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# Cross SACCO information sharing and collaboration environment: ucredit mobile application

Edwin Eddy Mukenya  
*Faculty of Information Technology (FIT)*  
*Strathmore University*

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**CROSS SACCO INFORMATION SHARING AND  
COLLABORATION ENVIRONMENT: UCREDIT MOBILE  
APPLICATION**

Edwin Eddy Mukenya

Submitted to the Faculty of Information Technology in partial fulfilment of the requirements for the Degree of Master of Science in Mobile Telecommunication and Innovation, at Strathmore University

Faculty of Information Technology  
Strathmore University  
Nairobi, Kenya

June, 2019

## **DECLARATION**

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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Name of Candidate: Edwin Eddy Mukenya

Signature :

Date : 06<sup>th</sup> June 2019

### **Approval**

The thesis/dissertation of Edwin Eddy Mukenya was reviewed and approved by the following:

Dr. Joseph Olukuru,  
Senior Lecturer, Head of Data Science and Analytics,  
Strathmore University

Prof. Joseph Orero  
Dean, Faculty of Information Technology,  
Strathmore University

Professor Ruth Kiraka,  
Dean, School of Graduate Studies,  
Strathmore University

## **ABSTRACT**

Savings and Credit Co-operative societies (SACCOs) are the financial arm of the cooperative movement in Kenya. SACCOs have identified with mobile banking applications as a means of cheaply, efficiently accessing SACCOs transaction by their membership. These SACCOs mobile applications are designed to fit individual SACCO policy and Philosophy, locking the membership from access and comparing rival SACCOs service rates and products portfolios on same application. Hence no information sharing or SACCOs collaboration is being supported on these mobile platforms.

Nevertheless, modern trends need to be adopted in the cooperative movement that will enable sharing of SACCOs information through mobile technology and inter SACCOs collaboration using mobile phone collaboration tools and thus SACCOs gaining stakeholders' trust. These factors are important for increasing growth of SACCOs financial base and increase of individual SACCOs potential to grow. Thus, avoid the need for SACCOs to merge, and make SACCOs provide a united front that perpetually creates a large business entity to compete effectively with other large financial institutions such as banks, for customer market share. Entrenching an environment that will make SACCOs able to maintain efficiency and security on financial information access. The mobile application platform will expand delivery of products and services to consumers who are SACCOs members, expand members' investment options and provide a simplified but high-quality service access to both current and new members.

The SACCO collaborative information sharing platform is expected to provide a simplified concept that will enable consumers select services competitively across multiple SACCOs on one platform, consuming less time and reduce options burden to membership and reduce operational burden to individual SACCO.

This dissertation is a study into possibility of designing and developing a mobile phone-based SACCO information sharing platform by adopting a collaborative business model. The study will apply theoretical frameworks which have been developed from existing literature on adoption of innovation in the sharing and collaboration application platforms. The factors that could influence SACCOs intention to adopt and use collaborative sharing platforms.

**Keywords:** Information sharing, Collaboration Technology, Savings and credit co-operatives societies.

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## ACRONYMS

ADT	Android Development Tools
ATM	Automated Teller Machine
BDRC	Business Development Research Consultants
CBR	Central Bank Rate
CMA	Capital Markets Authority
DTS	Deposit Taking SACCOs
Fintech	Finance Technology Companies
FOSA	Front Office Service Activities
FSD	Financial Sector Deepening
GDP	Gross Domestic Product
GSM	Global System for Mobile
ICT	Information Communication Technology
IDE	Integrated Development Environment
JSON	Java script Object Notation
KBRR	Kenya Bankers Reference Rate
KUSCCO	Kenya Union of Savings and Credit Cooperatives
MFI	Microfinance Institutions
MIS	Management Information System
MPC	Monitory Policy Committee
PHP	Personal Home Page Tools
PWC	Price Waterhouse and Coopers
SACCO	Savings and Credit Cooperative
SASRA	SACCO Societies Regulatory Authority
SDK	Software Development Kit
SQL	Structured Query Language
USSD	Unstructured Supplementary Service Data
WOCCU	World Council of Credit Unions

# **CHAPTER ONE: INTRODUCTION**

## **1.1 Introduction**

Credit unions also known as Saving and Credit Co-Operatives (SACCOs) have grown in terms of finance ratios and expanded utility of technology, thus providing ground for competition with commercially established banks that are controlled by different countries central banks. With the current phenomenal advancement in mobile software technologies, mobile application development and use has become the source of interest of most credit unions and financial regulators. The SACCOs regulator is interested in consumers' investment protection and at same time supporting the need for credit union to grow through innovation practice by embracing modern and new financial technologies to be able to starve out competition from other players in the financial sector.

This chapter of the study explains the background of co-operative movement with an overview of current trends in the context of services automation, it provides the insight through the problem statement, and it gives highlight on the objectives and research questions of the study and discusses the scope and significance of the study.

## **1.2 Background of the Study**

The cooperative society is a potential of human nature characterized by economic and political democracy, cooperative international relations and symbiotic relationship with nature. The cooperative movement traces its roots in Europe and North America as early as 1800s when credit unions were developed to assist poor rural populace to break from their dependence on shylocks or high interest moneylenders and to improve their welfare (Osemene & Abdulraheem, 2011).

A cooperative is a movement primarily organized to provide the necessary common needs of its members to improve and uplift their living conditions within the context of universally accepted country specific cooperative principles. In 1844 Rochdale pioneers created a set of principles on which co-operatives around the world operate to this day (Gatuguta, Kimotho, & Kiptoo, 2014). This principle involved a cooperative society selling services or its products that include loans to its members on a nominal profit; the earning is utilized for administration cost, with the surplus spent on the welfare of the members, portions kept in the reserve and the rest shared with members as interest on savings or dividends on shares.

SACCO is the acronym standing for saving and credit co-operative. There is no difference between credit union and the SACCO. The term credit union is generally not used in Africa to avoid confusion with the various labour movements. Bailey (2001), defines SACCOs as cooperatives which can provide their membership with convenient and secure means of saving money and obtaining affordable credit at relatively low interest rate depending on the economic area of operation or region. As per Kenya (SACCO societies Act, 2008) a SACCO is a saving and credit co-operative society registered under the co-operative society's act.

SACCOs promote the welfare and economic investments of its members through individual SACCO bylaws that have incorporated global credit union principles of voluntary, open and democratic membership, member controlled economic participation, autonomy and independence, co-operation among cooperatives, and concern for the community in general through member education, training and information. Although there is difference between a cooperative society and a SACCO in that, a cooperative society is an organization of people who have voluntarily come together for the purpose of solving their Socio-economic problems through self-help initiatives, mutual support and investment ventures aimed at equally benefiting the group members where as a SACCO is a type of cooperative whose objective is to pool savings for the members and in turn provide than with credit facilities (SACCO societies Act, 2008). The supreme authority of cooperative is vested in the general assembly commonly known as Annual General Meetings (AGM) at which members shall have the right to attend, participate and vote on all matters.

In Kenya the cooperative movement started during the colonial times, first as state-controlled organization but later after liberalization as self-controlled organization that spur development in the social economic sector. The first cooperative society in Kenya was established in 1908 by the colonial government which was the sole decision maker and manager, thus serving only interest of the settlers. After colonization cooperatives remained state-controlled borrowing heavily from colonial background policies (Develtere & Hertogen, 2005). Until the year 1997, the cooperative movement in Kenya was fundamentally characterized by close association with and controlled by the state, while remaining predominantly marketing and auxiliary focused (Delgado, 1997).

Originally registered as companies until the first co-operative ordinance was promulgated allowing registrations of co-operatives and the passing of the Co-operative societies act, in

which Cap 490 gave the commissioner for co-operative Development overbearing powers in the registration and management of cooperatives, and he/she was also mandated to enlargement; deregister cooperatives, approve annual budgets of co-operatives, authorize borrowing and expenditure; audit SACCO accounts, monitor financial performance and could even replace elected co-operative officials by management commissions at his/her pleasure (Gatuguta, Kimotho, & Kiptoo, 2014). Though, immediately after the independence; the government supported the cooperative movement with an aim of sparing economic growth, improve cooperate extension services delivery, access to markets, corporate governance and market efficiency; thus, alleviating poverty (Republic of Kenya, 2004).

After liberation of SACCOs, the government role remained advisory role in the form of the regulator through the SACCO Society Regulatory Authority (SASRA) and a facilitator through the ministry of cooperatives now a department in the ministry of industrialization while the responsibility of organizing and managing co-operatives was left to the members and their management committees (Wanyama, 2007). This produced SACCOs that are autonomous commercially and member owned as acclaimed in the international cooperative principles and ideals with legislative framework to enable survival in the competitive economic environment. Thus, SACCOs grew only limited by their individual independently configured by laws.

Through the support of the government, the Ethics Commission for Co-Operative Societies (ECCOs) was established to lead entrenchment of good corporate governance and best business management practices. Hence making the movement to produce some of the best and biggest players in provision of credit facilities to the urban communities, rural and the poor population. Especially in the rural areas where we have an upsurge of SACCOs that are now playing an important role in enhancing economic growth and development. The purpose of a SACCO in Kenya is to help relatively moderate-income earners and other associated stakeholders to use financial tools which are savings and borrowing, to improve their economic and their social wellbeing in the community.

The movement plays a major role by enabling middle and low-income earners create wealth, have food security and get employment; thus, help the government in alleviating poverty. To date Kenya has over 11200 registered SACCO's with a staggering membership of over eight million among them approximately 300000 employees who are also members (Ministry of

industry, trade and cooperatives, 2017). The movement boasts of over \$2.5 billion collective, domestic mobilized savings making it to be ranked as the first in Africa and seventh internationally according to World Council of Credit Unions (WOCCU). Entrenched in vitality all sector or sub sectors of economy, the cooperative movement in Kenya has grown tremendously and it is ranked first in East Africa according to (Ministry of industry, trade and cooperatives, 2017).

A SACCO in Kenya can be either deposit taking business if licensed by SACCO Society Regulatory Authority (SASRA) or non-deposit taking business that only needs to be registered by the commissioner of cooperatives as cooperative without a liability. Although a forum was created by cabinet secretary in the Ministry of industrialisation, Trade and co-operatives to look into ways in which non deposit taking SACCOs will be clustered as shown on Table B.1 and regulated. The regulation aimed to clearly differentiate SACCOs from welfare groups or charity groups, and provide jurisdictional framework that is similar across the SACCOs, making SACCOs authentic to customers who are their members, help the SACCOs collaborate in setting platforms that will help mitigate cybercrime and generally financial risk exposure, and working together as a team giving SACCOs as a body ability to bear compliance cost. Also, SACCOs are categorized into service SACCOs that include marketing, savings, and banking services and producer cooperative that are largely found in agriculture sector or regions.

The cooperative movement in Kenya is organized into four tier system consisting of apex represented by the Cooperative Alliance Of Kenya (CAK), tertiary national cooperative organizations which are currently ten; these are co-operative bank of Kenya limited, Kenya Cooperative Coffee Exporters (KCCE) limited, Co-Operative Development And Information Centre (CODIC) limited, Co-Operative Insurance Company Of Kenya (CIC) limited, New Kenya Co-Operative Creameries (KCC) limited, Kenya Planters Co-Operative Union (KPCU), Kenya Union Of Savings And Credit Co-Operative (KUSCCO) limited, Kenya Rural SACCO Societies Union (KERUSSU) limited, National Co-Operative Housing Union (NACHU) limited and Cooperative Communication Holdings Limited (CCHL). Secondary cooperatives which are county co-operative unions serving as agencies in the movements and finally the primary co-operatives that derive their members from individual persons in a locality or under a given common bond.

SACCOs in Kenya are supported by both local and international organization including the International Finance Corporation (IFC) the World banks private sector lending arm, cooperative bank the SACCOs bank, where SACCOs form the majority shareholding, SASRA the regulator under the department of cooperatives in the ministry of industrialization, KUSCCO the union of SACCO's. To tap into new markets the ministry of industrialization through the department of cooperatives has encouraged development of diaspora SACCOs, Sharia compliant co-operatives, transport and matatu SACCOs, and youth specific co-operatives.

### 1.3 Technology in Kenya SACCOs

The new stage in development of cooperative society or movement is characterized by mostly urban population, which is more decentralized and multipurpose in nature. With SACCOs in Kenya liberalized, Nairobi County is experiencing creation and growth of autonomous member-based cooperatives that are professionally managed, self-controlled and are self-reliant business. This SACCOs have transformed and grown into financial giants through market force that demand better services provision which at the same time require diversifying of activities and increasing innovative ventures that respond to their respective member's needs. The Table 1.1 below shows the capacity clustered in terms of portfolio of deposit taking SACCOs and their growth. This analysis shows the deposit market share for small deposit taking SACCOs (DTSs) declining over the four year period to 2018 in favor of the medium and large DTSs. SASRA notes that the small DTSs experience most challenges in terms of financial, human and technological resources and this adversely impacts on the regulatory compliance and competitiveness. Small Saccos lack the economies of scope and scale necessary in investing heavily in human and technological capacities.

<b>Depositor Cluster</b>		<b>2018</b>		<b>2017</b>		<b>2016</b>		<b>2015</b>
Above Ksh. 5Billion	16	181,737,034,278	13	147,817,596,320	11	123,014,491,472	8	94,864,390,861



Between Kshs. 1Bn & 5Bn	53	126,012,342,099	54	124,041,049,571	51	114,076,013,379	48	105,241,289,179
Below Kshs. 1Billion	105	34,546,509,793	107	33,445,961,012	113	35,488,097,235	121	37,706,661,271
<b>Total</b>	<b>174</b>	<b>342,295,886,171</b>	<b>174</b>	<b>305,304,606,903</b>	<b>175</b>	<b>272,578,602,087</b>	<b>177</b>	<b>237,812,341,311</b>
		<b>2018</b>		<b>2017</b>		<b>2016</b>		<b>2015</b>
Above Ksh. 5Billion		53.1%		48.4%		45.1%		39.9%
Between Kshs. 1Bn & 5Bn		36.8%		40.6%		41.9%		44.3%
Below Kshs. 1Billion		10.1%		11.0%		13.0%		15.9%

Table 1.1: Shows a summary of the DTSs market share based on deposits (SASRA, 2019).

According to (Ministry of cooperatives development and marketing, 2008), the cooperative movements in urban areas is a success story mainly in the disbursements of loans, and automation of operations with robust and integrated management information system (MIS). This is encouraged by SASRA coupled with stakeholder demanding for better service has forced most SACCOs to automate their services; hence ensuring ease of access to information, high percentage of uptime, accuracy of data and information that ensure growth, development and bridging of digital divide in the co-operative movement especially in Nairobi under the supervision of the ministry of industrialization.

Previously Urban SACCOs were operating with a common bond among the members of a SACCO in terms of same profession or living in the same area but currently SACCO's have expanded the bonds to include members from other non-primary organisation or individuals and with front office to support replica banking services. Thus one SACCO will host membership from multiple sector that include juakali artisans, farmers, tour guides, small business enterprises owners, government employees, private sector employees, students and trainers and groups also known as chamas. The same SACCOs also offer all round financial services including credit services, mortgages, e-channels, asset financing, savings, forex and international money transfer but regulated by SASRA to ensure legal liquidity rations are continuously observed.

In Nairobi county cooperatives are used as tools of county economic development, social harmonization, and as a source of employment. Competing with banks and micro finance institutions that have robust resources. Thus, SACCOs are investing on service and shared infrastructures to protect their membership and tap into current finance technologies through locally available finance technology companies.

With the introduction of automation of services through the web and other e-channels that involve Mobile applications, SMS services and ATM services courtesy of the cooperative bank, SACCO membership can transact, register and withdraw from their respective SACCOs and a SACCO can share information with its relevant stakeholders, to improve on its growth in terms of membership; savings and loan book (Ministry of industry, trade and cooperatives, 2017).

Most SACCOs own and offer mobile banking services to their members as their main user personalised technology initiative and priority. Supported by simplified digital experiences and effective promotion to drive online and mobile banking adoption. To understand what drives consumers and end-users to adopt and use a certain technology has become of increasing interest in the information technology research field. With the key to motivate online and mobile banking adoption being to attract customers and members who have already embraced digital channels.

Most deposit taking SACCOs in Nairobi County have integrated mobile application with the main management information systems sourced from vendors who are in partnership with major telecommunication service providers Safaricom, Airtel and Orange. Some of the applications available include MSACCO from Coretec, Cloudpesa from Surestep, ISACCO from Ozone technologies, SPOT CASH from Tangazo Letu, and MPAWA from Mobile financial solutions. With Smartphone cost coming down more SACCO members are owning Smartphones and making use of their respective SACCO mobile banking application to access SACCO service on need. Thus, Mobile applications have resulted in a paradigm shift in SACCO services and overall operational strategy making services more convenient, faster, ease accessibility and improved membership loyalty (Porteous, 2006).

Services offered by most mobile applications include balance inquiry, mini-statement, funds transfer between accounts, loan application, Send Money to M-pesa, Purchase Airtime, pay loans, Set/revoke standing order and Check guarantor status. These services vary from SACCO to SACCO in accordance to the category of the SACCO and transaction needs of their

membership (Njenga, 2011). Thus, they have adopted customized application to suite SACCO philosophy, logo and colours.

In a nutshell each SACCO has its own branded mobile application for marketing and offering products and services to their own membership. With approximately 600 SACCOs in Nairobi County it becomes virtually untenable for individual member to select which SACCO to invest to earn higher dividend returns or select the SACCO in which he/she can get cheaper credit within the period of credit value for lending. Thus, new investors still rely of workmates, family members, and friends to select a SACCO to invest in without sampling and comparing multiples SACCOs products and services.

The popularity of smartphone, lower data costs from telecommunication providers Safaricom, Airtel and Orange and high population density in Nairobi County connect to the use of collaborative SACCO systems that can share financial information and can quickly scale making use of the right business model. The multitude of resources concentrated in Nairobi County SACCOs also create ideal conditions for monetizing idle capacity, skills sharing and optimizing the match of products and services on demand.

Despite current mobile applications in SACCOs being individualized, the principles governing cooperative movement promote collaboration through cooperation, communication, and coordination among various credit unions. Collaborating by sharing cost of developing centralised data management centres, team up in creation of an environment for security and capacity to implement security in this era of profound cybercrime, work together to create a single common platform for management of SACCOs in which smaller SACCOs can tap into and cooperating together to find the right technology partner to develop solutions to be used by the SACCOs with support from the government were possible.

#### 1.4 Problem Statement

SACCO business in Kenya is restricted by limited economies of scale, with most of the SACCOs being community based, and relying on their member's income to finance growth. Most members continuously create and seek to invest in Cooperatives where they can get

higher returns on their investment and also search for Credit unions that offer cheaper credit. This is fuelled by the cooperative principal that allows voluntary joining and withdrawal from a SACCO and cooperation among cooperative thus allowing a member to move from one SACCO to another.

Credit unions are expected to use the spirit of collaboration through cooperation among cooperatives, helping SACCOs achieve a set of common goals successfully which include shared criteria of member recruitment drives, sharing processes information ,and sharing resources and experiences. Pappas (2014), notes that despite this expectation, most SACCOs act autonomously exhibiting competitive behaviours contrary to cooperative principles and philosophy leading to the collapsing or need to merge of small SACCOs. In SACCOs electronic channels, this is shown by SACCOs acquiring SACCO specific mobile application that allow their members to join, and patronize their products, but do not share information of other SACCOs within the same application.

Thus, as much as most SACCOs have expanded their respective common bond, the mobile applications of these SACCOs lock members to these SACCOs with no information on rates offered by their competitors. These makes SACCOs behave as business rivals, negating the cooperative principle of collaboration where SACCOs share challenges, opportunities, best practices and solutions to enhance service to their respective members and only compete on service delivery (Fearing, 2016).Hence it is a complex problem for the members or new investor to make informative decision on which SACCO to join, invest or divest. Thus, denying a potential SACCO investor a chance to compare and analyse variety of SACCOs products and services before deciding in which SACCOs to invest.

Action is needed to create a cross SACCO information environment that will include data from different SACCOs in terms of business operation category which will enable investors to evaluate financial information from the multiple SACCOs on the same platform. This will enable members to select a Kenyan SACCO to join and invest. Making Kenya SACCO members to connect to SACCOs that are more beneficial to them. The purpose of this dissertation is to evaluate the user and system requirements and develop a mobile application that will give a global business view of Nairobi County SACCOs Products and services through SACCOs independent third-party mobile application.

### 1.5 Research Objectives

- i. To identify shareable services and Products offered through current SACCO Mobile applications of various SACCOs.
- ii. To determine factors that fuel information sharing and collaboration among SACCOs through a single platform.
- iii. To design, develop and test information sharing and collaboration mobile application platform modules.
- iv. To implement and validate the functionality and operation of information sharing and collaboration mobile application platform.

### 1.6 Research Questions

- i. What are the category of services being offered currently by SACCOs Mobile applications that can be shared on a single collaborated platform?
- ii. How will individual SACCOs operational philosophy be standardised to promote collaboration?
- iii. What functionalities will be designed, developed, and tested in the information sharing and collaboration mobile application platform?
- iv. Will the implemented mobile application encourage information sharing and collaboration among SACCOs?

### 1.7 Scope and Limitation of this Study

This dissertation will be focused in Nairobi County, Kenya. The dissertation will cover the development of UCredit Mobile application platform which will be a native application using Java for Android development coupled with a Web backend that will host the web services and database and for administration purposes.

