MOBILE COMPUTING APPLICATIONS AND OPERATIONAL PERFORMANCE OF SACCOS IN NAIROBI COUNTY

SAMMY MAINA MBUGUA

A PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

DECEMBER, 2018

DECLARATION

This is my original work and has not been presented for examination in any other university

Signed …… Date……

Sammy Maina Mbugua

D61/65643/2013

This project has been submitted for examination with my approval as the university supervisor.

Signed …… Date……

Mr. Joel Lelei

Department of Management Science

University of Nairobi

DEDICATION

This research paper is dedicated to my family and friends for their inspiration, encouragement, understanding and support towards the successful completion of this course. I pay glowing tribute and gratitude to my supervisor for his guidance and untenable wisdom throughout this course.

ACKNOWLEDGEMENTS

My special and sincere thanks go to my supervisor Mr. Joel Lelei for his guidance, support, suggestions, useful comments and constructive critique which were all instrumental to the successful completion of this research work. I also wish to appreciate the support and encouragement from my friends during the tough time that I had to balance between the demands of a rigorous academic program, challenging work environment and family commitments. Special thanks go to my classmates for their encouragements and support.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ATM	Automated Teller Machine
DTS	Deposit Taking Savings and Credit Cooperative Society
EDGE	Enhanced Data Rates for GSM Evolution
FOSA	Front Office Services Activity
GDP	Gross Domestic Product
GOK	Government of Kenya
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GSS	Group Support Systems
HSCSD	High-Speed Circuit-Switched Data
ICT	Information and Communication Technology
IS	Information System
IT	Information Technology
MMT	Mobile Money Transfer
SACCO	Savings and Credit Cooperative Society
SASRA	SACCO Societies Regulatory Authority
SMS	Short Message Service
WOCCU	World Council of Credit Unions

ABSTRACT

This study focuses on mobile computing applications in SACCOs in Nairobi County. SACCOs have become an integral part of the Kenya financial sector especially in providing financial services to the unbankable population. Despite their tremendous growth and the important role they play, they still face numerous challenges ranging from inadequate capital, high operational cost, inefficiency, inadequate skills and liquidity issues among others. To address some of these challenges and increase their competitive edge SACCOs have invested in mobile computing application systems. This has enabled them to provide SACCO products and services through mobile computing devices such as mobile phones. However, the impact of mobile computing applications on operational performance in SACCOs has not been studied well. Various related studies done have majorly focused on mobile banking and financial performance. This opens a gap whereby this study seeks to investigate mobile computing applications and operational performance in SACCOs. The study addresses three objectives, the first two objectives explore the extent of use of mobile computing in SACCOs and challenges faced by SACCOs while using mobile computing applications. The third objective was to determine the relationship between mobile computing applications and operational performance in SACCOs. A descriptive research design was used. A census study was conducted on all the 45 SACCOs in Nairobi County licenced by SASRA as at 31st December, 2017. A structured questionnaire was administered targeting the IT managers in each SACCO for data collection. Data collected was analysed through frequency, mean, percentages, standard deviation and regression analysis. The study found that loans processing was the most used service of mobile computing applications in SACCOs. While high cost of installation and maintenance was the most challenging aspect of the technology. The study also found that mobile computing applications have contributed to improvement in the quality of services. The study recommends increased investment and utilization of mobile computing applications in SACCOs, increase public awareness of the many SACCO services offered by mobile computing applications for their optimum use and development of favorable government policies to reduce the hardware and software cost aimed at reducing the acquisition and maintenance cost of mobile computing applications.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

The relationship between information and communication technologies and business performance has attracted much attention from within academia for quite some time (Wambui, 2011). Recently mobile computing in the financial sector has been of great interest in Kenya with key focus on its effect on the financial performance due to the widespread use of mobile banking services. According to Communications Authority of Kenya, (2018) Quarterly Report mobile penetration stood at 88.1% (37.8 million users) with over 31.9 million users accessing internet through mobile devices. This uptake of mobile computing has seriously changed the way Kenyans live, work and interact.

It is in this spirit that players in the financial sector including SACCOs have invested in mobile and internet banking to improve their performance and address some of the challenges they face. Jenny and Isaac (2010) observe that adoption of mobile and internet banking has changed the way people access and perform financial transactions and how people interact with organizations. Such that it has transformed their savings and lending capabilities, increased their products portfolio and ensured effective competitiveness in the saturated financial services market (Wanjiru, 2012).

1.1.1 Mobile Computing

Over the years Mobile computing has undergone various evolutionary stages fuelled by innovation to get to the current state. According to Kjeldskov (2014) mobile computing has grown from just technical knowhow to now being about user experience, usability and

usefulness. Mobile computing is a field of computer technology where handheld and mobile electronic devices are equipped with computer technology and can access wireless networks to share information with other devices. This has been made possible by the shrinking hardware size and increase in computational power as observed by (McCullough, 2004). These mobile computing devices feature colour graphics display with touch sensitive capacitive screen as their major human-computer interaction model.

These devices include laptops, tablets, smart phones, PDAs and wearable computers e.g. smart watches, interactive glasses. They utilize wireless networks powered by radio frequencies such as WiFi, Bluetooth, GSM, HSCSD, EDGE, GPRS, Third-generation wireless systems (3G), Fourth-generation wireless systems (4G) networks among others (Mazliza, 2007).

The most familiar aspect of mobile computing is the mobile phone or smart phone. Apart from making voice calls, they have been embedded with diverse technologies and are used send text messages, used as cameras, video recorders, calendars, diaries, watches, alarms and reminders, browsing the internet, playing games, emails among other default activities. More so Colin (2016) observes that mobile computing devices are increasingly being used in M-commerce, E-banking, remote access of corporate databases, advertising, location tracking, remote health monitoring, video conferencing, file sharing and cloud computing.

1.1.2 Challenges of Mobile Computing Applications in SACCOs

Mobile computing has a lot of potential in the financial sector. However, it is face by a myriad of challenges. Some of the most glaring challenges as observed by Kendal et al., (2011) were high transaction costs, systemic delays especially during transaction

processing, vulnerability of the users to fraud and limits of the amount of money that can be transacted at any given time.

Wechuli, (2017) further observed that Mobile Computing Application in banking is faced with challenges such as: inadequate technical skills, lack of awareness, low prioritisation, poor technical design, and social engineering practices such as phishing, shoulder surfing, bating and eavesdropping. In order to minimise these challenges, the authors suggested the need for regular maintenance of the mobile banking service, increasing the capacity of the systems to handle more transactions per day, educating and training people on the need to resist social engineering, putting in place proper Mobile Computing security policy, and putting in place technical controls such as the use of firewalls.

In the rural areas, mobile computing application in the financial sector faces unique challenges. Odoyo (2016) postulates that lack national Identification Cards, lack of awareness on how to access and operate some features in the mobile computing platform as well as language barriers hindered the growth and uptake of the technology. These however has not stalled the investment into mobile computing application by SACCOs.

1.1.3 Operational Performance

Operation performance can be defined as the overall computable aspect of all the processes an organization undertakes. This normally includes quality of goods and services, speed of production and delivery, cost of production, dependability of the production system and flexibility of the production system (Davis, 1993).

According to Hagel (2010), measuring performance is a key activity in evaluating the competitiveness of a firm. The common method of measuring the performance of a firm is

conducted through financial return measures on sales, net profits, cash flows and the return on investment. Though, non-financial measures have also been tried in an attempt to find the performance of a company through operation performance (Stevenson, 2005).

1.1.4 Savings and Credit Cooperative Societies

According to World Council of Credit Unions (2008) Savings and Credit Cooperative Societies are credit unions owned by individuals who have a common interest in mobilizing monetary savings to facilitate provision of credit to themselves. In Kenya, the white settlers established the first co-operative at Kipkelion in 1908. It was registered under the companies' ordinance to dispense support for agricultural activities to the settlers (Obure, 2015). He further states that with the growth of cooperatives reforms on regulations have been put in place to assist in streamlining operations with an aim of increasing members' returns.

In Kenya, the SACCO subsector consists of Deposit Taking SACCOs and non Deposit Taking SACCOs. Deposit-Taking Savings and Credit Cooperative Societies are overseen by SACCO Societies Regulatory Authority (SASRA) within the SACCO Societies Act of 2008 (Mumanyi, 2014). DTS offer front office services activities (FOSA) unlike non DTS. FOSA allows them to offer basic banking services which include deposits, withdrawals, in-house transfers, ATM services among others hence increasing their cash flow.

SACCOs in Kenya are confronted by myriads challenges that include fraud, poor record keeping, loan backlogs, and high illiteracy level among the members, audit arrears, mismanagement, inadequate managerial skills, inadequate capital and heavy taxation. A research by WOCCU (2008) showed that cooperatives are face serious liquidity challenges

and a majority of them can not satisfy the ever growing appetite for loans and savings withdrawals. Hence the need to engage ICT to improve on their membership, streamlining operations, performance, profitability and transparency (Mugo, 2016).

1.1.5 Mobile Computing and Operational Performance in SACCOs

According to Davenport (2013) computer technology supports the primary objective of operational performance in ensuring the operations of a business go on uninterrupted, products and services are delivered on time, within budget whilst maintaining the quality standards. This technology is not only useful in operational objectives but also it can be used at strategic levels of management of a firm. This further enhances communication with the suppliers and customers thereby building to the competitive advantage.

Numerous studies have been done to establish the relationship between the mobile computing and information technology on operations performance of firms. For instance: Kungu (2014), concluded that mobile computing & information technology directly influence operational performance by increasing accuracy, speed, volume of work done, accountability, communication flow and reduced the operations cost. However, he noted that there were serious delays due to system failures, long response time due poor network connectivity, competence gaps, complicated processes and applications. In his study on the impact of mobile computing in a college setup, Colin (2016) observed that it cut lead time in provision of services, access to reliable information e.g. notices, timetables and surveys. In his research on the effects of mobile technology on performance of DTS in Kenya, Mugo (2016) observed that mobile banking had a positive influence on the overall performance of SACCOs. On the other hand he pointed out that mobile web services despite having so

much potential and versatility did not have any effect on the performance of SACCOs due to its low utilization.

1.2 Research Problem

Investment of ICT by organizations aims at improving efficiency whilst maintaining quality standards. Thus, automation of services through adoption of mobile computing applications promises to increase not only the efficiency of the cooperatives but also increase their membership, enhance performance and address the glaring challenges SASRA (2014).

