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Factors influencing successful use of mobile technologies to facilitate E-Commerce in small enterprises: The case of Kenya

Research Paper

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Abstract

This paper interrogated the suitability of Mobile Technologies to facilitate e-commerce in Kenyan Micro and Small Enterprises (MSEs). The study proposed a theoretical model and empirically tested it using a sample selected using proportionate stratified sampling within well-defined geographic clusters. The study revealed that, while there is massive use of Mobile Internet Services (MIS), there is limited use of Mobile Money Transfer Services (MMTS) for B2B and B2C transactions as opposed to C2C and C2B e-commerce transactions. Results also indicated that utilizing MIS and MMTS, positively and significantly influenced organization's performance through operational, transactional and interactional benefits. On the research model, the results indicated that Appropriateness and Usage directly and significantly affected Organizational Performance while User Acceptance and Appropriateness were significant determinants of Usage. Surprisingly, of the three theorized barriers (Security Risks, Affordability and Performance Risks), only Performance Risks had a significant negative effect on Usage. Finally, the study's results, theoretical, managerial and policy implications are discussed.

Keywords

Mobile Internet, Mobile Money Transfer, e-commerce, Kenya, MSEs

1. Introduction

The unprecedented penetration of mobile devices, wireless networks and mobile communication services has allowed the Kenyan MSEs to enjoy efficient communication, payments and marketing systems only available to the huge organizations and government corporations in the past. According to statistics from Communications Commission of Kenya (CCK, 2010) there were more than 19 million mobile telephone users in Kenya by the end of 2009, as compared to under 15,000 in 1999. This increase in the number of users has been supported by the expansion of cellular networks which impact positively on economic growth through emergence of new services and applications for mobile cellular services. For years, most Kenyans were "digitally under-served" as telephone and Internet services never managed to reach most parts of the country and where available, they were too expensive. By 1997, a landline was a privilege reserved for the wealthy, government offices, huge organizations and multinationals. People were forced to walk long distances or take bus rides to get to townships to use a telephone booth that was operated by the now defunct Kenya Posts and Telecommunications. The individual would be lucky to find the telephone working if not vandalized or dysfunctional. Kenya Posts and Telecommunications services were characterized by poor service, limited choices and high costs of installation and use. Even today, Kenya still has a low fixed telephone penetration rate with only 243,656 fixed lines (CCK, 2010) serving a population of about forty million people and out of this number only 7,439 subscribers are in the rural areas. This makes mobile telephony the first and the only accessible telecommunication infrastructure available and affordable to most of the Kenyan population both at home and in businesses, particularly the MSEs. Mobile telephones traditionally offer voice communication but have continued to evolve to become all-purpose tools with value added services such as mobile money transfers, mobile banking, Internet and data services which enhances the way MSEs conduct their business operations. Mobile telephones are also cheaper and more portable than computers which make their adoption much easier. This has successively reduced social-economic disparities within Kenyan MSEs as well as closing the existing digital divide between the rural and urban MSEs. Most MSEs' entrepreneurs had to travel or use public transport systems to send and exchange documents, access banking facilities or even transact their payments. This is not the case today, as they can e-mail the documents, pay for goods and services through mobile money transfers, use mobile banking and if one has a technologically advanced telephone, it is now possible to carry out the required tasks at any time and at any place. Statistics show that mobile network coverage is predominantly urban with data from Communications Commission of Kenya (CCK, 2010) indicating that cellular networks have a national coverage of about 84.5% of the population and only about 34% of geographic area coverage. This may require government intervention in expansion of the cellular networks to underserved areas which are usually regarded as not commercially attractive by profit oriented mobile telephone service providers.

Mobile telephones and related services have created new livelihoods through creation of professional and non-professional jobs. Statistics form the Kenya National Bureau of Statistics (KNBS) indicate that most Kenyans, about 67.7% (KNBS, 2010) live in rural and remote areas of the country while only 32.3% live in urban areas. Most of the rural population has no access to mainstream technologies and a considerable digital divide exists particularly between the urban and rural areas. There is also low access to conventional technologies by most of the urban poor who live in underserved areas. For the last few years, only a small fraction of the rural people had access to telephones before the cellular network coverage was expanded making mobile telephone the first and only accessible telecommunication infrastructure available to many rural communities. Today, most rural areas have mobile telephone networks which come with a number of developmental benefits in terms of employment creation, access to services and increased access to information, hence contributing significantly to economic growth. A fast, reliable and affordable mobile communication service in both rural areas and urban centers is vital to their social and economic development. Mobile telephone networks make both voice and high speed broadband data communication services available, tremendously paving the way for the diffusion of the Internet thus narrowing the digital divide. Mobile telephones and related services increase access to information and services while creating investment and employment opportunities.

This study sought to identify the key determinants of MMTS and MIS usage in Kenyan MSEs to facilitate business processes and transactions. This was achieved by developing a theoretical model that extends Task Technology Fit (TTF) by Goodhue *et al.,* (1995), with constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh *et al*., (2003) through a pilot study and using the extended model to investigate factors influencing adoption and use of MMTS and MIS for e-commerce infrastructure in Kenyan rural and urban MSEs. The proposed model was empirically tested using data collected from a survey of Micro and Small Enterprises in Kenya using proportionate stratified sampling method within well-defined geographic clusters.

The following definitions were adopted for the study.

1. Chaffey (2007) defines **E-commerce** as involving all types of electronic transactions between organizations and stakeholders whether they are financial transactions or exchanges of information or other services.
2. **Mobile Internet Services** can be accessed through a mobile device, such as cellular telephones, smartphones and personal digital assistants which are equipped with a web browser. It can also be accessed through public hotspots, desktop systems and laptops connected to a wireless Internet access device such as a fixed wireless desktop phone or a wireless data modem.
3. **Mobile Money Transfer Services** is an easy, efficient and immediate way of sending money both to businesses as well as individuals through a mobile telephone. In Kenya today, these services are offered through Safaricom's (http://www.Safaricom.co.ke) Mpesa services, Zain's (htpp://www.zain.co.ke) Zap services and yuCash service from Essar Telecom Kenya (www.yu.co.ke).

Objectives of the study

This study seeks to investigate important factors that influence successive adoption and use of MMTS and MIS as preferred infrastructure to facilitate e-commerce in Kenyan MSEs. The study will also seek to investigate the status of e-commerce applications among MSEs in Kenya.

Research questions

The following research questions guided the study:

1. Do User Acceptance and Appropriateness influence the adoption and use of MIS and MMTS to facilitate e-commerce?
2. What are the barriers to the adoption and use of MIS and MMTS to facilitate e-commerce?
3. What are the benefits of using MIS and MMTS to facilitate e-commerce in an organization?
4. Does the geographic location of the MSE influence the use of MIS and MMTS to facilitate e-commerce?

The motivation for this research was drawn from a look at the significant benefits mobile telephones have brought to disparate and geographically remote population in Kenya and sought to explore how this expanding mobile telephone based infrastructure can be harnessed to support an e-commerce infrastructure.