### 1.8 Significance of this Study

SACCOs in Kenya have launched their own mobile applications to suit their needs and enhance their specific customer experience, closing the door to global view of services offered by rival SACCOs. Thus, this study intends to research and proceed to develop a collaborative and

information sharing platform that will give universal view of services from subscribed SACCOs to their membership and new investors in cooperative movement. To the cooperative movement stakeholders in Nairobi County particularly the Members of SACCOs in this urban setting will have an opportunity to view globally products and rates as offered on the UCredit Mobile application platform by subscribed SACCOs. This will enable them to make a choice either to join a SACCO or transfer to a more profitable SACCO that suites his or her own economy.

UCredit Mobile application platform is aimed at connecting Kenyan urban cooperative community and consumers who are individual SACCO member's access top quality and affordable financial services. This is projected to help SACCOs collaborating through the platform in savings mobilization, understanding member credit Loading from different SACCOs before lending and mobile finance access to the unbanked among to the elite in the society and potential entrepreneurs especially students who have just left colleges. As Schrage (1995), explains that such sharing of information and inter collaboration among different stockholders is the bedrock of progress in many areas of the society and will continue to be critical even in the foreseeable future.

SACCOs customers will be able to select objectively rational pricing, low fees loans, evaluate multiple SACCO's information with a high level of integrity, voluntary withdraw transfer and join a SACCO that suites individual needs. This Ucredit sharing platform Mobile application is envisioned to develop a consolidated community of users who serve their interest while SACCOs grow in value driven members on same platform. It will also help in the growth of SACCOs by providing an environment for aggressive recruitment without regard to whether new members have a common factor with the founders of the SACCO. Sharing an independent platform for their products and services, SACCOs will be able to meet demands for the membership and achieve internal process efficiency, with value to membership and strategic advantages to cooperative business where SACCOs will use the platform to market and sell the products and services effectively.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter presents a review of the literature related to collaboration and sharing platform according to the objective of this study. Two theoretic frameworks are incorporated into this

study to identify the factors that influence the use of collaboration technologies. Also discussing the importance of collaboration in SACCOs, mobile banking in SACCOs, Mobile application service characteristics and technology options and collaboration empirical studies.

## 2.2 Theoretic Review on Adaption of Collaboration Technology

Deeply embedded in the SACCOs tradition is an ongoing search for better ways to understand and serve SACCO members. Open inquiry, the free flow of ideas, and debate are essential parts of the true democratic process as embedded in cooperative principles (Legris, Inghamb, & Collerettec, 2003). Vast varieties of theories and model have been designed, implemented and tested to understand information technology adoption and usage related to predicting behavioural intention to use technology and actual technology used primarily in organisational context (Venkatesh, Morris, Davis, & Davis, 2003).

Collaboration in SACCOs involves a shared mind and the concept of developing a cooperative through co-ownership and participatory governance encompassing both learning and action (Chen, Yeh, & Chen, 2010). Fulop (2009), supports that Credit unions require organising and development of products, services and policies with multiple stakeholders giving input which create clear expectations, fostering information sharing, problem solving and tracking progress. The focus of this theories is to understand individual intention and predict SACCO stockholders' behaviour toward new collaborative and sharing Information Technology artefacts and new technology innovations (Thong, Xu, & Venkatesh, 2012). Among the models developed, two stand out to enjoy the most popularity in the information technology field; namely: Technology Acceptance Model (TAM), and Unified Theory of Acceptance and Use of Technology (UTAUT).

### 2.2.1 Technology Acceptance Model (TAM)

Over the years, several independent theories for the acceptance as well as adoption of information technology have been developed. Based on related indexes of behavioural attitude variables in the theory of planned behaviour, the items in question include cooperative beliefs, intensity and expected results evaluation as will be generated by the information sharing and SACCO collaboration mobile application utility (Fishbein & Ajzen, 1975). Like most technology acceptance theories, it is assumed, that SACCOs could choose to employ collaboration technology based on individual cost-benefit considerations that promote financial

inclusion. One of the best-established models that will help explain the adoption and use of information sharing and collaboration platform is the Technology Acceptance Model (TAM) developed by (Davis , 1989).

TAM was developed as a theoretical basis for specifying the causal linkages between perceived usefulness, perceived ease of use, users' attitudes, intentions and actual usage behaviour (Davis, Bogazzi, & Warshaw, 1989). Figure 2.1 is a standard model of TAM accepted by systems researchers as a valid tool in predicting an individual's acceptance of new technology. Davis (1989), developed and validated better measures for predicting and explaining usage which crystallized on two theoretical constructs namely perceived usefulness (PU) and perceived ease of use (PEOU) as the fundamental determinants of system use. The goal of TAM is to predict information system acceptance and diagnose design problems before users have experience with a system.

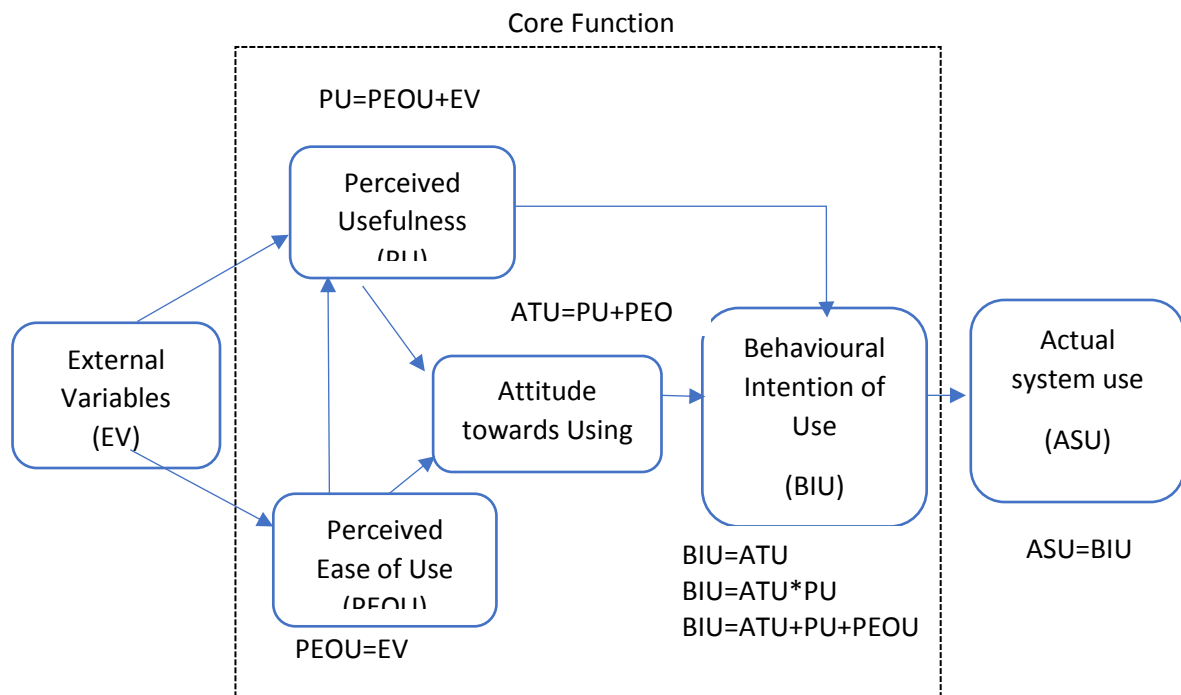


Figure 2.1: Technology Acceptance Model adapted from (Davis, Bogazzi, & Warshaw, 1989)

Predicting if the Ucredit Mobile application will be adopted and used is the key interest of this study. This study will use principles provided in technology acceptance theory to explore the factors that will influence the adoption and diffusion of this new platform throughout the cooperative movement financial section represented by SACCOs. Considering TAM is a further adaptation of the Theory of Reasoned Action (TRA) which is a general theory of human



behaviour, and specifically designed to model user acceptance in information systems (Mathieson, Peacock, & Chin, 2001) .

Legris et al (2003), concludes that although constructs in Technology Acceptance Model (TAM), (PEOU and PU) are valuable predictive constructs; however they cannot be considered as the sole constructs to be used to predict acceptance of information sharing and collaboration mobile application services because they are everyday context applications attached with usability cost and TAM is an organisation context model (Nysveen, Pedersen, & Thorbjornsen, 2005). It is strongly recommended, by many scholars, that other variables should be added to those constructs to have better prediction and understanding (Littler & Melanthiou, 2006).

Confirming the myth that information sharing and collaboration is an unnatural act, although when thinking about the model and process involved, collaboration is at the core of system thinking and strengthens the capacity of SACCO stakeholders as they seek to expand, grow and achieve common mission (Fulop, 2009). Riqueme et al (2010), concurs by suggesting that there are other possible factors that might affect mobile technology adoption such as subjective norm, social influence and perceived risk or uncertainty.

### 2.2.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh, Morris, Davis, and Davis (2003) reviewed user acceptance based on eight prominent models, formulated a unified model that integrates elements across the models and empirically validated the unified model. UTAUT has served as a baseline model and has been applied to this study because the information sharing, and collaborative mobile application is a model technology that will be used both in organizational and non-organizational settings.

Although mobile banking is found viable for every generation of SACCO membership, the longitudinal field study of how members and credit unions accept and use this information sharing and collaboration technology, will be explained UTAUT. Where UTAUT elucidates that about 70 percent of the variance is in behavioural intention to use a technology and about 50 percent of the variance is in technology use. Lincoln (2011) agrees with this model by observing that information knowledge about new technology use is essential because it determines success in evaluating, analysis and effective use of information from various sources as provided by the environment driven by technology.

Venkatesh et al ( 2012), extended the unified theory of acceptance and use of technology (UTAUT) to study acceptance and use of technology in a consumer context. Their work

culminated in the birth of an extended framework which is termed as “UTAUT2”. UTAUT2 incorporates three constructs into UTAUT namely hedonic motivation, price value, and habit. Giving rise to performance expectancy, effort expectancy, and social influence that are theorized to influence behavioural intention to use a technology, with behavioural intention and facilitating conditions determining technology use (Thong, Xu, & Venkatesh, 2012).

Performance expectancy in this study is the degree to which a SACCO member believes that using a particular system or technology in relation to information sharing and collaboration mobile application constructs such as mobile perceived compatibility, mobile perceived trust, and mobile perceived security risk to improve acceptability of mobile applications technology and consumer access SACCOs information using the technology (Faaeq, Ismail, Osman, Al-Swidi, & Faieq, 2013). Creswell (2013), defines collaboration as an ongoing interpersonal interaction not characterised by a significant power imbalance but with express purpose of achieving common goals. Thus the use of grounded theory under unified theory of acceptance and use of technology to understand the perceptions of participants of a process or interaction involving many parties in this study SACCOs.

Wunderlick et al (2014), indicated that together with social influence, we have additional factors that play a vital role in the adoption of relatively new technological services. These factors are economic and technological. Social factors identified include conceptualising electronic money, the social context of transactions, awareness, attitude towards change or embracing collaboration technology, trust in the service provider, convenience of service and comfort in using the services (Teo & Noyes, 2014). Figure 2.2 shows relationship between core determinants as well as the moderating factor related to use behaviour. Defining the degree to which an individual perceives technical infrastructures support for use of technology.

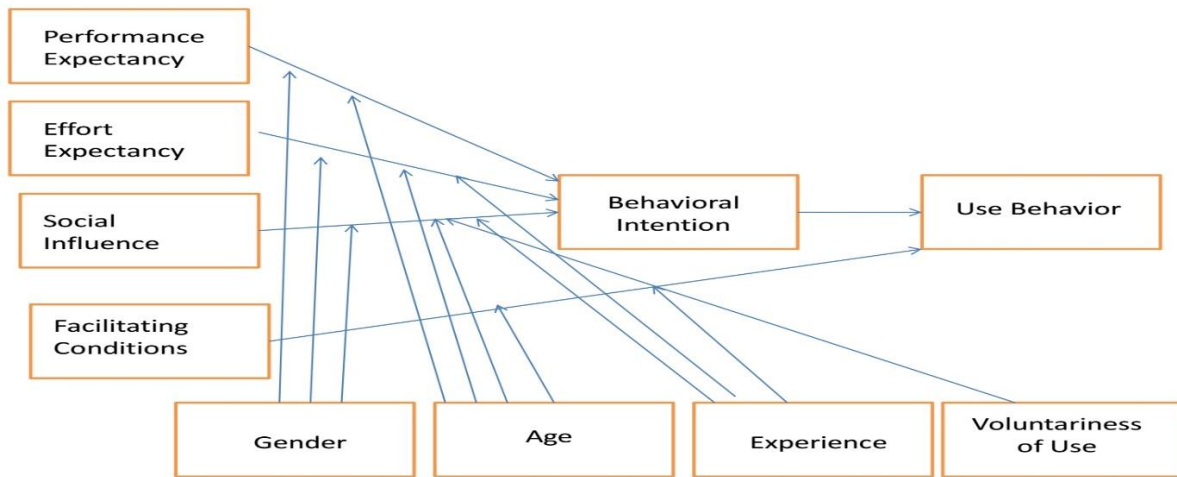


Figure 2.2: Unified Theory of Acceptance and Use of Technology Model (Venkatesh, Morris, Davis, & Davis, 2003)

Technological and economic factors are service availability, Mobile phone access, cost of the service, availability of alternatives, reliability, security, ease of use, and network coverage (Wunderlick, Grobler, Zimmerman, & Vennix, 2014). It is also worthy to note that performance expectancy is similar to other acceptance models such as perceived usefulness in Technology Acceptance model (TAM). Which in this study can be related to Ucredit mobile application usefulness and Effort expectancy being the degree of ease of using the information sharing and collaboration mobile application technology platform thus like perceived ease of use in TAM model also acknowledged as mobile ease of use (Ooi & Tan, 2016).

Also, individual difference variables, namely age, gender, and experience are theorized to moderate various UTAUT relationships. Nevertheless, extensions such as those exemplified in UTAUT2 are a proof that no single research model has absolute applicability across varying technological and organizational settings. Information system research should continuously explore further influences and factors that may alter the behavioural intention to use an information system in diverse settings.

### 2.3 Importance of Collaboration in SACCOs

Credit unions open operation environment are not statistically predefined but can dynamically change member requirements, SACCOs needs and technical requirements of the system in place (Frey, 1989). From globalization to technological innovation, SACCOs are exploring

new and different ways of achieving their service potential to their stakeholders by creating member centric thought practices and tailoring them to provide meaningful customer experiences (Bailey, 2001). With strong believe in collaboration between SACCOs and stakeholders: SACCOs seek to generate a people first experience, new ideas and cross-cultural strengths to position the cooperative movement in a level to offer diverse viewpoints with ability to deliver exceptional client services and be part of financial technological solutions to their membership (Republic of Kenya, 2004).

Deep in the credit union tradition is an ongoing search for better ways to understand and serve credit union members, through open inquiry, free flow of ideas and debate being essential parts of SACCO's with democratic process that embrace collaboration (Develtere & Hertogen, 2005). Collaboration is not just a good idea for small credit unions, but it's essential for survival for SACCOs benefiting from partners taking the lead in introduction of new technology, sharing successes on how to grow and thrive in operational processes and through rotation reducing individual risk, while indirectly moderating alignment among SACCOs memberships services including commoditized financial services and focus on efficiency as differentiating element. Thus, a better future for credit union sharing resources, processes or technology (Porteous, 2006).

According to (Mwiti, 2009), collaboration is a concept that allows the smallest, community-based SACCOs to exist, if members are given access to the products and services they need, the process in which they are made available to them is irrelevant. Thus, need to team up and form a partnership with the same software vendor to provide the services to the collaborating SACCOs (Owen, 2009). Collaboration or sharing economy is fuelled by instant connection and communication directly between credit union without the intermediation of a traditional financial institution such as cooperative bank. The wide variety of collaborative or shared cooperative resources vary not only in the organisational and operational aspects but also in geographical region, share of the financial market and human resources skills (Baldassarri, 2011). This heterogeneity enables informal savings and credit activity to profitability of the SACCOs at reduced cost of investment, gaining comparative advantage and economic rationale.

Transition from SACCOs individualistic business processes to collaborative and sharing through technology, will democratically give SACCOs investors a chance to select products of multiple SACCOs from one platform (Chilingirian, 2012; SASRA, 2012). Supported by International co-operative alliance, (2013) that affirms that information sharing and

collaboration among credit unions gives potential and existing membership a chance to decide where to invest to get returns and marginal benefits and in which SACCOs they can access cheap credit and more loan options, performing both functions on one platform.

Strengthening the connection between cooperatives and their communities being one of the seven cooperative principles, but to improve the community connections needs to become a higher priority of cooperatives and their apex organizations (International co-operative alliance, 2013). Thus, an environment that provides a win win situation where SACCOs that subscribed on the collaboration platform have higher chances of getting increased membership competitively, have a global view of credit history of their membership and members are given a choice of championing the growth of cooperative business (Gatuguta, Kimotho, & Kiptoo, 2014) .

Motivation for information sharing and collaboration is boosted by a key credit access constraint for low and middle-income earners occasioned with limited supply of financing and being shunned by commercial banks building on the limitation by banks in terms of risk-return decisions. Forcing this groups to entirely source their finances from SACCOs and welfare groups who easily reach and meet down market requirements by understanding the credit risk of the informal sector borrowers (Gatuguta, Kimotho, & Kiptoo, 2014). Although low demand for bank loans by individuals is due to lack of bankable projects and a harsh economic environment, created by profit driven banks that are driving individuals to customer centric SACCOs offering friendlier credits terms with credit limited by savings of the loanee. SACCOs are more accommodative in their collection even though credit from SACCO is limited by the amounts and shorter terms, this type of credit is more easily accessible and is provided at a cheaper rate than what many of the tradition banks offer (Fearing, 2016).

Thus, SACCOs cover areas not covered by banks but not fully because their source of liquidity is member deposits which has limited access to long-term source of finance (Kinyua, 2016). Although small credit unions may have few resources of their own, they expand can expand their reach through collaborated and shared back-office responsibilities, data processing, compliance, marketing and human resources with other small credit unions, making them function as if they are larger entities with same capacity as banks while sharing excess capacity in both their staffs and their technology resources (Nadeau & Nadeau, 2016).

Nadeau et al (2016), asserts that globally, service to members is the priority of cooperatives, but they also maintain a level of profitability that allows them to operate sustainability overtime, thus making cooperatives dominant in the society with almost 3 million cooperatives having about 2 billion membership and clients equivalent to over a quarter of the world population and an annual revenue of 3 million from 20 million in cooperative assets. This improves the quality of life for the low-income membership and equity in collaborative resource distribution and with processing outsourced, SACCO's can focus more effectively on growth areas through strategic planning and Staff could reduce routine transaction handing time and increase advising or assisting time, allowing the SACCO's to compete on a national level by combining the cost cutters to gain economy of scale of a larger branded bank (Fearing, 2016) .

Credit unions, which comprise part of the financial cooperative sector, also have shown impressive growth in recent years. Worldwide memberships of above 235 million as at 2016 in 109 countries and 68882 credit unions, with increase in loan volumes by an average growth of over 7 percent per year (World council of credit unions, 2017). This is made possible by SACCOs sharing infrastructure that include joint automated cleaning house, bank secrecy act training, policy sharing, reviewing under business loans, recruiting employees even completing vender due diligence and with the advent of community charters and open fields of membership, the willingness for SACCOs to share ideas has become more over time because despite opening the common bond a single SACCO cannot be good at everything but few niches. Sharing or collaborating with partners that specializes in an area allows SACCO's to benefit in something that is otherwise costly to replicate (Messick, 2017) .

Successful co-operatives around the world are allowing people to work together to create sustainable enterprises that generate jobs and prosperity and provide answers to poverty and short-term business practices (International co-operative Alliance(ICA), 2018). Encouraging routine processes outsourcing that allows a credit union to focus on growth areas and strategy thus collaboration allows focus on a better or additional service to offer members mitigated by sharing expertise and widening their support network for critical function in addition to existing platforms used by SACCO's. Organizations that collaborate reduce errors and improve accuracy and process consistency, leading to increased member satisfaction and better efficiencies.

## 2.4 Mobile Banking in SACCOs

For organisation that care about innovation ,individual creativity is not enough anymore; people need to be in creative ,sharing,collaborative relationships but with knowledge and tools to be successful in today and future shared space (Schrage, 1995). Owen (2009), suggest that SACCOs should have a global focus of improving member's lives by bringing about networking among SACCOs across different business, geographical and membership segments at the benefit of the membership through Mobile applications. This trend of continued reliance on mobile devices to execute monetary transactions is steadily gaining momentum. In an effort to gauge the implications of this mobile phone phenomena, most banks and SACCOs are investing heavily in application for smartphones and digital tablets that make it easy for customers to conduct a wide range of banking activities while on the go (Njenga, 2011). Wang et al (2012), agrees by acknowledging that the development of the mobile internet and the increasing adoption of smartphones have influenced all aspects of people's life.

Some SACCOs are developing interactive tools through mobile applications that help customers analyse their spending habits and strengthen their money management skills (SASRA, 2012; Okiro & Ndungu, 2013). With need to increase quality and quantity of membership, SACCO's are exploiting technologies such as virtual assistants that uses voice commands to perform transactions with the mobile applications. These technologies are already in use in both automobile makers and tech players such as Google and Apple Siri (Blonder, 2014).

Other technologies being exploited include cordless ATM cash access where SACCO clients initiate ATM withdrawals using mobile application instead of ATMS cards, mobile banking application that are highly personalized for each user. In the next generation credit union application gaining deep loyalty from membership, and photo bill pay such as MVisa introduced by visa or pay pass by MasterCard (McGarvey, 2014). Mobile application technology is expected to grow in the financial sector due to availability of robust but cheap smartphones, increased developers of the applications and move to high speed internet courtesy of 5g technology (International Telecommunication Union, 2014) .