Various studies have been conducted on the impact of mobile computing in SACCOs. For instance: Harelimana (2017) investigated how mobile banking was impacting financial performance in Rwanda. He observed that there a positive relationship between investment in mobile banking and financial performance leading to a conclusion that financial institutions need to invest in mobile banking services in order to extend their reach in rural areas and reduce operational costs; Siddaraju (2012) in a study on Cooperatives and financial inclusion in India regarding Issues and challenges, observed that despite cooperatives playing a vital role of encouraging financial inclusion in low income and rural area, they are plagued by problems of inadequate capital, poor member participation, mismanagement, corruption and frauds. He concluded that it has negatively impacted their efficiency and competitiveness of this financial institutions.

In his study on the factors affecting the financial performance of SACCOs in Kenya Maingi (2014) evaluated various factors affecting financial performance where he observed that SACCOs faced numerous challenges ranging from liquidity, human resources,

membership and awareness. He concluded that Mobile computing applications would address some of the challenges and recommended SACCOs to invest in mobile computing applications; Okiro and Ndungu (2013) concluded that SACCOs among other financial institutions are adopting mobile and internet banking to increase their efficiency but this was a generalized study on effects of ICT in financial institutions; Wanjiru (2012) observed that savings and credit cooperatives are embracing the mobile platform to enhance service delivery in her research on effect of Mobile technology on financial performance of SACCOs but the study solely focused on financial performance. It's worth pointing out that despite mobile computing technology's potential, SASRA (2011) raised concerns regarding the rising fraud incidences high cost of maintenance in terms of upgrades and skilled personnel among DTS therefore questioning the impact of ICT on operational performance of SACCOs.

However, some studies have established that the adoption of ICT by firms may not automatically translate to improved organizational performance and may even expose a firm to greater risks than before (Mugo, 2016). SACCOs still face a myriad of challenges as a result of using mobile computing applications. This range from fraud, cyber threats, high costs of acquisition and operations, illiteracy among members, system failures, delays, inability to recruit qualified personnel and high employee turnover (Mvula, 2013).

A limited understanding of the impact of the mobile computing technology might mislead Savings and Credit Cooperatives to investing in irrelevant technology or failing to take up technologies that would improve productivity. It is thus against this backdrop of confusion that this study asks; What is the extent of use of mobile computing by SACCOs in Nairobi County? What are the challenges facing the use of mobile computing by SACCOs in

Nairobi County? Is there a relationship between mobile computing on operational performance of SACCOs in Nairobi County?

1.3 Research Objectives

The objectives of this study were to:

i. Establish the extent of use of mobile computing applications by SACCOs in Nairobi County.
ii. Establish the challenges faced by SACCOs in Nairobi County in the use of mobile computing applications
iii. Determine the relationship between the use of mobile computing applications and operational performance of SACCOs in Nairobi County.

1.4 Value of the Study

This study aims to give a view into the performance of SACCOs and provide evidence on the role of mobile computing applications on their operational performance. More so, this study comes at a time when the country has witnessed considerable growth in terms of cooperatives. As such, the author hopes that the findings of this study will be used to enlighten other cooperatives in other parts of the country on the significance of Mobile Computing in cooperatives especially in streamlining their operations and service delivery. Moreover, the author hopes that cooperatives members will see the merits and demerits of accepting and using mobile computing technology. It is also hoped that through this study, the regulators will see the importance of adapting as well as encouraging innovations within the Kenyan financial sector.

The study may provide relevant information to the SACCOs governing authorities on formulating better policies to adopt and manage the implementation and use of mobile computing applications in the SACCOs. Lastly, this study may be invaluable in the world of academia. The author hopes that the study may contribute to the available knowledge regarding mobile computing technology in SACCOs by validating information systems adoption models in the studying the challenges and extent of use of mobile computing technology and further provide critical information pertaining to mobile computing and operational performance of cooperatives to researchers interested in this field.

CHAPTER TWO

LITERATURE REVIEW

In this chapter, the author explored the various articles that have focused on the ICT adoption theories, extent of use of mobile computing in SACCOs, challenges of mobile computing in SACCOS and the relationship of Mobile Computing and operational performance of Savings and Credit Cooperatives.

2.1 Theoretical Review

In this section, the theories that the study is based on are explored. First, Diffusion of Innovation, Technology Acceptance theory to elucidate how organizations adopt and use new technological advancements, information systems success model, challenges of mobile computing applications and the objectives of operational performance.

2.1.1 Diffusion of Innovation Theory

Rogers developed the Diffusion of Innovation (DOI) theory in 1962 as a theoretical approach to transforming the common practices in the society (Denning, 2004). According to Rogers (1995), innovation is a practice or an idea perceived as new in a given social system while DIO entails the process whereby new ideas are integrated into the workings of the specified social system. In reference to Mobile Computing technology the DOI describes and explains the mechanism by which novel practices in this case, mobile banking and internet are incorporated in the provision of effective service delivery.

Nonetheless, Tiwari (2006) argued that although innovations may change the way things are done, not all new ideas are adopted. According to him, resistance to change is the major

hindrance that derails diffusion of innovation in financial institutions. However, it is imperative to understand that the Roger's DOI theory took into account the resistance to change. In light of the Roger's theory, diffusion of innovation is achieved as potential users realize the innovation, assess its value, and make decision on its implementation or rejection (Berger, 1993). Thus, stakeholders' input in the adoption of the new technology in the cooperatives sector is important to its success.

2.1.2 Technology Acceptance Model

Designed by Davis (1986), the Technology Acceptance Model emphasizes on social beliefs and psychological predispositions including attitudes, intentions, and beliefs. Its core purpose is to determine the acceptability of a new tool and establish integral modifications that should be included to make it more acceptable to the stakeholders. Indeed, he posited that the acceptability of new information is driven by perceived usefulness and ease of use. Nonetheless, Bates (2007) asserted that apart from the user's attitude, the impact it might have on one's performance was a key factor in determining its acceptability. Based on this aspect, it is important to note that the trialibility of the innovation precedes it acceptability because the stakeholders would review it depending on user experience. Furthermore, although employees' attitude may be negative towards the new idea, they might end up using it in light of the perceived impact it would have on their performance.

While automation faced some resistance among cooperatives employees, its acceptance succeeded however; it was informed by the technology's dependability and its ability to enhance the ease of doing work (FSD Kenya, 2010). Nonetheless, FSD Kenya (2010) explained that depending on the users' experience, various modifications were added to

promote its universal acceptance as a significant innovation in the sector. The importance of the Technology Acceptance theory in the current study cannot be underrated. It serves as a reminder to the cooperatives on the significance of notifying their employees about impeding innovative technology they wish to integrate in their operational practices. This aspect is integral because it prepares the employees to accept readily, its adoption once it is integrated in their organizational system.

2.1.3 Information Systems Success Model

The justification for adopting and continually using an information system is possible only after measuring its success in the firm. Hence an integrative model that conceptualizes and operationalizes an IS success factors was put forward by (DeLone & McLean, 2004). In this model, IS success is assessed via the systems technical quality and the quality of information output. Systems technical quality focusses on success of an IS at the operational technical level verifying the desired aspects of an IS that produces information. Nils and Benjamin (2016) further claim that information output quality deals with assessing how successful the information is in communicating the intended meaning. These two dimensions are indirectly linked to IS effects on an organization's stakeholders.

SACCOs have been investing in IS to improve their efficiency, according to Okiro and Ndungu (2013), they rank second in adoption of computing technology after banks in the financial sector. The author explores the two dimensions of IS technical quality and information output quality in assessing mobile computing success in SACCOs.

2.2 Extent of Mobile Computing Adoption by SACCOs

ICT has become ubiquitous in the modern society (Kjeldskov, 2014). SACCOs have taken the opportunity to explore this diffusion of ICT to increase their efficiency and boost their membership. Wanjiru (2012) postulates that although there are other technologies that are used by SACCOs with a view to improve their financial performance, mobile and internet banking has undoubtedly become the most used platform by many.

Mugo (2016) breaks down mobile computing in SACCOs into mobile banking services (m-banking), mobile communication services and mobile web services (e-banking and Mobile Apps). M-banking refers to provision of bank like services via a mobile computing devices while mobile web services is the use of internet on these devices to access a wide range of banking services remotely (Steven, 2002). Mobile communication services relates to sending and receiving of information through mobile computing devices such as mobile calls, chatting, short messaging services, video conferencing and emails.

SACCOs have invested in mobile banking application for their banking services. Okiro and Ndungu (2013) explains that SACCO members are able to do a variety of transactions with their phones, for instance, checking the loan balances, paying their loans, receive SACCO notifications and even requesting for salary among others. This is mainly through the use of USSD and internet banking using Mobile computing devices. Wambari (2009) asserts that among financial institutions, SACCOs in Kenya are slowly adopting the use of mobile and internet banking even though they ranked second in the usage of internet and mobile banking services.

According to Mugo, Muathe and Waithaka (2018), mobile communication is the use of mobile computing devices as tools in aiding exchange of business information via emails, messaging, calls, conferencing services, mobile advertising and mobile chatting services. Through Mobile communication services stakeholders can communicate from anywhere to anyone which is very important when dealing with geographical barriers as it allows the communicating parties to minimize on transportation costs. The time taken to access information is greatly reduced. This saves the organization as it can automate its customer care desk thereby reducing on the physical branches and employees. In effect reducing the operating costs while making the services available throughout the day and night. SACCOs have the ability to effectively advertise their products by sending targeted adverts using mobile computing devices thereby cutting down on advertising and promotions expenditures.

2.3 Challenges of Mobile Computing in SACCOs

In general, despite the huge positive impact that mobile computing has had on the modern society brought about by portability, mobility and wireless connectivity of these devices MC still faces many challenges (Tactical Technology Collective, 2008). These challenges include; limited range and band width, unstandardized security features, font size, limited battery capacity vis-à-vis high consumption, interference in transmission, potential of health risk and limited human interface options with the devices (Reza, 2016).

Ogola (2014) postulates that, just like any other ICT related investments in SACCOs it faces adoption and operational challenges. He further broadly categorizes the Challenges into financial, technical, human resource and awareness.

SACCOs need sufficient capital and liquidity to function properly in their day to day activities and for growth (Zeuli & cropp, 2004). In their quest to increase growth and productivity SACCOs are investing in mobile computing systems, however, this needs additional capital for feasibility studies, purchase, training, maintenance and licenses. More so, the Sacco Star (2011, July) reported that SACCOs require significant financial resources to upgrade their systems in terms of technical specs and enhancing skills of the users of the system. Mobile computing systems are not cheap. Cohen, Galribaldi and Scarpetta (2004) further argue that expenditure are massive yet their benefit is not realized in the short term and neither is it direct. Considering that the ICT budgets are shrinking in many organizations Ogola (2014) further observes that SACCOs have a hard time upgrading or buying new systems and for those that already have face financial challenges in maintaining them such as training, recruitment, hardware upgrades are not prioritized leading to reduced performance.

