cards, credit cards, electronic fund transfer, direct credits and internet banking. E-payment can refer to a payment system for buying and selling goods or services offered through the internet or any type of electronic fund transfer. Banks play a critical role in these e-payments as an intermediary. Traditional e-payment systems such as MoneyGram and Western Union are noted to have many limitations which inhibit consumers from adopting them. Earlier research suggests that some of these factors relate to lack of trust, security, usability, high transaction costs, lack of perceived advantage and perceived risk. These factors are deemed to be important to provide banks with the confidence to switch to an online payment system (Ozkan, 2010).

Importantly to note is the fact that electornic payment instruments are not used with equal intensity even in developed countries. The variations in intensity of adoption as revealed by previous research works are caused by issues to do with security, infrastructure, regulatory and legal and socio-cultural challenges (Ingenico, 2012). However, efficient and safe payment systems matter for the smooth functioning of commerce, financial intermediation and ultimately economic growth.

The popularity of e-payment systems is enhanced with widespread use of internet based shopping and banking (Bizina, 2012). Nevertheless, electronic payments systems innovations are meant to fulfill two perspectives: - One is to replace existing funds transfer systems that are deemed risky because of their “informality” therefore freeing people from money lenders or other shady characters (a version of the empowerment). The second context, is that the designers of electronic payment systems are simply seeking a piece of the money transfer business (a version of the market share), where they seek to replace Western Union or MoneyGram (Boyd & Jacob, 2007).

E-commerce provides the opportunity to buy and sell products, information and services on the internet. Thus it requires an effective standardised online payment system. According to Đurić, Marić, & Gašević (2007), several online payment proposals both for coin-like and cheque-like systems have arisen with none achieving mass acceptance. This lack of a uniform platform for operation by banks leaves a strategic linger. All the e-payment service providers are expected to meet five central requirements of electronic payments to win trust from commercial sectors, i.e., security, cost, time, risk and capacity. Among the five factors, security is very crucial as it affects the trust and confidence of customers.

The other risks with e-payment lies in banks over reliance on IT; increased electronic access by customers and attacks by hackers through packet/ address spoofing, stealth diagnosis, sniffers, sweepers and backdoors; low public acceptability, lack of adequate infrastructure, staff resistance and legal challenges.

Laudon & Traver (2007) highlights the advantages of electronic payment systems over the traditional methods. They encourage privacy, integrity, compatibility, good transaction efficiency, acceptability, convenience, mobility, low financial risk and anonymity. The other advantages are reaching out to customers in remote zones, minimizing on costs associated with premises leasing and security and enhancing customer awareness and loyalty (Magutu, et al., 2011).

Kenya’s electronic payment systems dates back to 2005 when Central Bank of Kenya commissioned a Kenya electronic payment and settlement system (KEPSS), a pioneer real time gross settlement (RTGS) system. RTGS supports continous concurrent processing and final settlement of funds transfer instructions from one bank to another, in the accounts of participants in the Central Bank of Kenya as long as they have sufficient covering balance or credit. The other electronic payment systems in use include Nairobi automated clearing house (NACH), ATMs using cards, securities payment and settlement systems (Central Depository & Settlement Corporation), cross border money

transfers including Western Union and MoneyGram, and mobile payments such as M-pesa, Yu Cash, Orange Money and Airtel Money (CBK, 2012).

Since electronic payments are typically cheaper than paper-based or cash payments, pricing these transactions should speed up the shift to electronics (Bolt, Humphrey, & Uittenbogaarda, 2008). The key players in Kenya electronic payment systems in conjunction with Central Bank of Kenya are banks, infrastructure providers, non-bank mobile service providers, and regulatory bodies including the government.

2. FRAMEWORK FOR THE LITERATURE REVIEW

Two research theories were adopted for this study, that is, technology acceptance model (TAM) and DeLone & McLean Information System Success model. Most of the studies touching on electronic payments have their roots in Technology Acceptance Model (TAM) originally proposed by Davies in 1986. TAM was designed to predict user's acceptance of Information Technology and usage in organisational context as shown below.

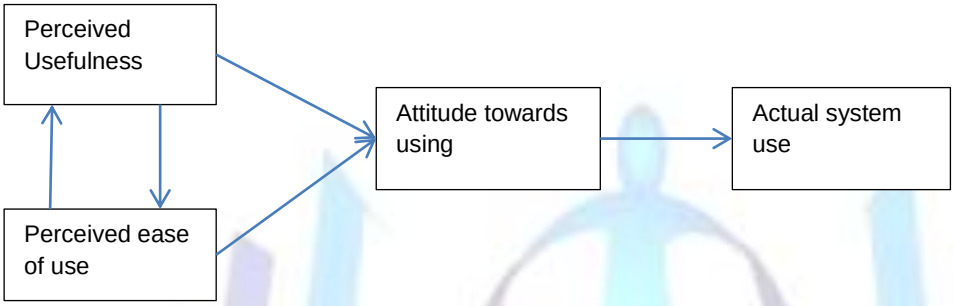


Figure 1: Technology Acceptance Model (TAM)
Source: Lule, Omwansa, & Waema (2012)

TAM model suggests that two important factors influence users when confronted with a new technology. These factors presented below determines when and how users will use the new technology (Lule, Omwansa, & Waema, 2012). They are: -

A. *Perceived usefulness* – The degree to which an individual believes that using the system will help him or her to attain gains in job performance, and
B. *Perceived ease of use* –The degree of ease associated with the use of the system

Technology acceptance model was therefore used to explore the level of motivation and user attitude that determined whether the user actually used or rejected the system in question (Kim, Mannino, & Nieschwietz, 2009).

On the other hand, the use of DeLone & McLean Information System Success model as a framework for measuring the success or effectiveness of information systems, was critical to understanding of the value and efficacy of information systems management actions and relevance of its investments (Delone & McLean, 2003). Key factors in considerations are identified in the figure below.