2. Literature Review

The number of mobile telephone subscribers has grown steadily (CCK, 2010) over the years since the liberalization of the Kenyan telecommunications sub-sector through the 1998 Communications Act (KCA, 1998). The act facilitated the creation of Communications Commission of Kenya (CCK) as the primary regulator of the telecommunications industry to formulate regulations, monitor, solve disputes and above all protect the interests of all users of telecommunication services in Kenya with respect to the prices charged for and the quality and variety of such services. Statistics given by

International Telecommunication Union (ITU, 2007) regarding access to Information and Communications Technologies (ICTs) indicated that Africa had the least broadband subscriber base with only one million broadband subscribers. This was a meager 0.4 percent of the 281 million subscribers in the world by the end of 2006. But the figures have increased to about 12 million subscribers (ITU, 2010) as more people access mobile broadband. By the end of the third quarter of 2010, Africa had more than 500 million mobile telephone users and more than 110 million Internet users (ITU, 2010) which is more than double the 2007 figures when Africa had about 265 million mobile telephone users and 50 million Internet users (ITU, 2007). Mobile cellular technology has a higher coverage rate in Africa than any other telecommunication technology. Cheaper infrastructure and larger regional penetration, cheaper handsets, competitive markets and business models oriented to the needs of the poorer segments of the population, such as affordable prepaid cards, have resulted in a mobile boom in Africa during the last decade (ITU, 2007). Data released by Communications Commission of Kenya (CCK, 2010) in March 2010 indicates that mobile telephone networks have a national coverage of about 84.5% of the Kenyan population and 34% geographic coverage. This 34% geographic coverage implies that large portions of Kenyan land mass are not covered by mobile telephone networks especially in the arid and semi-arid areas. CCK also estimates Internet usage at about 4% of the population and an estimated population that had access to Internet services during the same period as 10.2%. But with high mobile phone networks penetration, Internet access could increase dramatically. CCK sector statistics indicate a penetration rate of mobile service as 51 per 100 inhabitants which compares favorably with the developing world's penetration of 49.5 per 100 inhabitants (ITU, 2009).

In Kenya, MSEs are defined as enterprises in both formal and informal sectors employing 1-50 workers (Republic of Kenya, 2005). Micro-enterprises are those that employ 10 or fewer workers and small enterprises employ 11-50 workers. The National Baseline Survey (ICEG, 1999) revealed that the business activities of MSEs include manufacturing, trade and service provision with 13.4% of the enterprises in manufacturing, 64.3% engaged in trade while 14.8% of the enterprises are in services provision. MSEs contributed 18.4% of the GDP in the year 2002 (Republic of Kenya, 2003) and have continued to create employment opportunities for most Kenyans. In 1999, MSEs employed 2.4 million people (ICEG, 1999) compared to 8.3 million people in 2009 (Republic of Kenya, 2010). This could only mean that with the help of the right technologies and technical support services, MSEs can contribute immensely to the growth of the Kenyan economy.

Despite the exponential growth in the use of mobile telephones in East Africa, the literature review indicates that only one research study (Donner, 2007) on the impact of using mobile telephones in microenterprises in East Africa has been done within the last five years. This is a survey conducted in Kigali, Rwanda by Donner (2007). The study found that mobile telephones had an impact on microenterprises since entrepreneurs developed new business contacts and expanded their social and business networks.

On mobile technologies and financial transactions, Duncombe's (2009) analysis on mobile device-based payments in Africa indicated that use of mobile payments is conditioned by non-market factors related to financial and technical literacy. William Jack of Georgetown University and Tavneet Suri (Suri et al., 2010) of MIT surveyed Kenyan households in December 2009 and found that MMTS (in particular M-PESA) is reaching a majority of Kenya's poor, unbanked, and rural populations. This implies that the use of MMTS in Kenya defies the Duncombe (2009), and Boateng (2009) arguments that the overall level and pace of adoption of m-finance services in developing countries is relatively low and confined to more affluent users. Most Kenyan poor and unbanked fully embraced the use of MMTS to store money and make payments. This is mainly because MMTS offer cheaper and secure alternatives to the existing informal money transfer channels. Most Kenyans also find it appropriate to use MMTS for their everyday transactions. This necessitates the use of user level IT acceptance and usage models such as the Task Technology Fit (TTF) (Goodhue *et al.,* 1995) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al*., 2003) to investigate mobile

technologies usage and impact in Kenyan MSEs. Most Kenyan MSEs are also managed by their owners and hence most technology adoption decisions are based on individuals and not organizations. Regarding the use of e-commerce, the status of e-commerce in Kenya has been studied by Mureithi (2000), Kiiru (2002), Mureithi (2005) and Muganda *et al.*, (2008). These studies highlighted Internet usage and e-commerce in Kenyan microenterprises for the last decade. Muganda *et al*., (2008) highlighted that by the year 2008, only less than 10% of the Kenyan population was accessing the Internet and that it was mainly in urban areas. They noted that the national Internet connectivity infrastructure was skewed in favor of urban centers. Their study also found that only a few sophisticated Internet applications were in use. Mureithi (2000) found that B2B and B2G were very low while B2C was experiencing very slow growth and only in urban areas. He attributed this to limited Internet access locally, low awareness and lack of distribution infrastructure. From the study, Internet access was reported to be very low, with only 17 people being able to access Internet for every ten thousand people while telephone lines and credit card access was at 1% and 0.2% respectively. Another challenge to e-commerce usage in Kenya that was cited by Mureithi (2000) was inadequate legal framework.

On Internet usage in MSEs, Mureithi (2005) found that none of the MSEs at Kariobangi Light Industries had a website and only 7.8% had an email address. A number of studies conducted on Kenyan MSEs mainly focused on the sector's contribution to the economy in terms of employment, income, and gross domestic product (ICEG, 1999) while other studies focused on access to credit (Aketon, 2007), and government policy and strategy frameworks (ACEG, 2006; Ronge *et al.,* 2002). There has been no known research to the knowledge of the researcher that has studied the adoption and impact of mobile technologies on e-commerce usage in Kenya and their impact on organizational performance. This study seeks to fill this void in research on business applications of new and emerging mobile technologies on use, adoption and diffusion of e-commerce in Kenyan MSEs.

Several research studies relating to the use of wireless technologies and mobile devices have also been conducted in several countries: Carlsson *et al.,* (2006) studied the adoption of wireless mobile communication in Europe; Heidi and Mathiassen (2010) studied adoption of the iPhone; Park *et al.,* (2007) studied the adoption of Mobile Technologies for Chinese Consumers; Andersson and Hedman (2007) studied diffusion of advanced mobile Services in large Swedish firms; and a study on cross-country adoption of mobile services in Finland, Germany and Greece by Frank (2001). Balacco *et al.,* (2009) did a study that focused on the factors which affect the adoption of mobile Internet amongst Small and Medium Enterprises (SMEs) in Italy.

3. Research Methodology

This exploratory and descriptive study sought to identify specific factors that influence the use of mobile technologies in Kenyan MSEs' business processes and examine the impact of their use on the organizational-wide performance. Peil (1995) recognizes descriptive research as having the ability to give room for probing for more information, exploring new ideas and simultaneously generating discussions and information on emerging concerns on the line of thought. Since this study sought to describe the factors influencing the applications of mobile technologies in Kenyan MSEs e-commerce processes, a descriptive research design was considered the most appropriate. Therefore a descriptive research design was used for this study because as Chandran (2004) suggests, a descriptive study describes the existing conditions and attitudes through observation and interpretation, and this is what this study intended to do. Based on Yin (2003), the suitability of descriptive research design for this study rests on the fact that human beings live by interpreting phenomenon around them.

Since data was to be collected in two different geographical locations, an area sampling or geographic cluster sampling was used. The enterprises were either in cluster one, which was Nanyuki town or cluster two, which was Nairobi city. In each cluster, the researcher employed proportionate stratified random sampling to select the respondents. In proportionate stratified sampling, the number of elements from each stratum in relation to its proportion in the total population is selected (Kumar,

2005). This means that the chosen sample is forced to contain participants from each of the segments or strata of the population such that the number of participants chosen from each group is proportional to the number in population. In this study, the population was segregated into mutually exclusive subpopulations or strata using business categories. Stratified random sampling was chosen because it is efficient and gives adequate data and accommodates varying research procedures (Cooper and Schindler, 2008).