As technology advances conversations around the opportunities and risks posed by automation and digitization on the future of work have inevitably increased although cannot overcome the benefits gained by SACCO's by attracting younger generation clientele that is proving to be

the life blood of many credit unions, but at the same time driving the growth of mobile banking (Blonder, 2014). Blonder (2014), complains that smaller SACCO's adoption of mobile application has plateaued after nasty experience experienced observed by competing SACCO's that were early birds in converting into mobile transaction. Despite smartphones and other mobile devices becoming cheap and easily accessible, making it common for members access their statements, balances, deposit money, scan cheques, and apply loans through mobile applications without lining in the SACCO; the convenience provided is accompanied by a series of risks ranging from outright fraud to unintended errors (Lyte, 2015) .

Mobile applications have become the gateway to most commerce activity with shoppers invariably using their smartphones for discovery, research and price comparison leading to practices such as SACCO registration, transfers and withdrawals (Gaggioli, 2015). Mobile supported applications are now the largest banking channel by transaction volume, with more than 25% of the world's population being mobile bankers (Urrico, 2015). Credit union are currently innovating into new ways of enhancing use of mobile banking apart from wallets, introducing services such as remote deposit capture that offers a quick and easy mode of access to members account than online banking (Nysveen, Pedersen, & Skard, 2015).

Urrico, 2015 argues that the Ability to bring new sources, better quality, and faster responsiveness to the members appeals to many. Mobile banking application advancement have made it a dream come true for SACCO businesses that can now provide ground breaking, location-sensitive services on ubiquitous ("anytime, anywhere") basis to customers on the move. According to a survey conducted by discount (2016), smartphone users touch their phones 2,617 times each day, and spend an average of 145 daily minutes on their mobile phones.

An indication that Mobile phone users are one of the most active consumers which is a good indicator to credit unions because you can now reach your target audience on the go. The uptake of mobile phones in Kenya has been unprecedented. Of vital significance is the rapid absorption of mobile based banking services. SACCOs are currently positioning themselves as fast growing, innovative institutions riding on the mobile technology wave platform to offer quality services to their membership by enabling mobile withdrawals, check account status, make deposits and pay loans (Ministry of industry, trade and cooperatives, 2017).



## 2.5 Mobile Application Service Innovation Characteristic

Current financial systems need collaboration among all players, feedback and sharing of information to their consumers to increase viability of financial institutions that increase easier communication, increased collaboration, faster decision making and organization culture similarities (Q.A. Technologies, 2011). Delivery of mobile application for financial services involves multiple key players; Finance provider such as banks, SACCOs and insurance, telecommunication operators such as Safaricom, Airtel and Orange, a mobile application technology vendor and the consumer who in this dissertation is the SACCO member. With agreements between financial provider not to compete on the shared products and services but enhance accessibility and information exchange between them (Robleck, Stok, & Mesko, 2016).

Figure 2.3 shows features that are characterized by the availability of granular, detailed data as an enormous enabler to a new level of mobile and online collaboration, but the key to making collaboration a success by putting advanced analytics and insights at the centre of collaboration, with a laser focus on understanding the customer. Effective digital collaboration is a scalable shared analytical platform that facilitates greater transparency and trust, enables rapid joint real-time data discovery and insight sharing.

Such collaboration facilitate joint customer targeting and personalization, assortment mix, promotions, demand forecasting, on-shelf availability, channel optimization, and precision pricing in order to drive brand and category growth simultaneously (Accenture Analytics, 2016). The shared analytics platform should also facilitate self-service analytics that put analytical insights in the hands of business users and help them integrate these insights into their operational business processes.

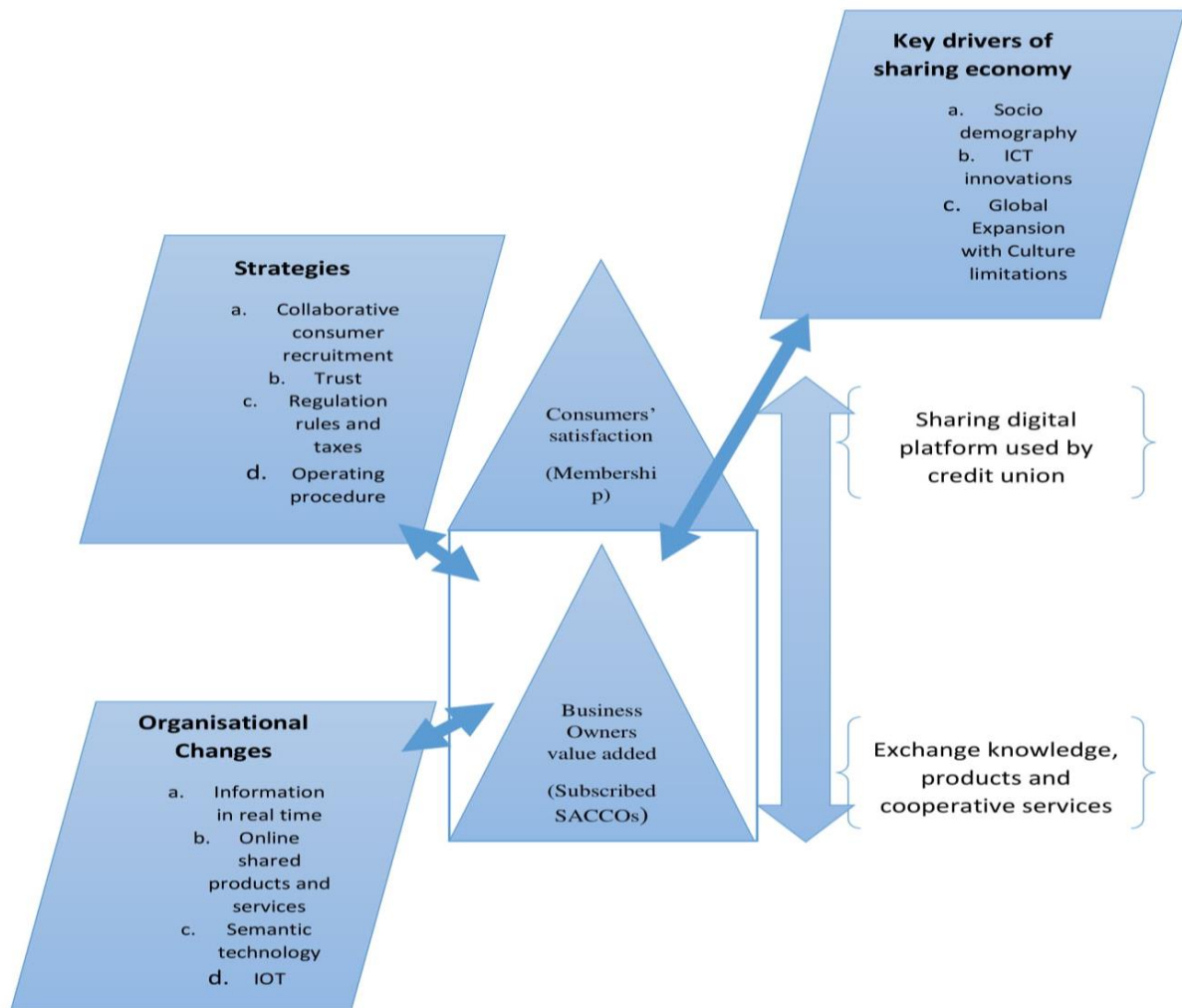


Figure 2.3: Collaboration characteristic adaptation according to performance Prism Cranfield University (Neely, Adams and Crowe, 2001)

## 2.6 Mobile application technology options and Connectivity

Most mobile application contain advanced features that are custom built and installed on smart mobile phones by being downloaded from technology stores such as google store, and apple store. Data is stored and processed externally by the mediating server that is found either on cloud or dedicated servers found in a data centre. This server is accessed through the internet using application program interface or web services designed using scripts such as ASP, PHP, HTML, JSON and JavaScript. The backend used for administration are always web application accessed through web browsers or thin clients where the core functional web services are stored and processed.

Considering mobile networks have very high latencies, it is normal for SACCO members to lose connections and have their device internet protocol (IP) address change during session coupled with less power compared to desktops. Thus, the need to use same application program interface (API) for native, hybrid and mobile web applications using technologies such as Restful API that utilizes JSON as serialization and lightweight, asynchronous (event driven) servers. Mobile application can be simplified even further by using social login platforms such as Facebook, twitter and other single-sign on options (McLean & DeLone, 1992).

For this study front end application technologies to be used will include JavaScript, Hypertext marker language (HTML), JavaScript object notation (JSON), and Java for android. Backend technologies are Linux, Apache, MySQL, PHP otherwise known as LAMP or MongoDB, expressJS, AngularJS and Node.js also known as MEAN technologies. But preferred for unified SACCO application due to reliability is LAMP coupled with Node.js to create event driven architecture that improves user experience and reduces application loading time (Porteous, 2006). From figure 2.4 the mobile network operator (MNO) provides the mobile phone and the ability to use the mobile phone for providing banking services to the consumers.

Leveraging MNO bearer channel and infrastructure to extend services to mobile facilities as a channel, provide access to multiple technologies in the distributed network thus extend membership base to target new market segments and giving a chance to the mediation platform to provide a unified cost efficient channel for SACCOs by allowing less charges for transactions and permit membership with immediate access to information from their accounts (Krugel, 2007).

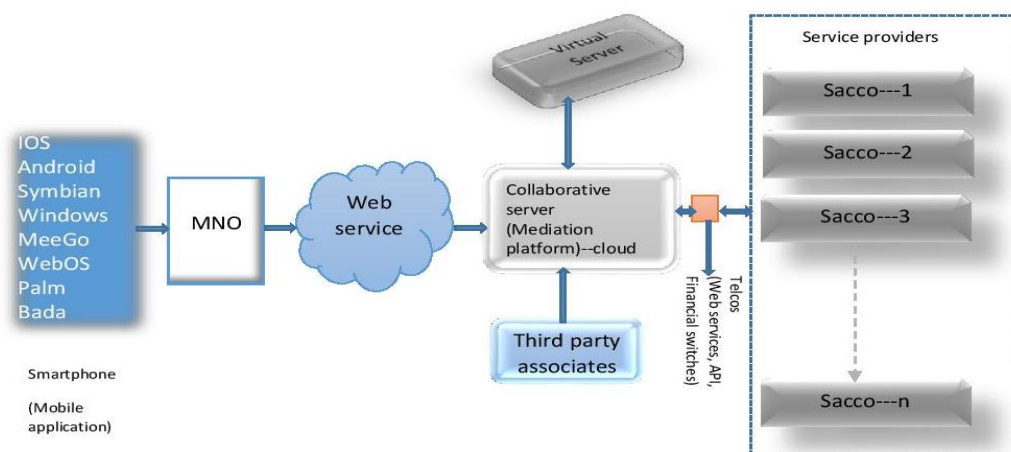


Figure 2.4: Mobile application technology architecture adopted from (Jaouad, Wadii, & Souhail, 2014)

Hence in relation to this study most mobile application developed locally tend technology wise to favour an android development environment using java technology on android platform and android toolkit along with studio and developer's tools for eclipse. Using connectivity webservices that help navigating the complex and time-consuming SACCO backend integration considering the levels of security and standardization that need to be complied with (Lawson, 2013). Considering that the most popular mobile operating system is Android adopted by most phone gadget manufacturing companies because it is open and free software stack that includes an operating system, middleware and key application for use on mobile devices as developed by Google (Google, Open Handset Alliance, 2014 and The PHP Group, 2017).

## 2.7 Commercial Information Sharing and Collaboration Platforms

### 2.7.1 Consumer and Technology on Sharing Environment

Despite adult population having knowledge on collaboration and sharing, a survey by dimensional research, reports that the degree of importance of mobile collaboration is higher among younger knowledge workers with 32% of millennials agreeing that collaborating on their mobile devices is very important compared to 29% of Gen Xers and 23% of baby boomers and since modern professionals live a connected lifestyle and want to be productive anytime, anywhere, from any device, mobile is playing a vital role in professional collaboration. While only half (49%) use mobile devices for collaboration, such as smartphones or tablets, most business professionals (92%) say it is important (Legris, Inghamb, & Collerettec, 2003).

A study by price water coopers (PWC) in the United State of America showed that consumers are showing a robust appetite for the sharing-based economy business models hosted through digital platforms that enable a more precise, real-time measurement of spare capacity and the ability to dynamically connect that capacity with those who need it. Most of this internet-based companies do not own property that they lease but they are co-ordinators and agents of host property owners and only receive commission on successful dealing (Gansky, 2010; Carr, 2011; Etherington, 2013). With over 44% of US adults familiar with the sharing economy, 8% of all adults having participated in some form of automotive sharing. 1% have served as providers under this new model.

Collaborative sharing mobile technology platform makes users and providers have an independent platform that enables users to access superior quality products and services (Pais & Provasi, 2015). Providers grow monetary wise from capitalization of idle capacity, unused assets, providing flexible operational hours, and enhanced ability to tap new customer base while creating new markets. This enables development of a digital social community that has loyal customers and access to a wide market with higher transaction volumes through user recommendation (Sundararajan, 2016). Majority of respondents in Strategy&, 2016 survey attributed the reduced cost of services as the main benefit of sharing economy, followed by improved trust between producers and consumers in the Gulf cooperation council and in United States according to price water cooper's customers listed convenience, efficiency, and flexibility as top benefits from sharing economy platform (Bozdoganoglu, 2017; PWC, 2017).

People use the same shared platform models to build trust among collaborating partners and consumers, allowing transacting partners to limit counter pay verification and liability expenses while reaping the benefit of sharing. The Strategy& white paper explains that collaborative consumption encompasses private exchanges through online economic models based on sharing, swapping, trading, or renting products and services. Such platforms include Thredup for selling women and children second hand clothing online at 90 percent off retail price (Thredup Inc, 2018), and Peerby.com a Dutch tools library application that operates a peer to peer sharing service that allow users to share or request items from people in their neighbourhood online (Peerby, 2018).

### 2.7.2 Airbnb an Online Sharing and Collaborative Platform

Launched in 2008, is a safe, reliable, user friendly and convenient marketplace that makes it easy to rent and lease accommodation; Airbnb platform is proving to be a challenging market for hoteliers to complete with (Carr, 2011). Because it targets different clientele online and offers them excellent services, with intension to list accessible places to stay all over the world. Initially known as air bed and breakfast, with an aim of renting out air mattresses in apartments, the Airbnb application grew to support home sharing across US and now targets to be a worldwide home sharing application by including traditional family run hostelries on their listing (Siegler, 2011).

Considering that sharing and collaboration applications are found majority in the hospitality industry where online applications have been developed that allow users to select travel media, hotels, and holiday destinations on a single platform (Wang, Park, & Fesenmaier, 2012; EyeforTravel, 2013).

To get their first visitor Airbnb integrated with Craigslist that allow posting on the site automatically, integrated with multiple global payment systems, and built a sophisticated search algorithm to determine relevance of a given location (Abrosimowa, 2013). With concern about user data authenticity and safety Airbnb makes use of social connection such as Facebook, private messaging through Twilio to automate mobile communication between rental hosts and potential guests, and compensation guarantee for hosts in case of damage. Concur, the leading money management solution, confirms that Airbnb relays on loyal hosts who do not list with rivals and charges a commission of 6 to 12 percent of the total rental revenue and host 3 percent of the total earnings from the site.

The BDRC market research shared by Hotels show that new trends in behaviour of consumers on sharing platform has grown tremendously where 19% of US travellers used some shared accommodation site in 2014 to search and book accommodation, 44% of consumers would consider using one in the future and 66% of millennials and 62% of Gen Xers will use shared accommodations for more than once, with 51% of baby boomers becoming repeat users. Thus, hotels that fail to respond by either subscribing on existing shared platform or collaborate to create one will continue to lose business (Wang, Park, & Fesenmaier, 2014).

According to (Gaggioli, 2015) sharing economy has greatly influenced the hospitality industry over the past few years, through socio-economic ecosystem built around the sharing of human and physical resources that includes the shared creation, production, distribution, trade and consumption of goods and services by different people and organizations. Sharing technology platform in the hospitality industry such as Airbnb has increased collaborative consumption.

Despite the Airbnb global success, it was not the first company to offer online alternative to hotels accommodation bookings. Others included HomeAway and Priceline which owns booking.com currently considered one of the best managed internet companies in the world (Weed, 2015; Lardinois, 2015). Couchsurfing.com as a sharing economy platform allows users host and book to stay in local's homes around the world for little to no cost. Airbnb clone Wimdu also offers a centralised platform for people with extra rooms to rent them out to tourists

by connecting travellers with private accommodation hosts around the world (RCKT.Rocket Communicationspressroom, 2015). Viable is a platform for locals to offer tourists on unique experiences through their cities. All these companies contribute to the sharing economy and pose a threat to hotels still rigid in individualistic approach to the market even when utilizing current technology.

Gaggioli (2015) further argues that times are changing and adapting to collaborative sharing means more opportunity for businesses expansion by offering local services through third party collaborative platform mobile applications, and websites to stimulate the local economy or expand their reputable brand names. Hence sharing creates a sense of community among strangers, which help to facilitate trust and social inclusion (Nysveen, Pedersen, & Skard, 2015). With the rapid growth of sharing economic platforms, coupled with funding from incubators, venture funds, accelerators, and investment models; Price water coopers (PWC) projects a 20-fold increase of collaborative finance, peer to peer accommodation, peer to peer transportation, on demand household services and on demand professional services between the year 2016 and 2025 (PWC, 2016).

Developed using Ruby and JavaScript for flexibility, efficiency, and dynamic development, Airbnb platform uses Nginx to ensure security and scalability (Tokareva, 2017). Alongside Redis database and Amazon cloud hosting Airbnb is set to be the largest online rental and accommodation sharing economy platform. The company is evolving from being just a platform for overnight stays booking into a comprehensive travel company, with intention of an even greater share of tourists spending (Mccarthy, 2017; Menze, 2018; Spinks, 2018). Cheif procedures for selecting technology utilised by Airbnb are guided by respect for local regulation, ensuring guest's information safety and increasingly, the need to fend off rivals. Other application that are similar include Turo rental sharing system which is a person to person car sharing service (Jacobs, 2018).

### 2.7.3 Zipcar Car Sharing Model

Zipcar is pay-per-use models for car sharing offering the shared use, self-driving networks of the future; while differing self from uber which uses ride hailing business model. Designed for people who do not own vehicles but need one on occasion errands own a smartphone making

use of GSM network (Cheng, 2009). Ushering in a new Era of mobility as a service in which car sharers outnumber car owners. The Zipcar platform is envisioned to bring into transportation sector a smart, and efficient collaborative environment with connected vehicle that fit the duty at the time of request. Including Luxury vehicle, tour van, and even hatchback for hauling groceries and building materials thus changing need of ownership into access (Cox, 2010).

As in Zipcar collaborative transportation platform mechanism enhances information sharing for transporters and clients through global third parties that prove heterogeneous information systems (Chen, Yeh, & Chen, 2010). Mobile applications and web services are used to provide flexibility and interoperability that are found in Zipcar collaboration platforms that integrate Vehicle owner's heterogeneous systems with Zipcar mobile application for client access (Richardson, 2013; Ceille, 2018). Solving logistics problems by tracking vehicle demands, driver reservations and car maintenance.

#### 2.7.4 Cintas Online Collaborative Platform

Cinatis is an example of collaborative platform in service-oriented architectures that integrates transport and logistic providers, thus using digital supply chain to improve customer loyalty, optimized logistic flows and reduce transport costs. The application is available in Europe and supports multilingual feature. According to world economic forum white paper (2017), sharing to sharing economy involve collaboration in which there is use of digital technology to match buyers and sellers accurately and timely on same platform through a measure of ideal capacity and dynamically connect potential users of an asset with its users.

#### 2.7.5 Yard Club Equipment Sharing Platform

Yard Club is an integrated web and Mobile application for construction professionals to better manage their owned and rented equipment fleets. Founded in San Francisco in year 2013 by Colin Evran, Yard club is dedicated to building collaborative consumption and construction technology sharing platform. The platform is intended to help constructors and equipment rental companies better manage their equipment fleets with the goal of maximizing utilization of the capital assets (Zimmerman, 2015). The internet company Yard Club makes use of the



sharing economy model in its platform, thus making it possible for constructors to rent out their idle equipment. This business model is gaining an economic foothold in the business to business sharing area and consumer facing industries (Lawler, 2017).

#### 2.7.6 Features of Trending Collaboration and Sharing Economy Platforms

From the same website and Mobile applications users can search, reserve, pay and manage booking online on 24-hour 7 days basis. This sites and mobile applications assist holiday makers select cheap and pocket friendly destinations with offers and bonus that are provided by different hotel owners and cheap services (Sun, Law, Schuckert, Kucukusta, & Guillet, 2016).According to Forbes (2016), sharing economy is a collaborative approach to acquiring goods and services across a variety of industries through online retail sharing platforms that continue to see growth as people become more technology-oriented. Current demography shows that sharing economy segment of the market surpassed \$250 billion in 2017, with leaders like Amazon and eBay leading the way (Seth, 2017).

It is common to see consumers ordering meals or car rides via their smartphones, booking hotel or flight reservations with a few taps, and order products with two-day delivery at Competitive prices, authentic experiences, and perks unique to every host (Zamolo, 2017). The seamless integration of trading partners in the transport sector ensure accurate and quick response to customer needs and effective utility of tracking information including proper control of transportation resources.

United Kingdom sharing and collaboration online platforms expected to expand at a rate of over 30% and Yano research institute estimates that transactions on Japan's sharing platform will grow from 29 billion Yen in 2016 to around 60 billion Yen (Takeo, 2017).China sharing economy research institute suggest the market value of China's sharing activity will grow at 40% per year and account for 10% of Gross Domestic product (GDP) by 2020 due to rapid development of China's sharing economy has been spurred by technological and social trends, supported in turn by explicit government backing (Yan, 2017).