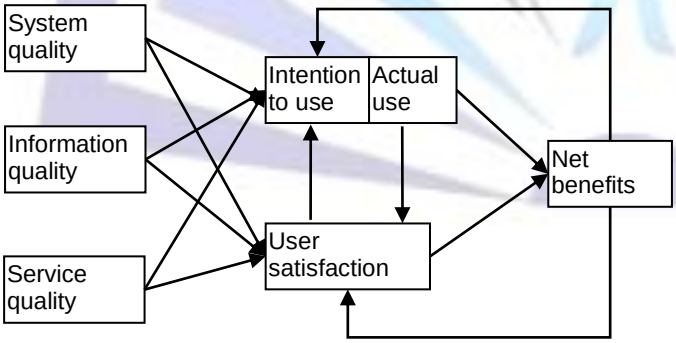


Figure 2: Delone & McLean IS Success Model
Source: Delone & McLean (2003)

A. *System quality* – this refer to the features that you expect from a system mainly reliability, portability, user friendliness, understandability, effectiveness, maintainability, economy, and verifiability.
B. *Information quality* – refers to the quality of information outputs, that is, management reports and web pages. It is a key dimension of end-user satisfaction instruments.
C. *Service quality* – a part from the use of SERVQUAL rater, other measures of service quality include the skill, experience, and capabilities and responsiveness of the support staff.
D. *System use* – is the degree and manner in which staff and customers utilize the capabilities of an information system. Empirical studies have adopted multiple measures of information system use, including intention to use, frequency of use, self-reported use, and actual use.

E. User satisfaction – The most widely used user satisfaction instruments are the Doll et al. (1994) End-User Computing Support (EUCS) instrument and the User Information Satisfaction (UIS) instrument (Petter, DeLone, & McLean, 2008).

F. Net benefits – Different aspects of impact, i.e., task productivity, task innovation, customer satisfaction, and management control are the key dimensions measured at the individual level. At the organizational level, a variety of measures are employed; but profitability measurements seem to be preferred (Petter, DeLone, & McLean, 2008).

A combination of two theories generated a framework that provided a better study platform for understanding the drivers explaining why users adopt e-commerce payment systems and whether the adopted systems had any business relevance. This operationalised construct is shown below.

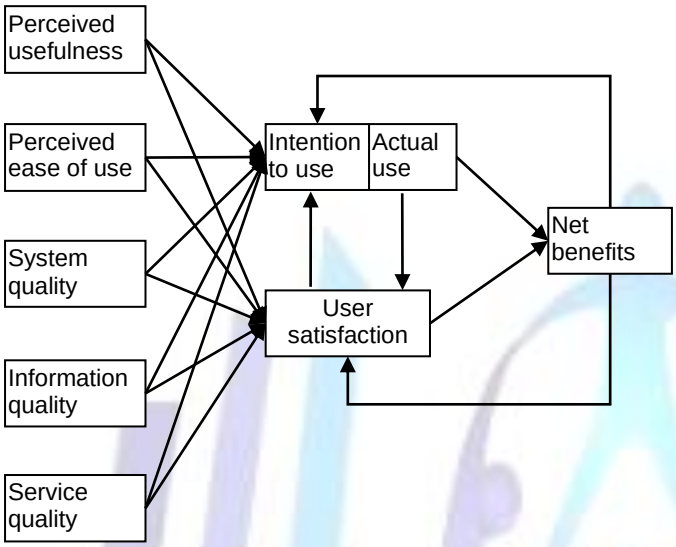


Figure 3: Research Constructs for Adoption and Impacts of Information Systems
Source: Researcher (2013) Adopted from Delone & McLean (2003)

3. RESEARCH METHODOLOGY

A descriptive cross-sectional survey research design was adopted to offer a substantial body of knowledge about extent of online payment systems and drivers for adoption of this methods of payament by banks in Kenya. The descriptive approach was concerned with who, what, where, when or how much of the interest variables being studied were adopted by banks (Howitt & Cramer, 2011). This approach was prime for investigating the forces behind the success or failure of electronic payment systems. A survey strategy was adopted since it allows collection of a large amount of data from a sizeable population in a highly economical way. Quantitative data collected with survey are easy to analyse quantitatively using descriptive and inferential statistics. The results thus can be used to suggest possible reasons for particular relationships between variables and to produce models of these relationships. For the case of this research, an establishment of relationship between the extent of EPS used by banks against the drivers for adoption of EPS was very important.

As at 31st December 2012, the banking sector comprised of the Central Bank of Kenya, as the regulatory authority, with other 43 commercial banking institutions (CBK, 2012). Out of the 43 banking institutions, 30 are locally owned banks while 13 are foreign owned. Since there are only 43 banking institutions, the study covered the whole sample frame (population). With census, generalisation of results is made simpler and accurate (Saunders, Lewis, & Thornhill, 2009).

Although the study coverered all the banks in Kenya as census, the subjects of interest were two staff members from each bank, that is, one from finance and another from information and communication technology. The people chosen for the study bore characteristics of interest to the theoretical concerns of the researcher, hence forming a research sample set. Based on the facts stated in the preceding paragraphs, the respondents in this study were arrived at as follows:

N (Total number of banks in Kenya (CBK, 2012)) = 43

n = Nx2 - > 43 x 2 respondents from each bank = 86

Therefore n = 86

Out of the 86 questionnaires given out to respondents, 70 were successfully returned with 16 failing to be honoured. This represents 81% response rate. According to Saunders, Lewis, and Thornhill (2009), a questionnaire response rate of between 50-70% is adequate for research study.