The survey data was collected from 570 MSEs with the help of the entrepreneurs or key managers. Only one person per enterprise was allowed to participate in the survey. The primary data collection tool was a questionnaire. To ensure the questionnaires usefulness, it was pre-tested and refined to capture data from a large number of participants in a less supervised setting. The questionnaire had five sections: Section one had eleven questions to capture general information about the enterprise and respondent. Section two had eighteen questions to capture information on the current enterprise business technological infrastructure and use of web and e-commerce. Section three consisted of twenty-six general statements to measure the factors determining the use of mobile technologies in the organization's business processes. Each item in this section of the questionnaire was measured on a five-point Likert-type scale aimed at testing the level of agreement about the use of mobile technologies in MSEs business processes with two extreme end points of "strongly agree" (5) and "strongly disagree" (1). Section four had statements to measure the frequency of using different mobile technologies for business processes within the organization. This was supposed to measure how dependent the enterprise was on various mobile technologies.

The research model was made up of five constructs and each construct was measured using multiple measurement items adapted from existing literature but modified to reflect the research context of using mobile technologies for e-commerce infrastructure. The initial model was developed based on the TTF model (Goodhue *et al.,* 1995) and the UTAUT (Venkatesh *et al*., 2003). The proposed model (Fig. 1) also had a construct to test for the barriers to using MIS and MMTS to facilitate e-commerce transactions.

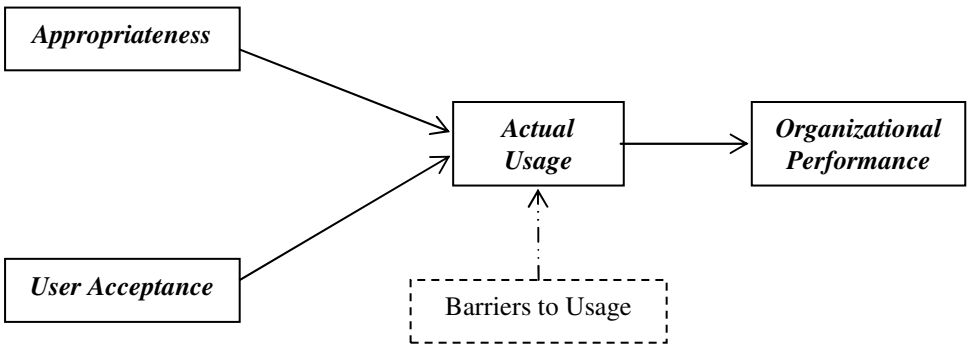

Fig. 1: Proposed Research Model (Authors' illustration)

Appropriateness

Appropriateness or Task Technology Fit (TTF) is defined as the degree to which a technology assists an individual in performing his or her portfolio of tasks. TTF can also be defined as the degree to which the capabilities of the technology match the demands of the task (Goodhue and Thompson, 1995). This implies that any technology will be used if and only if the functionalities made available to the user supports the accomplishment of the tasks that the user is expected to perform. In this case the tasks refer to any automated business activity which involves use of mobile technologies. During the preliminary study some of the TTF twelve constructs were not well supported and were removed. A new construct, mobility, which is specific to mobile technologies use environment, was added. The

TTF construct investigates whether the two mobile technologies meet the organizational e-commerce infrastructure needs hence contributing to usage and performance.

Appropriateness was measured using the following seven dimensions:

- Currency: Mobile technologies allow me to access up-to-date information to meet my needs
- Accuracy: The data that I use or would like to use is accurate enough for my purposes
- Accessibility: I can get the information I need quickly and easily using mobile technologies
- Ease of Use: I find Mobile technologies convenient and easy to use
- Reliability: Mobile technologies are not subject to frequent problems
- Assistance: I am satisfied with the technical support provided by the suppliers of mobile technologies
- Mobility: Mobile technologies allow me to perform my duties anywhere/anytime (away from my desk/office environment)

User Acceptance

User acceptance of any technology is based on the belief that using the technology would be beneficial to both the user and the organization. Acceptance was used to look at the other essential factors facilitating the use and integration of mobile technologies in MSEs' business processes and which are not part of the Appropriateness measurement. This study adopts Dillon and Morris's (1996) definition of User Acceptance as "the demonstrable willingness within a user group to employ IT for the tasks it is designed to support." Two factors and seven questions were identified to measure acceptance. These factors are the Performance Expectance (also referred as Perceived Usefulness) and Social Influence and are based on items from Venkatesh *et al.,* (2003). In this relationship the study tests whether Performance Expectancy and Social Influence contributes to Usage.

Performance Expectance: Performance Expectance refers to the degree to which the user of a system believes that using the technology would enhance his or her job performance in carrying out their job related task.

- I find mobile technologies useful in my work
- Using mobile technologies increases my productivity
- Using mobile technologies improves my job performance
- Using mobile technologies enables me to accomplish my tasks more quickly

Social Influence: Social Influence is defined as the users perception that others believe it is important that he or she should use the system.

- The management supports the use of mobile technologies
- Our customers/suppliers think that the enterprise should use mobile technologies
- We are using mobile technologies because they are now widely used

Barriers

Though mobile technologies may meet the MSEs' e-commerce infrastructure requirements and even be widely accepted and used, there are factors which might negatively influence their usage. These include:

> **Affordability:** Refers to the ability of the MSEs to pay for mobile technologies and related services. It is the ability of the enterprise to pay for the equipment, subscription of the services and continued use of the services. Affordability is usually determined by the price attributed to the purchase of the wireless equipment and the expenses associated with using

the related services. Price is viewed more broadly as the sum of the values consumers exchange for the benefits of having or using the product or service (Kotler, *et al*., 2004); it is the amount of money an individual is prepared to pay to acquire a product or service. Siegel (2003) indicate that most consumers use price as a determining factor in deciding whether or not to purchase a product implying that affordability is dependent on prices.

- It is expensive to buy good quality mobile technologies and related services
- It is expensive to use mobile technologies and related services

Performance Risk: The reputation of any mobile technologies is garnered through its performance and reliability. Performance Risks are the technical challenges related to use of mobile technologies as e-commerce infrastructure. Grewal *et al*., (1994) defines Performance Risk as the possibility of the product malfunctioning and not performing as it was designed and advertised and therefore failing to deliver the desired benefits and so does Horton (1976) who defines Performance Risk as a fear of loss that may be incurred when a brand, product or supplier does not perform as expected.

- There are functionality (network outages such as temporary disruptions or communication failures) issues when using mobile technologies
- There is high uncertainty about provider's action with errors occurring during the use of mobile technologies and related services such as money transfers

Security Risks: This implies that data, information and financial transactions could be accessed without authorization or even stolen during transmission. It is more important and critical to keep enterprise data and information private and secure. A security threat is a circumstance, condition, or event with the potential to cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, denial of service, and/or fraud, waste, and abuse (Kalakota and Whinston, 1996). A security risk is therefore the degree to which a person believes that using mobile technologies in his or her daily business tasks renders them vulnerable to security risks while Perceived Security could be defined as the ability of the mobile technologies to protect data, information and financial transactions from being accessed without authorization or even stolen during transmission.

- Security concerns are an obstacle to the use of mobile technology services
- There is a possibility of my information getting into the wrong hands when using mobile technologies

Usage/Utilization: The intensity, diversity and frequency of using mobile technologies to facilitate intra-enterprise and inter-enterprises business processes. It is a measure of how the organization is dependent on the mobile technologies for its e-commerce infrastructure and how mobile technologies support existing business processes.

- I consider using mobile technologies very positively
- It is a very good decision to use mobile technologies
- I am willing to use mobile technologies continuously

Organizational Performance: Measured by evaluating the impact of usage on service delivery processes, service quality, delivery costs and efficiency. It is the presence of identifiable operational, transactional and interactional benefits.

- Mobile technologies have a large, positive impact on enterprise performance
- Mobile technologies have improved efficiency in the enterprise processes
- Mobile technologies have helped the enterprise to provide better services
- Mobile technologies have reduced the enterprise's operational costs

Fig. 2 represents a detailed research model.