Generally, in collaborative sharing economy we have economic systems with decentralized networks and market places that unlock the value of underused assets by matching needs and

haves, in ways that bypasses traditional institutions. The parties show intention for interaction by registering on the platform for instance ParkFlyRent collaborative sharing platform allows matching cars left by members departing from European airports to those arriving and seeking to rent cars during their stay (PWC, 2017).

## 2.8 Sharing and Collaboration in Financial Sector

### 2.8.1 Banks Collaborating and Sharing Through Financial Technology

One area in which traditional players (banks) and financial technology (Fintech) players are aligning is collaboration. According to Roland Berger study both players are keen to engage in collaboration. Banks are encouraged by the working environment to engage with telecommunication operators (Telco's) to utilize new mobile phone interfaces.

The research from Capgemini and Efma further shows that both banks and Fintech's are keen to collaborate with 75.3% of Fintech and 91.3% of banks agreeing that collaboration is part of their future strategy. With both Fintech and banks keen to maintain their independence and compete on their own domains, only collaborating through application program interfaces (APIs) can provide a link between to the two field (King, 2017) . Providing a clear information technology interface between banks and a Fintech offering collaboration services. Offering enhanced customer experience and expand revenue streams with APIs providing the required agility in the banking sector.

With positive customer experiences above traditional banking services, Fintechs provide open banking services by offering collaborating banks an opportunity to retain and grow their customer base as they add the varied services of third parties to personalize and customize product and services. Banks that do not think strategically and establish a role in collaboration sharing or open banking through Fintechs will be disintermediated from their customers, hence need for banks to consider business transformation by establishing and solidifying long term base in open banking (Seth, 2017). Key areas in which Fintechs and other technology giants are key to financial services market is ability to offer intuitive and crisp solutions for simple user-interface hence better front-end service at lower- fees and greater convenience (Consultancy, 2017).

In the modern world economics it is hard to weather financial storms generated through the age of digital disruption with banks now facing a new era of competitive pressure, some of which have been touted cut deep in the market share previously relied on and keep relationship between customers, Banking market incumbents and potential banking disrupters such as credit unions and internet only banks if not on collaborative sharing open banking Fintech, as per a new report 2017 world Retail Banking Report from Capgemini and Efma.

King (2017) concur that a banking revolution is coming in form of open banking that allow customers to share their financial data between banks, allowing the creation of new type of smart banking services, through working with Fintech to foster an entirely new financial services ecosystem. Open banking through collaboration and sharing stand to benefit end users as well as enhance innovations and new areas of competition between banks and nonbanks (Brodsky & Oakes, 2017). HSBC is already teaming up with Fintechs such as Tradeshift to create a broad collaboration strategy that will see open banking strategy that will allow customers to see accounts from different banks on a single screen through published APIS.

This is because customers are not necessarily eager to change their bank but are ready to change how they bank if it means finding better experiences by getting more of what they want. HSBC has partnered with Bud a financial application platform that allows deep integration with bank technology bring together data from multiple banks on savings, loans, insurance and many other services that allow people to move easily manage their money (King, 2017). Using this opportunity to create a regulated all in one digital experience of multiple services. HSBC is now leading other banks on the way to ensure continued success through smart collaboration.

With new demand in the general financial sector that is trending, requiring consumer self-service through ability to pay bills, get loans, receive financial advice, and manage their money themselves online; thus, demanding more accessibility and streamlined transactions driving innovations while simultaneously meeting new regulatory requirements (Forster, 2018).

### 2.8.2 Netherland Banks Digital Sharing and Collaboration

Netherland has benefited from creation of a technology base for sharing information and collaboration between multiple parties involved in financial payment system. A research by

(Dutch Payments Association, 2016) scrutinized the main features of the Dutch financial sector payment systems reliability, efficiency and security; which showed a decline in fraud but increase in customer satisfaction and compliments. These was made possible by collaboration between Dutch financial institutions information sharing and analysis centre, a public private partnership with agreements that banks will not compete on security, agreements on the type of information to be shared between banks, collaboration between banks to include the shared delivery of products and services; collaboration between banks and public and private sectors and sharing strong technical security measures.

The Dutch economy is highly dependent on having a payment system that works well. This is made possible through good, active collaboration between the provider of these payment services and the representative of end users, that include consumers and entrepreneurs who are private individuals, retailers, companies and financial institutions. Due to increased public interest in an efficient and secure payment system Netherlands created the Dutch payment associations(DPA) that brings together all the key stakeholders (Doeland, 2017) .Since each party has a role to play in coordinating and facilitating reliable payments, monitoring and ensuring reliability of payment systems, and perform analysis of incidents, threats and risks involved in payments.

Hence the development of the Dutch ecommerce payment platform that enables consumers to make online payment through their own banks IDEAL. Thought at first to be impossible due to banks having different standards but parties involved developed standards and agreements that made sharing and collaboration between stakeholders easy and efficient. DPA encourages new developments that help to make payment systems safer, more secure and affordable to all stakeholders both now and in future. AS an improvement on IDEAL, DPA is developing, in close collaboration with its members, a new infrastructure for real time payment or instant payment using mobile application that can access customer banks information from multiple banks on one interface.

### 2.8.3 Challenges in Data Sharing and Collaboration

Not all aspects of sharing economy models are positive, limitations occur in the creation of policies and regulatory frameworks for platforms with network effects making collaborative

sharing platforms to be seen as monopolies. With the amount of customer data stored on the sharing platform rising exponentially, challenges are also growing in protecting consumers, avoiding unfair competition, modernizing outdated regulators sharing principles and assuring social equality (SHARENL, 2016).

As much as customer transparency and control remain key to designing products for sharing and collaboration platforms; different data categories require different levels of security and consent after understanding the access impact before approving (Doeland, 2017). In most cases the Bank retains more information about a product or service being offered through the mobile application. This information asymmetry according to (Bohsali, Papazian, Samad, Vaughan, & Rizk, 2017) leads to “a market of lemons”, in which sellers with high quality goods are unable to convince buyers to pay more, resulting in only low quality goods being supplied and eventually the buyers lose interest in the digitally shared platform and stop transacting through it.

Banks traditionally viewed the custody and protection of their client’s data as a responsibility, more than a commercial asset. Thus, inability to share data with third parties and viewing external parties as threats than opportunities. This is because data sharing tends to be risky and permission based, accompanied with necessary audit trails, risk management and subjection to regulation. This is done with a purpose to increase security hence enhance fraud detection, identity validation and know your customer capabilities (Brodsky & Oakes, 2017). Also, banks have legitimate concerns regarding loss of brand recognition and reputational risk due to investment involved and customers do not accord the same value and sensitivity to certain data elements as banks and regulators do.

Other factors hindering collaboration in banks include legislation on privacy and mistrust among banks. This are barriers to active sharing of information and to collaborations through mobile applications. With most non-financial sectors collaborating and sharing information for purposes of processing transactions, marketing, business development and growth; it is now apparent that banks need to find common ground and develop a zero-sum collaborating and information sharing mobile platform to ensure robust recruitment of customers, secure payment systems and single point multiple financial information access environments.

## 2.9 Summary and Conclusion

Whereas collaboration and information sharing platform seems to be the way to the future operation for institutions, Kenyan organisations particularly in the financial sector are hesitant to adopt and establishing sharing and collaborative environment as part of their business model. The advent of community charters and open fields of membership has created fertile ground for unhealthy competition among financial organisation particularly SACCOs and reduced the willingness for credit union to share ideas over platforms although the need to collaborate and share is well acknowledged. The biggest challenge being ability convince organisations to use shared environment, and establishment of policies and procedures to govern collaboration and sharing information to the consumers who in this study are SACCO membership, without competing on the platform or infrastructure but administering the service (Ellifritz, 2017; Kenya Union of Savings and Credit Co-operatives Ltd, 2018).

There is a perceived lack of education as to the specific benefit of mobile collaboration in the SACCOs own situation that will enable SACCOs to re-engage more deeply with their core membership (International co-operative Alliance(ICA), 2018). Meanwhile, the ability to genuinely connect with members on a deeper level is strategic important advantage for cooperative business and provides credit unions with smartest ways to amplify SACCOs brand. Thus, credit unions have turned out phenomenal performance over the past decade but if the cooperative movement wants to serve members in 10 years, it is time to think collaboration and information sharing through an independent mobile application platform and online (Johnson, 2018).

Hence regardless of region demography, sharing and collaborative models' momentum through mobile applications seem clear, requiring SACCOs to position themselves in the new opportunity and reap benefits that result due to customer adoption impact such as improved membership experience, new revenue streams and a sustainable service model for traditionally underserved markets. Collaborative sharing is expected to enable SACCOs, SACCO members and service providers to have an independent platform through financial technology in this study, that will enable users' access superior quality product and services and providers to grow monetary wise from capitalizing on idle capacity or unused assets, flexible working hours, and ability to tap customer base in creating new markets offering. This will enable a digital social community that provide loyal customers and access to a wide market with higher transaction volumes through user recommendations.

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Introduction**

This chapter underlines methodology of this dissertation by describing the approach and processes used to fulfil the dissertation aim and objective. Focusing heavily on requirements analysis, usability, product design, and quality assurance with an aim of dramatically reducing the long-term total cost of ownership, alleviating unanticipated expenses associated with excessive user training and re-implementation. Generally giving an overview of the steps taken to fulfil the objective of this study.

### **3.2 Research Design**

Mixed approach was employed in this dissertation, in which qualitative analysis was used to understand the fears that stakeholders have while using of current mobile banking and future shared collaborating platforms. Qualitative analysis was used to explore views and behaviour patterns, using the two main methods of in-depth interviews and focus groups giving a basis that helped derive relevant questionnaire content (Meadows, 2003). From the questionnaires data quantitative analysis was employed to interpret how stakeholders perceive use of mobile application to access SACCO services on day to day basis.

### **3.3 Hybrid Lean and Scrum Agile Methodology**

The application development used a marriage of lean and scrum agile project development frameworks that provide broad applicability for managing and controlling iterative and incremental projects due to simplicity, and proven productivity. Lean methodology was used in order to eliminate wastage by selecting only valuable features for the system, prioritizing those selected, and delivering them in small batches. Emphasizing on speed and efficiency of development workflow and relying on rapid and reliable feedback emanating from stakeholders. The combined framework empowered creativity, communication, learning, feedback and self-organization on the same development framework making it simpler and more understandable (McLaughlin, 2016). Scrum model being an iterative and flexible offering specific rules and procedures to the application development, helped respond to user complaints and propositions and provide solution updates on the application development and

deployment.

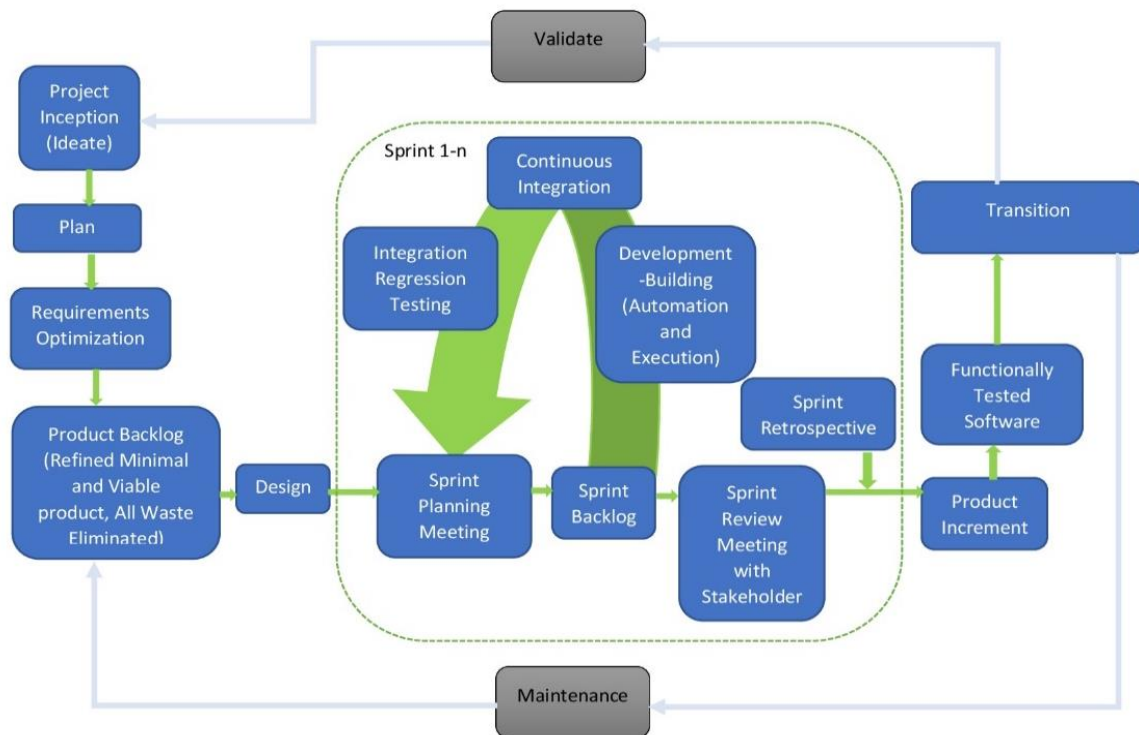


Figure 3.1: Hybrid Lean and Scrum Agile methodology adopted from (Heller, 2011) and (Durnez, 2015) and (Disciplined Agile Consortium, 2017) and (Rios, 2018)

The combination of lean and scrum agile methodology revealed their full potential by making development more flexible and agile, thus reducing waste during development and make it possible to avoid investing resources into solution functions that do not meet the required customer needs in the application. Hence helped in fast delivery of the mobile software by integrating agile build measure in the learning loop to identify the best fit solution for stakeholder problems and servicing their needs.

### 3.4 Application Development Process

To achieve the Objective of this study the following phases were followed as shown in the sequence below. The mobile Software development process used was meant to consistently deliver quality results on time and within budget with clear study objective. Since each software module is unique in terms of business objectives, environment and constraints, yet each mobile application module needs to be delivered with equal efficacy.



#### i. Idea Inception

This phase was concerned with establishing processes that uCredit Mobile application will perform. By development of a business case and project planning in conjunction with stakeholders buy-in to give vision for the application development. This involved a feasibility study that assessed the viability of the project through study of other Mobile application deployed in cooperatives financial management field and gathering user data, generation of business goals and requirement analysis, and evaluating the technology requirement making a detailed scope of the application.

#### ii. Design

This phase involved generation of Ucredit Mobile application development blue print, which provided the information architecture of the application that include sitemaps, wireframes, work flow and content classifications with graphical and technical designs for prototyping in accordance with the scope and research case identified in idea inception. Generally, this phase was concerned with selecting the application base architecture using use cases, and sequence diagrams, giving a list of modules, brief functionality of each module, interface relationship, dependencies, database tables which will include entity relationship diagrams, architectural diagrams and details of technology.

#### iii. Development

In this phase a demo prototype was built in relation to the design blue print, iteratively while synchronizing with stakeholder's feedback. Then this lead to writing the refined prototype function final code and integrate into the main Application.

#### iv. Quality Assurance

At this level the perform unit, features and functionality testing was conducted before user testing, to identify bugs and resolving them to meet the stakeholder business requirement.

#### v. Deployment

During this stage the user and technical references were generated and discussed with selected stakeholders while verifying if the complete full featured application meets the underlined set objectives and requirements of the dissertation.

## vi. Review

Recommendation for future work was highlighted at this point, subject to user review.

### 3.5 Requirement Analysis

This phase involved interaction with stakeholders, users and ultimate consumer of the application developed. The information gathered by the researcher was consolidated and categorised to determine if it was consistent with the objective of this study and the consumer requirements were close software functionality requirements expected to be delivered by the collaborative and information sharing environment created.

#### 3.5.1 Data Collection Process

Data for this dissertation was collected using primarily open and closed questionnaires designed to enable soliciting from several respondents within a short notice and use of unstructured interviews and online surveys to gather information that is not covered by the questionnaires. The Questionnaires were accompanied with introduction letters. Oppenheim (1992) asserts that while open questionnaires enables respondents to answer using his/her own words thus giving more depth of thoughts, feelings and experiences; closed questionnaires enabled comparison across individuals and group of respondents. Interviews accompany close questionnaires which tend to be more attitudinal or factual and the choice of answers or response options to form art of the question (Oppenheim, 1992).

Online survey and questionnaires reduce chances of evaluator bias because same questions are asked of all respondents (Mathers, Fox, & Hunn, 2009). The online survey will be promoted to gather data from system administrators, information technology manager and other chief level staff of SACCOs within Nairobi County and questionnaires will target mostly SACCOs membership and other stakeholders of interest including current SACCOs management information system providers and SACCOs apex bodies.

### 3.5.2 Target Population

The target population for this dissertation are SACCOs in Nairobi County which consist of multiple sector SACCOs categorized in deposit taking SACCOs and non-deposit taking SACCOs. This provided a fair sample representation of all SACCOs in the country Kenya. The unit of Analysis will be 43 deposits taking SACCOs in Nairobi that are registered by the Ministry of industrialization, trade and cooperatives as at 31<sup>st</sup> December 2017, with the respondents expected to be the information communication manager or system administrators of this SACCOs.

### 3.5.3 Sampling Techniques and Sampling Size

According to (McLeod, 2014) Sampling reflects the characteristics of the population from which its drawn and should give unit of the sample an equal chance of being selected. Slovin formula will be used to get a sample number of SACCOs in this study with a precision level of between 0.02 and 0.07 targeting to have a confidence level of above 88%. This is because Slovin's formula allows sampling of the population with a desired degree of accuracy (Ellen, 2017).

$$n = \frac{N}{(1 + Ne^2)} \dots \dots \dots \text{Equation 3.1}$$

$n$  = Number of samples  $N$  = Total population  $e$  = Error tolerance

With licensed deposit taking SACCOs in Nairobi county being 44 and taking the highest precision level of 0.02

$$n = \frac{44}{(1 + 44(0.02)^2)}$$
$$n = 43.2390$$

This number of deposits taking SACCOs that will be involved in this study are  $n = 43$

### 3.6 System Design

Graphical user interfaces layouts were designed tapping into user experience analogy where storyboards designed using MarvelApp with selected stakeholder participation to enhance usability.

Entity relationship diagrams modelled using Lucidchart integrated with Visio, linked to MySQL database on domain hosted by Safaricom cloud to show the relationship between objects in the database and define business processes.

The unified modelling language was used to design the processes using the standard modelling language for object-oriented modelling; which will involve use case design, sequence diagram and class diagram.

### 3.7 System Implementation

SACCO branch sharing platform uCredit mobile application will be developed using java for android which is an open source and most popular mobile operating system (Google, Open Handset Alliance, 2014). The development of an android application requires the Eclipse integrated development environment (IDE) and its Android Development Tools (ADT) plugin to be able to use the Android software development kit (SDK) and Android studio 3.3.2 with IntelliJ IDEA distribution cloned with Google cloud storage JSON API, Google cloud Resource Manager API and Google analytic API.

Personal home page (PHP) is a server-side based language that is used to design applications to be executed on the web server that contain file for the database processes and the server application uses a connection to initiate communication between server and the Android application (The PHP Group, 2017). The Android application will be built using SQLite inbuilt database for localized services and will be connected to MySQL server database found on the web server using application interfaces designed in PHP code, Python and JavaScript Object Notation (JSON).

### 3.8 System Testing and Validity

To achieve the objectives of this study and meet the requirements of system, multiple forms of system tests were conducted, with prototypes for testing working of the functions done using Visual studio 2017 c#, before transfer to Android. Information Technology staff from the selected SACCOs were given the prototypes of the software solution as proposed in this study to verify if it meets their expectations from which they will give feedback on their experience of use. Some members of this selected SACCOs were given the solution to determine the reliability and ease of access to SACCOs information as provided through the system.

Integration testing was done to validate the connection between the mobile system solution and the backend web application through the web service. This was necessary to determine if the solution can securely transfer information data and the transaction flow seamlessly between the endpoint processes and the information accessed can be authenticated and verified.

Functional testing was necessary to verify if the expected functions required meets the study objectives and processing modules are in place to meet user expectations. Load testing was also done to verify that system can accommodate information from multiple SACCOs and user detail without degrading in terms of performance, response time and evaluate behaviour of the system during high volume data processing and multiple user engagement with the system in one instance.

### 3.9 Ethical Considerations

A note accompanied each questionnaire during conduct of the survey and SACCOs clarifying that there is no cost, risk of exposure of the research subject during and after study. This was extended to respondents explaining through a letter the purpose of this study and procedures that will be used to collect data from them and that their identities will remain anonymous.

## **CHAPTER FOUR: SYSTEM DESIGN AND ARCHITECTURE**

### **4.1 Introduction**

This chapter explores the user requirements analysis, which is merged with the researcher idea concept. Generating a design and architecture which is the blue print of the proposed solution.

### **4.2 System Requirements**

The User requirements where derived from the data gathered through questionnaire structured using google forms and analysis of the data was done as the interviewee answered and submitted their answers. A sample of the questionnaire is in appendix A.

The questions were structured, under themes that reflect the research objectives and for easy analysis through precise interpretation of the answers. This help in determining the functionalities and features to be included in the implementation of the solution.

#### **4.2.1 Domain Requirements**

Domain requirements are highly heterogeneous social cultural and professional stake holder viewpoints about a given procedural, technology and solution architecture background. Necessary for development and choosing of technology architecture that help develop models of a solution that addresses specific needs of the domain (Calvaresi, Sturm, Yu, & Dragoni, 2014). The software solution being developed will be based on the cooperative movement environment in Kenya, exploring and mapping practises, processes and procedures that are performed globally by the SACCOs based in Nairobi. As depicted from the information gathered supporting the objective of this dissertation. Some of the requirements include environment that supports self-recruitment into SACCOs, selection and view of variant SACCOs and their products and view of member personal load in multiple SACCOs.