Primary data was collected using structured questionnaires that focused on on benefits of deploying e-payment systems, the challenges that come with e-payment system and lastly the key drivers that were behind adoption of e-payment systems irrespective of the challenges that were faced by banks. The questionnaire was validated through a rigourous process.

The following Linear Probability Model (LPM) was used to establish the drivers of e-commerce payment systems.

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Whereby
- Y = e-payment methods (ATM, debit/credit cards, mobile, and Internet)
- $\beta_{0..}\beta_2$ = Constant/ co-efficient
- X_1 = Determinants of e-payment (security, trust/risk, capacity, cost, benefits)
- X_2 = Characteristics of the bank (number of branches and ownership)
- ε = Random error term

4. DATA ANALYSIS, RESULTS AND DISCUSSION

Analysis of data looks for patterns or trends across the results, to track progressions or to seek out repetition of certain results to build up a strong case. More so, quantitative analysis deals with data in the form of numbers and uses mathematical operations to investigate their properties (Walliman, 2011).

To be sure that what was found in the questionnaires actually represented what was measured, a section of the questionnaire was designed to capture background data on respondents as well the banks they represented. Background data therefore took care of the validity and reliability of the questionnaires used as data collection tools.

4.1 Extend of EPS Use by Kenya Banks

Banks and other financial institutions in Kenya are one of the largest investors in the fields of information systems (IS), and there are many indications that these trend will continue in the future. When the correspondents were asked whether their respective banks use electronic payment systems, 91% percent admitted having installed ATMs, 64% gave consent of using debit cards, credit cards attracted 73%, mobile payment methods got 88% with internet supported transactions taking 73%. All the five methods of electronic payments under study scored above 50% which is an indicator of their intensity of use by commercial banks in Kenya. Table 4.4 below indicates the extent of adoption of electronic payment systems by commercial banks in Kenya.

Table 1: Extent of EPS Adoption by Banks in Kenya

	No		Yes		Total	
	Count	Row N %	Count	Row N %	Count	Table N %
Bank e-system ATM	6	9%	64	91%	70	100%
Bank e-system debit Cards	24	36%	42	64%	66	100%
Bank e-system Credit Cards	17	27%	47	73%	64	100%
Bank e-system Mobile Payment	8	13%	56	88%	64	100%
Bank e-system Internet Payment	17	27%	46	73%	63	100%

The most preferred method of electronic payment by banks is ATM (91%) followed by mobile payment methods (80%). Debit card payment method was the least accepted by correspondents with a rating of (60% each). The bar chart allows direct comparison of the methods of payment against the opinions of the respondents.

Kenya as a developing country still has a long way to go before the banks can accept implementing electronic payment systems as a mainstream method of financial transaction. The variations in intensity of adoption as revealed by previous researches are security, infrastructure, regulatory and legal issues and socio-cultural challenges (Ingenico, 2012).

4.2 Benefits of Electronic Payment Systems

The benefits of electronic payment systems were sought from the respondents and their response is shown in the table below. ATM methods of payment had a strong approval of 15% probability for increasing global reach of bank payments while 29% agreed that the ATM service would grant their clients a 24/7 hours service without the attention of teller clerk. Internet payment method also attracted a probability of 31% for improving the customer access through low capital costs as well as providing a 24/7 hours service to the customers. However, 20% of respondents did not agree that internet payment adds value to global reach. This could be explained by the different legal policies adopted by different countries concerning electronic payment systems. On average, quite a number of respondents did not have an opinion, that is, they were neutral on whether there are any benefits that come with electronic payment systems.

Table 2: Benefits of EPS to Commercial Banks in Kenya

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Count	Table N %
ATM: global reach.	2	3%	9	14%	18	27%	27	41%	10	15%	66	100.0%
ATM: high revenue	6	9%	9	13%	17	25%	31	46%	5	7%	68	100.0%
ATM: low cost	3	4%	5	7%	35	51%	18	26%	7	10%	68	100.0%
ATM privacy features	4	6%	9	13%	13	19%	37	54%	5	7%	68	100.0%
ATM: mass customization	5	7%	10	15%	18	26%	26	38%	9	13%	68	100.0%
ATM: 24/7 services	6	9%	3	4%	14	21%	25	37%	20	29%	68	100.0%
Debit Card: global reach	3	4%	9	13%	28	41%	19	28%	9	13%	68	100.0%
Debit Card: high revenue	2	3%	10	15%	30	44%	20	29%	6	9%	68	100.0%
Debit Card: Low cost	3	4%	9	13%	28	41%	23	34%	5	7%	68	100.0%
Debit Card: privacy features	4	6%	2	3%	26	38%	32	47%	4	6%	68	100.0%
Debit Card: mass customization	6	9%	11	16%	25	37%	23	34%	3	4%	68	100.0%
Debit Card: 24/7 services	0	0%	12	18%	23	34%	26	38%	7	10%	68	100.0%
Credit Card: global reach	1	1%	13	19%	27	40%	17	25%	10	15%	68	100.0%
Credit Card: high revenue	7	10%	4	6%	25	37%	26	38%	6	9%	68	100.0%
Credit Card: Low cost	9	13%	1	1%	34	50%	21	31%	3	4%	68	100.0%
Credit Card: privacy features	1	1%	6	9%	27	40%	31	46%	3	4%	68	100.0%
Credit Card: mass customization	11	16%	4	6%	24	35%	26	38%	3	4%	68	100.0%
Credit Card: 24/7 services	3	4%	2	3%	20	29%	29	43%	14	21%	68	100.0%
Mobile Payment: global reach	4	6%	13	19%	19	28%	26	38%	6	9%	68	100.0%