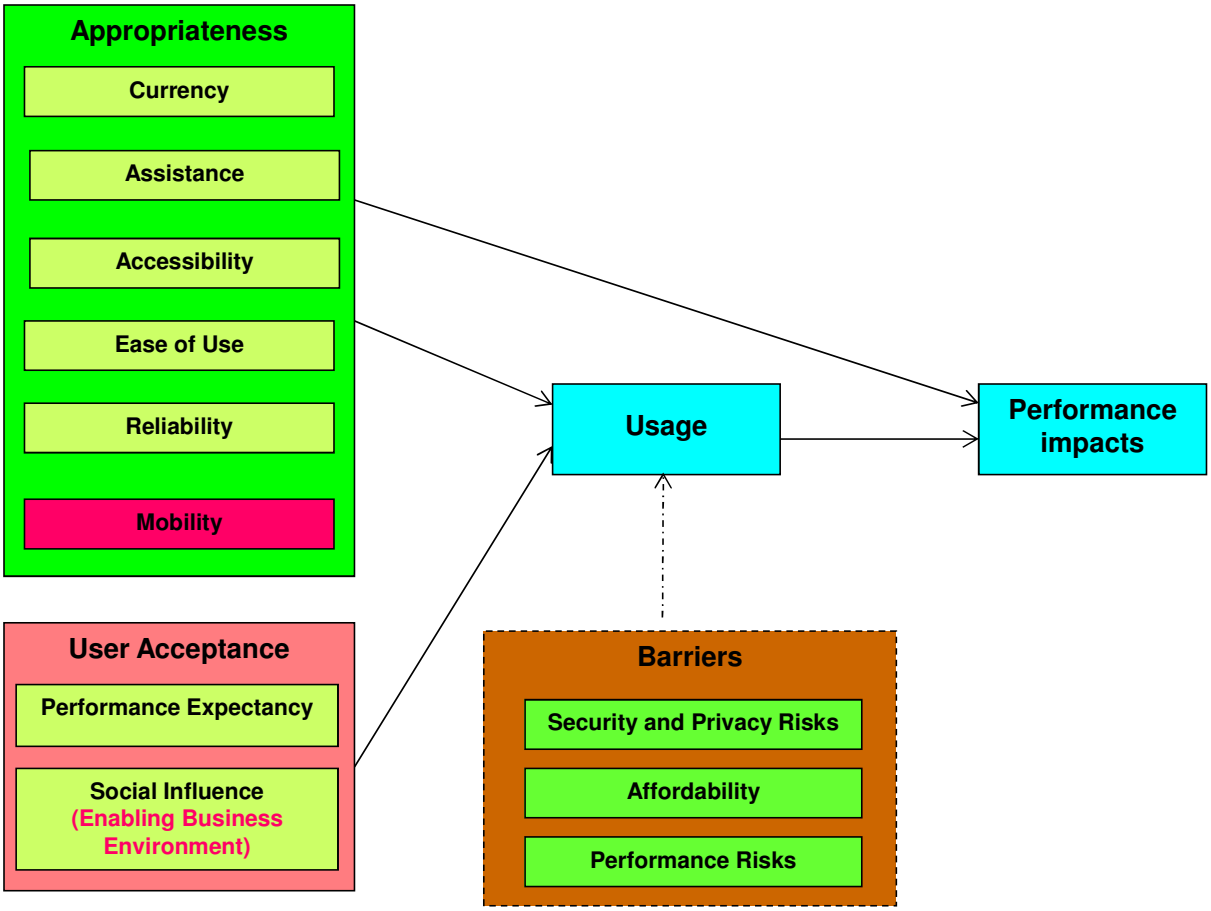

Fig. 2: Detailed Research Model (Authors' illustration)

Note: The research model is based on Task-Technology Fit (TTF) Model Goodhue *et al*., (1995), Unified Theory of Acceptance and use of Technology Venkatesh *et al*., (2003) and a pilot study.

4 The Research Model Assessment

The study questionnaire used a 5-point Likert-type scale ranging from "Strongly disagree" to "Strongly agree" where 1 indicated strong disagreement; 2 showed some extent of disagreement; 3 stood for Uncertain; 4 was for agreement to some extent; and 5 indicated strong agreement. Statistical tests were conducted to ensure that the model results could be generalized, replicated and are statistically relevant. The statistical tests done to measure the quality of the study instrument and the research model are the reliability, convergent validity and discriminant validity. Multiple regression analysis was done to assess the impact of independent variables on dependent variables.

4.1 Reliability

Reliability is an assessment of the internal consistency of the measurement instrument and a measure of the degree of homogeneity among the measurement items in a given construct. It is the assessment of whether the study instrument would give similar results in different situations or under similar circumstances but at a different time such that the results remain consistent over repeated testing. Cronbach's alpha is widely accepted as a measure of internal reliability and consistency. The reliability analysis aims at identifying those items in the questionnaire that have low correlations in

order to exclude them from further analysis. Cronbach (1951) proposed that reliability should be greater than 0.7, DeVellis (2003) suggested that an alpha value of 0.70 should be considered "acceptable" while a value equal to or greater than 0.70 is considered satisfactory (Nunnally and Bernstein, 1994). The alpha coefficients for the individual constructs are given on table 1. All the constructs have Cronbach's alpha between 0.712 and 0.929 hence the internal consistence of the study instrument is good, acceptable and satisfactory.

Construct	Mean	Std. Deviation	Cronbach's Alpha
Task -Technology Fit	4.1657	.52660	.712
Acceptance	4.2382	.55016	.745
Barriers	3.6332	.86710	.817
Usage	4.6541	.44416	.929
Performance	4.0981	.71502	.771

Table 1: Descriptive statistics and Cronbach's Alpha

4.2 Validity

Validity of a study instrument is the measure of whether the study instrument would give the same results under similar conditions, implying that the instrument is actually measuring the concept it purports to measure. Three methods are used in measuring validity of a study instrument. These are the factor loadings, Composite Reliability and Average Variance Extracted (AVE). The following section evaluates the measurement instrument for convergent and discriminant validity.

Convergent validity is supported by examining the constructs' Cronbach's alpha, Composite Reliability, Average Variance Extracted, and item loadings. For satisfactory convergent validity, Cronbach's alpha should be more than 0.7 (Hair *et al.*, 2006), composite reliability should be above 0.7 (Fornell and Larcker, 1981), AVE of at least 0.5 and item loadings of above 0.7 (Hair *et al.*, 2006). All constructs showed adequate convergent validity (table 2).

Construct	Cronbach's Alpha	AVE	Composite Reliability
Task-Technology Fit	.712	0.578	0.891
Acceptance	.745	0.545	0.827
Barriers	.817	0.547	0.857
Usage	.929	0.739	0.895
Performance	.771	0.555	0.788

Table 2: Cronbach's alpha, composite reliabilities Average Variance Extracted

To extract relevant factors from the research measurement items, factor analysis was conducted using principal component analysis and varimax rotation based on Kaiser-Guttman rule that retains components with Eigen values of equal or greater than 1. Various recommendations exist for the acceptable levels of significant factor loadings such as the Hair *et al*., (2006) recommendation of .5 while Comrey *et al.,* (1992) as cited in Tabachnick *et al.,* (2007) considers .55 as good, .63 as very good and .71 as excellent. To ensure the factor loadings meets the recommended criteria, all loadings less than .63 were suppressed. The items loaded on five distinct constructs (table 3) and accounted for 76.012% of the total variance. Each item loaded distinctively on one factor and there were no cross loadings.

Measurement Item	**Factor 1 Task Technology Fit**	**Factor 2 Acceptance**	**Factor 3 Performance**	**Factor 4 Barriers**	**Factor 5 Usage**
Currency	.657				
Assistance	.748				
Accessibility	.804				
Ease of Use	.662				
Reliability	.856				
Mobility	.812				
Performance Expectance_1		.775			
Performance Expectance_4		.703			
Social Influence_1		.671			
Social Influence_3		.797			
Organizational Performance_2			.787		
Organizational Performance_3			.694		
Organizational Performance_4			.750		
Affordability_1				.664	
Affordability_2				.796	
Security Risks 1				.806	
Security Risks 2				.690	
Performance Risks_1				.732	
Usage_1					.850
Usage_2					.883
Usage_3					.846
%Variance explained	15.54%	13.16%	13.07%	17.40%	16.84%
Cumulative	15.54%	28.70%	41.77%	59.17%	76.01%
Eigen values	2.269	2.018	1.739	6.939	2.997

Table 3: Measurement factor loadings

For satisfactory discriminant validity, Fornell and Larcker (1981) indicate that the square root of the AVE for any particular construct should be higher than the correlations between that construct and other constructs. This is shown in the inter-construct correlation matrix (table 4) with the square root of Average Variance Extracted presented in brackets and bolded.