In their operations, SACCOs face a variety of technical challenges. This range from cyber security threats, system failures and inadequate skills. Nairobi Business Monthly (2017, January) reports on a study by Consulting firm PwC, cyber security incidences grew by 38% in 2015 since the survey began over a decade ago. This has been exacerbated by the fact that 95% of the over 22 million mobile devices users in Kenya do not have mobile security. In addition to cyber security, SACCOs face inadequate ICT skills, old and obsolete systems, system outages and processing error as technical operational challenges. In their study, Kendall et al. (2011) argued that these technical challenges lead high transaction costs, systemic delays especially during transaction processing, vulnerability

of the users to fraud and to some extent led placing of limits of the amount of money that can be transacted at any given time.

In their study, Wechuli et al. (2017) observed that mobile computing application in SACCOs is faced with challenges including inadequate technical skills, lack of awareness, low prioritisation, poor technical design, and social engineering practices such as phishing, shoulder surfing, bating and eavesdropping. In order to minimise these challenges, the authors suggested the need for regular maintenance of the mobile banking service, increasing the capacity of the systems to handle more transactions per day, educating and training people on the need to resist social engineering, putting in place proper Mobile Computing security policy, and putting in place technical controls such as the use of firewalls.

Human resource influence on the performance of mobile computing applications in organizations is critical. According to Ogola (2014), based on a Kenya's Economic Survey in year 2003, the main challenges facing IS and mobile computing technology were inadequate skills and lack of information on latest technology, low appreciation of IS technology, a lacking in awareness of the changes in technology, inadequate information flow between various levels of an organization and inadequate linkages between institutions in the public and private sector. Despite ICT being the fastest growing sector in the world economy, Microsoft (2004) argue that third world countries still face a chronic shortage of ICT skilled workers and lag behind in ICT literacy. Inadequate skills makes it difficult to effectively utilize the ICT systems and employee's fear of loss of employment makes the training and adoption of the systems challenging. Procasur Africa (2012, March)

reports that qualified ICT personnel are too expensive for many SACCOs to acquire and maintain them.

2.4 Mobile Computing and Operational Performance in SACCOs

LaMarco (2016) postulates that there are five objectives of operation performance areas that a company tries to improve in order to achieve competitive advantage. These are quality, speed, cost, dependability and flexibility. Various studies have been done to establish impact of mobile computing on these objectives as detailed in this section.

There are standards and specifications set for various products in a market. Quality is therefore a measure how well a product conforms to those specifications and standards. More so, Neely (2002) states that it is how attractive the attributes of a product are in terms of reliability, durability, serviceability and functionality and customers perception of its value. Obure (2015) explained that quality service is an imperative element in enhancing the performance of cooperatives in the highly competitive financial sector. Supporting this observation, Wambari (2009) posited that quality products are the embodiment of SACCO's operational performance because it is a driving force in customer satisfaction. Nonetheless, technology has been instrumental in promoting quality products in them. They use technology to facilitate various services such as internal funds transfer, resolve customer complaints, facilitate change of personal information, and securing members funds (Zerfeshwa, 2010). However, the quality of service delivery is driven by technology, costs, and time taken to process the services. Therefore, they have embraced technology to boost the quality of their products by minimizing their costs and processing time thus gaining a competitive edge against other providers of financial services.

Speed in service delivery has been integral in enhancing the performance of Mobile Computing services in cooperatives in Nairobi. Customers in this sector demand for faster services an aspect that they have invested heavily by tapping into this technology. Martin (2010) expounded that, highly competitive cooperatives have embraced the Mobile Computing technology with a view of promoting speedy service delivery. Furthermore, the authors posited that their members no longer need to visit the SACCO's physical offices but access services through their mobile phones. The Mobile phone platform allows them to check balances as well as apply and process loans, and salaries thus minimizing the time they initially wasted while queuing in the halls (Kendall et al., 2011). In light of this aspect, most cooperatives with the effective mobile network have been able to cut a competitive edge thus increasing their client base and overall productivity.

Being a reliable service provider is an integral aspect particularly in financial services (Odoyo, Samuel, Benson & Silvance, 2016). Cooperatives operating in Nairobi have taken into account the importance of being dependable to their customers perhaps to boost their competitive advantage. Under this perspective, they have launched 24/7 mobile phone service access to allow their customers to use their FOSA (Front Office Services Activities) accounts at the comfort of their places at any time (Okiro & Ndungu, 2013). According to Mang'ana, Nyaboga, Momanyi, and Makone (2015), dependability has been contributing immensely towards the success of Mobile Computing technology. The author explains that the cooperatives came up with services that encompassed reduced product costs, minimal time for application processing, and faster mode of disbursement (the use mobile phones). Thus, dependability remains a driving force on the operational performance of the cooperatives.

SACCOs in Nairobi are technology driven an aspect that has significantly reduced their cost of operations. They no longer need to invest more on extensive branch network and staff to meet their service delivery demands. However, as Auka and Mwangi (2013) explained, all they need is technology investments that would create sustainable product delivery thus minimizing costs. Based on this view, Mobile Computing operate at minimal costs thus reducing the transferable costs to their customers. Through this concept, they have been able to increase their client base due to their cheaper products (Tiwari, 2006).

Flexible operations measures how easily a firm can adapt its production lines to match the changing customer needs and market requirements and it is also closely related to the speed objective (LaMarco, 2018). Apparently, flexibility enhances the operational performance of the cooperatives by harnessing technology to allow customers' access to proper service delivery. Mobile Computing services success has been enhanced by their focus on Mobile Money Transfer (MMT) technologies that enable them to reach heterogeneous client base. Tchouassi (2012) postulated, automated business settings allow the SACCOs to serve both members and target customers in affluent and remote areas in the region. Furthermore, service delivery is highly flexible including the provision of 24/7 services and wide variety of products including minimal savings and loans (Sonja, 2010). Therefore, the success of Mobile Computing services cannot be complete without its flexibility due to its role in enhancing customer satisfaction.

2.5 Empirical Studies

Okiro and Ndungu (2013) carried out a study with a view to determine the potential impact of mobile and internet banking on the performance of various financial institutions in

Kenya. Their study revealed that mobile and internet banking was mostly embraced by commercial banks. Additionally, the authors found that cooperatives although to a minimal extent, had also started adopting mobile and internet banking whereas other small finance institutions were yet to adopt the same. In the same study, the authors also reported that customers used internet technology largely for the purposes of inquiring the use of online credit cards as well as seeking product rate information. They concluded that the use of internet banking had a positive impact with regards to banking industry performance since it led to increased efficiency and effectiveness.

In their study, Aduda and Kingoo (2012) sought to determine whether there was a positive relationship between electronic banking and performance of banks that embraced the same in Kenya. In particular, the researchers wanted to determine the relationship between the return on investment and investment in the electronic banking (e-banking). The authors relied on secondary data that they collected from Central Bank of Kenya as well as the annual reports of the specific banks under investigation. The findings of the authors were that there was a positive impact of e-banking on the returns of investment of the banks that embraced the same. Consequently, Aduda and kingoo (2012) concluded that adoption of e-banking by the particular banks under investigation led to improved performance by ensuring efficiency in the provision of services.

In her work, Sonja (2010) studied the potential impact of automating financial services on the growth of SACCOs in Uganda. In conducting the study, the researcher relied on data obtained from the financial reports of five SACCOs in Mid-North and Southern regions of Uganda. The researcher's findings showed that automation of SACCO services such as the use of internet banking and mobile banking led to increased efficiency within the SACCOs,

increased customers and improved accuracy in the financial reports generated by the SACCOs. However, despite the proven significance of automation, Sonja (2010) reported that only a few SACCOs had taken a step to automate their services. She cited challenges including capital requirement as a major impediment towards automations of the SACCOs.

In his work Tchouassi (2012), carried out a study with a view to determine whether mobile phones extended banking services to the unbanked in select countries across Sub-Saharan Africa. In particular, the author investigated the way mobile phones could help extend banking services to the unbanked population and especially those living in remote areas with limited access to financial services. In his findings, Tchouassi (2012) observed that indeed mobile phones could help provide banking to the unbanked population. Besides, the author noted that mobile banking had the potential to ensure efficiency as it did away with the need to travel long distances to in order to access physical bank branches.

In his work, Wambari (2009) sought to determine whether mobile banking offered benefits to small businesses in the country and any challenges that those businesses using m-banking faced. In the study, the researcher used cross-sectional design and semi-structured questionnaires in collecting data. The findings of the study revealed that over 73 percent of the respondents in urban areas confirmed that indeed they used mobile banking in their business. Additionally, the authors established that overall use mobile banking conferred economic benefits to those businesses largely due to their safety and efficiency.

2.6 Summary of Literature and Research Gap

From the literature review, there is evidence of various studies in mobile computing and financial sector as a whole. However some gaps have been revealed from the review. The

review has exposed a gap to study the relationship between mobile computing and operational performance of SACCOs in Nairobi County. The focus of the studies conducted is generally on adoption of ICT and its impact of the financial performance of organizations. The next gap arises from the issues of adoption and post adoption of the mobile computing technology especially the effect towards enhancing organizational operational performance and the challenges faced in that period.

The contradicting accounts into the impact of mobile computing on various performance facets of organizations exposes the third gap. While there are studies showing evidence of enhanced organizational performance due to use of mobile computing applications, others contradict. However, this could have resulted from the different research designs used in different studies and a limited knowledge of mobile computing models of businesses, therefore, it necessitates further investigation given the exponential growth of mobile computing applications that Kenya has witnessed.

2.7 Conceptual Model

Based on the review of the Literature, there are certain factors influencing mobile computing in SACCOs. For this study, aspects of mobile computing applications were considered as the independent variable while operational performance of SACCOs is the dependent variable. These variables are represented in the conceptual model shown in Figure 2.1.