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Count	Table N %
Mobile Payment: high revenue	7	10%	9	13%	7	10%	32	47%	13	19%	68	100.0%
Mobile Payment: capital cost	3	4%	8	12%	10	15%	35	51%	12	18%	68	100.0%
Mobile Payment: privacy features	3	4%	8	12%	21	31%	26	38%	10	15%	68	100.0%
Mobile Payment: mass customization	4	6%	10	15%	18	26%	30	44%	6	9%	68	100.0%
Mobile Payment: 24/7 services	3	4%	6	9%	13	19%	28	41%	18	26%	68	100.0%
Internet Banking: global reach	14	21%	6	9%	1	1%	29	43%	18	26%	68	100.0%
Internet Banking: high revenue	4	6%	10	15%	20	29%	24	35%	10	15%	68	100.0%
Internet Banking: capital cost	9	13%	6	9%	10	15%	22	32%	21	31%	68	100.0%
Internet Banking: privacy features	10	15%	11	16%	11	16%	25	37%	11	16%	68	100.0%
Internet Banking: mass customization	5	7%	12	18%	16	24%	21	31%	14	21%	68	100.0%
Internet Banking: 24/7 services	4	6%	6	9%	10	15%	27	40%	21	31%	68	100.0%

4.3 Challenges Facing Implementation of Electronic Payment Systems

The challenges facing electronic payment systems in Kenya were recorded as follows in table 4.5 below. There is strong evidence that the challenges actually exist and affect the adoption of electronic payment systems. Online fraud (strongly agree - 16%) is one of the most challenging factors in adoption of electronic payment systems. The other equally worrying challenges are different software platforms (12%) and lack of cross border EPS support (14%). Where different implementation platforms are involved, banks find it difficult to interface with each other hence hampering smooth interbank transactions. Where banks have overseas branches, the challenge of inter-border transaction is also difficult if the host country does not ratify electronic payment as one of the official modes of transaction.

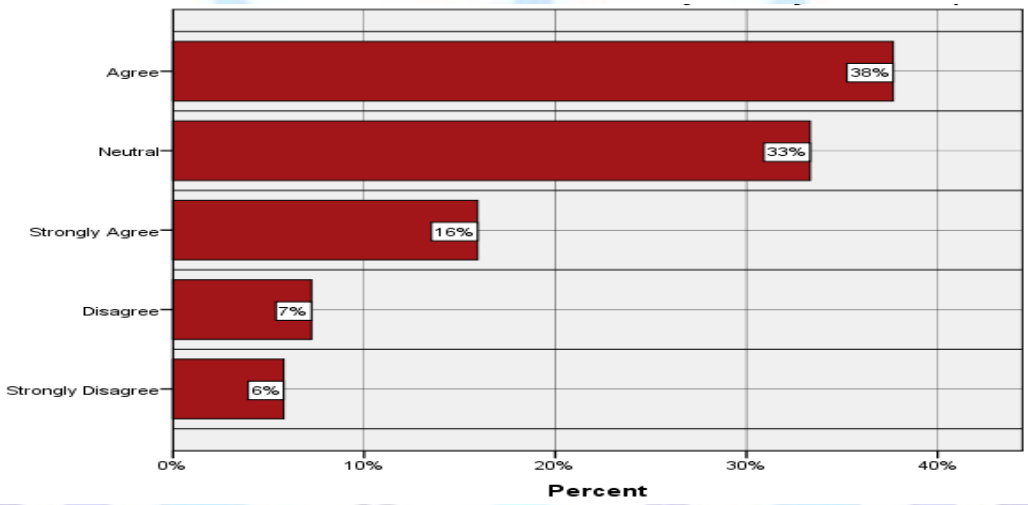
Table 3: Electronic Payment Challenges Facing Banks

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Count	Total N %
different e-payment platform	4	6%	2	3%	33	48%	22	32%	8	12%	69	100%
Low uptake cashless society	4	6%	13	19%	17	25%	29	42%	6	9%	69	100%
Increased online fraud	4	6%	5	7%	23	33%	26	38%	11	16%	69	100%

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Count	N %	Count	N %	Count	N %	Count	N %	Count	N %	Count	Total N %
Over reliance on IT	2	3%	9	13%	22	32%	32	46%	4	6%	69	100%
fear for layoffs	8	12%	12	17%	19	28%	26	38%	4	6%	69	100%
cross border e-payment system	2	3%	13	19%	22	32%	22	32%	10	14%	69	100%

The least challenge came from fear for layoffs (12% strongly disagree). Where change management is professionally carried out, staffs have no intrinsic fear of future consequences. The findings of the major challenges were presented in a bar chart for clarity of the opinion as shown in Figure 4.1 below. Online fraud bar charts indicate a larger portion of respondents with certain levels of agreement.

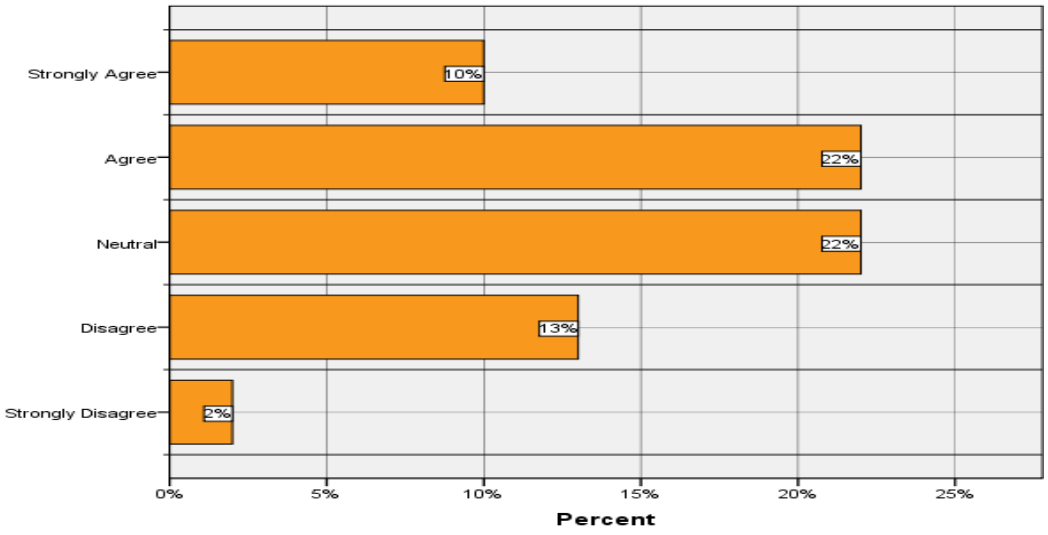
Figure 4: Increased Online Fraud Effects on Approval of E-Payment Systems



Banks' use of different electronic payment software and platform also has a strong indication for being a stumbling block to success of electronic payment systems deployment by banks.