#### **4.2.2 Functional requirements**

These are statements of services that the system should provide, how the system should react to particular inputs and how the system should behave in particular situations. This consist of functionalities that are necessarily incorporated into the solution as stated by the user in this

case co-operative stakeholder (Shrivathsan, 2012). To fulfil the objectives of this study the solution being designed will include:

- ◆ User Accounts
  - ▣ User accounts will password protected.
  - ▣ Password reset will be handled through the backend website.
  - ▣ With exception of the administrators, all contact persons accounts will be tied to a SACCO.
  - ▣ All users except administrators will register through the Mobile application interface.
- ◆ Entity Profile Administration and Panel
  - ▣ All entities profiles will be verified and updated by the administrator.
  - ▣ The administrator will have the authority to block or update users.
  - ▣ SACCOs authorised representative will have editing rights for institution essentials through the backend website.
  - ▣ Administrator will be Designated as the first priority user of the solution.
  - ▣ Administrator can create ,edit, and disable user accounts.
- ◆ Data integrity
  - ▣ The system will block over stayed information from view by Users in this case SACCOs stakeholders,thus require continuous updates for the data to remain current.
  - ▣ New profiles must be reviewed and approved by the Administrator before appearing online.
- ◆ System Security
  - ▣ Public will have read only rights after registration,selecting and linking accounts.
  - ▣ API connecting SACCOs will provide read-only data access.
  - ▣ Change log records details on data modification(date,username).

### 4.3 System Architecture

System architecture describes in terms of components and their interactions, to give specific viewpoint of the conceptual model and structural complexity of the system to be developed (Kasse Initiatives, LLC, 2004). Figure 4.1 gives exploratory architecture of the solution to be developed to fulfil the objective of this study.

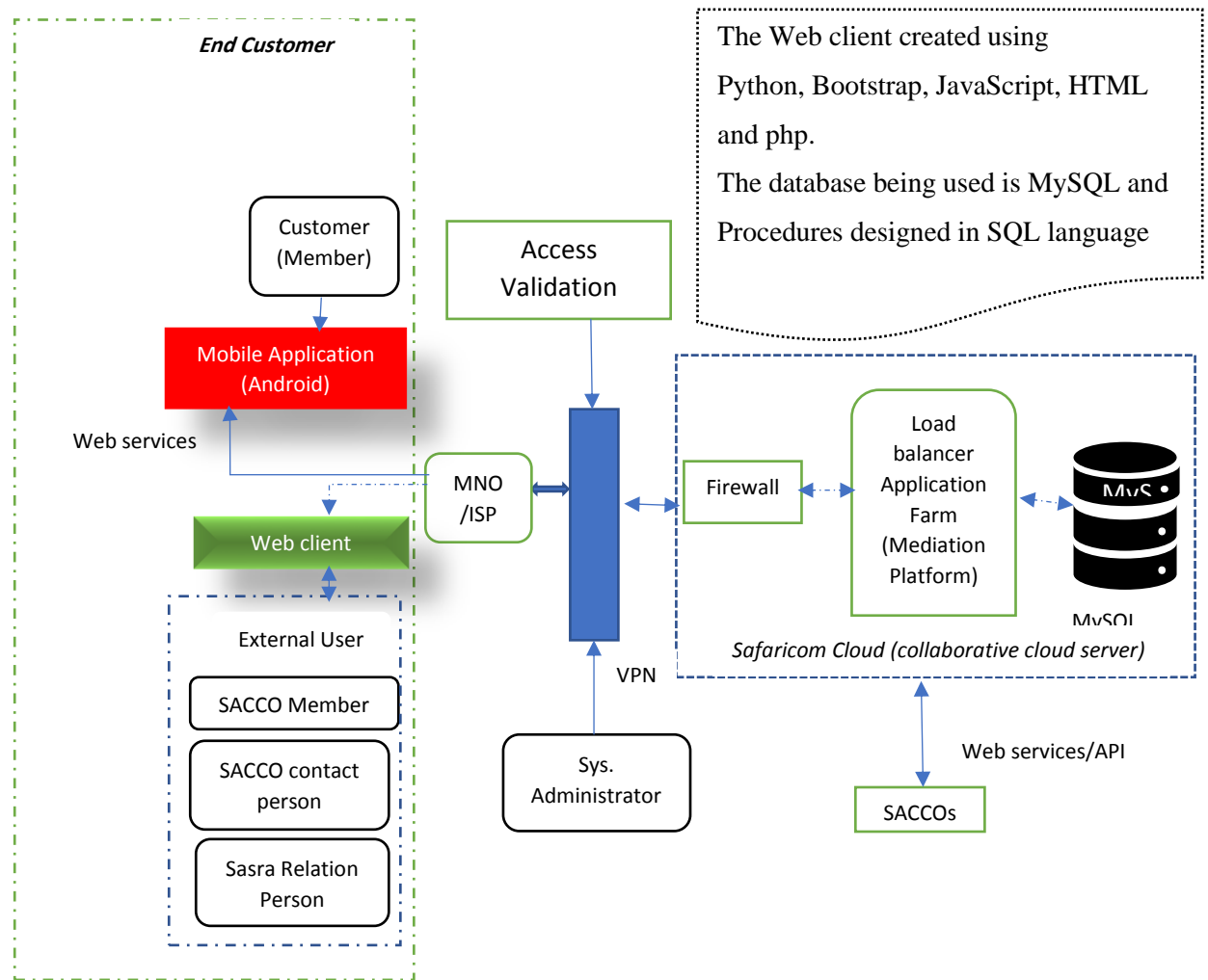


Figure 4.1: System Architecture

### 4.4 System Design

The user response was critical in the determining the requirement of the collaboration and information sharing Mobile application development by the researcher. The researcher come up with user centred components of the application with model functions aimed to meet the objective of this study. The design UML diagrams were used in the design of the application



as follows: Use Case diagram, Activity diagrams, sequence diagram, class diagram and entity relationship Diagram

#### 4.4.1 Use-Case Diagrams



Figure 4.2: Ucredit Mobile Application use case diagram

Figure 4.2 shows the interaction of the members, SACCOs, and cross SACCO collaboration and information sharing subsystems.

Followed by the Table 4.1, that shows the use case index alongside primary actors and priority, and some of the use cases are explained below.

<b>Use Case Index Table</b>					
<b>Id</b>	<b>Use Case Name</b>	<b>Primary Actor</b>	<b>Scope</b>	<b>Complexity</b>	<b>Priority</b>
1	Create Account	New Member	in	high	1
2	Login	Registered Member	in	low	1
3	View SACCO Listings	Registered Member	in	med	1
4	View SACCO Products Listings	Registered Member	in	med	1
5	User Authentication	System	in	med	1
6	Register With SACCO	Registered Member	in	high	1
7	Membership Management	Ucredit Administrator	in	med	1
8	Update Sacco Records	Ucredit Administrator	in	med	1
9	Validate User Credentials	Ucredit Administrator	in	med	1
10	View Membership Detail	SACCO	in	high	1
11	Move to SACCO	Registered Member	in	med	1
12	Apply Loans	Registered Member	in	med	2
13	Pay Recovery	Registered Member	in	high	2
14	View Statement	Registered Member	in	med	2
15	Generate Utility Report	System	in	med	1
16	Generate Invoices	System	in	high	1
17	Nominee Details	New Member, Registered Member	in	low	2
18	Register Other SACCOs	New Member	in	med	2
19	Authenticate Membership	System	in	high	1
20	Add SACCO products	Ucredit Administrator	in	high	1

Table 4.1: Use case Index table

Below is the detail description of some Use Cases as shown in the Use case index table.

**i. Use case Create Account**

The use case allows the users to create accounts on the platform and be issued with login credentials.

<b>Use Case Element</b>	<b>Description</b>
Use Case Number	1
Application	Ucredit Mobile Application
Use Case Name	Create Account
Use Case Description	The user enrolls onto application by providing his or her details in addition to details of nominee. Upon Detail validation he is issued with Login credential to be able to access the system. The user will end up being a member of a SACCO on registration with that SACCO.
Primary Actor	new member
Supportive Actors	Registered Member, Ucredit Administrator, Ucredit System
Offstage Actor	SACCO
Pre-Condition	The enrolled user is either a potential client of a SACCO or an existing member of one or more SACCO.
Triggers	The user wants to select a SACCO to invest in. The user wants to view available SACCOs in the market from the platform. The user wants to evaluate the SACCO that provides rational rates or value on its products to be able to make smart decisions on the investment.
post-condition	The member will register with Ucredit Mobile Application. Will be provided with login credentials Will be able to login If user is already a SACCO member, he will be able to view, and select a SACCO on the platform.

The user if a member of a given SACCO will register his SACCO account and ultimately view his or her summary transaction with SACCO with which she is a member and are available on the platform.

Action  
(normal flow)

- 1 The user will download the application on his smart phone.
- 2 Upon successful download the user will install the application on the smart phone.
- 3 The user will register with the application by providing personal details and profile including phone number and location.
- 6 The user may optionally add more nominee details.
- 7 The user could optionally personalize login credentials on first login.

System

- 4 The system will validate user credentials by ensuring key fields are duly filled before updating the record.
- 5 The system will generate and issue the user with login credentials after the registration details are validated by parameters provided by the Administrator.
- 8 The system will authenticate the user on change of credentials or first login.

alternative flow

- Step 1: If the user does not have android smartphone, he will not be able to download and install the application. Hence the user will have to use alternative channels or avail on android phone.
- Step 2: The user can add nominee later after getting a accustomed to his/her profile, all compulsory fields on the registration will have to be filled before updating the details, other noncompulsory details can be edited or updated later and nominees update are optional and can be changed at users wish.

## ii. Use case Login

The use case allows the user, to use his assigned credentials to access the system and validates the user credentials

Use Case Element	Description
Use Case Number	2
Application	Ucredit Mobile Application
Use Case Name	Login
Use Case Description	The user logs in to the application to check her profile, SACCO products or link self with the SACCO of choice. The user will be able to view listed SACCOs and products and if a member of existing SACCO on the platform can link his/her self with the SACCO account.
Primary Actor	Registered Member
Supportive Actor	Ucredit System
Offstage Actor	SACCO
Pre-Condition	The member wants to view her current positions on the existing SACCOs on the platform. The members want to evaluate other SACCOs rate and services terms.
Post-Condition	User will be able to register with SACCO of choice. User will be able to see his or her details on the SACCOs available on the platform. They will check the summary of listed SACCOs, SACCO products and use other application.
Action (normal flow)	1 User will login on Ucredit Mobile Application with personal login credentials

	3	User accesses his personalized details on the platform and view summary of products and SACCOs.
	4	User who is now a member can consume and process of the application.
	6	The member can check the changes as done by him or her
System		
	2	Authenticate User Login credentials
	5	The system will process the member requests and generate reports on the same.
	7	The system records every login and deducts commission at the rates set on the system.
Alternative flow		
	step2	If the credentials of the users are not valid, she or he will be given another opportunity to login to the third option before being asked to request for reset.

### iii. Use case Register With SACCO

The use case provides a chance to the first-time user to link with the SACCOs he or she is a member and also gives a chance to a new investor to join SACCO of choice.

<b>User Case Element</b>	<b>Description</b>
Use Case number	6
Application	Ucredit Mobile Application
Use Case Name	Register with SACCO
Use Case Description	If the User does not have a SACCO, can view summary of SACCOs, profiles, products and product rates thus select which SACCO to invest in and register.
Primary Actor	New Member
Supportive Actor	Ucredit System
Offstage Actor	SACCO

Pre-Condition		There has been a need to join and benefit from the SACCO platform
Trigger		Interest to get better dividend, associate with successful SACCOs, and need for cheap credit.
Post-Condition		The member will recruit self into to a given SACCO. If the user is already a SACCO member, he will optionally select alternative SACCO to join to benefit from its products. If already a SACCO member will provide account of the SACCO or SACCOs in which he is a member thus register/link the SACCO on his/her profile.
Action		
(normal flow)	1	User will login to the application
	2	View SACCOs and products available on the Ucredit platform
	3	Register to his or her SACCO if available on the platform
	4	After registration, the system will display all the user consumed products from the SACCO or SACCOs the member is registered.
	5	The user can transfer to new SACCO if he has no liability (loans)on current SACCO.
	6	The members will see rates offered by other SACCOs on the same view and statistics on benefits offered before investing with the SACCO.
	7	Requests for SACCOs not on the platform will be rejected
Alternative flow		
	step3	The user can link the SACCOs with ability:
	1	Register on to SACCOs in which he is a member
	2	If not a member of any he can select a SACCO of choice on the platform and join the SACCO.
	3	Can deregister from or withdraw from the SACCO.
	4	Can transfer from one SACCO to another if he or she has no liability with the SACCO

#### iv. Use case Membership Management

This use case allows System administrator and SACCOs view and control membership

<b>Use Case Element</b>	<b>Description</b>
Use Case Number	7
Application	Ucredit Mobile Application
Use Case Name	Membership Management
Use Case Description	The SACCO can know the new membership, recruited, converted, transferred and withdrawals.
Primary Actor	SACCO
Supportive Actor	Ucredit Administrator
Triggers	SACCOs need to know the number of membership generated or lost through the platform
precondition	The SACCO has been documented and uploaded on the platform.
post condition	The SACCO will get statistics report of the number of new members SACCO will get to know lost members withdrawn from the SACCO. SACCOs will know which of its products is highly consumed by the members and which one is rated low in the market.
Action (normal flow)	<ol style="list-style-type: none"><li>1 Member will login on the application</li><li>2 The system will present the listing of all SACCOs on the platform</li><li>3 Member will be able to expand on each SACCO</li><li>4 The system will display more information about the SACCO and the products.</li><li>5 On further query the system will present product rates of a given SACCO both for loans and savings products.</li></ol>



- 6 The member will select the SACCOs with favorable rates to move to.
- 7 The member will check the SACCO to register or move from
- 8 The user will register as new member, move to other SACCOs.
- 9 The system will process the action and allow the SACCO, to clear the member or authenticate the membership
- 10 The system indicates to the user or member clearance from the SACCO or rejection with reason.
- 11 The user will exist system

alternative flow

- Step 3 In case a member searches for a SACCO that is non-existent:
  - a He will be informed of its absent
  - b Message of request will be sent to the SACCO to request for information to join platform.
  
- Step10 The user will be requested to clear with SACCO liability before moving or entry fee before acceptance.

**v. Use case View Membership Detail**

It gives a chance to a SACCO to analyse Members investment and liability with other competing SACCOs

<b>Use Case Element</b>	<b>Description</b>
Use Case Number	10
Application	Ucredit Application
Use Case Name	View Membership Detail
Use Case Description	Before accepting of the products consumption by the members, a SACCO will have a chance to view a member load either internally or from other SACCOs
Primary Actor	SACCO
Supportive Actor	Ucredit Administrator
Offstage Actor	SASRA

Trigger		The SACCO will have the to authenticate members individually
Pre-Conditions		SACCO must update the products and services on the platform by live access(APIs).
Post Conditions		The SACCOs will be guided with risk appetite to determine which new recruit to accept and which to reject. SACCOs will be provided by the products applied or paid off by members using the platform. System will generate all the members with transaction on the SACCOs affected.
Action		
(normal flow)	1	Use request for transferred/joining or withdraw/apply loans/from a SACCO
	2	The system forwards the request to the SACCO with all the details on the user liabilities.
	3	SACCO views the member details with and responds to the request.
	4	Member will indicate acceptance of the response.
	5	System will submit the acknowledgement.
	6	The system will process the transaction and indicate action to both member and SACCO.
	7	The system will indicate process done to both the users and SACCO.
Alternative flow		
	step 3:	If the member has liability, the SACCO will request clearance of liability. If the member has liability with other SACCOs, will be requested to clear or permission for the SACCO to buy off the liability.

#### 4.4.2 System Activity diagram

The activity diagram visualizes, specifies and document the dynamics of a society of objects modelling operations flow control. Thus, shows how activities are coordinated to produce a service or achieve a process with different levels of abstraction (Felici, 2009). The researcher in this study, used Activity diagram illustrates the coordination of activities within the application, by showing the relation between use cases and operations that need to be achieved.

Figure 4.3 shows the activity diagram of cross SACCO collaboration and information sharing activity diagram giving work flows and level of complexity of activities on the platform.

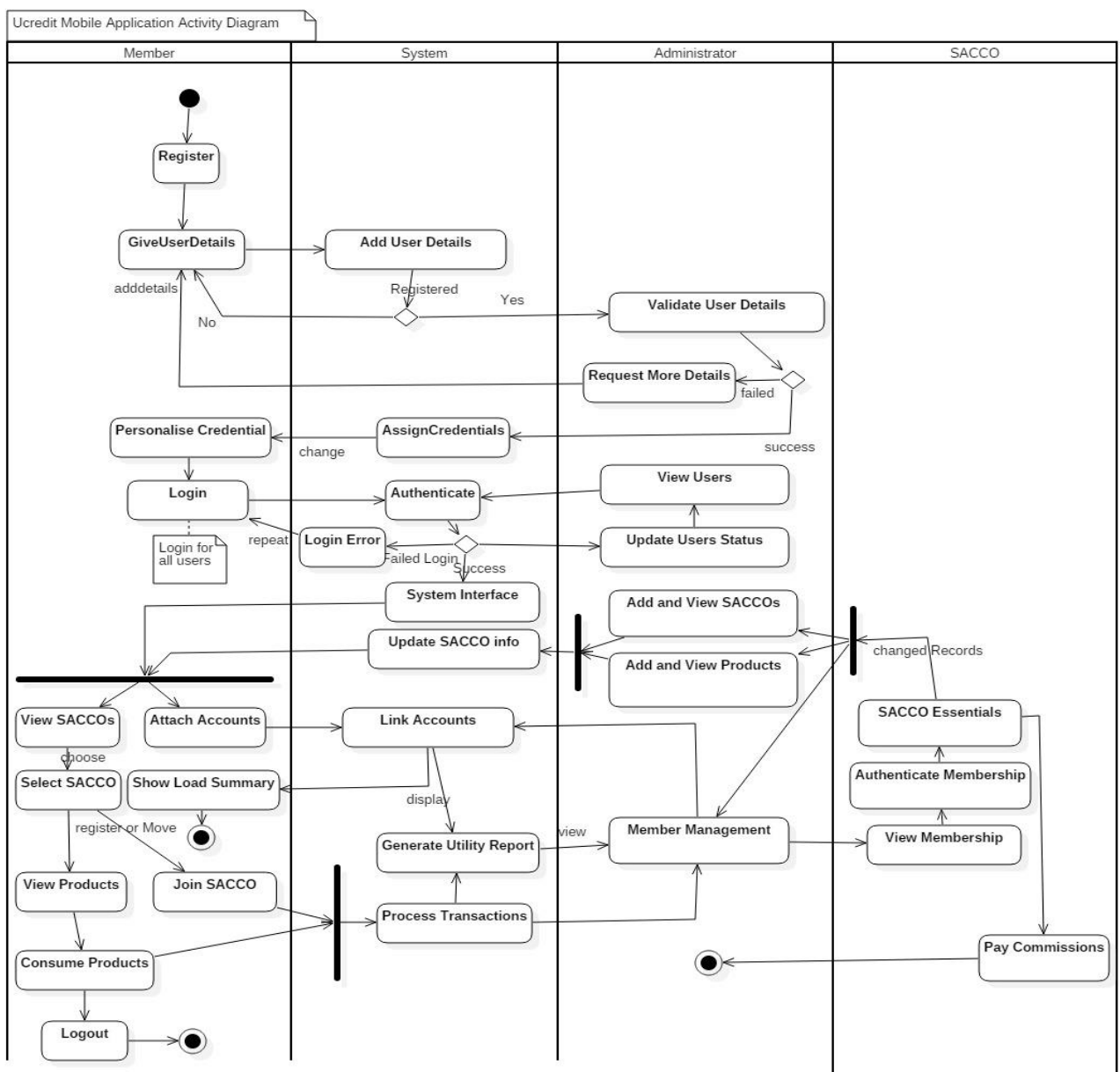


Figure 4.3: Ucredit Mobile Application Activity Diagram

#### 4.4.3 System sequence diagram

In this study the sequence diagram is used to describe some of the methods customised in this cross-SACCO collaboration and sharing mobile application design. The diagram shows the action and behaviour of this methods that enable viewing listing of SACCOs, Products and user profiles. Figure 4.3 illustrates structural aspects of the solution mobile application, clearly showing the flow of information within the modules and functions.