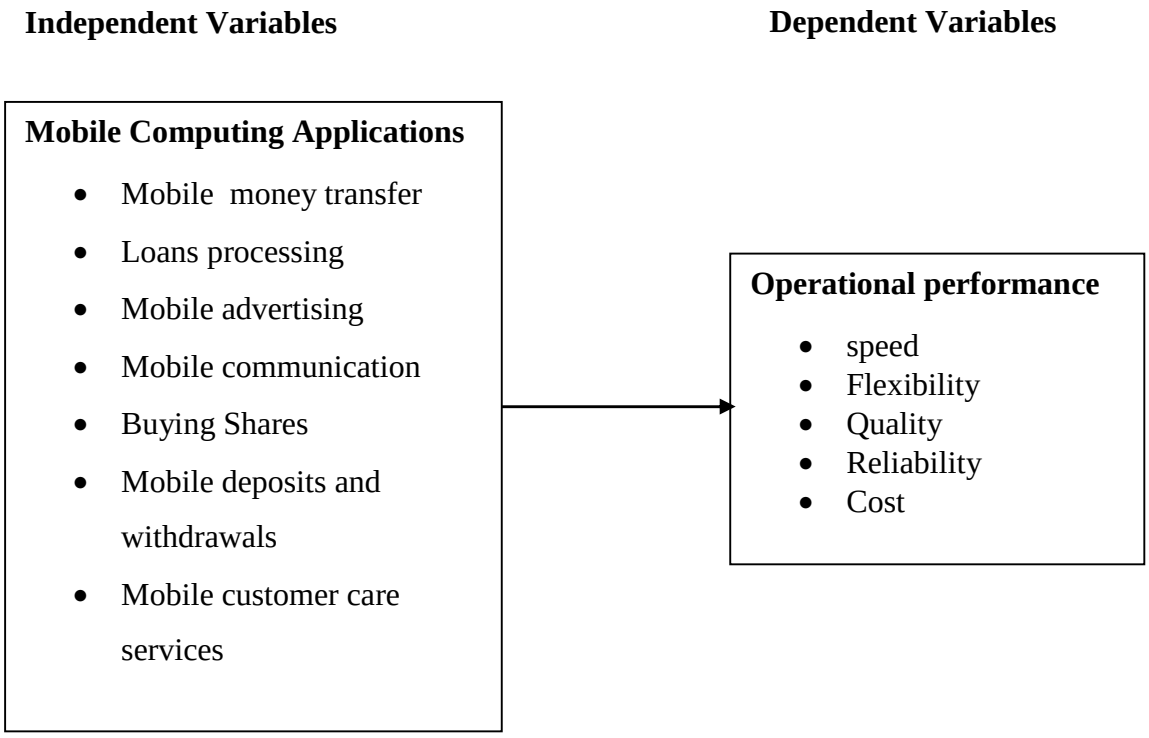

Figure 2.1. Conceptual Model

CHAPTER THREE

RESEARCH METHODOLOGY

The purpose of a research methodology is essentially to produce data that is reliable, valid and free from personal biases and other potential errors. According to Smith, Thorpe and Jackson (2012), it gives the direction through which the researcher follows in finding in their bid to unravel answers to their research questions. In this chapter the author presents the research design, sampling and population, data collection and analysis method employed in this study.

3.1 Research Design

According to McMillan and Schumacher (2001) research design is the strategy for identifying subjects, research locations and data collection methods to answer the research questions. This is the conceptual framework from which the research is done and forms the foundation for collection of the data and analysis of the data collected. Considering the objectives of the study and the type of data required, a descriptive designs was employed. The goal was to provide an understanding of the extent of use of mobile computing applications, challenges of mobile computing applications and the relationship between Mobile computing and operational performance of SACCOs in Nairobi County.

3.2 Population

Banerjee (2010) defines population as the total assembly of elements upon which a researcher intends to make inferences. An element therefore is a subject upon which a measurement is being obtained and it is the basic unit of a study.

In conducting this research, the author targeted all 45 SASRA accredited SACCOs registered and operating within Nairobi County. This was informed by the fact that the city is cosmopolitan and as such, deemed to provide a fair representation for the study and there is a wide spread use of mobile computing applications as per previous studies. There was no sampling since the entire population of SACCOs within Nairobi was studied, hence a Census study.

3.3 Data Collection Method

The author used primary data in his research. The questionnaires were designed in such a manner that they allowed for both closed and open-ended questions and were e-mailed and some physically delivered to target population. For each SACCO, the information technology officers were sampled as sole respondents in the study.

The questionnaire had five sections. The questions in Section A and B sought to find out general information about the respondents and SACCO. The questions in the Section C sought information on the extent use of mobile computing application in SACCOs. Data collected in Section D was on challenges of using mobile computing applications in SACCOs and Section E was on the relationship between mobile computing applications and operational performance.

3.4 Data Analysis

According to Bryman (2011) the techniques utilized to bring out inferences from collected data collected through systematic and objective identification of specific characteristics form data analysis. After collecting the data, it was edited to ascertain completeness, coded and entered in a data processing software for display through graphs and charts.

Data on demographics was analysed using descriptive techniques to show frequencies for Age, size of SACCO, duration of work and gender. The mean and Standard deviation were obtained for data on extent of use and challenges of mobile computing on SACCOs. Data on relationship between mobile computing applications and operational performance on SACCOs was analysed using a linear regression model as follows:

$Y = \alpha_o + \beta o X_1 + \varepsilon$

Whereby:

Y = SACCO Operational Performance

X_1= Mobile Computing Applications

ε = error

α_o = constant term

βo = coefficient of the independent variable

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the data that was found on mobile computing applications and operational performance of SACCOs in Nairobi County. The research was a census conducted on a population of 45 respondents. Out of the 45 questionnaires, 40 were returned which represented an 89% response rate. The chapter begins with analysing the respondents' personal information, followed by an analysis of the SACCO, extent of use, challenges and operational performance.

4.2 Background Information of the Respondents

This section presents data on respondent's age, how long the respondent has worked in the SACCO and distribution of respondent's gender.

4.2.1 Respondents Age

The study sought data on age of the respondents. The results of the findings are as shown in Figure 4.1

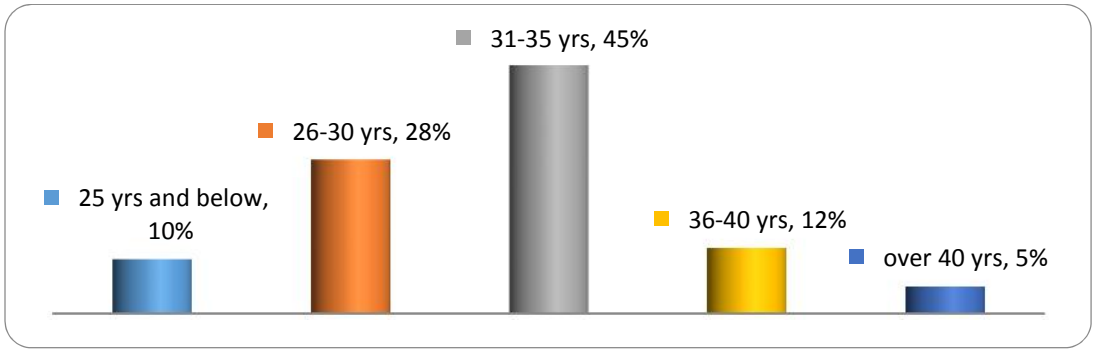

Figure 4.1. Distribution of Respondents by Age

According to the findings, 45% of the respondents were between 31-35 years, 28% were 26-30 years, 12% were 36-40 years, 10% were below 26 years and 5% accounted for over 40 years, depicting that majority of the respondents were of adequate age and thus could offer high quality information because of their experience.

4.2.2. Duration of Working in the SACCOs

The study also sought to data on how long the respondent had worked for the SACCO. Figure 4.2 shows the findings.

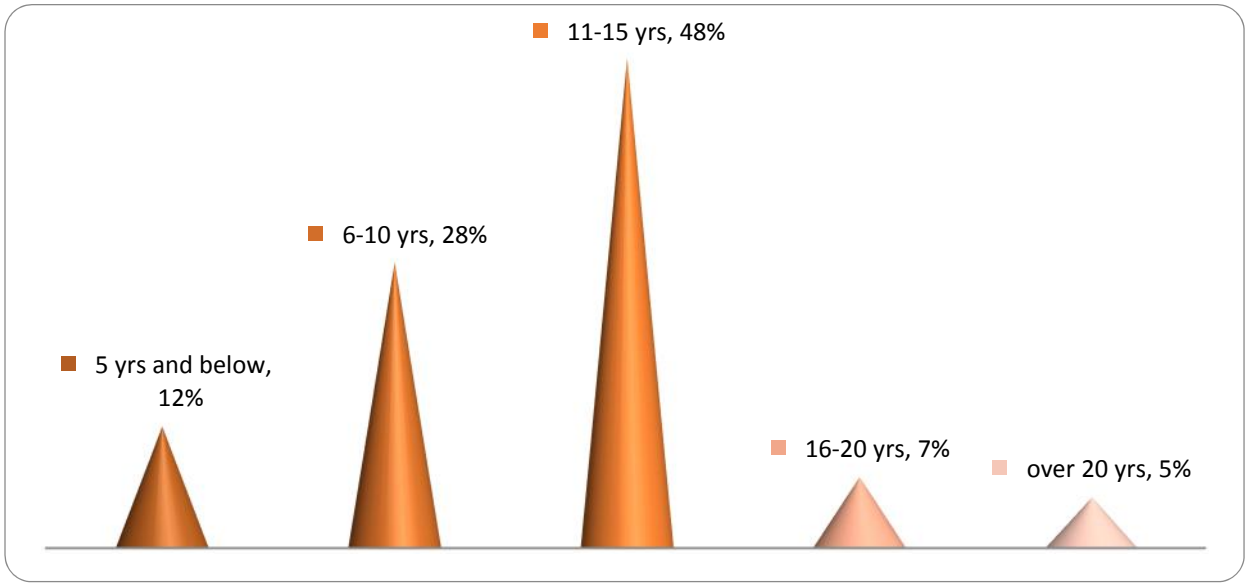

Figure 4.2. Duration of Working in the SACCOs

As per the findings (48%) of the respondents had worked in the SACCOs for a duration between 11-15 years, 28% indicated 6-10 years, 12% indicated 5 years and below, 7% indicated 16-20 years, while 5% indicated over 20 years. This shows that the majority of the respondents had worked in the SACCOs for a duration between 11-15 years which was a sizeable duration of time to understand the operations of the SACCO.