Construct	Task Technology Fit	Acceptance	Barriers	Usage	Performance
Task-Technology Fit	**(0.760)**				
Acceptance	.541**	**(0.738)**			
Barriers	.484**	.265**	**(0.740)**		
Usage	.516**	.475**	.411**	**(0.860)**	
Performance	.580**	.496**	.408**	.419**	**(0.745)**
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 4: Inter-construct correlation matrix and AVE

4.3 Assessment of the structural Model

To assess the structural model quality, the study tested the model for the statistical significance of the estimated model's path coefficients (β) and the ability of the model to explain the variance in the dependent variables (R^2). This was done using linear regression. Fig. 3, represents the results of the structural model test which includes the path coefficients (β) which gives the strength of the relationships between the independent and dependent variables and the R^2 value which represents the amount of variance explained by the independent variables.

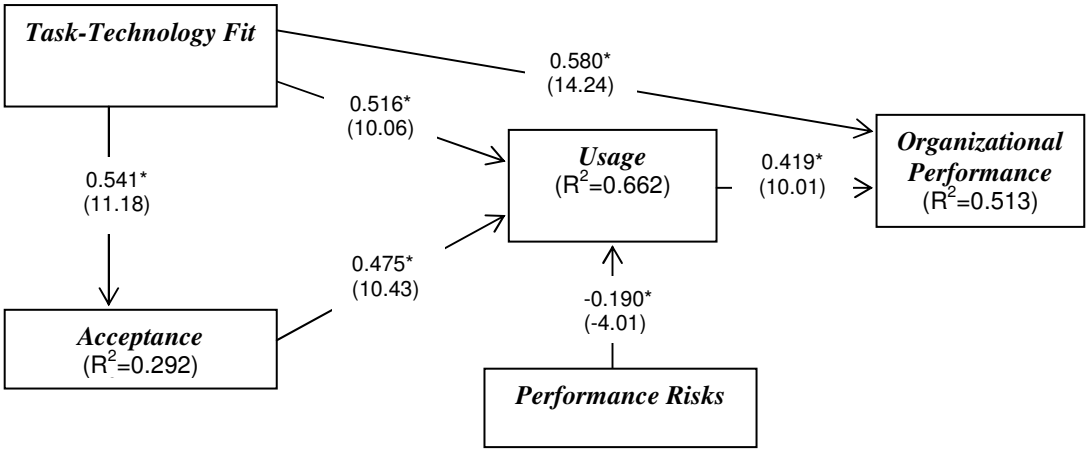

Fig. 3: Research Model result

Note: *path coefficients (β) significant at $p<0.001$ and corresponding t-value in parentheses.

Both TTF and Usage have significant positive influence on Organization Performance and together explain 51.3% of the variance in Organization Performance ($R^2 = 0.513$). This R^2 value exceeds Falk and Miller's (1992) recommendation that R^2 should be greater than or equal to 10% as an indication of substantive explanatory power. Direct and total effect of TTF on organization performance was 0.580 while the total effect of Usage on organization performance was 0.419. TTF and Acceptance both showed significant relationships with Usage. The value of R^2 for usage is 0.662, indicating approximately 66.2% of the variance in Usage is explained by TTF and User Acceptance. Of the three theorized barriers, only Performance Risks had a significant negative effect on Usage (β = -0.190 significant at $p<0.001$).

4.4 Model Fit Indices

A confirmatory factor analysis was conducted to test the fit between the research model and the data by estimating the research model parameters. This was done using AMOS graphics version 5.0 maximum likelihood estimation as recommended by Byrne (2001). The Fit indices of the model are shown in table 5. A comparison with their corresponding recommended values indicate that all the indices are above the suggested levels, thus a implying a good fit.

Goodness of Fit Indices Measure	Recommended value	Measurement Model
X^2/d.f - chi-square to the degrees of freedom, Bentler and Bonnet (1980)	<=5	4
Normed Fit Index (NFI), Bentler and Bonnet (1980)	>=0.95	0.993
Tucker-Lewis Index (TLI), Hair *et al*., (2006)	>=0.90	0.946
Comparative Fit Index (CFI) Hair *et al*., (2006)	>=0.90	0.995
Goodness-of Fit Index (GFI) Bagozzi, R. *et al.,* (1988)	>=0.90	0.997
Goodness of Fit Index (AGFI) Bagozzi *et al.,* (1988)	>=0.90	0.955
Incremental Fit Index (IFI) Bagozzi *et al.,* (1988)	>=0.90	0.995
Root Mean Square Residual (RMSR), Hair *et al*., (2006)	<0.05	0.007
Root Mean Square Error of Approximation (RMSEA) (Browne and Cudek, 1993)	<0.08	0.075

Table 5: Fit indices for the proposed model

5. Study Findings

The study sample consisted of 570 respondents. A total of 541 participating enterprises returned their questionnaires of which eleven were incomplete or had one or two missing entries and therefore were considered invalid for the study. The remaining 530 questionnaires, representing a response rate of 94.9%, were used for data analysis. The respondents were persons well placed to knowledgably answer questions on the business. Out of the 530 respondents, 74% were owners-managers and 26% were the personnel responsible for the ICTs.

5.1 Demographics

The characteristics of the sample were captured under demographics, ICT usage, and e-commerce applications usage. The basic demographics characteristics of the entrepreneurs were based on age, education level, number of employees, number of computers and use of LAN (table 6).

Demographic Item	Category	Frequency	Percentage	Important notes
Age	18 – 24	77	15%	A substantial number of the respondents were in the age group 25-34 years (56%), and 35-44 years (20%) which is consistent with Ronge *et al.,* (2002) which indicates that most Kenyan MSEs are owned and mainly run by people in their late 20s and early 30s.
	25 – 34	299	56%	
	35 – 44	107	20%	
	45 – 54	33	6%	
	55 or older	14	3%	
Education Level	High School	29	5%	Majority of the respondents had post high school training (95%), which contradicts Ronge *et al.,* (2002) where the conclusion is that MSEs are dominated by people with low levels of education. Only 5% of the respondents had no further training after finishing high school.
	College Certificate	73	14%	
	Professional Qualification Such as CPA	34	6%	
	College Diploma	229	43%	
	Undergraduate Degree	126	24%	
	Postgraduate Degree	39	7%	
Number of employees	Less than 5	185	35%	This implies that 53% of the enterprises were micro enterprises, while 47% were small enterprises which contradicts the 1999 National Baseline Survey (ICEG, 1999), that only a small proportion of MSEs employ 11-50 workers.
	5-10	95	18%	
	11-20	82	15%	
	21-50	168	32%	
Number of Computers	Less than 5	200	38%	Most enterprises had at least one computer with the majority of the enterprises (38%) having less than 5 computers. This availability and ease of accessing computers is a good indicator of the current and future technological capacity of most enterprises.
	5-10	163	31%	
	11-15	85	16%	
	16-20	34	6%	
	More than 20	48	9%	
LAN	None	69	13%	9% of the enterprises in the study had used wireless LANs to extend their wired LANs. Lack of financial resources to invest on wired LANs has made implementation of WLAN a cheaper and reliable alternative
	Wired	234	44%	
	Wireless	253	48%	
	Blue tooth	30	6%	
	Both (Wired and Wireless)	48	9%	