Lack of cross-border e-payment system legal and technical support proves to be a huge challenge too. In the absence of an ex ante agreed upon resolution and burden-sharing mechanism and deteriorating health of the bank, incentive conflicts escalate and supervisory cooperation breaks down. Those who were neutral tied up at 22% with agreed respondents. Perhaps any slightest cross border transactions inconvenience would see them join the 'agree' group.

Figure 5: Lack of Cross-Border E-payment Systems



4.4 Key Drivers of Electronic Payment Systems

The research data obtained through questionnaires from banks respondents touching on key drivers for adoption of electronic payment systems are illustrated in the table 4 below. The answers are divided into two main categories of Yes and No for each payment method against the rows which constitute the key drivers for adoption. Majority of the respondents approved the role of drivers in adoption of electronic payment systems. Mobile phone payment system led the pack with 85% suggesting that they may take shorter time to transact. Improved system security providing trust and confidence to banks deployment of ATMs scored the highest probability of 79%. Perceived usefulness of ATMs probability stood at 81% while banks capacity to deploy and manage credit cards electronic systems probability was 81%. In contrast to the above supportive indicators, 47% mobile and internet method of payments was considered to have higher transaction risks. The opinion could be shaped by the fact that once the password is known to a third party, fraud can take place undetectably.

Table 4: The Main Drivers of Electronic Payment Systems

	Yes					No				
	ATM	Debit Card	Credit Card	Mobile Payment	Internet Payment	ATM	Debit Card	Credit Card	Mobile Payment	Internet Payment
Improved e-system security	79%	54%	59%	75%	59%	21%	46%	41%	25%	41%
User anonymity	66%	66%	65%	62%	68%	34%	34%	35%	38%	32%
E-payment long term strategy	71%	65%	69%	78%	77%	29%	35%	31%	22%	23%
Low costs of implementation	62%	62%	54%	70%	65%	38%	38%	46%	30%	35%
Perceived usefulness	82%	68%	73%	75%	65%	18%	32%	27%	25%	35%
Low transaction risk	67%	65%	55%	53%	53%	33%	35%	45%	47%	47%
System capacity	77%	76%	81%	66%	77%	23%	24%	19%	34%	23%
Short transaction time	70%	84%	75%	85%	67%	30%	16%	25%	15%	33%
System opportunities	74%	62%	69%	75%	80%	26%	38%	31%	25%	20%
Changes in lifestyle	72%	69%	73%	82%	83%	28%	31%	27%	18%	17%

There is generally high score in changes of lifestyle having effect on adoption of EPS. Internet method (80%) provides the highest chances of creating more opportunities than all the other EPS.

4.5 Correlation and Regression of Determinants of E-Payment Systems

The technique of correlation is used to test the statistical significance of the association. On the other hand, regression analysis is used to describe the relationship precisely by means of an equation that has predictive value. The two analyses techniques are important because of their different roles.

4.5.1 Correlation of Determinants of EPS

Pearson correlation is used to evaluate the relationship between variables and its matrix is an important indicator that tests the linear relationship, between the variables. The matrix also helps to determine the strength of the variables in the model, that is, which variable best explains the relationship between determinants of e-payment systems and the current method of electronic payment systems used by commercial banks in Kenya. This is important since it helps in deciding which variable(s) to drop from the equation. Table 5 presents the correlation matrix in levels. Table 5 also shows that there is no statistical relationship between key EPS determinants with the use of ATM as an electronic

payment method. However, improved systems security, perceived usefulness, low transaction risk, capacity of banks system and the presence of bank branches had a positive relationship with use of ATM method.

Table 5: Pearson Correlations - ATM Payment Method

		e-system: ATM	Improved security	low costs of implementation	Perceived usefulness	low transaction risk	system capacity	Bank Ownership	bank branches
e-system: ATM	Pearson Correlation	1	.089	.194	-.144	.229	.076	-.252*	.265*
	Sig. (2-tailed)		.465	.125	.241	.071	.530	.043	.032
	N	70	70	64	68	63	70	65	66
Improved security	Pearson Correlation	.089	1	.010	-.060	.222	-.284*	.046	.214
	Sig. (2-tailed)	.465		.937	.626	.081	.017	.715	.084
	N	70	70	64	68	63	70	65	66
low costs of implementation	Pearson Correlation	.194	.010	1	-.078	.193	-.224	.064	.105
	Sig. (2-tailed)	.125	.937		.545	.146	.076	.632	.415
	N	64	64	64	62	58	64	59	62
Perceived usefulness	Pearson Correlation	-.144	-.060	-.078	1	-.257*	.107	.023	.038
	Sig. (2-tailed)	.241	.626	.545		.042	.385	.857	.764
	N	68	68	62	68	63	68	63	64
low transaction risk	Pearson Correlation	.229	.222	.193	-.257*	1	-.216	-.098	-.220
	Sig. (2-tailed)	.071	.081	.146	.042		.089	.466	.094
	N	63	63	58	63	63	63	58	59
Banks system capacity	Pearson Correlation	.076	-.284*	-.224	.107	-.216	1	-.101	-.105
	Sig. (2-tailed)	.530	.017	.076	.385	.089		.423	.400
	N	70	70	64	68	63	70	65	66
Bank Ownership	Pearson Correlation	-.252*	.046	.064	.023	-.098	-.101	1	-.009
	Sig. (2-tailed)	.043	.715	.632	.857	.466	.423		.943
	N	65	65	59	63	58	65	65	63
Bank branches	Pearson Correlation	.265*	.214	.105	.038	-.220	-.105	-.009	1
	Sig. (2-tailed)	.032	.084	.415	.764	.094	.400	.943	
	N	66	66	62	64	59	66	63	66

*. Correlation is significant at the 0.05 level (2-tailed).