4.2.3. Distribution of Respondents by Gender

The respondents were requested to indicate their gender. The findings are as presented in Figure 4.3

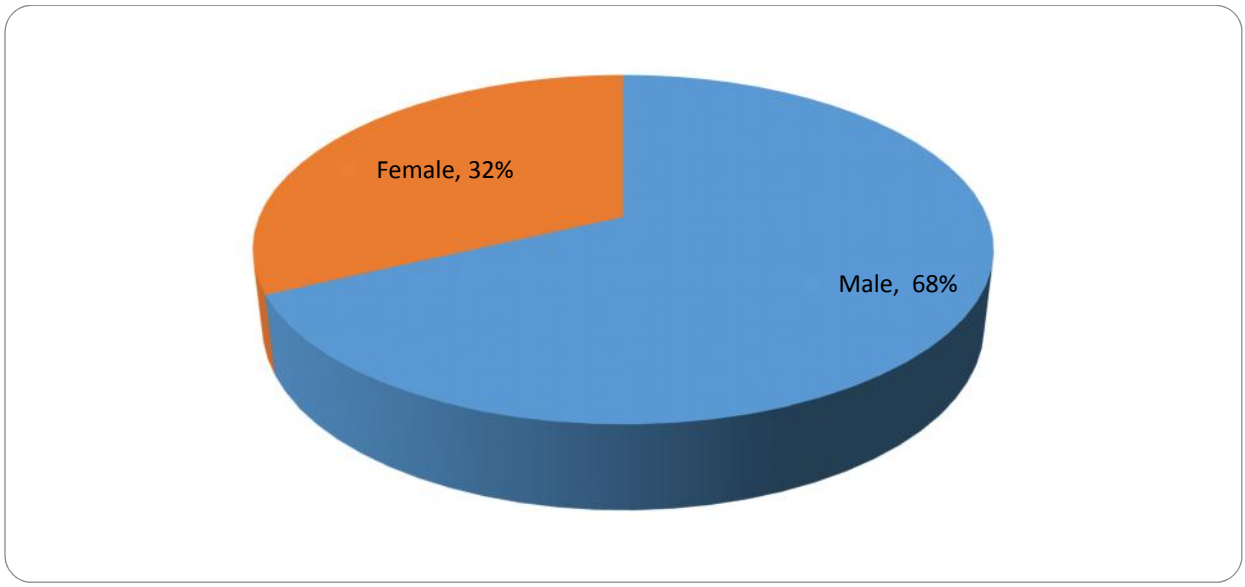

Figure 4.3. Distribution of Respondents by Gender

From the findings, majority (68%) of the respondents were male and 32% of the respondents were female. This implies that even though most of the responses emanated from males and there was gender imbalance. The gender information was significant for the current study in that it helped the researcher to identify the gender which was actively involved in the formulation and operations ICT in the SACCOs.

4.3. Background Information of the SACCOs

The respondents were requested to provide data on ownership, how long the SACCO has been in operation and size of SACCO as categorized by SASRA.

4.3.1. Ownership Category

The respondents were requested to indicate the ownership category of the SACC0. The findings are presented in Figure 4.4.

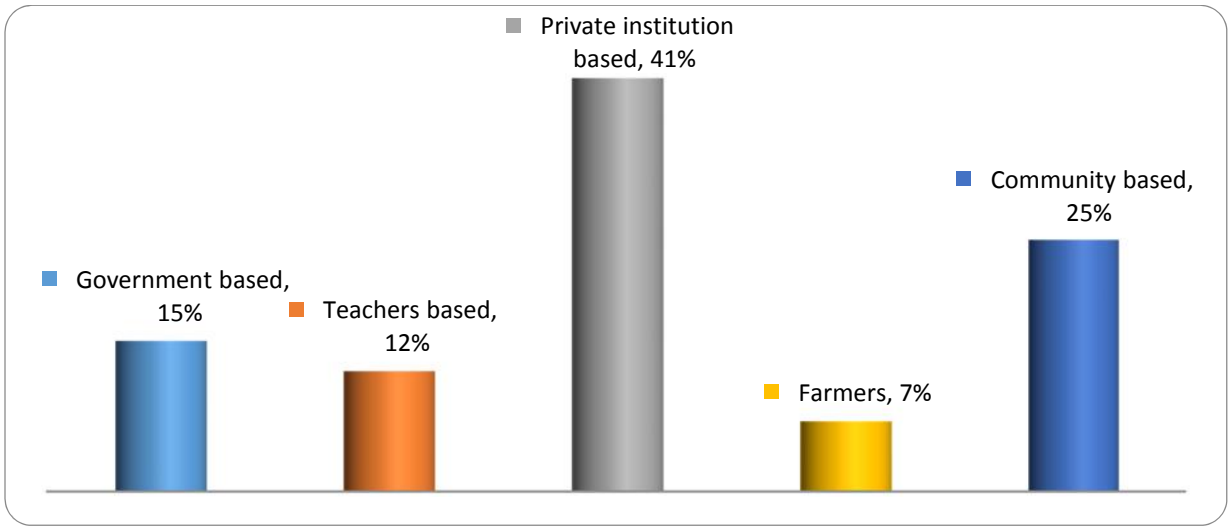

Figure 4.4. Ownership Category

From the findings most (41%) of the respondents indicated that the SACCO was private institution based, 25% indicated community based, 15% indicated government based, 12% indicated teachers based, while 7% indicated farmers.

4.3.2. Operation of the SACCO

The respondents were requested to indicate the duration the SACCO has been operation. A majority (70%) of the respondents did not fill this question. According to the respondents who did, the SACCOs that have been operational for more than 15 years were 88% and the rest below 15 years.

4.3.3. Categorization of SACCO by SASRA

The respondents were requested to indicate how SASRA has categorized the SACCO. The findings are shown in Figure 4.5

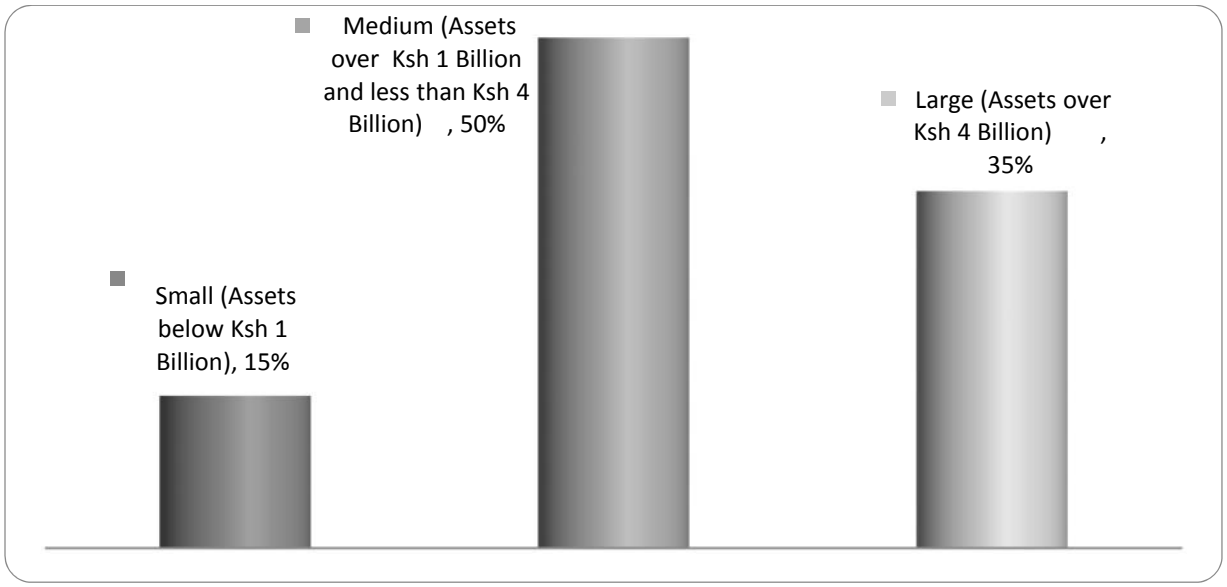

Figure 4.5. Categorization of SACCO by SASRA

From the findings majority (50%) of the respondents indicated SASRA had categorized their SACCO as medium (Assets over Ksh 1 Billion and less than Ksh 4 Billion), 35% indicated Large (Assets over Ksh 4 Billion), while 15% indicated Small (Assets below Ksh 1 Billion).

4.4. Extent of Mobile Computing Technology

This section presents findings on the extent of mobile computing technology among the SACCOs. The findings are as shown in the subsequent sections.

4.4.1. Main Services Offered by Mobile Computing Applications in SACCOs

The respondents were requested to indicate the extent to which they apply the various services offered main services offered by mobile computing applications in SACCOs. The responses were placed on a five point scale where 1 = Not At All, 2=Little Extent, 3 = Moderate Extent, 4 = Great Extent, and 5 = Very Great Extent. On the basis of the responses gathered, the mean and standard deviation were calculated and are shown in the Table 4.1.

Table 4.1. Main Services Offered by Mobile Computing Applications in SACCOs

Statements	Mean	Std Dev.
Membership Application	3.61	0.1569
Loans processing	3.99	0.2378
Buying shares	3.78	0.1872
Money deposit and withdrawal	3.57	0.1920
Communication with customers. (e.g. Sending statements, alerts and answering customer queries)	3.70	0.2145
Transfer of money to other accounts	3.68	0.2431
Stopping a service (e.g. Deactivating an ATM card)	3.50	0.1998

The mean is interpreted on a 5 point scale where < 1.5 = Not at All, between 1.5 and < 2.5 =Little Extent, between 2.5 and < 3.5 = Moderate Extent, between 3.5 and < 4.5 = Great Extent, and > 4.5 = Very Great Extent. From the findings the respondents indicated to a

great extent that loans processing was the main service use by SACCOs that was offered by mobile computing application in SACCOs (mean=3.99) and a small standard deviation of 0.1569. The small deviation shows that the response largely converged on the high use the loans service. The loans service high use was due to less bureaucracy and quick processing of loan as opposed to the manual loan application. This was followed by buying shares (mean=3.78), communication with customers. (E.g. sending statements, alerts and answering customer queries) (Mean=3.70), transfer of money to other accounts (mean=3.68), membership application (mean=3.61), money deposit and withdrawal (mean=3.57), and stopping a service (e.g. Deactivating an ATM card) (mean=3.50).

4.4.2. Challenges of Mobile Computing Technology

The respondents were requested to indicate the extent to which the various challenges are experienced in application of Mobile Technology Systems. The responses were placed on a five point scale where 1 = Not At All, 2=Little Extent, 3 = Moderate Extent, 4 = Great Extent, and 5 = Very Great Extent. On the basis of the responses gathered, the mean and standard deviation were calculated and are shown in the Table 4.2.

Table 4.2. Challenges of Mobile Computing Technology

Challenges	Mean	Std. Dev
System failure and processing errors	3.89	0.4321
Inadequate system recovery capabilities	3.82	0.4532
Security risks through malicious attacks and hacking incidents	4.04	0.4098
Compatibility issues of system and users devices	3.79	0.4918
Delays and long system response time	3.77	0.4462
Too Many Steps in a Procedure	3.60	0.3987
Complicated Applications	3.64	0.5129
Obsolete and Old hardware and software systems	3.70	0.4129
Skills gap among staff	3.51	0.4864
Staff resisting adoption of the new technology due to fear of loss of jobs	3.68	0.4101
Staff are reluctant to adopt new methods as they fear change	3.57	0.4219
Customer's reluctance to use mobile system	3.54	0.4352
High cost of Installation and maintenance	4.16	0.4187

The mean is interpreted in a 5 point scale where < 1.5 = Not at All, between 1.5 and < 2.5 =Little Extent, between 2.5 and < 3.5 = Moderate Extent, between 3.5 and < 4.5 = Great

Extent, and > 4.5 = Very Great Extent. From the findings the respondents indicated to a great extent that the challenge they experienced in application of mobile technology systems was cost challenges associated with high cost of installation and maintenance (mean=4.16) and a standard deviation of 0.4187, followed by security risks through malicious attacks and hacking incidents (mean=4.04), system failure and processing errors (mean=3.89), inadequate system recovery capabilities (mean=3.82), compatibility issues of system and users devices (mean=3.79), delays and long system response time (mean=3.77), obsolete and old hardware and software systems (mean=3.70), staff resisting adoption of the new technology due to fear of loss of jobs (mean=3.68), complicated applications (mean=3.64), too many steps in a procedure (mean=3.60), staff are reluctant to adopt new methods as they fear change (mean=3.57), customer's reluctance to use mobile system (mean=3.54), and skills gap among staff (mean=3.51).