Table 6: Sample Characteristics

5.2 Business use of Mobile Telephones in MSEs

Mobile telephones have become a part of everyday Kenyan's life mostly due to portability, availability and network coverage. The number of mobile telephone subscriptions stood at 19.5 million by March 2010 (CCK, 2010). Mobile telephones provide convenient services to Kenyan population including voice communication, entertainment, business tools and most valued data services. The enterprises in the study use mobile telephones in their business operations as shown in table 7. The study shows high level of mobile telephone use by enterprises with all (100%) of the enterprises in the study using mobile telephones to make voice calls. SMS is usually considered a cheaper option to making voice calls, but from the study, there is no preference for SMS despite its

low costs with only 51% of enterprises using it for official communication. This is due to the limited amount of information that could be passed as well as time taken to compose the required text. It also requires sending more than one message to fully pass the desired message making it expensive in time and money. The majority (66%) of the enterprises in the study use wireless desktop telephones as it is difficult to have fixed telephone lines installed and if one is lucky to have them installed, they are also prone to constant breakdowns and vandalism. The use of mobile telephony to check utility bills such as water and electricity is another mobile telephone service that most enterprises are using. With 35% of the enterprises using it as a quick method of getting their bill, other enterprises find it too expensive as it costs almost three times that of an ordinary SMS.

Mobile telephone – Uses	**Frequency n=530**	**Percentage %**
Voice calls	530	100
Send text messages (SMS)	269	51
Wireless Desktop telephone calls	348	66
Voice over Internet Protocol calls	148	28
Checking and paying utility bills	162	32
Receive SMS advertisements	220	42
Send SMS advertisements	63	12
Checking product and stock prices	87	16
Business information management	462	87
Download ring tones, wallpapers, games	57	11
News (Entertainment, Sports, Headlines)	180	34
Mobile Global Tracking System	13	2

Table 7: Uses of mobile telephones

The survey revealed that pay as you go or prepaid service is the preferred mode of mobile telephone subscriptions with more than 99% subscriptions. This could be attributed to the availability of low value prepaid calling cards and ease of dropping a provider in case of changes in pricing and service tariff. A substantial number of enterprises had subscriptions from more than one service provider in order to reduce cross network charges. Cross network costs were usually high and switching to a different provider would also disadvantage the existing business relations hence the best option has always been to have several SIM cards and using them when there is a need to call people in a different network.

5.3 Mobile Internet Access

Inter-organization and intra-organization communications would be nearly impossible without the use of Internet especially if it involves faster document and information exchange. Most of the enterprises (77%) use some form of cellular Internet either through wireless modems, mobile telephones or wireless desktop telephones. It is also of interest to note that there are still a number of enterprises (4%) which are still using public Internet access services at cyber cafés for their Internet access and a 1% of the enterprises access their Internet through the satellite connection. Only 18% of the enterprises were accessing the Internet through a wired connection, with 70% of these users on wired broadband while 30% of these users were on the traditional dial-up connection. It is also worth noting that most enterprises had multiple Internet access using different methods of Internet access as complementary to each other. For the enterprises accessing mobile Internet, they were using different methods with 42% using wireless modems, 33% using mobile telephones, and 8% using wireless desktop telephones and 17% using wireless broadband (Fig. 4). Unpredictably all the ten cyber cafés in Nanyuki were all using wireless Internet as opposed to only 2 in Nairobi.

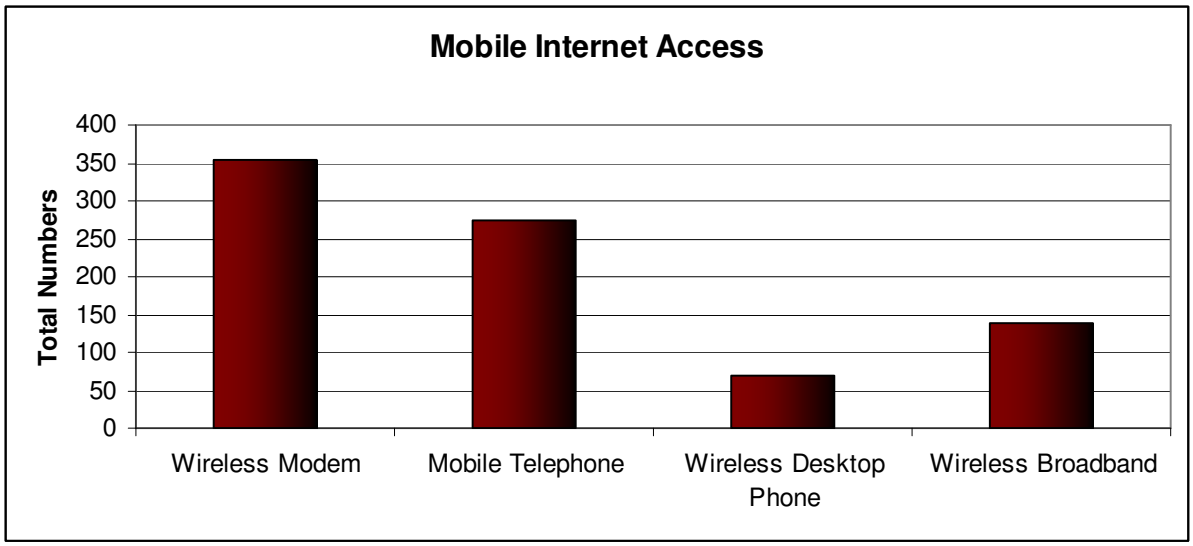

Fig. 4: Mobile Internet Access

The majority of the enterprises (64%) spends less than Kenya Shilling 5,000 per month while only 6% of the enterprises were paying more than Kenya Shilling 10,000. This is quite interesting as most enterprises use cellular Internet which is usually expensive. This could only indicate use of stringent measures within the enterprises to ensure that only business related use of the Internet is allowed as opposed to most conventional organizational environments where employees use company Internet to do personal tasks.

Respondents highlighted that the challenges to using cellular Internet are high costs and low bandwidth (Low speeds and exorbitant prices). Also most mobile data service offers are not business friendly as they are off-peak rates which are available at night and weekends when most enterprises are usually closed for business. If the mobile service providers would lower charges, this would translate to cheaper transaction costs hence wider usage.

The majority of the enterprises use email, computers and telephones in their business processes as a form of e-commerce solutions. 38% of the enterprises have a website for providing enterprise information. However, use of sophisticated eBusiness solutions is limited with a low usage rate of less than 10%. This could be attributed to inadequate legal and regulatory frameworks which expose enterprises to risk.

5.4 Mobile Banking, Mobile Money Transfer and M-Commerce

Kenyan market is a liquid cash market with most people preferring money changing hands as face to face transactions are regarded as secure transactions. Table 8 shows that 38% of the enterprises use MMTS for sending, receiving or storing money. The stored money value could be used in paying for goods or services, sent to another subscriber or converted back to cash. The study revealed that there is limited use of MMTS for B2B and B2C e-commerce transactions as opposed to C2B and C2C ecommerce transactions. Largely this is due to limited amount of cash one can hold in their virtual account at a time, agent's lack of float and frequent outages which result to confirmation failures, delays or even absolute interruptions. The use of MMTS in B2B, C2B, C2C and B2C is also mired by the fear of losing money through the touch of the wrong button or through criminal acts. It takes at least 72 hours to reverse a wrong transfer of money by a user of MMTS and that is only possible if the recipient (wrong number) has not used a cent of money sent. Despite these barriers, C2C and C2B e-commerce transactions seem to have greatly benefited from MMTS as most customers use it to pay for their goods and services especially where the costs are below the maximum value transferable at

once of 35,000 Kenya Shillings. Paying of utility bills using MMTS is the most acceptable and readily used type of C2B e-commerce transactions in Kenya today.