The number of bank's branches indicates a strong positive relationship with use of credit cards as shown in table 6 below.

Table 6: Pearson Correlation - Credit Card Payment Method

		e-system Credit Cards	improved security	low costs of implementatio	Perceived usefulness	low transaction risk	Banks capacity	Bank Ownership	bank branches
e-system Credit Cards	Pearson Correlation	1	.295*	.311*	.017	-.295*	.097	-.127	.615**
	Sig. (2-tailed)		.018	.019	.900	.020	.449	.336	.000
	N	64	64	57	59	62	63	59	60
improved security	Pearson Correlation	.295*	1	.070	.392**	-.044	.120	-.174	.298*
	Sig. (2-tailed)	.018		.596	.001	.733	.334	.172	.017
	N	64	68	59	63	64	67	63	64
low costs of implementation	Pearson Correlation	.311*	.070	1	.317*	.028	.161	-.100	.120
	Sig. (2-tailed)	.019	.596		.015	.836	.226	.462	.384
	N	57	59	59	58	56	58	56	55
Perceived usefulness	Pearson Correlation	.017	.392**	.317*	1	.264*	.240	-.019	.316*
	Sig. (2-tailed)	.900	.001	.015		.043	.061	.884	.015
	N	59	63	58	63	59	62	60	59
low transaction risk	Pearson Correlation	-.295*	-.044	.028	.264*	1	.223	-.249	-.112
	Sig. (2-tailed)	.020	.733	.836	.043		.078	.057	.396
	N	62	64	56	59	64	63	59	60
Banks capacity	Pearson Correlation	.097	.120	.161	.240	.223	1	-.250*	-.137
	Sig. (2-tailed)	.449	.334	.226	.061	.078		.048	.281
	N	63	67	58	62	63	67	63	64
Bank Ownership	Pearson Correlation	-.127	-.174	-.100	-.019	-.249	-.250*	1	-.009
	Sig. (2-tailed)	.336	.172	.462	.884	.057	.048		.943
	N	59	63	56	60	59	63	65	63
bank branches	Pearson Correlation	.615**	.298*	.120	.316*	-.112	-.137	-.009	1
	Sig. (2-tailed)	.000	.017	.384	.015	.396	.281	.943	

	N	60	64	55	59	60	64	63	66

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

A similar relationship is also exhibited in table 7 below where internet payment method has a positive relationship with presence of bank branches.

Table 7: Pearson Correlation - Internet Payment Method

		e-system Internet Payment	improved security	low costs of implementatio	Perceived usefulness	low transaction	Banks capacity	Bank Ownership	bank branches
e-system Internet Payment	Pearson Correlation	1	-.055	-.060	.007	-.143	.138	.181	.377**
	Sig. (2-tailed)		.671	.650	.957	.275	.280	.163	.003
	N	63	63	59	58	60	63	61	61
improved security	Pearson Correlation	-.055	1	-.005	.371**	.359**	-.043	-.173	.035
	Sig. (2-tailed)	.671		.967	.002	.003	.721	.168	.779
	N	63	70	63	65	66	70	65	66
low costs of implementation	Pearson Correlation	-.060	-.005	1	.269*	.024	.329**	-.062	.051
	Sig. (2-tailed)	.650	.967		.038	.858	.008	.644	.700
	N	59	63	63	60	60	63	58	59
Perceived usefulness	Pearson Correlation	.007	.371**	.269*	1	.149	.160	-.251*	.088
	Sig. (2-tailed)	.957	.002	.038		.252	.203	.049	.499
	N	58	65	60	65	61	65	62	61
low transaction risk	Pearson Correlation	-.143	.359**	.024	.149	1	.106	-.213	-.132
	Sig. (2-tailed)	.275	.003	.858	.252		.398	.099	.305
	N	60	66	60	61	66	66	61	62
Banks capacity	Pearson Correlation	.138	-.043	.329**	.160	.106	1	-.134	-.125
	Sig. (2-tailed)	.280	.721	.008	.203	.398		.287	.316
	N	63	70	63	65	66	70	65	66
Bank Ownership	Pearson Correlation	.181	-.173	-.062	-.251*	-.213	-.134	1	-.009
	Sig. (2-tailed)	.163	.168	.644	.049	.099	.287		.943
	N	61	65	58	62	61	65	65	63
bank branches	Pearson Correlation	.377**	.035	.051	.088	-.132	-.125	-.009	1

Table 7: Pearson Correlation - Internet Payment Method

	e-system Internet Payment	improved security	low costs of implementatio	Perceived usefulness	low transaction	Banks capacity	Bank Ownership	bank branches
Sig. (2-tailed)	.003	.779	.700	.499	.305	.316	.943	
N	61	66	59	61	62	66	63	66

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.5.2 Determinants of E-payment Systems Regression

The five factors of research framework are improved systems security, perceived bank trust/ low risk, enhanced infrastructure capacity, cost reduction and perceived benefits. To test for statistical significance, these factors were regressed against the identified methods of electronic payments by commercial banks in Kenya. Regression was used since it is the best technique used to measure the effects of two or more independent variables on a single dependent variable measured on interval or ratio scales (Walliman, 2011).