4.4.3. Operational Performance and Mobile Computing Technology

The respondents were requested to indicate the extent to which mobile computing applications have contributed to each of the following operational performance indicators. The responses were placed on a five point scale where 1 = Not At All, 2=Little Extent, 3 = Moderate Extent, 4 = Great Extent, and 5 = Very Great Extent. T On the basis of the responses gathered, the mean and standard deviation were calculated and are shown in the Table 4.3.

Table 4.3. Operational Performance and Mobile Computing Technology

Contributions	Mean	Std. Dev
Reduction of time taken to complete a task by the staff	3.88	0.2834
Reduction in time taken to research and develop new products	3.97	0.2113
Improvement in the quality of services	4.28	0.1901
Improvement in the quality information	3.79	0.2183
Improvement in reliability of the SACCO processes	3.70	0.2984
Ability to introduce new services has improved	3.68	0.2345
Ability to customize new and existing services has improved	3.71	0.2190
Improvement in Information and data security	3.66	0.1923
The time the SACCO services are available to members has increased	3.53	0.1963
Operating costs of the SACCO have reduced	3.50	0.2009
Operational targets are achieved within budget	3.60	0.2132
Operational targets are achieved within set timelines	3.58	0.1986

From the findings the respondents indicated to a great extent that mobile computing applications have contributed to improvement in the quality of services (mean=4.28) and a small standard deviation of 0.1901, operating costs of the SACCO have reduced (mean=3.97), reduction of time taken to complete a task by the staff (mean=3.88), improvement in the quality information (mean=3.79), ability to customize new and existing

services has improved (mean=3.71),improvement in reliability of the SACCO processes (mean=3.70), ability to introduce new services has improved (mean=3.68), improvement in information and data security (mean=3.66), operational targets are achieved within budget (mean=3.60),operational targets are achieved within set timelines (mean=3.58), the time the SACCO services are available to members has increased (mean=3.53), and reduction in time taken to research and develop new products (mean=3.50). This depicts that to a great extent that mobile computing applications have contributed to improvement in the quality of services.

4.5. Relationship Between Mobile Computing and Operational Performance

In order to test the relationship between mobile computing application (independent) variables on the operational performance (dependent), a linear regression analysis was conducted using Statistical Package for Social Sciences (SPSS). The outputs include: Model summary, coefficient of determination and ANOVA Results.

4.5.1. Model Summary

Table 4.4. provides the model summary of the relationship between the predictor variable and SACCO Operational Performance.

Table 4.4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.737[a]	.544	.518	.239

a. Predictors: (Constant), mobile computing

b. Dependent Variable: SACCO Operational Performance

The model summary table shows that R^2=0.544, i.e. 54.4% variation in that SACCO Operational Performance can be explained by the models' predictor. However the balance of 45.6% variation is unexplained in the SACCO Operational Performance is attributed to other considerations not factored in the regression model. Findings in the above table show the variables have a positive relationship whereby R = 0.737, i.e. 73.3% indicating a significant relationship between predictor variable and SACCO Operational Performance.

4.5.2. ANOVA Results

Table 4.5. provides the ANOVA results of the relationship between the predictor variable and SACCO Operational Performance.

Table 4.5. ANOVA of the Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.649	1	2.649	46.474	.023[a]
	Residual	2.223	39	.057		
	Total	**4.872**	**40**			

The study shows significance value to be 0.023 which is less than 0.05 therefore making the model statistically significant in predicting how mobile computing influence SACCO Operational Performance. At 5% level of significance, F critical was 2.649 making it less than F calculated it indicates that the overall model was significant.

4.5.3. Coefficient of Determination

Table 4.6. provides the Coefficient of Determination on the relationship between the predictor variable and SACCO Operational Performance.

Table 4.6. Coefficient of Determination

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Model 1(Constant)	0.181	0.416		0.192	0.847
Mobile computing	0.469	0.100	0.383	4.69	0.033

The researcher conducted a regression analysis so as to determine relationship of SACCO Operational Performance and mobile computing. The following regression equation was generated from the table above:

($\mathbf{Y = \beta_0 + \beta_1 X_1 + \varepsilon}$) is:

($Y= 0.181+ 0.469X_1+ \varepsilon$)

Using the established regression equation and taking into account all factors (mobile computing) constant at 0, SACCO Operational Performance was 0.181. The equation also shows that when all the other independent variables are at 0, increasing mobile computing by one unit, leads to 0.469 increase in operational performance of the SACCO.

4.6. Discussion of Findings

The study found that most of the SACCOs were private institution based. It also found that SACCO has been operational for more than 15 years. The study further found that most of the SACCOs were medium (Assets over Ksh 1 Billion and less than Ksh 4 Billion). The study found that loans processing was the main service use by SACCOs and that was offered by mobile computing application in SACCOs.

In addition the study found that the challenge they experienced in application of mobile technology systems was high cost of installation and maintenance. Wechuli et al. (2017) observes that Mobile Computing Service in SACCOs is faced with challenges including inadequate technical skills, lack of awareness, low prioritisation, poor technical design, and social engineering practices such as phishing, shoulder surfing, bating and eavesdropping. In order to minimise these challenges, the authors suggested the need for regular maintenance of the mobile banking service, increasing the capacity of the systems to handle more transactions per day, educating and training people on the need to resist social engineering, putting in place proper Mobile Computing security policy, and putting in place technical controls such as the use of firewalls.

The study also found that to a great extent that mobile computing applications have contributed to improvement in the quality of services. Finally, the study found that at 5% significance level and 95% confidence level mobile computing was significant on SACCO Operational Performance. Martin (2010) expounded that, highly competitive cooperatives have embraced the Mobile Computing technology with a view of promoting speedy service delivery. Furthermore, the authors posited that their members no longer need to visit the SACCO's physical offices but access services through their mobile phones. The Mobile phone platform allows them to check balances as well as apply and process loans, and salaries thus minimizing the time they initially wasted while queuing in the halls (Kendall, 2011). In light of this aspect, most cooperatives with the effective mobile computing applications are able to increase their competitive edge thus increasing their client base and overall productivity.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary, discussion, conclusion and recommendations on mobile computing applications and operational performance of SACCOs in Nairobi County.

5.2. Summary of the Findings

The study found that most of the SACCOs were private institution based. It also found that SACCO has been operational for more than 15 years. The study further found that most of the SACCOs were medium (Assets over Ksh 1 Billion and less than Ksh 4 Billion). The study found that loans processing was the main service use by SACCO s and that was offered by mobile computing application in SACCOs. In addition the study found that the challenge they experienced in application of mobile technology systems was high cost of installation and maintenance. The study also found that mobile computing applications have contributed to improving the quality of services in SACCOs. Finally the study found that at 5% significance level and 95% confidence level mobile computing was significant on SACCO Operational Performance

5.3. Conclusion of the Study

The study concluded that loans processing was the main service use by SACCO s and that was offered by mobile computing application in SACCOs. In addition the study concluded that the main challenge they experienced in application of mobile technology systems was associated with high cost of installation and maintenance and security threats from hackers

and online fraud. The study also concluded that mobile computing applications have greatly contributed to improvement in the quality of services offered by SACCOs. Finally the study concluded that mobile computing had significant influence on SACCOs Operational Performance.

5.4. Recommendations of the Study

The study recommends that there is need to keep abreast and up-to-date on the current technological changes that mobile computing is undergoing and what that means to the SACCOs operations. This will help them in doing their SWOT analysis effectively thereby enhancing their competitive advantage thus ensuring their survival in the competitive financial industry.

Investing and utilising ICT not only improves the operational performance of SACCOs it also boosts the image of the organization in the public. The SACCO will have a wider market reach and will process huge volumes of tasks quickly, effectively, conveniently and accurately. Mobile computing applications provide a platform of convenience and speed thereby making the SACCO win against competition.

To facilitate and improve mobile computing services by SACCOs in Kenya, the ICT infrastructure and favourable government policies need to be set in place. This will create the right environment for SACCOs that are yet to adopt mobile computing application invest in them while those that already using them increase their efficiency and effectiveness. Therefore infrastructural aspects such as high speed internet, ICT skilled manpower development and reliable electricity. While policies such as regularisation of

mobile banking (including transfer, loans and fixed deposits) and reduction of tariffs on ICT imports would address challenges of high costs of installation and maintenance.

5.5. Limitations of the Study

Challenges noted included the fact that some SACCOs IT managers were hesitant to provide information claiming that they received many questionnaires from various students and organizations and they were afraid that the information they provided would be used by their competitors. Time constraint was a key issue as a lot was expected to be done within a short period. Nevertheless, the study was successful as it was able to examine the extent use of mobile computing application, challenges faced as a result of using mobile computing application in SACCOs and the relationship between mobile computing applications and operational performance in SACCOs.

5.6. Suggestions for Further Research

Since the study focused on mobile computing applications and operational performance of SACCOs in Nairobi County, further studies should be done on all Savings and Credit Co-operative Societies to allow for generalization of findings for the Kenyan Savings and Credit Co-operative Societies. Further studies should also be done on the challenges that affect the Mobile SACCO services among deposit taking SACCOS in Nairobi County licensed by SACCO Society Regulatory Authority in Kenya since it is not fully employed despite previous studies showing it is beneficial in customer acquisition. The study also recommends that further studies should be done on the effect of other factors affecting operational performance in the SACCOs such as number of branches, number of customers and level of technological adoption among others.

REFERENCES

Aduda, J. & Kingoo, N. (2012). The relationship between electronic banking and financial performance among commercial banks in Kenya, *Journal of Finance and Investment Analysis, 1* (3), 99-118. Retrieved from: http://ijecm.co.uk/wp-content/uploads/2015/11/31151.pdf

Auka, D, & Mwangi, J. (2013). Factors influencing SACCO members to seek services of other financial service providers in Kenya. *International Review of Management and Business Research, 2*(2), 610-626. Retrieved from http://www.irmbrjournal.com/

Banerjee, A., & Chaudhury, S. (2010). Statistics without tears: Populations and samples. *Industrial psychiatry journal, 19*(1), 60-5.