Even though MMTS has solved most of the hassles people go through when paying for services, cases of customers being forced to pay their utility bills again as they sort out issues with the MMTS providers for delayed or failed remittance due to errors occurring during MMTS are common. The number of organizations registered as pay bill partners to enable such organizations receive bulk mobile money is also limited with figures from all the three providers of MMTS showing a figure of about 344 partners as at August 2010. Another major challenge is lack of network coverage or poor signal strength in most rural areas, where subscribers have to climb trees or travel for kilometers to be at a particular hill to make a call or confirm whether the MMTS transactions have been successful.

Mobile banking is also not so popular among MSEs with only 29% of the study enterprises using it. This is because most Kenyan banks do not offer the services as well as high levies charged for using mobile banking services.

With M-Commerce, 21% of the enterprises in the study were using it. These are fewer enterprises compared with the number of MSEs using mobile devices to access the Internet. Most entrepreneurs argued about the mobile telephone display size and security risks as some of the factors limiting the use of M-Commerce.

M-Transaction	**Frequency (n=530)**	**Percentage (%)**
M-Banking	154	29%
M-Commerce	112	21%
Mobile Money Transfer	201	38%

Table 8: Use of Mobile banking, Mobile money transfers and M-Commerce

Fig. 5 shows that there is limited use of MMTS for B2B and B2C e-commerce transactions as opposed to C2B and C2C ecommerce transactions. Of the 38% of MMTS users, almost all (98%) had used C2C MMTS as opposed to 30% and 21% who had use it for B2B and B2C respectively. C2B e-commerce transactions also had a higher percentage of use with 82% of respondents having used the services. This is mainly due to most entrepreneurs opting to pay for goods and services through MMTS.

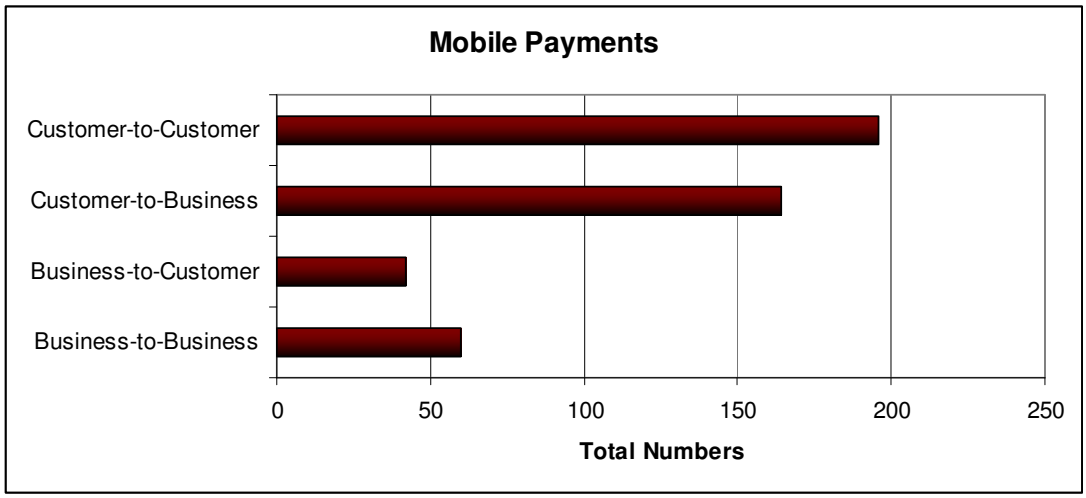

Fig. 5: Mobile Money Transfer E-commerce Transactions

6. Discussions

The study proposed the "Suitability of Wireless eBusiness Infrastructure" (*SWeBI*) model that integrated Performance Expectance, Social Influence and barriers with Appropriateness/TTF to investigate the suitability of using mobile technologies for MSEs' e-commerce infrastructure. The study found positive relationships between TTF and Performance, TTF and Usage, Usage and Performance, and also between Acceptance and Usage which are consistent with previous research results (Goodhue and Thompson, 1995; Venkatesh *et al*., 2003, Goodhue, 1995; Dishaw and Strong, 1999; Benslimane *et al*., 2002; Gagnon *et al.,* 2004; Norzaidi and Intan Salwani 2008; Klopping and McKinney, 2004; and Davis, 1989). TTF has a significant positive correlation with Acceptance, Barriers, Usage and Performance. This confirms the existence of a direct effect of TTF on Usage and Performance and is an indication that TTF highly and significantly predicts Usage and Organizational Performance. The positive correlation between TTF and User Acceptance is an indication that TTF also does influence Acceptance and that people who value TTF find it easy to accept the technology if it meets their task requirements and that User Acceptance of using mobile technologies in MSEs' business processes is largely dependent on the fit between the e-commerce infrastructure requirements and the functionalities of mobile technologies. This relationship was also established in a study on use of e-commerce by Klopping and McKinney (2004). The positive correlation between TTF and Barriers is an indication that technological barriers do influence TTF. Acceptance is correlated to Barriers, Usage and Performance. This suggests that technological barriers also affect acceptance while acceptance affects both Usage and Performance. This is an indication that users of mobile technologies in MSEs' business processes have concerns about each of the barriers as regards use of mobile technologies to implement e-commerce infrastructure. Usage is correlated to performance. This suggests that Usage and Performance are related. Those people who use the technology expect improved organizational performance. Barriers are correlated to Usage and Performance. This is an indication that barriers to usage also impact negatively on organization performance.

The results of the study answered research questions as discussed in the following section.

Question One: Do User Acceptance and TTF influence the adoption and use MIS and MMTS to facilitate e-commerce?

The results of the study show that User Acceptance and TTF very strongly influence utilization when considering the predictive power and the path coefficient score of the structural model. User Acceptance and TTF have significant direct influence on utilization which implies that higher User Acceptance and TTF results in higher utilization as they both positively affect utilization. The structural model indicated that TTF has a stronger total effect on utilization compared to user acceptance. With TTF having a high effect on utilization, this supports the need to include constructs in TTF that describes mobile technology use in context with such mobility. Therefore, increasing TTF increases utilization and is an indication that TTF is a critical usage factor.

Question two: What are the barriers to the adoption and use of MIS and MMTS to facilitate e-commerce?

In this study, the barriers construct is a multidimensional construct and consist of Affordability, Security and Privacy Risks, and Performance Risks. The expectation is that a higher perception of barriers will result in less use of wireless technologies to implement an eBusiness infrastructure in Kenyan MSEs. A further analysis of the barriers using stepwise multiple regression analysis, where all the measurement items in the barriers construct were considered simultaneously, showed that only Performance Risk had a significant negative effect on Usage.

These results suggest that there is trust towards use of wireless technologies to implement eBusiness infrastructure which removes all unnecessary security and privacy fears. It also could be attributed to what Karvonen, (1999) refers to as do not care attitude by the users. Karvonen, (1999) when

describing users of computing technologies indicate that when users of information technology are questioned on security and privacy matters they respond with "they do not care about security or insecurity of their systems". It could also be attributed to the decision by the users of wireless technologies to throw caution to the wind when they have an urgent need that can only be met by using of wireless eBusiness infrastructure.