A regression of ATM as an EPS is shown in table 4.7 below. Only 12.6% of variables in the use of ATM payment method can be explained by all the independent variables.

Table 8: ATM Payment Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.355[a]	.126	.042	.301

a. Predictors: (Constant), ATM: Perceived usefulness, ATM: low costs of implementation, ATM: Improved e-system security, ATM: system capacity, ATM: low transaction risk

The table above indicates that 12.6% of total ATM usage variance is explained by all the independent variables. The remaining 87.4% is explained by other factors unknown to the researcher.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.679	5	.136	1.503	.205[b]
	Residual	4.700	52	.090		
	Total	5.379	57			

a. Dependent Variable: Bank e-system ATM

b. Predictors: (Constant), ATM: Perceived usefulness, ATM: low costs of implementation, ATM: Improved e-system security, ATM: system capacity, ATM: low transaction risk

Significance of 0.205 implies that there are some differences between variables explaining usage of ATM payment method. Therefore, the hypothesis that drivers of e-payment systems have no effect on the usage of ATM services is rejected since p-value of the F statistics is <1.

Co-efficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.661	.186		3.555	.001
	ATM: Improved e-system security	.055	.111	.071	.493	.624
	ATM: low transaction risk	.147	.093	.223	1.572	.122
	ATM: system capacity	.137	.099	.193	1.386	.172
	ATM: low costs of implementation	.100	.084	.161	1.191	.239
	ATM: Perceived usefulness	-.088	.109	-.109	-.805	.425

a. Dependent Variable: Bank e-system ATM

However, it is important to note that 'low transaction risk' variable increase the usage of ATM payment method by 22% (t=1.572). Low transaction risk t-value is the only one amongst the rest which is closer to the critical value of 95% confidence interval (Z-score = 1.96). Perhaps the withdrawal put on ATMs could explain why banks were more confident hence strong relationship.

Table 9: Credit Card Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.678[a]	.460	.404	.342

a. Predictors: (Constant), Credit Card: Banks capacity, Credit Card: low costs of implementation, Credit Card: improved E-payment security, Credit Card: low transaction risk, Credit Card: Perceived usefulness

With credit card payment method, 46% of Credit card usage is explained by all independent variables in the study. This falls short of the 50% mark by only 4%.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.771	5	.954	8.179	.000[b]
	Residual	5.600	48	.117		
	Total	10.370	53			

a. Dependent Variable: Bank e-system Credit Cards

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.

b. Predictors: (Constant), Credit Card: Banks capacity, Credit Card: low costs of implementation, Credit Card: improved E-payment security, Credit Card: low transaction risk, Credit Card: Perceived usefulness

Since the p-value of factor statistics is <1, there is strong statistical significance between usage of credit card payment method and the drivers of EPS under study. The f-value is 8.179 which is a strong indicator of variables roles in credit card usage.

Co-efficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.683	.123		5.575	.000
	Credit Card: improved E-payment security	.414	.105	.469	3.944	.000
	Credit Card: low costs of implementation	.317	.101	.362	3.137	.003
	Credit Card: Perceived usefulness	-.231	.131	-.231	-1.771	.083
	Credit Card: low transaction risk	-.367	.099	-.414	-3.720	.001
	Credit Card: Banks capacity	.055	.134	.049	.412	.682

a. Dependent Variable: Bank e-system Credit Cards

The t-test shows three research factors have a strong probability relation with usage of credit cards. These are improved security with probability of 47% (t=3.944), low costs of implementation with 36% (t=3.137) and low transaction risk with 41% (t=3.720). Since ATM cards at times are used as credit cards, it is possible that the security of maximum transaction cap with presence of regional offices helping out customers could explain the positive relation. However, low transaction risk reverses the strong positivity of the first two factors. The banks uneasiness with credit card risk level could be because many vendors participating in online transactions tend to store customers data and that would jeopardise privacy of data policy.

The remaining research variables under study, that is, debit cards, mobile payment and internet banking regression was somehow weak. The f-test in all of them showed slight statistical significance. For the t-tests, banks infrastructure capacity to handle transactions electronically remained positive and strong amongst in all the studied variables. The usage of the variables were explained by 28% (t=1.615), 29% (t=2.009) and 33% (t=2.247) respectively. More details can be found in table 10, 11 and 12.

Table 10: Debit Card Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.329[a]	.108	.016	.492

a. Predictors: (Constant), Debit Card: system capacity, Debit Card: low costs of implementation, Debit Card: Perceived usefulness, Debit Card: low risk of transaction, Debit Card: improved E-payment security

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.414	5	.283	1.168	.339[b]
	Residual	11.623	48	.242		
	Total	13.037	53			

a. Dependent Variable: Bank e-system debit Cards

b. Predictors: (Constant), Debit Card: system capacity, Debit Card: low costs of implementation, Debit Card: Perceived usefulness, Debit Card: low risk of transaction, Debit Card: improved E-payment security

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.415	.181		2.290	.026
	Debit Card: improved E-payment security	.077	.159	.078	.485	.630
	Debit Card: low costs of implementation	-.160	.140	-.159	-1.141	.259
	Debit Card: Perceived usefulness	-.043	.163	-.041	-.264	.793
	Debit Card: low risk of transaction	.015	.155	.015	.098	.923
	Debit Card: system capacity	.325	.201	.275	1.615	.113

a. Dependent Variable: Bank e-system debit Cards

Table 11: Mobile Payment Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.411[a]	.169	.072	.295

a. Predictors: (Constant), Mobile Payment: Banks capacity, Mobile Payment: improved E-payment, Mobile Payment: low costs of implementation, Mobile Payment: low risk of transaction, Mobile Payment: Perceived usefulness