Bates, M., Manuel, S. and Oppenheim, C. (2007). Models of Early Adoption of ICT Innovations in Higher Education, *Ariadne Issue 50*. Retrieved from http://www.ariadne.ac.uk/

Berger, A., Hunter, W. & Timme, S. (1993). The efficiency of Financial Institutions: A review of research past, present and future. *Journal of Banking and Finance, 17* (2&3), 221-250.

Bryman, A. & Bell, E. (Eds.).(2011). *Business Research Methods* (3rd Ed.). Oxford University Press.

Cohen, D., Garibaldi, P. & Scarpetta, S. (2004), *The ICT Revolution: Productivity Differences and the Digital Divide*. Oxford University Press.

Colin, C. (2016). *Impact of Mobile Computing "Anticipating the Effects on the Campus"* Retrieved from http://webmedia.jcu.edu/

Communications Authority of Kenya. (2018*). Kenya's mobile penetration hits 88 per cent.* Retrieved from http://www.ca.go.ke/

Davenport, H. (2013, December). Analytics 3.0. *Harvard Business Review*. Retrieved from: https://hbr.org

Davis, F. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results.* (Doctoral dissertation. Cambridge, MA: MIT Sloan School of Management). Retrieved from: http://hdl.handle.net/1721.1/15192

Davis, G. (1993). Firm Resources and Sustained Competitive Advantage. *Journal of Management.* Texas A & M University 1991 Vol. 17.

DeLone, H. & McLean. E (2004). "Measuring E-Commerce Success: Applying the DeLone & McLean Information Systems Success Model, *International Journal of Electronic Commerce, 9*(1).

Denning, P. (2004). Building a culture of innovation. *Ubiquity, 5*(8). Retrieved from: http://www.acm.org/

Financial Sector Deepening Trust (FSD) Kenya (2010). *Automation of SACCOs: Assessment of potential solutions.* Retrieved from: http://fsdkenya.org/publication/automation-of-saccos-assessment-of-potential-solutions/

Hagel, III J., John, B., Lang, D. (2010). The Best Way to Measure Company Performance. *Harvard Business Review.* Retrieved from https://hbr.org/

Harelimana, J. (2017). Impact of Mobile Banking on Financial Performance of Unguka Microfinance Bank Ltd, Rwanda. *Journal of Harmonized Research in Management. 4*(26), 26-40. Retrieved from: https://globaljournals.org/

Jenny, C. & Isaac, M. (2010). Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives, 24* (3): 207-32. DOI: 10.1257/jep.24.3.207. Retrieved from: http://www.aeaweb.org/

Kendall, J., Maurer, B., Machoka, P., & Veniard, C. (2011). An emerging platform: From money transfer system to mobile money ecosystem. *Innovations: Technology, Governance, Globalization, 6*(4), 49-64.

Kjeldskov, J. (Ed). (2014).*The Encyclopedia of Human-Computer Interaction.* (2nd Ed.). Retrieved from: From https://www.interaction-design.org/

Knupfer, N.N. & McLellan, H. (1996). '*Descriptive research methodologies.' Handbook of research for educational communications and technology*, pp.1196-1212. Retrieved from: http://members.aect.org:80/Intranet/Publications/edtech/41/41-ref.html

Kungu, D. (2014). *Information Technology and Operational Perfromance of Firms in the Kenyan Hospitality Industry*. (Master's Thesis From University of Nairobi). Retrieved from: http://hdl.handle.net/11295/74932

LaMarco, N. (2018). *Objectives of Operational Performance*. Retrieved From https://smallbusiness.chron.com/

Maingi, M. S. (2014). Factors Affecting the Financial Performance of SACCOs in Kenya. *International Journal of Business and Management, 2*(8). Retrieved from: http://internationaljournalcorner.com/index.php/theijbm/article/view/132465

Mang'ana, E., Nyaboga, B., Momanyi, C. &Makone, M. (2015). Extent to which SACCOs Have Invested in Information Technology to Achieve Sustainable Competitive Advantage over Their Rivals in Kenya. *International Journal of Innovative Research and Development, 4*(2). Retrieved from: http://www.ijird.com/

Martin, M. (2010). *Factors Affecting SACCO Performance in Meru South*. (Master's Thesis From University of Nairobi).

Mazliza, O. (2007). *Principles of Mobile Computing and Communications*. l ISBN 978-1-4200-6158-1. Auerbach Publications.

Microsoft. (2004). *ICTs as enablers of development: A Microsoft white paper*. Retrieved from http://www.itu.int/

McMillan, J. H., & Schumacher, S. (Eds.). (2001). *Research in Education. A Conceptual Introduction* (5th ed.). New York: Longman.

McCullough, M. (2004). Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing.*The MIT Press.* Retrieved from: https://mitpress.mit.edu/ books/digital-ground

Mugo, D. (2016). *Mobile Technology Services and Performance of Deposit Taking Savings and Credit Cooperative Societies in Kenya*. Retrieved from: https://ir-library.ku.ac.ke/

Mugo, D., Muathe, S. & Waithaka, S. (2018). *Effect of Mobile Communication Services on Performance of Saccos in Kenya*. Doi: 10.19044/esj.2018.v14n30p46 URL:http://dx.doi.org/10.19044/esj.2018.v14n30p46

Mumanyi, E. (2014). Challenges and opportunities facing SACCOs in the current devolved system of government of Kenya: A case study of Mombasa County. *International Journal of Social Sciences and Entrepreneurship, 1*(9), 288-314.

Mvula R. (2013). *Common issues affecting performance of SACCO in Malawi*. (Paper presented at SACCO Board Chairpersons and Managers MUSCCO Managers Forum). Mangochi, Malawi. Retrieved from: http://strategicjournals.com/index.php/ journal/article/download/433/463

Nairobi Business Monthly, (2017, January, 5) *Cybercrime, the biggest threat to online banking transactions*. Retrieved from: http://www.nairobibusinessmonthly.com

Neely, A. (Ed.). (2007). *Business Performance Measurement: Unifying Theory and Integrating Practice,* (2nd Ed.). Cambridge University Press.

Nils, U. & Benjamin, M. (2016). *Delone and McLean IS success model.* Retrieved on 11 August 2018 from: https://is.theorizeit.org/

Obure, H. (2015). *Effect of Internal Factors on Performance of SACCOs in Kenya: A Case of Kisii County*. Retrieved on 7th July 2018 from http:// ijecm.co.uk/

Odoyo, c., Samuel, L., Benson, C. & Silvance, A. (2016). Challenges Facing the Use and Adoption of Mobile Phone Money Services. *World Journal of Computer Application and Technology 4*(1): 8-14, 2016. Retrieved from: http://www.hrpub.org DOI: 10.13189/wjcat.2016.040102

Ogola, A. E. (2014). *An investigation into the challenges facing the uptake of the SACCO link system a case of selected SACCOs in Nairobi County, Kenya*. (Master's Thesis From Kenyatta University, Kenya). Retrieved from: https://ir-library.ku.ac.ke/handle /123456789/10225

Okiro, K. & Ndungu, J. (2013). The impact of mobile and internet banking on performance of financial institutions in Kenya. *European Scientific Journal, 9*(13). Retrieved from: https://profiles.uonbi.ac.ke/kennedyokiro/publications/impact-mobile-and-internet-banking-performance-financial-institutions-keny

ProcasurAfrica. (2012, March). *An Overview of SACCOs in Kenya: "In pursuit of ideas to develop Savings and Credit Cooperatives*. *Learning from Kenyan SACCOs*". Retrieved from http://africa.procasur.org/

Reza, B., Seif, F., & Bayati, A. (2016). The Correlation between Cell Phone Use and Sleep Quality in Medical Students. *Iranian Journal of Medical Physics*. *13*(1), 8-16. Retrieved from: http://ijmp.mums.ac.ir/article_7140.html

Rogers, E. (Ed.). (1995).*Diffusion of information*, (4th Ed.). New York, NY: The Free Press.

Sacco Star. (2011, July). *Lanstar Technologies Ltd*, p. 18. Retrieved from http://www.kuscco.com/index.php/publications/cat_view/52-publications

SASRA. (2011). SACCO *Supervision Report 2011*. Retrieved on 15th July 2018 from: http://www.sasra.go.ke.

SASRA. (2014). SACCO *Supervision Annual report 2014*. Retrieved on 11th July 2018 from: http://www.sasra.go.ke.

Siddaraju, V. (2012). Cooperatives and financial inclusion in India: Issues and challenges. *International NGO Journal Vol. 7*(3), pp. 46-54, October 2012. http://www.academicjournals.org/INGOJ DOI: 10.5897/INGOJ12.008

Skoko, H., Ceric, A., Huang, C. (2008, October). ICT adoption model of Chinese SMEs. *International Journal of Business Research.* Retrieved from http://mpra.ub.uni-muenchen.de/11540/

Smith, M., Thorpe, R. & Jackson, P. (Eds.). (2012). *Management research*. (4th ed.). London: SAGE Publications

Steven A. (2002), *Information Systems: The Information of E-Business*, New Jersey: Natalie Anderson, pp.11-36

Stevenson, T. (2005). Operations Management Research Methodologies using Quantitative Modelling. *International Journal of Operations and Production management, 22* (2), pp. 241-264

Sonja, K. (2010). *Effect of computerization on performance of SACCOs in Uganda*. (Master Research Project Reutlingen), Germany.

Tactical Technology Collective. (2008). *Mobiles in-a-box.* : Rick B., Ken B., Trixie C., Toni E., Christiana I., Muthondu G., Nnadi K. Retrieved from http://mobiles.tacticaltech.org/

Tchouassi, G. (2012). Can Mobile Phones Really Work to Extend Banking Services to the Unbanked? Empirical Lessons from Selected Sub-Saharan Africa Countries. *International Journal of Developing Societies, 1*(2), 70-81.

Tiwari, R., Buse, S., and Herstatt, C. (2006). "Mobile Banking as Business Strategy: Impact of mobile Technologies on Customer Behaviour and its Implications for

Banks", in*: Technology Management for the Global Future –Proceedings of PICMET*, pp. 1935 –1946. Istanbul, Turkey.