The results also indicate that the benefits of using wireless technologies to implement an eBusiness infrastructure outweigh the purchase, installation and usage costs. This eliminates the perceived negative effects of high purchase, installation and usage costs on usage. Also the cost of implementing an eBusiness infrastructure using wireless technologies is not as high as that of either the available alternatives or traditionally existing methods of doing the same business transactions. The lack of negative effect in case of costs and security does not necessarily mean that they are not important barriers to use of wireless technologies to implement an eBusiness infrastructure. This could only be taken to imply that there are some inherent advantages in using wireless technologies to implement an eBusiness infrastructure that diminish the effects of costs and security concerns. This could also imply that many respondents may not be aware of the security risks associated with using wireless technologies to implement eBusiness infrastructure. It may also imply that the price competition among the service providers and retailers of wireless products give the users of wireless technologies and related services a wide price range to choose from hence lowering the costs of using wireless technologies. The Kenyan Mobile telephone service providers have been using the low-cost competition strategy for the last few years as they try to retain their customers as well as make some profit as a result of mass affordability. Lack of any negative significant effect on using wireless technologies to implement an eBusiness infrastructure by Affordability could also be attributed to the Kenyan market where service providers and suppliers of wireless technologies and services use price and not quality of service as the main units of competition making the choice of wireless technologies and services vary widely. This also creates the advantage to the users that they do not need to worry about prices and security. Therefore cost factors are not perceived to be critical impediments in the wider use of wireless technologies by Kenyan MSEs but a reason to take advantage of the best price bargains. This could also be attributed to other mitigating factors such as time and cost savings achieved in using wireless technologies as compared to other available alternatives. Also the cost of implementing an eBusiness infrastructure using wireless technologies is not as high as that of other existing alternatives. It is also relatively easier to implement an eBusiness infrastructure using wireless technologies and there is also a wider choice of technologies and service providers to choose from. For now Security and Affordability have no any significant negative association with usage while Performance Risks is the only barrier that has significant negative effect on use of wireless eBusiness infrastructure.

This absence of negative relationship between costs and usage could also be attributed to the nature of Kenyan wireless technologies market. The Kenyan mobile telephone and related services markets are characterized by price wars which have seen prices of using mobile telephone and related services reduced drastically in recent months. Therefore, the users usually go for the cheaper option hence reducing the negative effect of usage costs. Although most price offers seems to target personal users rather than business users as cheaper rates are usually offered during off-peak hours when businesses are closed for the day, the entrepreneurs are able to choose the best tariff for their businesses based on the available options. From the case studies results, it is worth noting that even if affordability did not have a negative effect on usage for the entire study, the high-end mobile services such as Mobile Banking, Mobile Money Transfer Services and Wireless Internet acceptance is still determined by their pricing. MSEs require affordable prices to be able to continue using these services and therefore the providers of mobile telephone and related services should consider price as a primary determinant of usage.

Performance Risks effects on Usage showed a significant and strong negative relationship. This indicates real concerns on the frequency of technical failures during business operations when using mobile technologies and related services to facilitate e-commerce transactions.

Performance Risks adversely affect most of mobile technology services hence the need for the manufactures of wireless devices and related technologies as well as the service providers to continuously look for solutions to mitigate performance risks related to use of mobile technologies. Performance risks are experienced more on voice communication, wireless Internet and Mobile Money Transfer Services. Using MMTS for e-payments offers a convenient and dependable way of paying for goods and services. It has offered both the MSEs, their suppliers and customers easy access to payment services though it comes at a cost. Most entrepreneurs believe mobile payments are a secure, convenient and faster mode of making payments than most of the other traditional modes of payments though hampered by persistent outages. They also felt that the technical hitches experienced when using wireless technologies could be avoided if the service providers had offered some basic training to users and had a refund and compensation system that allows compensations when the systems do not meet users' expectation. One message that all MMTS users dread when sending or depositing money is: **"The service is experiencing delays and is not able to accept your request. Please wait for 10 minutes before trying again."** From the study results, the respondents who had this experience indicated that these 10 minutes may translate into hours causing a lot of anxiety to both the recipient and the sender of the money if they had already performed the required transaction request. Another message that also drives the users of MMTS crazy, who hold money on their mobile account and would want to buy airtime from the service provider while away from office is: **"The service is already attempting to purchase AirTime for you. For more information call or SMS the customer services on 234."** When connecting to MIS, frequent failures are also a common thing as cellular based Internet uses shared bandwidth between all connecting devices. One message that all MIS users dread is: **"The remote computer did not respond. For further assistance, click more information or search help."** The remote computer may fail to respond for a very long time hence delaying access to the Internet for a long duration of time which greatly affects interactions and transaction processing within and between the MSEs and its partners and customers.

Question three: What are the benefits of using MIS and MMTS to facilitate e-commerce in an organization?

The results revealed some of the benefits of using mobile technologies in MSEs' business processes as improved business correspondence, reduction in operations cost, speedy and reliable communication between and within businesses and customers, efficient coordination among MSEs and closer relationship among business partners. For each of the MSE studied the mobile technology used has greatly helped to transform the enterprise to a smart MSE. These results serves as a proof that no matter the size or the location, MSEs can significantly benefit from using different mobile technologies to address their e-commerce infrastructure needs.

Question four: Does the geographic location of the MSE influence the use of MIS and MMTS to facilitate e-commerce?

MSEs in the rural areas have embraced use of MIS as this is the most available Internet connectivity with 73% of the MSEs using wireless modems for their Internet connection as compared to 64% of MSEs in the urban areas. This is an indication that MIS is a blessing to the MSEs in the rural areas as there were more users of wireless Internet in rural areas as compared to urban centers. On using web technologies, MSEs in rural areas lagged behind the urban MSEs in the adoption and use of websites, e-commerce and advanced eBusiness solutions. This is demonstrated by having 50% of urban MSEs having websites as compared to 10% of MSEs in the rural areas. The urban MSEs also have a higher rate of e-commerce usage with 23% as compared to 4% of MSEs in the rural areas. On advanced eBusiness solutions the MSEs in the rural areas have an average usage of 4% as compared to an average of 11% of MSEs in urban areas. With most MSEs in Kenya using mobile telephones for their voice communication, it is expected that M-commerce rates of the adoption should be high. On the contrary only 23% of urban MSEs and 9% of rural MSEs are using M-commerce. But when it comes

to M-banking and MMTS, the rural MSEs have a high average rate of using these two M-transactions with an average of 40% as compared to urban MSEs with an average of 30%. This is a clear indication of how MSEs in rural areas have continued to benefit greatly by the availability of mobile telephone networks.

To alleviate the existing huge technology access disparity between rural and urban areas, and to ensure equity in digital access, the rural areas should leapfrog to mobile technologies which offer relatively faster and less expensive ways of building telecommunication infrastructure over the more expensive and time-consuming tasks of building fiber cable based connectivity or the fixed (wired) telephone networks. Mobile technologies could also be used in urban areas to complement the fixed broadband networks.

6. Conclusion

The results of this study indicate that Appropriateness, User Acceptance and Performance Risks (Technological Challenges) play an important role in shaping the use of mobile technologies to implement an e-commerce infrastructure in Kenyan MSEs. The availability of mobile technologies for use in MSEs has greatly reduced social-economic disparities within Kenya as well as narrowing the rural-urban digital divide which is a positive stride towards Kenya's Vision 2030 (NESC, 2007). Mobile technologies have provided suitable infrastructure solutions to MSEs seeking to integrate and use e-commerce solutions in their business processes.

To alleviate the existing huge technology access disparity between rural and urban areas, and to ensure equity in digital access, the rural areas should leapfrog to mobile technologies which offer relatively faster and less expensive ways of building telecommunication infrastructure over the more expensive and time-consuming tasks of building fiber cable based connectivity or the fixed (wired) telephone networks. Mobile technologies could also be used in urban areas to complement the fixed broadband networks. There is a need to setup community Internet centers in the rural areas to pave way for general uptake of Internet based technologies which would integrate well with the presence of rural smart MSEs and which would encourage digital channel interactions as opposed to face-to-face or personal interactions.

7. Limitations and Opportunities for Future Research

Generalization of the results to other sectors or countries should be made carefully because only the Kenyan MSEs' sector was investigated in this study. This study is also limited in terms of comparisons due to lack of similar previous studies from other African and developing countries for cross country evaluation. However, the researcher is confident that this model will have significant applicability with similar socio-economic environments.

Future research should focus on further testing and refinement of the new model to establish its external validity as well as testing whether the study findings results can be replicated in other contexts such as different technologies or economic sectors (such as education). It is currently unknown how well the model and its findings will generalize beyond the specific conditions of this study. Future research should include a thorough testing of the proposed research model variables to determine whether the conceptual model proposed receives further empirical support.

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