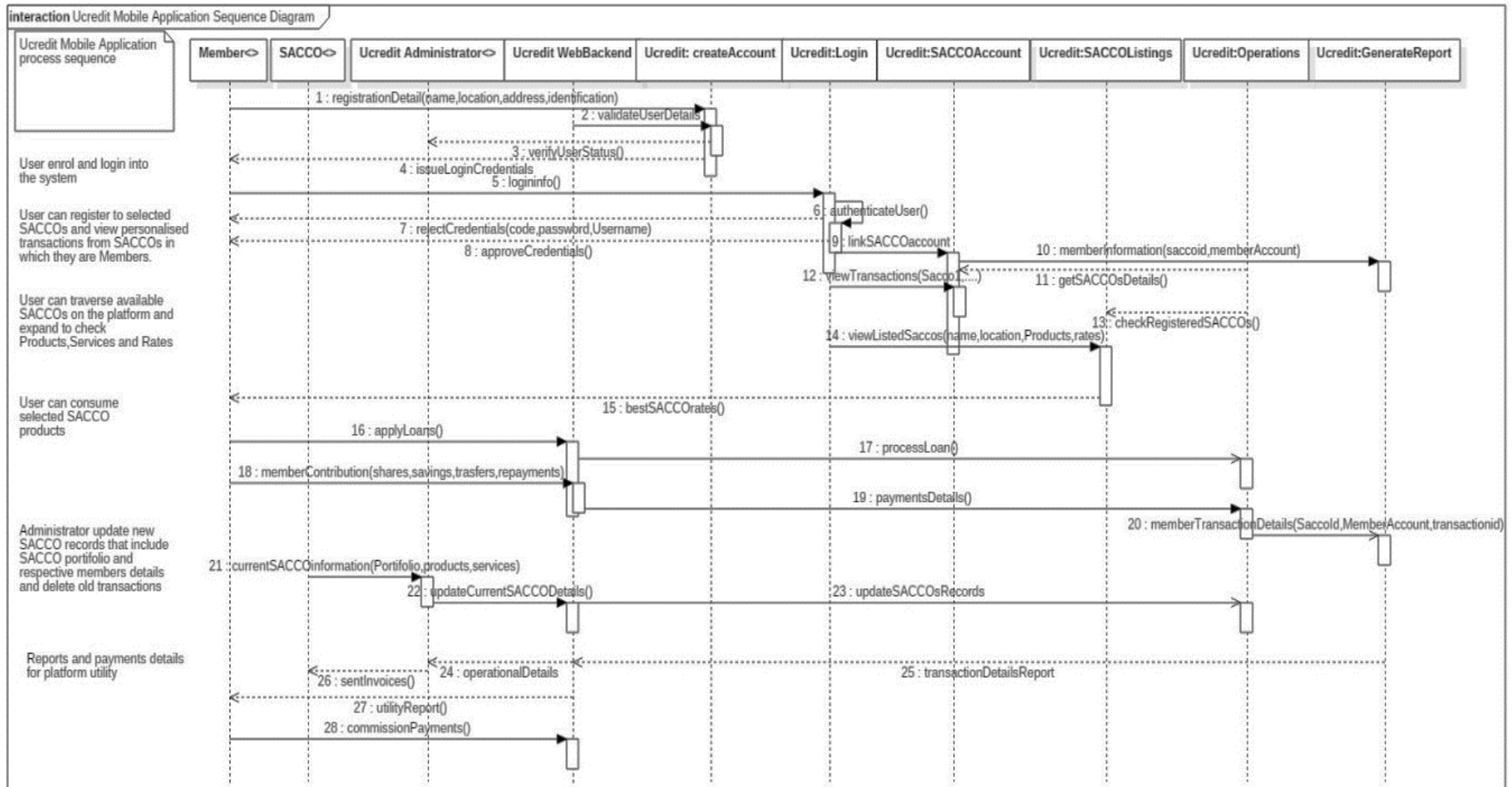


Figure 4.3: Ucredit Mobile Application Sequence Diagram

#### 4.4.4 Class diagram

The class diagram in the figure 4.4, was used to model the solution to be implemented giving the structure and behaviour of the application prototype to be developed.

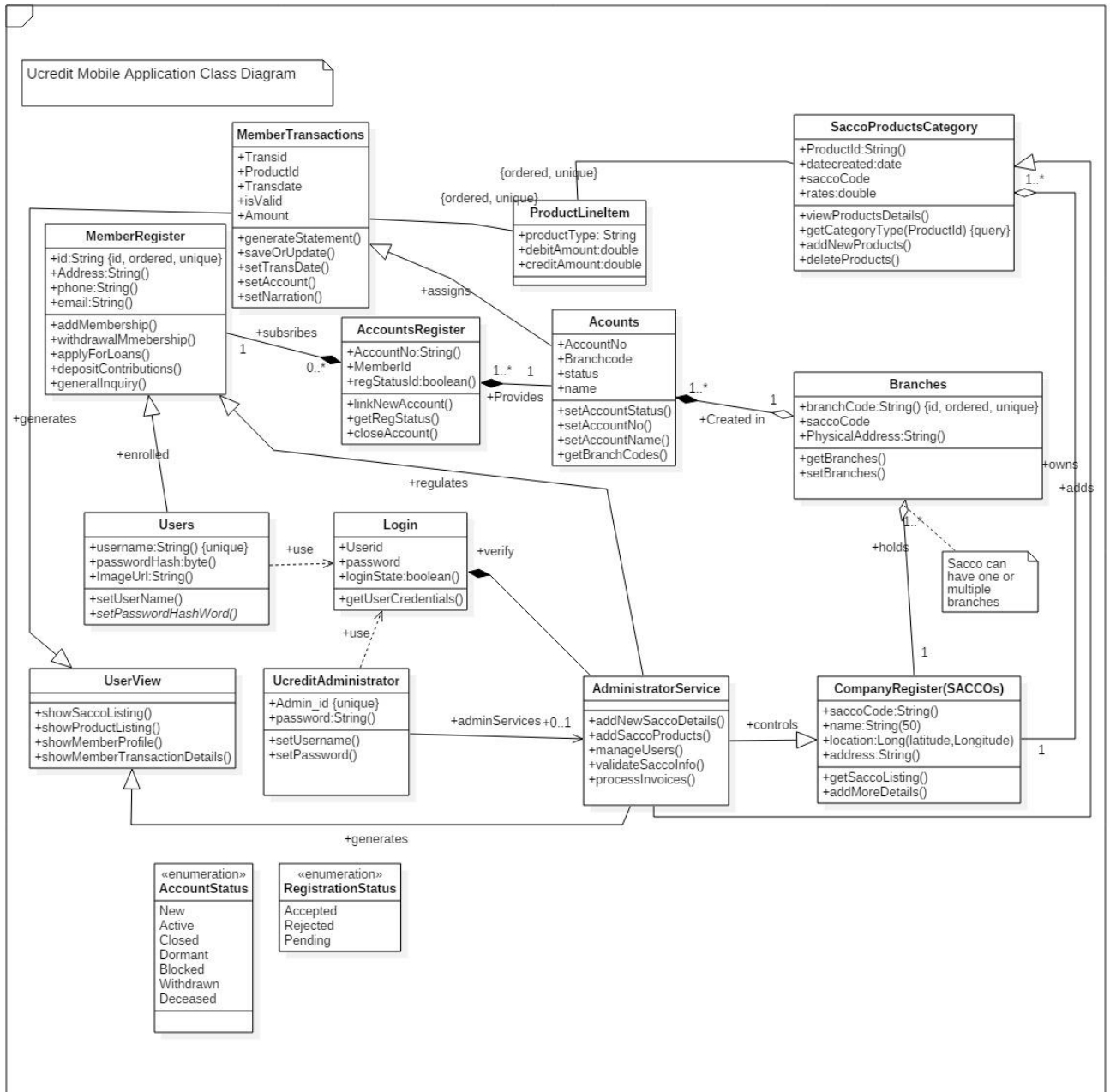


Figure 4.4: Ucredit Mobile Application Class Diagram

#### 4.4.5 Ucredit Database Schema

A database Schema is the blue print or a skeleton of the database to be created and represents the logical view of the entities, fields, attributes, views and procedures providing the framework for the database operations and contents. It defines how the database is to be organized and the way the relations among entities are associated. It the developer to perceive and formulate the constraints that are to be applied to the information.

4.4.5.1 Below is a listing some of the entities to be created

<b>ENTITY</b>	<b>DESCRIPTION</b>
LEDGER ALIGNMENT	Gives The classes, sections, category of chart of accounts. The Id is used to associate with Company Products Table
COMPANY PRODUCT	Give listing of Shared Products
COMPANY PROFILE	Contains Details of the Company including Date of registration, Member number, loan portfolio, savings portfolio
PRODUCT DETAILS	This Entity connects Company Register to the Products indicating products associated to a given SACCO
EMPLOYER DEPT	Categories Members into self-employment or employed and if employed from which segment
COUNTRY	Contains the Listing of countries
PAYMENT	Keeps record of Commission generated
USERS	Record of Users with Credentials to Log into the Application
CUSTOMER REGISTER	SACCOs member Listing registered through the Application
COMPANY BRANCH	Keeps Details of the location of SACCOs
COMPANY REGISTER	List of SACCO registered or loaded in the database
LEDGER HISTORY	Ledger item that support Member transaction and associated with Company Profile
BRANCH ACCOUNT	To contain SACCO number (Member Number) for SACCOs in the application
ACCOUNT STATE	It contains the status listing of the Accounts (ACTIVE, Dormant)
CUSTOMER LINKED ACCOUNTS	Contains unique Association between Member and a SACCO
IDENTITY	Unique Identification number and links Customer Register to Identity Documents entity
COMPANIES TRANSACTION	Contains Member transaction
ACCOUNT TYPE	List showing account Types (Individual,Joint,Group,Company)
IDENTITY DOCUMENTS	Contains List Of Identification Documents

Table 4.2: List of Entities to be implemented

#### 4.4.5.2 Entity Relationship Diagram

The Prototype solution to be developed will make use of database at the backend and below as shown in figure 4.5 is the entity relationship diagram showing the relationship between some of the tables that will be used to develop the database.

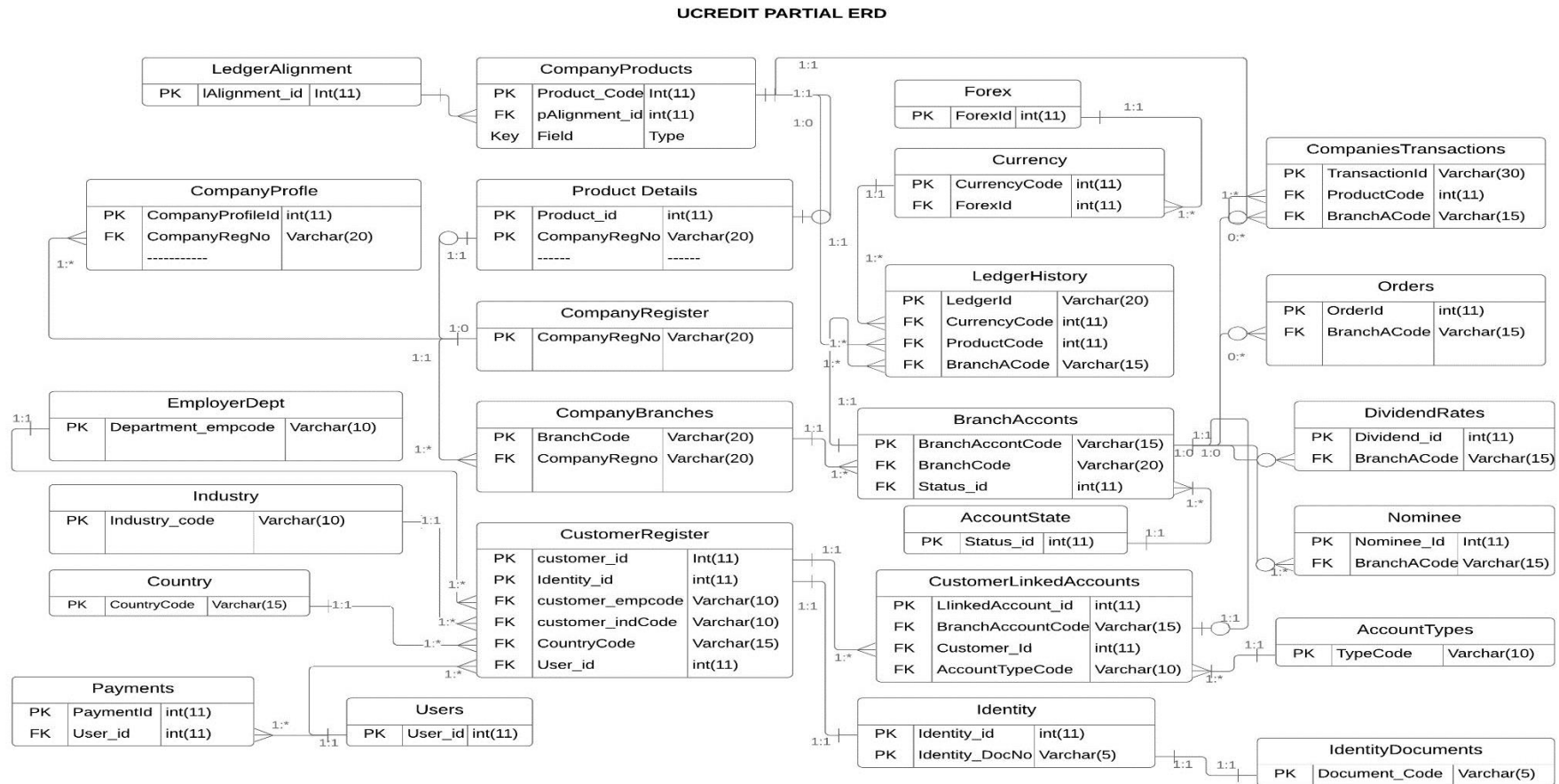


Figure 4.5: Ucredit Mobile Application Entity Relationship Diagram



#### 4.4.6 Context Diagram

Shows the general overview of the prototype application being designed and the wholesale characteristics that include entities that will participate in the application utility and flow of information between the entities. This is as shown in the figure 4.6 the context diagram below.

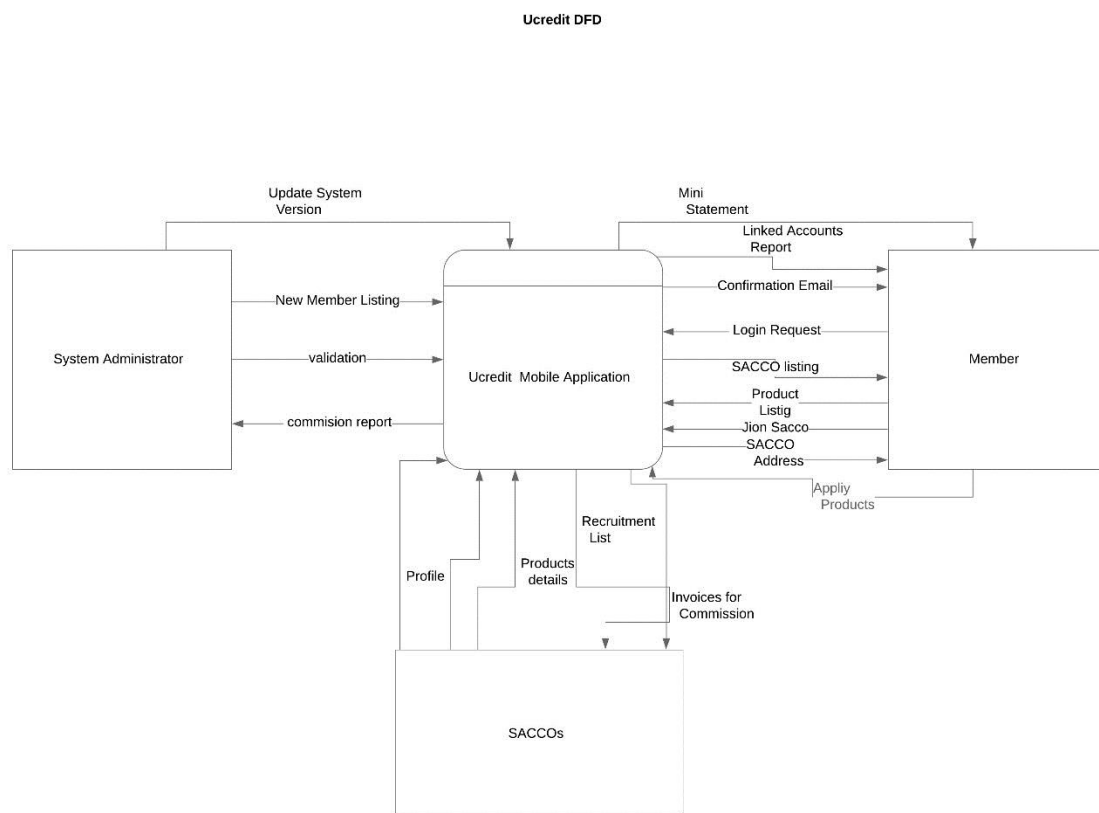


Figure 4.6: Ucredit context diagram

#### 4.4.7 Level One Data Flow Diagram

Below is partial level one data flow diagram for the application prototype being developed and it is broken down in to figure 4.70,figure 4.71,figure 4.72 and figure 4.73. They show flow of the prototype operation.