Wambari, P. (2009), *Mobile banking in developing countries. A case study on Kenya*. (Unpublished Master's Thesis Vaasan Ammattikorkeakoulu). Retrieved from: http://www.theseus.fi/handle/10024/4402

Wambui, K. (2011). *The influence of mobile phone usage on performance of Supermarkets in Nairobi, Kenya*. (Master's Thesis University of Nairobi). Retrieved from:

Wanjiru, F. (2012). *The effect of mobile SACCO service on the financial performance of licensed deposit taking SACCOs in Nairobi County.* (Master's Thesis University of Nairobi). Retrieved from:

Wechuli, N., Franklin, W., & Jotham, W. (2017). Cyber Security Challenges to Mobile Banking in SACCOs in Kenya. *International Journal of Computer*. *27*(1). Retrieved from: http://ijcjournal.org/index.php/InternationalJournalOfComputer/article/view/1086

World Council of Credit Unions (2008). *Statistical Report.* Retrieved on 11th July 2018 from at www.woccu.org

Zerfeshewa, B. (2010) *Determinants of Saving and Credit Cooperatives (SACCOs) Operational Performance in Gondar town, Ethiopia* (Doctoral dissertation, Mekelele University). Retrieved from: http://opendocs.ids.ac.uk/opendocs/handle/123456789/5180

Zeuli, K. A., Cropp R. (2004). Principles and practices in the 21st century. *Cooperative Financial Management.* P.63. Retrieved from http://community-wealth.org/

QUESTIONNAIRE

Dear Sir/Madam,

This questionnaire is designed to collect data from SACCOs in Nairobi County which will be analyzed to establish the relationship between mobile computing applications on SACCOs' operational performance, challenges and extent of use. The data will be used for academic purposes only and will be treated with utmost confidence. Your participation in facilitating the study is highly appreciated. There are no right or wrong answers. The questionnaire comprises five sections. Kindly fill in your responses as keenly as possible.

SECTION A: Respondent's Background Information

Respondents age:
- 25 years or below [ ]
- 26 years – 30 years [ ]
- 31 years – 35 years [ ]
- 36 years – 40 years [ ]
- over 40years [ ]

How long have you worked in this SACCO?
- 5 years and below [ ]
- 6 years – 10 years [ ]
- 11 years – 15 years [ ]
- 16 years – 20 years [ ]

		over 20 years [ ]
Gender: Male [ ] Female [ ]		
Job Title ……		
SECTION B: Background Information of the SACCO		
Q1	Name	……..
Q2	Please tick (∨) the ownership category that best describes this SACCO?	Government based----------[ ] Teachers based ----------[ ] Private institution based----[ ] Farmers----------[ ] Community based----------[ ] Others _____
Q3	For how long has the SACCO been operational? …… years	
Q7	How has the SASRA categorized the SACCO? Please tick (∨) where appropriate.	1) Small (Assets below Ksh 1 Billion) [ ] 2) Medium (Assets over Ksh 1 Billion and less than Ksh 4 Billion) [ ] 3) Large (Assets over Ksh 4 Billion) [ ]

SECTION C: Extent of use of Mobile Computing Applications

Q1 The following are the main services offered by mobile computing applications in SACCOs in Kenya. To what extent do they apply in the SACCO? Indicate with a tick (∨) using the scale:

1 = Not At All, 2=Little Extent, 3 = Moderate Extent,

4 = Great Extent, 5 = Very Great Extent

		1	2	3	4	5
1	Membership Application					
2	Loans processing					
3	Buying shares					
4	Money deposit and withdrawal					
5	Communication with customers. (e.g. Sending statements, alerts and answering customer queries)					
6	Transfer of money to other accounts					
7	Stopping a service (e.g. Deactivating an ATM card)					
	Other Services:					

SECTION D: Challenges of Mobile Computing Applications

The following are the main challenges experienced in mobile computing applications. To what extent does the SACCO face each of the following? Indicate the extent with a tick (∨) using the scale:

1 = Not At All 2 = Little Extent , 3 = Moderate Extent,

4 = Great Extent, 5 = Very Great Extent

		1	2	3	4	5
Q1	System failure and processing errors					
Q2	Inadequate system recovery capabilities					
Q3	Security risks through malicious attacks and hacking incidents					
Q4	Compatibility issues of system and users devices					
Q5	Delays and long system response time					
Q6	Too Many Steps in a Procedure					
Q7	Complicated Applications					
Q8	Obsolete and Old hardware and software systems					
Q9	Skills gap among staff					
Q10	Staff resisting adoption of the new technology due to fear of loss of jobs					

Q11	Staff are reluctant to adopt new methods as they fear change					
Q12	Customer's reluctance to use mobile system.					
Q13	High cost of Installation and maintenance.					
Q14	In your own words, explain any other Challenge/s you feel are left out ……. ……. …….					

SECTION E: Mobile Computing Applications and Operational Performance

Indicate the extent to which mobile computing applications have contributed to each of the following operational performance indicators. Indicate with a tick (∨) using the scale:

1 = Not At All, 2 = Little Extent, 3 = Moderate Extent,

4 = Great Extent, 5 = Very Great Extent

		1	2	3	4	5
Q1	Reduction of time taken to complete a task by the staff					
Q2	Reduction in time taken to research and develop new products					
Q3	Improvement in the quality of services					
Q4	Improvement in the quality information					
Q5	Improvement in reliability of the SACCO processes.					

Q6	Ability to introduce new services has improved					
Q7	Ability to customize new and existing services has improved					
Q8	Improvement in Information and data security					
Q9	The time the SACCO services are available to members has increased					
Q10	Operating costs of the SACCO have reduced					
Q11	Operational targets are achieved within budget					
Q12	Operational targets are achieved within set timelines					
Q13	In your own words, explain specifically how mobile technology have contributed towards the operational performance of your SACCO …… …….. ……					

APPENDIX 1

Table 6. 1 . SASRA Accredited SACCOs in Nairobi County.

NO	NAME OF SOCIETY	POSTAL ADDRESS
1	AFYA SACCO SOCIETY LTD	P.O.BOX 11607 – 00400, NAIROBI.
2	AIPORTS SACCO SOCIETY LTD	P.O BOX 19001-00501 NAIROBI.
3	ARDHI SACCO SOCIETY LTD	P.O. BOX 28782-00200, NAIROBI.
4	ASILI SACCO SOCIETY LTD	P.O.BOX 49064 – 00100, NAIROBI.
5	CHAI SACCO SOCIETY LTD	P.O.BOX 278-00200, NAIROBI.
6	CHUNA SACCO SOCIETY LTD	P.O.BOX 30197 – 00100, NAIROBI.
7	ELIMU SACCO SOCIETY LTD	P.O BOX 10073-00100, NAIROBI.
8	FUNDILIMA SACCO SOCIETY LTD	P.O.BOX 62000 – 00200, NAIROBI.
9	JIJENGE SACCO LTD (UNDER STATUTORY MGT)	P.O Box 25089 – 00100, NAIROBI
10	HARAMBEE SACCO SOCIETY LTD	P.O.BOX 47815 – 00100, NAIROBI.
11	HAZINA SACCO SOCIETY LTD	P.O.BOX 59877 – 00200, NAIROBI.
12	JAMII SACCO SOCIETY LTD	P.O.BOX 57929 – 00200, NAIROBI.
13	KENPIPE SACCO SOCIETY LTD	P.O.BOX 314 – 00507, NAIROBI.
14	KENVERSITY SACCO SOCIETY LTD	P.O.BOX 10263 – 00100, NAIROBI.
15	MIL SACCO SOCIETY LTD	P.O.BOX 73236 – 00200, NAIROBI.
16	KENYA POLICE SACCO SOCIETY LTD	P.O.BOX 51042 – 00200, NAIROBI.
17	KINGDOM SACCO SOCIETY LTD	P.O.BOX 8017 – 00300, NAIROBI.
18	MAGEREZA SACCO SOCIETY LTD	P.O.BOX 53131 – 00200, NAIROBI.
19	MAISHA BORA SACCO SOCIETY LTD	P.O.BOX 72713 – 00200, NAIROBI.
20	METROPOLITAN NATIONAL SACCO SOCIETY LTD	P.O.BOX 5684 – 00100, NAIROBI.
21	MWALIMU NATIONAL SACCO SOCIETY LTD	P.O.BOX 62641 – 00200, NAIROBI.
22	MWITO SACCO SOCIETY LTD	P.O. BOX 56763- 00200, NAIROBI
23	NACICO SACCO SOCIETY LTD	P.O.BOX 34525 – 00100, NAIROBI.
24	NAFAKA SACCO SOCIETY LTD	P.O.BOX 30586 – 00100, NAIROBI.
25	NASSEFU SACCO SOCIETY LTD	P.O.BOX 43338 – 00100, NAROBI.
26	NATION SACCO SOCIETY LTD	P.O.BOX 22022 – 00400, NAIROBI.
27	NYATI SACCO SOCIETY LTD	P.O. BOX 7601 – 00200, NAIROBI.
28	SAFARICOM SACCO SOCIETY LTD	P.O.BOX 66827 – 00800, NAIROBI.
29	SHERIA SACCO SOCIETY LTD	P.O.BOX 34390 – 00100, NAIROBI.
30	SHIRIKA SACCO SOCIETY LTD	P.O BOX 43429-00100, NAIROBI.
31	SHOPPERS SACCO SOCIETY LTD	P.O. BOX 16 – 00507, NAIROBI
32	STIMA SACCO SOCIETY LTD	P.O.BOX 75629 – 00100, NAIROBI.

33	TAQWA SACCO SOCIETY LTD	P.O. BOX 10180–00200, NAIROBI.
34	TEMBO SACCO SOCIETY LTD	P.O.BOX 91 – 00618, RUARAKA NAIROBI.
35	UFANISI SACCO SOCIETY LTD	P.O BOX 2973-00200, NAIROBI.
36	UKRISTO NA UFANISI WA ANGALICANA SACCO SOCIETY LTD	P.O BOX 872-00605, NAIROBI.
37	UKULIMA SACO SOCIETY LTD	P.O.BOX 44071 – 00100, NAIROBI.
38	UNAITAS SACCO SOCIETY LTD	P.O.BOX 38721– 00100, NAIROBI.
39	UNITED NATIONS SACCO SOCIETY LTD	P.O.BOX 2210 – 00621, VILLAGE MARKETNAIROBI.
40	WANAANGA SACCO SOCIETY LTD	P.O.BOX 34680 – 00100, NAIROBI.
41	WANANDEGE SACCO SOCIETY LTD	P.O.BOX 19074 -00501, NAIROBI.
42	WAUMINI SACCO SOCIETY LTD	P.O.BOX 66121 – 00800, NAIROBI.
43	COMOCO SACCO SOCIETY LTD	P.O. BOX 30135 – 00100, NAIROBI
44	MILIKI SACCO SOCIETY LTD*****	P.O. Box 43582 – 00100, NAIROBI
45	TELEPOST SACCO SOCIETY LTD	P.O BOX 49557-00100 NAIROBI.

Table 6.1. contains a list of SACCO societies licenced to undertake deposit- taking SACCO business in Kenya for the year ending December 2017 in Nairobi County by SASRA.