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.758	5	.152	1.746	.145[b]
	Residual	3.732	43	.087		
	Total	4.490	48			

a. Dependent Variable: Bank e-system Mobile Payment

b. Predictors: (Constant), Mobile Payment: Banks capacity, Mobile Payment: improved E-payment, Mobile Payment: low costs of implementation, Mobile Payment: low risk of transaction, Mobile Payment: Perceived usefulness

Co-efficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.948	.126		7.535	.000
	Mobile Payment: improved E-payment	.051	.109	.068	.468	.642
	Mobile Payment: low costs of implementation	-.102	.102	-.157	-.995	.325
	Mobile Payment: Perceived usefulness	-.124	.119	-.181	-1.041	.304
	Mobile Payment: low risk of transaction	-.116	.088	-.192	-1.325	.192
	Mobile Payment: Banks capacity	.190	.095	.295	2.009	.051

a. Dependent Variable: Bank e-system Mobile Payment

Table 12: Internet Payment Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.341[a]	.116	.022	.450

a. Predictors: (Constant), Internet Banking: Banks capacity, Internet Banking: improved E-payment security, Internet Banking: low costs of implementation, Internet Banking: low transaction risk, Internet Banking: Perceived usefulness

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.250	5	.250	1.237	.307[b]
	Residual	9.504	47	.202		
	Total	10.755	52			

a. Dependent Variable: Bank e-system Internet Payment

b. Predictors: (Constant), Internet Banking: Banks capacity, Internet Banking: improved E-payment security, Internet Banking: low costs of implementation, Internet Banking: low transaction risk, Internet Banking: Perceived usefulness

Co-efficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.622	.158		3.927	.000
	Internet Banking: improved E-payment security	-.015	.138	-.016	-.106	.916
	Internet Banking: low costs of implementation	-.078	.140	-.082	-.559	.579
	Internet Banking: Perceived usefulness	-.065	.145	-.069	-.446	.658
	Internet Banking: low transaction risk	-.165	.133	-.183	-1.240	.221
	Internet Banking: Banks capacity	.358	.159	.333	2.247	.029

a. Dependent Variable: Bank e-system Internet Payment

5. CONCLUSION

Banking industry in Kenya is undergoing technological evolution that is shaping business landscape extensively. From the study, banks are not sure on the most appropriate direction to take, that is, maintain status quo or shift their operations to the demands of digital generation lifestyle. Nevertheless, it is notable that ICT has made it possible to have electronic payment systems like debit cards, credit cards, electronic fund transfer, direct credits and internet banking a reality in banking sector. These new methods of transactions have made it easier for banks operations to cut on capital costs, reach many clients irrespective of distance, improve security while transacting large amounts of sums, easier financial packages mass customization with the end result being high revenue stream for the banks.

Of course where benefits are involved, a few challenges will always pop up. The obstacles that banks should address in order to continue benefiting from e-payment systems relate to factors like lack of e-payment systems trust by majority of bankers, incidences of online fraud, difficulty in usability of some technologies hence need for highly trained technical staff, high transaction costs due to double taxations and fear for high risk investments. If these factors can be overcome by banks, cash transaction will automatically come down with high uptake of EPS.

5.1 Recommendations

E-payment systems are a congruent of many subsystems ranging from software, hardware and human resources. The success of such a system may not take a 'one-size-fits-all' approach. However, where appropriate steps are taken involving all stakeholders, a lot can be realized by banks from such a system. The stakeholders in mind include the banks, government, and telecommunication operators.

Commercial banks in Kenya should increase accuracy and update of their product description. This helps to decrease the doubts of consumers in e-transaction and proves the seriousness of e-electronic payment systems. More and improved guidelines/ functions for websites will help them convince and attract more online buyers. Banks diversification of payment, decreasing cash and increasing non-cash payment would stimulate electronic payment transactions. Equipping bank staff with right information and communication technology (ICT) skills would motivate the staff who will eventually support online transaction projects initiated by the management.

The government of Kenya should continue to promulgate necessary regulations to make e-commerce legal framework complete and encourage the development of electronic payment systems platforms. The legal framework would provide the desired transaction features like non-repudiation, security, anonymity, divisibility among others which will encourage banks to launch online-based products with hope of good response from the market. Certain official electronic payment benchmarks should be established to have official and sufficient statistics of this business at government level. Efforts, through proper government programming, must be put in to educate and create awareness to the public of online transactions and the benefits accruing from electronic payment systems. Regular and supportive policies emphasizing use of electronic payment should also be into place.

This is the era of information and communication technology. The leading concern of electronic revolution in this 21st century is to establish and ensure a better, easy and comfortable way of management, communication and development with the use of information technology. Thus e-commerce has become a buzzword of present information technology (Laisuzzaman, Imran, Nahid, Amin, & Alim, 2010). ICT has reshaped e-commerce beyond online shopping, online stock, bond transactions, buying and downloading software without ever going to a store. These activities involve electronic payment systems which are a backbone activity of banks and other financial institutions.

Since telecommunication network is a major player in implementation of e-payment systems, high speed, competitive international broadband access coupled with high density of local telecommunication facilities is essential for growth of e-commerce transactions backed by banks in Kenya.

5.2 Further Research Suggestions

Citing scholarly publications and recommendations regarding effectiveness and efficiency brought about by electronic payment systems, it will be prudent for upcoming researchers to concentrate on a particular e-payment system, for example, ATM and do further prodding that will provide insight on how to make it cost effective hence likely to attract mass adoption on the market.

Further research is also suggested to find out why many electronic payment systems fail at infancy stage. Take the case of DigiCash, and BitCoins, irrespective of their unique innovations, the technology could not sustain itself on the market.

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