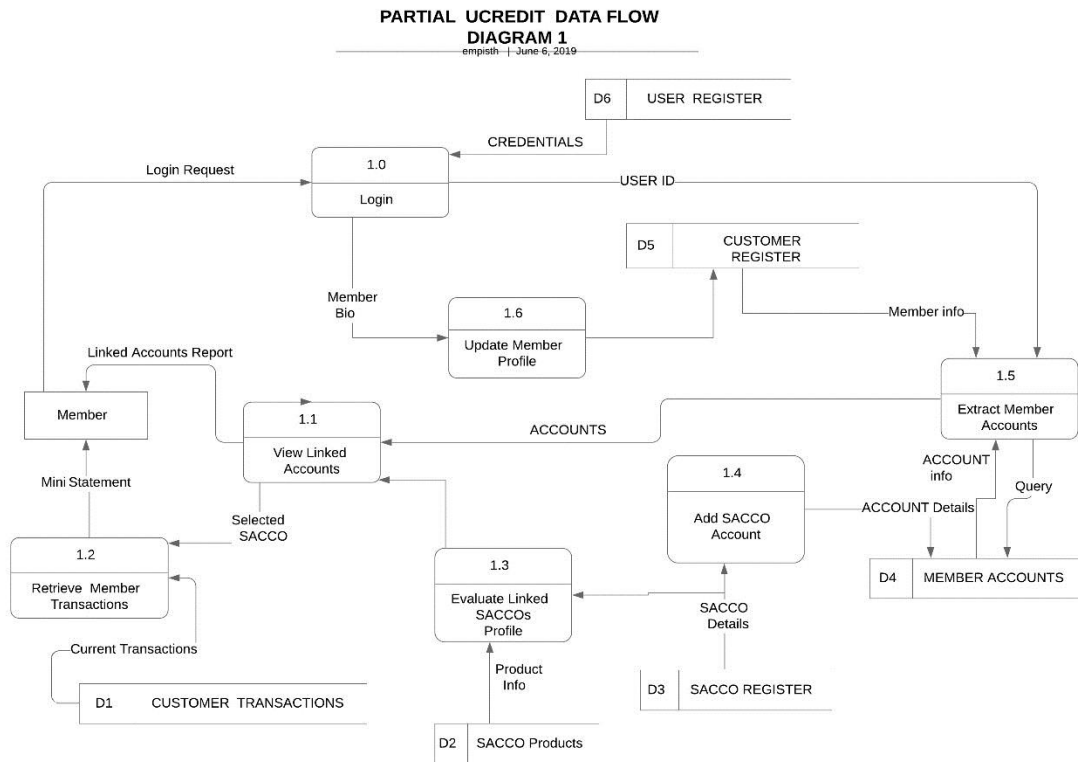


Figure 4.70: show part of level 1 Ucredit data flow diagram

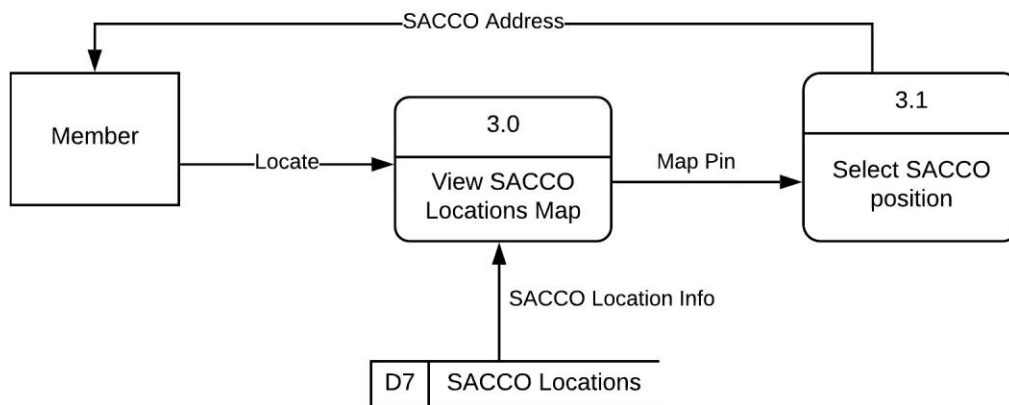


Figure 4.71: shows second part of level 1 Ucredit application data flow diagram

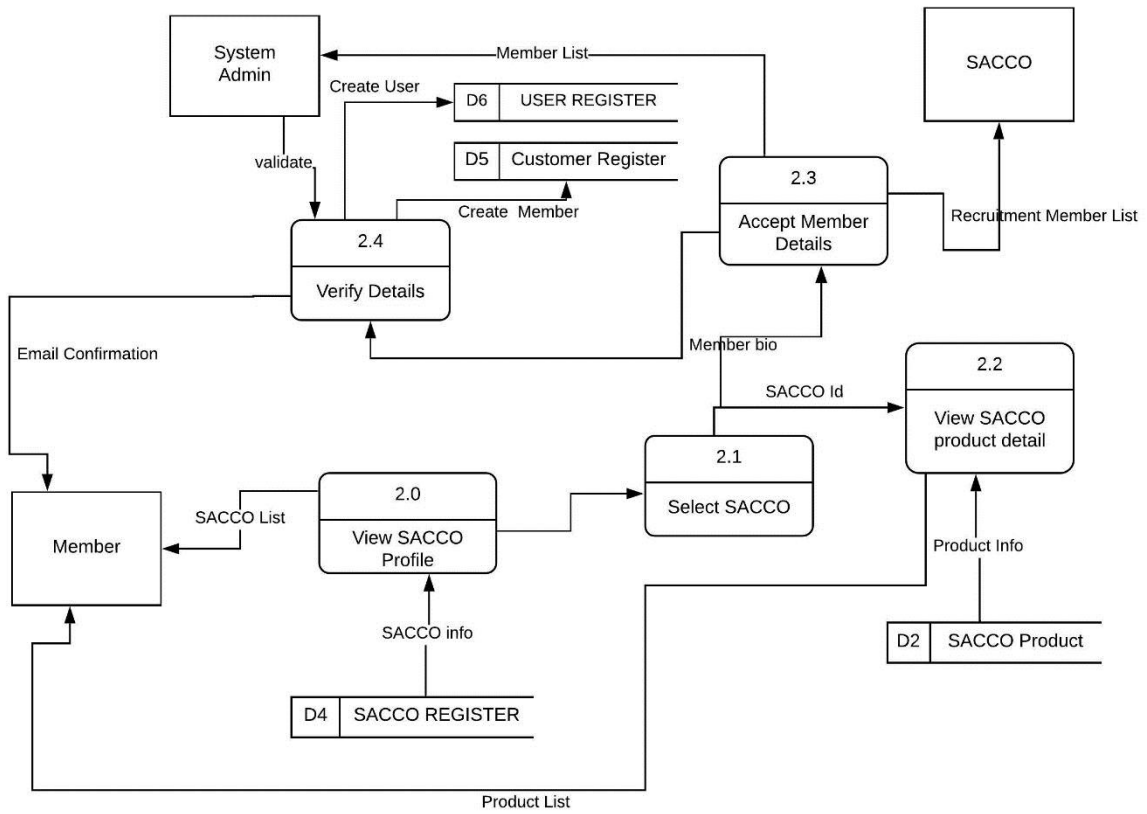


Figure 4.72: show the third part of Ucredit data flow diagram

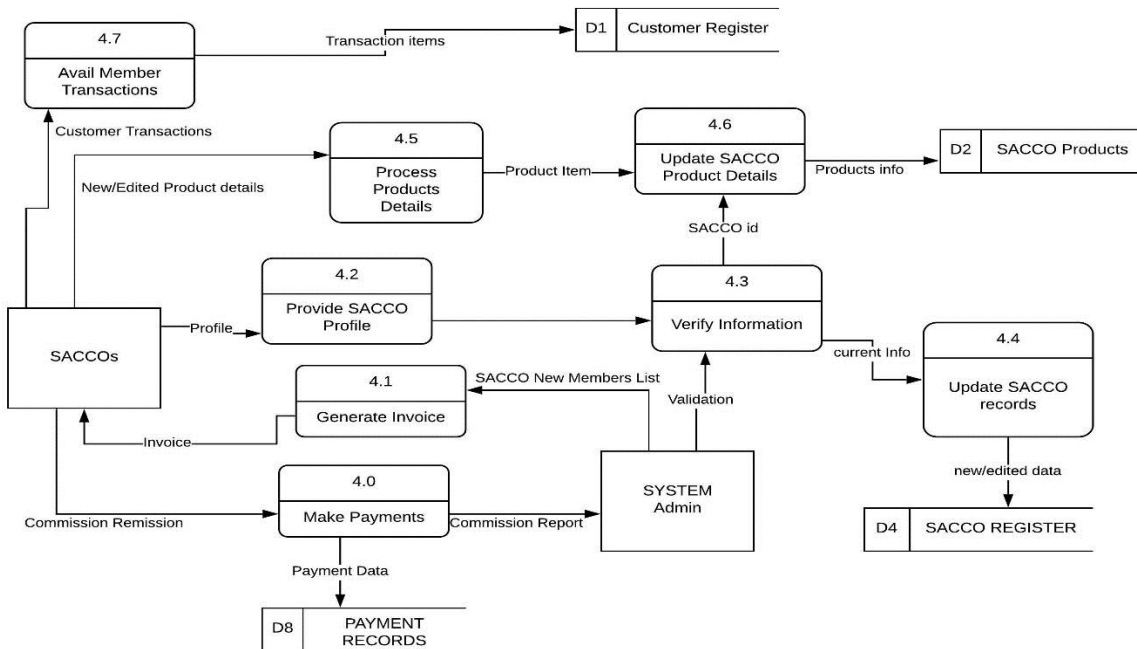


Figure 4.73: shows the Last Portion of Ucredit level 1 Data flow diagram

#### 4.4.8 Wireframes

The wireframes for the mobile application were designed using both Lucichart and MarvelApp and are shown in the Appendix B, as figure B.1, B.2, B.3,B.4 and B.5.

This are the interfaces that will be implemented and used by the SACCO stakeholders to access and view the application services and transactions.

#### 4.5 Conclusion

This chapter concentrated in the design and generally development of the blue print for the solution prototype that will be implemented to fulfil the objective of this dissertation.

## CHAPTER FIVE: SYSTEM IMPLEMENTATION AND TESTING

### 5.1 Introduction

This Chapter focuses on the implementation and testing of different modules of the Ucredit mobile Prototype, in this section the prototype of the solution that fulfils the objectives of this study is developed and the functions and usability of this proposed solution tested. Checking connection operation of the application and possibility of connecting the application server side to the collaborating SACCOs backend. The client-side application is designed based on the hybrid lean and scrum agile methodology stated in section 3.3, making use of the right sets of libraries, database design and programming methods while providing a good user experience.

The implementation of prototypes was a process that occurred in the context of many changes within development environment. It required constant change of processes as well as way of thinking in implementation of the modules, along with trials and error of differing approaches on modules as requested by the user's feedback. Some changes involved using static data that was quite different from live environment formats.

### 5.2 System Prototype Implementation

The application is split into two sub sections the client side and backend (server side), the front end is the android Mobile application that the user or SACCO stakeholder will use to access, view and update his details. The backend developed using bootstrap, PHP and python is the web part of the application that will be accessed and updated by the system administrator and third parties that include SACCO contact persons or Stakeholders.

#### 5.2.1 Mobile application

The mobile application was developed in the Android studio 3.3.2 using the Android SDK downloaded from the Android official website, powered by open source software as shown figure 5.1 dependencies used. The application is split into modules and the common modules being the APIs and animation functions that are implemented as a library. Containing classes that are useful when designing or embedding a similar functionality into adjacent classes of the application. The actual prototype application, includes functional library in java, kotlin script and graphical interfaces assets, located separately within the same package: Ke.co.cybertextdigitalcommunication.Animation, Ke.co.cybertextdigitalcommunication.View and Ke.co.cybertextdigitalcommunication.Production. The application is configured to a minimum API level of 8 and declares permissions to use the WAKE\_LOCK, INTERNET, ACCESS\_NETWORK\_STATE and CAMERA functionalities of the system manifests.

The Mobile application prototype makes use of both internal and external database, internal being the SQLite that acts as a cache in the case of unstable network connection .The main solution database is MySQL version 5.1.73 database hosted on Safaricom cloud under domain cybertextdigitalcommunication.co.ke. The database is shared and accessed using same connection PHP scripts and JavaScript object notation (JSON) files as a web service for both mobile and web sub systems. The Android studio provides functional development using java and interface design using xml layout design.

```
android {
    compileSdkVersion 28
    defaultConfig {
        applicationId "ke.co.cybertextdigitalcommunication.ucreditmaster"
        minSdkVersion 15
        targetSdkVersion 28
        versionCode 1
        versionName "1.0"
        testInstrumentationRunner "android.support.test.runner.AndroidJUnitRunner"
    }
    buildTypes {
        release {
            minifyEnabled false
            proguardFiles getDefaultProguardFile('proguard-android.txt'), 'proguard-rules.pro'
        }
    }
    dependencies {
        implementation fileTree(dir: 'libs', include: ['*.jar'])
        implementation 'com.android.support:appcompat-v7:28.0.0'
        implementation 'com.android.support.constraint:constraint-layout:1.1.3'
        implementation 'com.android.support:design:28.0.0'
        testImplementation 'junit:junit:4.12'
        androidTestImplementation 'com.android.support.test:runner:1.0.2'
        androidTestImplementation 'com.android.support.test.espresso:espresso-core:3.0.2'
        implementation 'com.android.support:gridlayout-v7:28.0.0'
        implementation 'com.android.support:cardview-v7:28.0.0'
        implementation 'com.mcxiaoke.volley:library-aar:1.0.0'
    }
}
```

Figure 5.1: Dependencies used in the Android studio

### 5.2.1.1 Login page

The users will initially register themselves on the application by entering their respective details that include names, username, password and emails. Only after registration, the users can login with their respective credentials. If authentication is incorrect, access is denied but the user will be given more chances of repeating the process or request reset as in the Figure 5.2 below. Depending on the features the user wants to access, he/she will be provided with data dynamically from the MySQL database tables. Users' will be able to update their profile, view SACCOs available on the platform with the products features, link or register with the SACCO of choice, and view his/her own load of products from the SACCO linked.

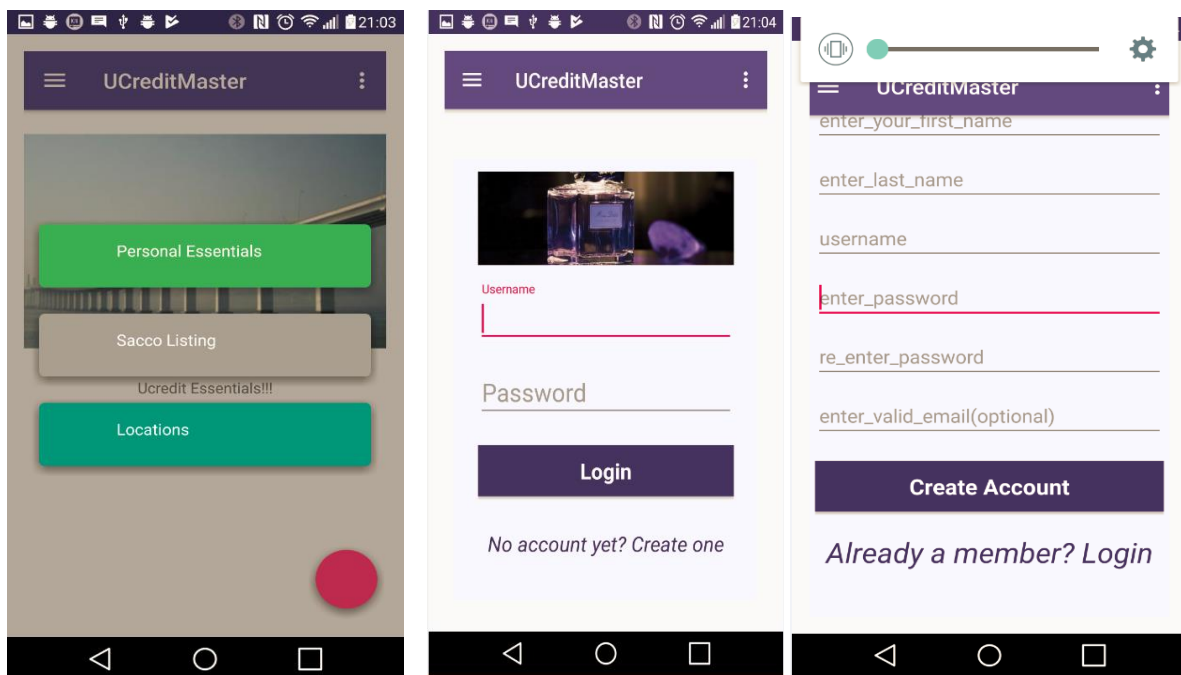


Figure 5.2: Shows Login and registration interfaces

### 5.2.1.2 Listing of SACCOs

The android application will dynamically update SACCOs as they are added on the application backend. The interface will give the user options of searching the SACCOs by Name, Regionally, Portfolio and by Sector Thus giving the user option of selecting SACCO that suite his/her needs thus proceed to register. Generally the user who will be either a SACCO member or a potential SACCO member will have three options; first he/she will be able to register and link to the SACCO(s) in which he is a member and thereafter he can view his transactions. The other option is view of SACCOs loaded on the backend database that are accessed using HTTPs inbuilt in the Android application as in figure 5.3 below. The member can also view the location of various SACCOs. Also figure 5.4 displays the view of SACCO products with parameters

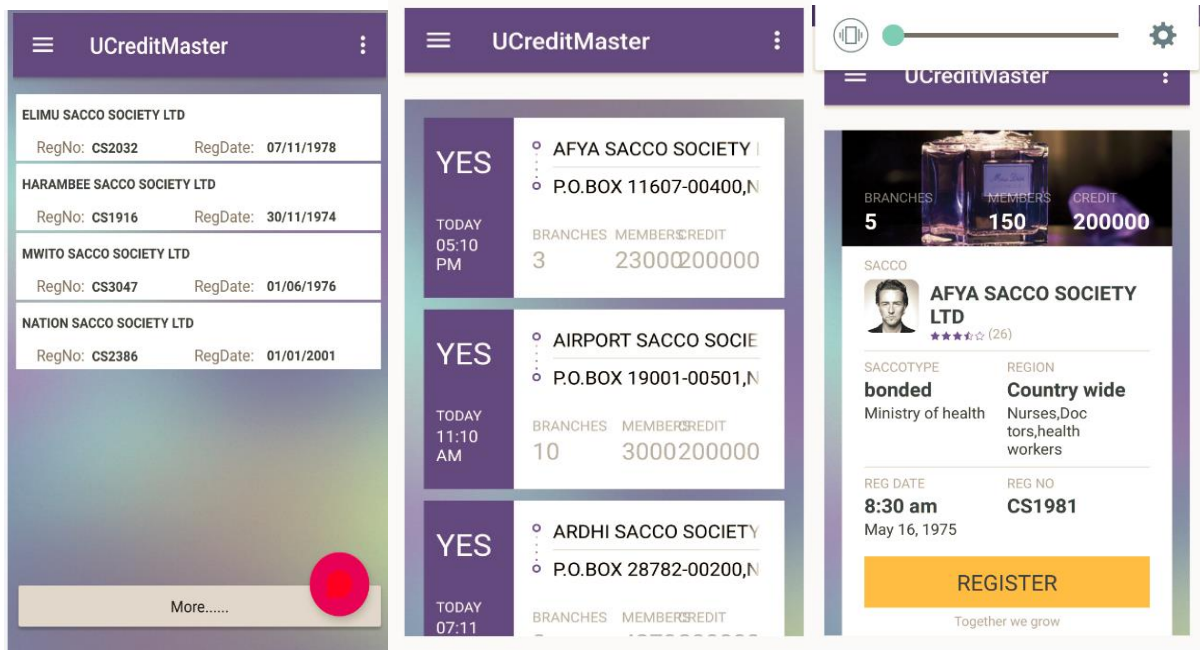


Figure 5.3: Sacco listing and option to register



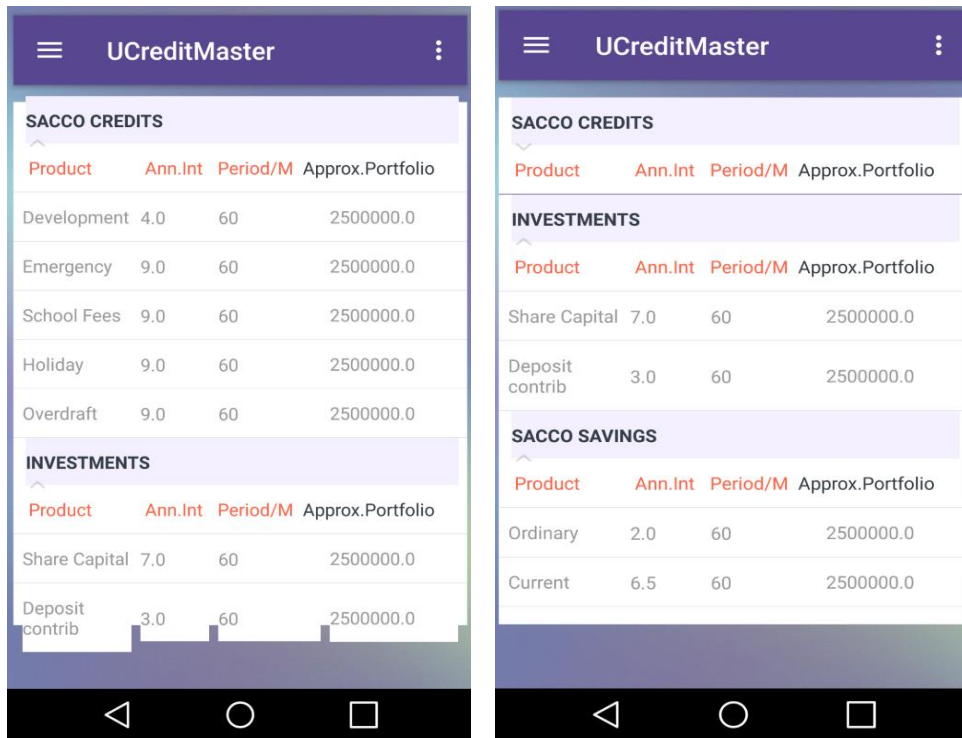


Figure 5.4: Showing Sample Categorization of SACCO products

### 5.2.2 Web Based Backend System

The Web system, is the Second sub system implemented in this study that is used to manage, control, view and update the entire solution. It is developed using bootstrap and PHP scripts, hosted on the Safaricom cloud together with the Ucredit MySQL database. The PHP scripts are used to create the web service shared also by the mobile application to access the database. This subsystem shown in figure 5.5 and figure 5.6 is mainly used by the System administrator to monitor and regulate the main application, SACCO contact person or selected agent to view and update SACCO records, and other stakeholder view his transactions.

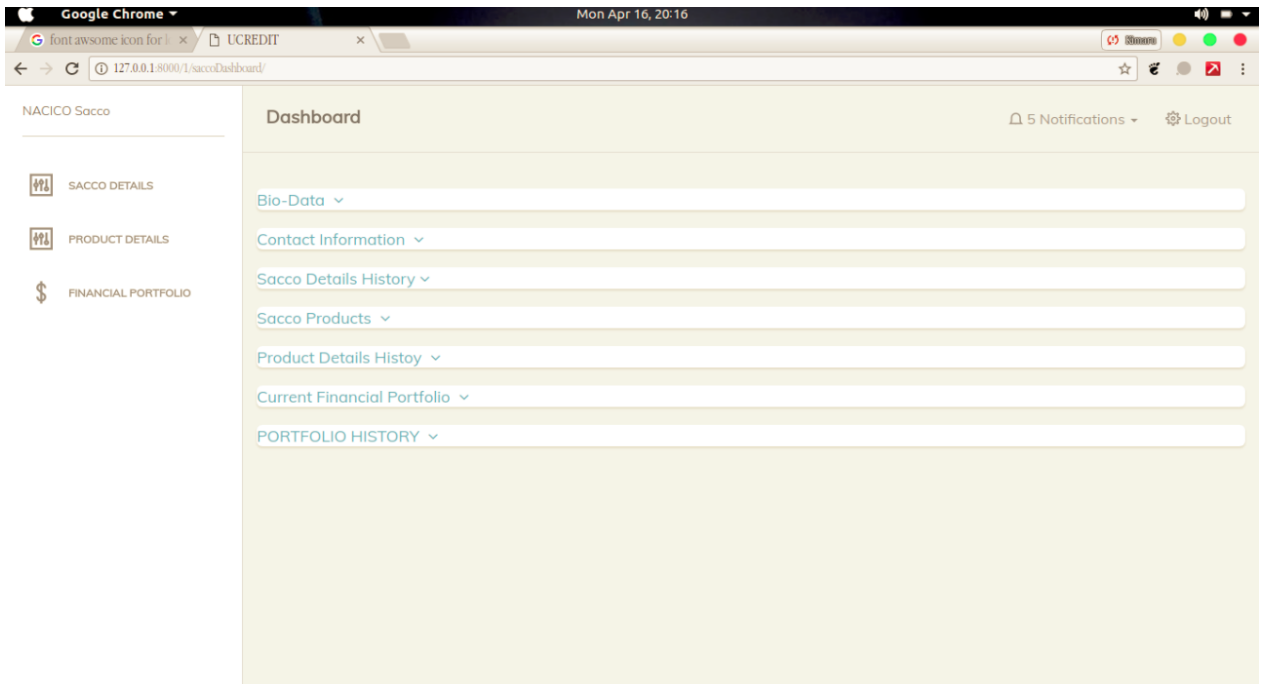


Figure 5.5: Web system Dashboard

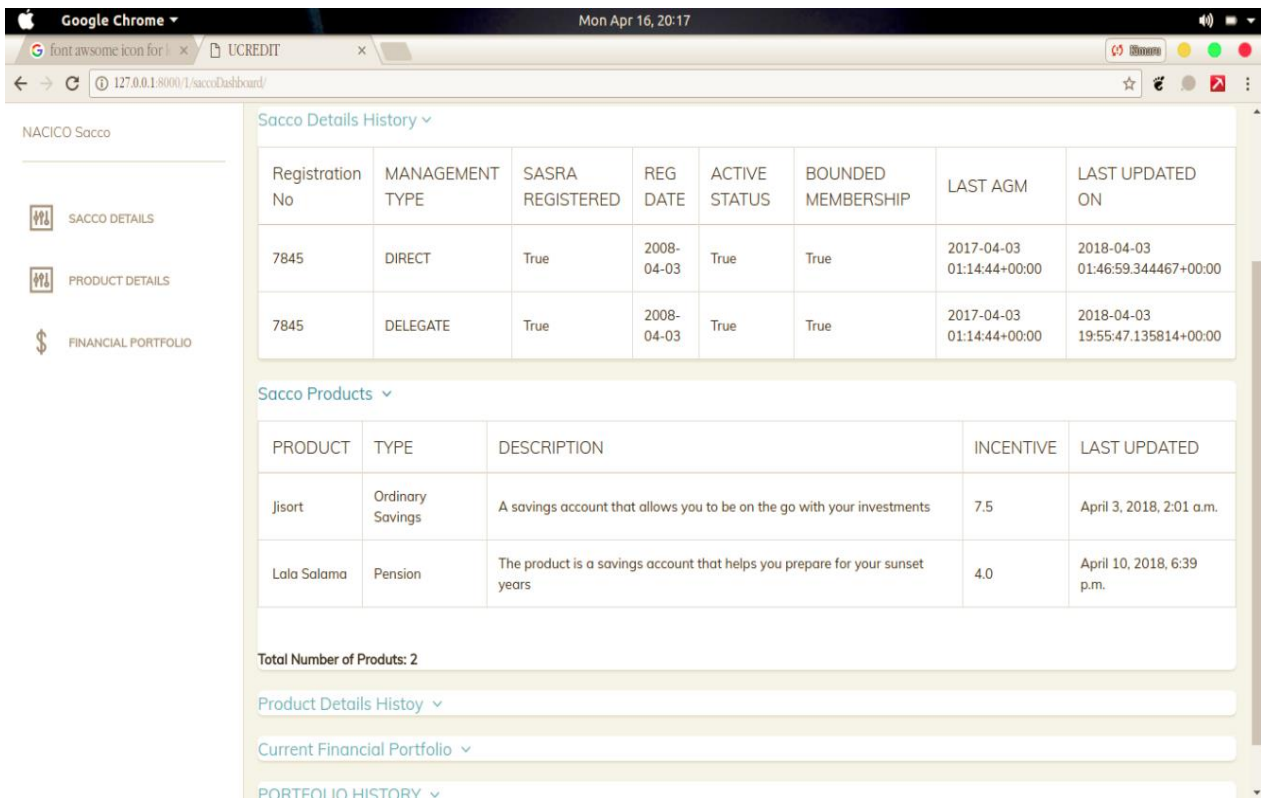


Figure 5.6: Web system Administrator products update window

#### 5.2.2.1 SACCO contact Person

The SACCO contact person has the responsibility adding, updating, view and pick any financial transactions (invoices) on the system. The credentials of the SACCO contact person will be assigned and changed by the system administrator upon application by the SACCO and a contract signed between the SACCO and system management.

#### 5.2.2.2 System Administrator

The System administrator is the main user of the web system, he authenticates users on the web system and the mobile application, and adds, reviews and update SACCO records and generate invoices for commissions depending on the subscription of membership to a particular SACCO. He validates all transaction entered and deleted from the system.

### 5.3 Solution Prototype Testing

In system testing, the Ucredit system was tested as a modular units to test its functionality. A variety of tests on the system are performed to explore functionality, to identify user problems and development bugs. It is done before and after the prototype system is put in place. As this is a prototype that has modules fully functioning, but under continuous modification due to user agile changing needs; working modules were continuously tested. This section ensures the intended objectives of this study and system requirements are fulfilled in the solution. Hence the use of grounded theory approach that allowed for emerging concepts to drive the process of revealing common themes, as well as divergent notions, from participants in order to gain an understanding of the implementation of a collaborative Ucredit platform (Creswell, 2013).

For the purpose of this study we shall dwell on the evaluation and testing of the mobile application in both development and operational environments. Since Ideas from users keep on growing through thoughtful and scientific analysis of top priority SACCOs, public policy, and credit union competitive issues. Users were given considerable latitude in their exploration and studying the prototype in order to enable segmentation of high-priority issues to implement.

### 5.3.1 Compatibility Testing

As the modules and functionality were being developed, they were built and run on application virtual device (AVD) manager on the Android studio. Multiple types of AVD were downloaded and installed thus enabling the application code to run on the simulator or emulator depicting different Android platforms from Android version 3.0 Operating system to Android API Q. The application was later executed while on development using actual mobile phones that are two different models of LG phone, Samsung edge 7 and Samsung note 9 all making use of Android operating system. The system interfaces were displayed correctly and the functionalities executed as expected. Any change on the application responded correctly on any of the mentioned devices. The devices were connected to the main local environment IDE using USB cable.

### 5.3.2 Connection Testing

Once the application is installed on the mobile phone, and the mobile phone finds internet access either using Wi-Fi or data bundles; the application could access the main domain database hosted on the Safaricom cloud. The quality of internet access determined the speed at which the mobile application could load and display information from the database.

### 5.3.3 Usability Testing

After Developer tests, the generated APK file was issued to respondents from the SACCOs found in Nairobi metro. A questionnaire was developed in Appendix A, to get feedback from the targeted SACCO population on how easy was it to install and use the functionality of the application compared with their current SACCO specific application. The reaction of the respondents on the application showed the fulfilment of the dissertation aim to develop an application that will encourage sharing among SACCOs and functions that are collaborated across all SACCOs for ease of consumption by users who are the stakeholders of the cooperative movement.

### 5.3.4 User Response

Out of targeted 43 SASRA registered SACCOs in Nairobi as estimated in Chapter 3, only 34 responded because most SACCOs staff had busy schedules occasioned by most SACCOs being in the process of closing their financial periods and preparing for annual general meeting and

member education during this first quarter of the year. Nonetheless 3 SACCOs response were discarded since they are currently on restricted licensing by SASRA. Thus, we remain with results of 31 SACCOs that represents 72.1% of the expected SACCOs with 56.5% of the responses coming from system administrators ,1.0 percent ICT Managers ,17.4% from chief executive officers, 8.7% credit managers and the others (Finance Manager and others) 16.4 %.

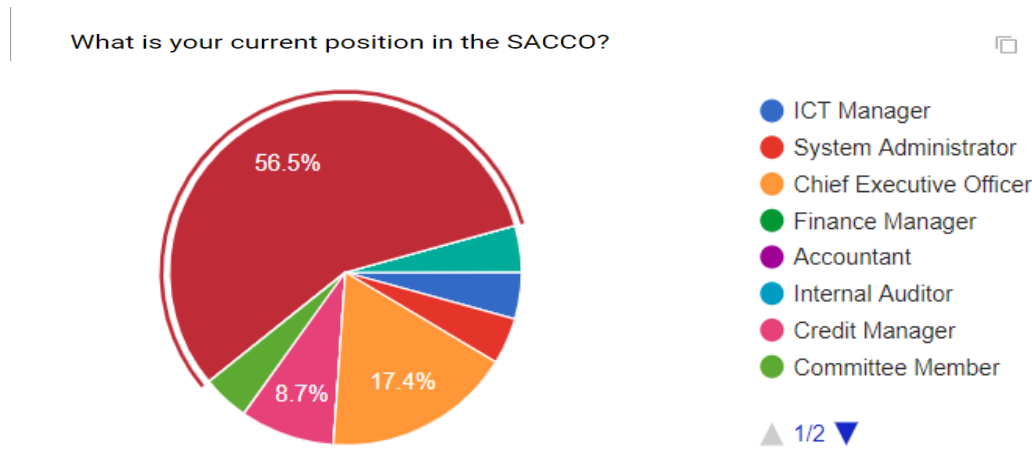


Figure 5.7: Chart showing categorisation of responses from Google survey forms

### 5.3.5 Age of respondents

With the changing environment in terms of investments, businesses and savings in Kenya, more youth are involved, it was vital for the study to examine the trends in this study areas. Majority of the respondents across the Nairobi cooperatives survey area were in the 30 – 39 years bracket (37%) while the least were in the age bracket 18-24 years (10%). The youthful generation (25-40) years contributed 72% of the total respondents, this particular group is of interest as they comprise the majority in the working population with high earning potential. It would therefore be of great interest to target this age bracket as they give more dynamic requirements for the system and they are the main user of Mobile application.

### 5.3.6 Acceptance and Performance Testing

Most users who Registered and login on the Mobile application prototype reacted positively on the new phenomenal that was projected, which is sharing of information of multiple

SACCOs on one application the ability to check products of each SACCOs. This help any stakeholder to evaluate characteristics of the SACCOs on one platform and make a positive decision on which SACCO to invest into in an efficient way. Although the data of SACCOs Loaded on the database is the information gathered during interviews but when the system prototype will be fully developed and commercialised there will be need to link through web service to the backend of SACCOs MIS .Below is the figure 5.7 showing evaluation of the prototype by the team that tested the application.

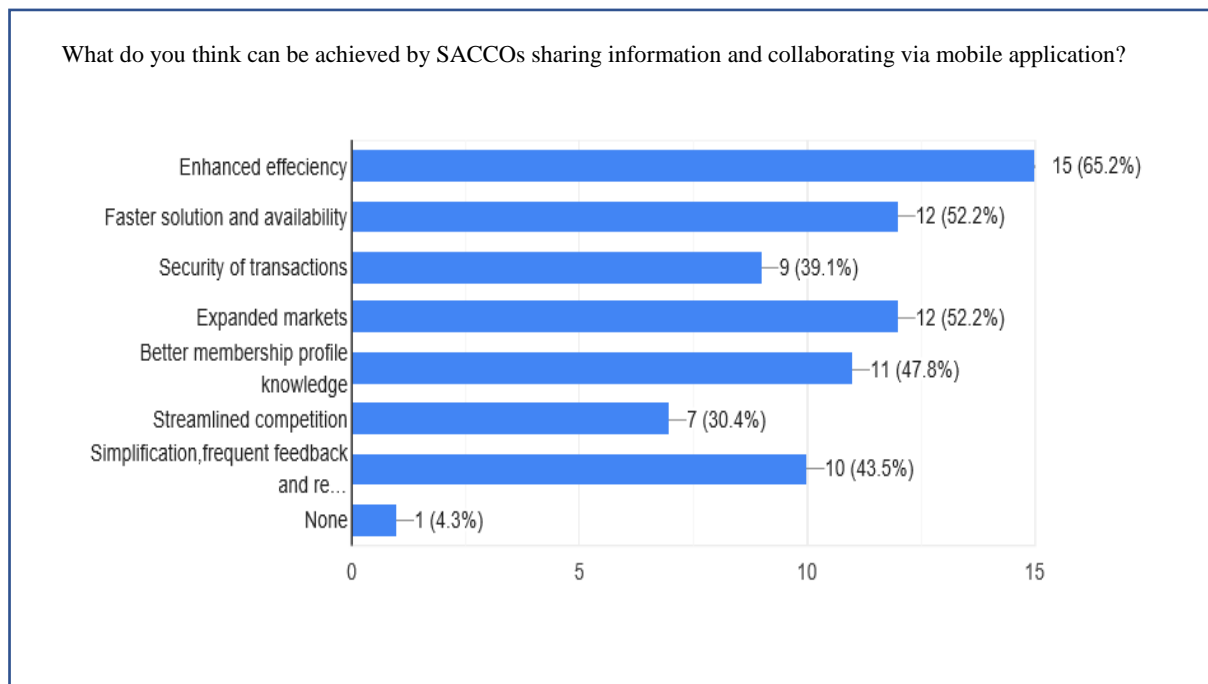


Figure 5.8: response of users

## CHAPTER SIX: DISCUSSION OF RESULTS

### 5.1 Introduction

This chapter presents a discussion of results of the study research findings in relation to the literature review and the extent to which the study research objectives are fulfilled. The feedback obtained that formed the basis of developing the information sharing and collaboration Mobile application (Ucredit).

### 5.2 SACCO Services Offered To Stakeholders

Most SACCOs operating in the regulated regime have set financial inclusion as an important development priority through embracing policies that encourage mobilization of both human and financial capital. This is made possible by SACCOs innovating financial expansion ways by coming up with creative products in credit apart from common products such as development loans, emergency loan and school fees loan to include investment such as term savings, mortgages, insurance, share capital and deposit and also long term investing on partners ventures to increase returns on members investment .Table 6.1 shows some of the common products in SACCOs with their parameters. To motivate savings SACCOs have invested in e-channels, although most of the SACCOs still prefer to have an application that contains most features of the legacy or institution based mobile application such having society colours,logo,SACCO specific products application and utility by members .

	<b>Common Credit Products</b>	<b>Interest rate % (Annually)</b>	<b>Repayment Period (Months)</b>
1	Development Loan	12%-14%	48M-72M
2	Emergency Loan	12%-18%	12M- 36M
3	School Fees Loan	12%-18%	12M- 36M
4	Holiday Loan	12%-24%	12M- 36M
5	Salary Advances	60%-240%	1M-12M
6	Overdraft	120%-300%	1M
7	Dividend Adance	96%-120%	ONE OFF

	<b>Common Saving Products</b>	<b>Dividend/Interest rate % (Annually)</b>	<b>Financial Period (Months)</b>
1	Share capital	7%-19%	12M
2	Deposit Contribution	5%-16.5%	12M
3	Benevolent	0	
4	Group Shares	14%-22%	12M

Table 6.1: Sample SACCO products

### 5.3 Information Sharing and Collaboration among SACCOs

SACCOs are organised on collaborative principals and structure, thus to acquire scalability credit union seek to create efficient operations, effective collaboration, and innovative services collectively. Hence reducing operational costs for the SACCO members who are the owners and generating noninterest revenue by providing shared non-traditional financial services. Hence the SACCOs will achieve expanded membership and large financial base through commitment to collaboration and information sharing with a sense of urgency making use of Mobile and Web technologies. Even from the survey carried out, it was clear stockholders in the cooperative movement or SACCOs within Nairobi County seek a solution that will help them share information and collaborate but they have different opinions on what should be shared and viewed on such a platform.

### 5.4 Development of an Information Sharing and Collaboration Mobile Application

The goal of the third objective of this research, was the creation and evaluation of an Android application that lets a user test and use a shared and collaborative platform .This goal was achieved by implementing Ucredit prototype that lists SACCOs, Products of this SACCOs with their rates and portfolio, allows members to create their profile by Linking their accounts in SACCOs and selecting the credit union to do business with democratically as shown in table 6.1 comparing requirements and what has been developed on the prototype. The application was developed to complement already existing localised legacy applications running in SACCOs, creating a corner stone that will match interest of users based on their area of need or desire.



List of requirements	Developed prototype
View categories of SACCOs	Credit gives access to SACCO listings and allows search.
Register to self and link SACCO of choice.	User have to register to get login credentials before linking SACCO in which he/she is a member.
Access SACCO products, check rates.	Sacco and their products can be viewed without login, so long as you start the application.
Register to specific SACCO.	On the user access the application can view saccos and products and later decide to register on SACCO of choice.
View self-profile.	On login one can view SACCO products consumed from SACCO of choice.
View member loan in SACCO and other SACCO.	Sacco administrator or contact person can view loan of a member of web system.
App with differentiated functions from common SACCO application.	The application does not perform loan application because each SACCO has self-criteria of loan application
Generic product names but specific to a given SACCO.	Products are categorised globally into saving, credit and investment to accommodate any product from any SACCO.

Table 6.2: Features of system Prototype against Requirements

## 5.5 Setback with shared platform Mobile Application

The application exhibit high technology of graphical interface that make use of complex algorithms to execute function that can only be used on smart phones with availability of internet connection to enable connectivity between the user interface and the backend of the application. While most members of the SACCOs make user on non-smart phone and have no internet access making the application not to be used optimally unless it is expanded on to USSD platform that can be used on any phone type.

The other problem is linking SACCOs MIS to the application backend, since SACCOs run different Models of MIS from different vendors, some with third party support and some without .Coupled with security concerned SACCOs are only ready to issue limited static data off the production system.

Fear of losing their members to rival SACCOs that offer better rates for their products, SACCOs tend to refuse to share their business information that include products and their portfolio since members will be accessing the information through the solution giving them competitive disadvantage.

## 5.6 Conclusion

Focused on future sustainable development, SACCO have crafted complex business strategic plans in order to expand their financial reach but the future holds for those SACCOs will to collaborate through shared platform to scale business financial and membership base by creating competitive products and services on the platform.

## **CHAPTER SEVEN: CONCLUSION, RECOMMENDATION AND FUTURE WORK**

### **7.1 Conclusion**

A sharing economy Mobile platform requires that there be a substantial number of existing or potential SACCO members and SACCOs management with technical enabled mind-set, enabling participants on such a platform to have a greater number of services, products, and member demography matches. Since a higher number of registered users on the platform will draw a higher number of SACCOs seeking to recruit members through the platform and, conversely, a higher number of SACCOs on the platform providing competitive rates on products and service will give potential consumers (Members) a variety of products and services to select from on the same platform .

The study elaborates the potential generated through enabling of collaborative sharing business model through mobile platform for SACCOs. This model boosts SACCOs and generally cooperative movement economies, development of two-sided sharing phenomenon creating a networking effect between Users and SACCOs on the platform, a sense of community among users and sharing and collaborative culture across the cooperative movement.

The ultimate goal of the cross-SACCO collaboration and information sharing Mobile application platform is a good user experience for acceptance, scalability, responsiveness, stability, availability, and providence of appropriate navigation.

### **7.2 Recommendation**

Collaborative and information sharing digital environment is a new phenomenon in the cooperative movement in Kenya and most users find it fascinating. Nonetheless it was noted that such Mobile application should developed into a complete integrated solution that allows credit unions to analyze complex data, identify trends in member demographics and behavior, provide an aggressive service to members that results in credit growth, member growth and expansion in financial, organizational and marketing sections of SACCOs.

Fulfilling the objective of providing great member services proactively and reactively from a shared platform that offers an enabling environment and then allow SACCOs to act on these insights to plan effective and execute precisely targeted campaigns that drive high response rates in member recruitment and innovative product and services generation.

### 7.3 Future Work

While the project reached its goals, there are still several ways both the framework as well as the game application could be extended and improved. This to be done on a technological business model that enable accurate revenue sharing contracts on multiple platforms in a more secure, disintermediated, transparent and in real time without hindrance of the operating system. With product services distributed through multiple physical and digital channels, ensuring a cohesive and engaging experience for SACCO membership.

Currently we have diverse models of smart phones making use of different types of operating system such as android, apple and less extend windows restricting development of sharing and charge platform complicated since one type application will be developed differently or not completely similar with features varying on different platform.

Future research should be expanded to find the possibility of implement the collaborative and sharing plat on multiple registers platform such as block chain share and charge model that is also a phenomena worldwide on other economic sector such as crypto currency and transport.

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# APPENDIX

## APPENDIX A: QUESTIONIARE

### A. MOBILE TECHNOLOGY

1. Do your Sacco own an e-channel platform with a mobile application within it?

If (Yes ): what is the name of the platform?

.....  
.....  
.....  
.....  
.....

2. Who is the vendor who developed the application?

- Locally developed by Sacco IT team
- Outsourced to a development company
- Ridding on co-operative bank e-wallet

3. Does it have other integrated features in the package such as

- MOBILE WEB
- USSD
- WALLET
- M-SURVEY

4. Which technologies are involved in your mobile application?

- Android
- IOS
- Windows phone
- Mobile web

5. Is your membership clustered into sectors? .....

If (yes): Are these sectors involved?

- Employed (both salaried and permanent) salaried

Business

Agriculture

If (no): What are the functions /sectors that you are involved on?

.....  
...  
.....  
...  
.....  
...  
.....  
...

6. What is the expectation of your stakeholders on the feature, specifications that need to be developed in to the application?

○ .....  
.....  
.....  
○ .....  
.....  
.....  
○ .....  
.....  
.....

7. Is your organisation willing to share data on the application?

If (YES). What data are you willing to share (tick all appropriate)

Members profile

Sacco products

Member transactions

- Sacco portfolio summary
- Sacco profile
- Others ... (you can specify)

## **B. SACCO CHARACTERISTICS**

8. Is the Sacco licensed by sasra?

- Yes
- No

9. Is the Sacco a deposit taking Sacco?

- Yes
- No

10. In what sector does your Sacco belong

- Land and housing Sacco
- Trade Sacco
- Education Sacco
- Agriculture Sacco
- Human health Sacc0
- Finance and insurance Sacco
- Manufacturing and survey

11. Which cluster is your Sacco as categorized by C.A.K?

- Tier 1 (Deposits above Kes 5 billion)
- Tier 2 (Deposit between Kes 1 and 5 billion)
- Tier 3 (Deposit below Kes 1 billion)

12. How many employees does your Sacco have?

- Less than 10
- More than 10 but less than 20
- More than 20 but less than 50

More than 50

13. What is the name of your website?

14. What is the name of your contact person and his/her email?

NAME

.....

EMAIL.....

.....

15. How does the Sacco pay for the mobile application development or platform?

One off

Sharing formulae

16. Do you support investment onto an independent shared platform?

Yes

No

17. What is the size of your membership?

In

general

.....

.....

Fosa

.....

.....

Those registered for e-channels?

Mobile

.....

.....



- Portal

.....  
.....

- ATMS.....

.....

18. What functions /features do you feel are required to feature on the mobile applications in order to serve better to your stakeholders?

- .....
- .....
- .....

**C. UCREDIT APPLICATION FEATURES**

19. What is your take on the look and feel of the ucredit mobile application interface?

.....  
.....  
.....  
.....  
.....  
.....

20. How could you describe its ease to use and access as compared to the current mobile that you are using?

.....  
.....  
.....  
.....  
.....

21. Are you satisfied with the functions integrated on the application?

Yes

No (comment on areas you didn't feel comfortable)

.....  
.....  
.....  
.....  
.....  
.....  
.....

22. Categorization of Sacco's on the mobile application: does it ease selection of a Sacco to invest in?.....
23. According to your Judgement, is the application integration with your SACCOs key MIS backend of any value to the Business?.....
24. Indicate what you will like to see on the application

No.	Features	Selection
1	Independent Sacco Categorisation	
2	Sacco with it Products	
3	General Products found Across Saccos	
4	Product rates of linked accounts	
5	General Products rates for all listed Saccos	
6	Summary of balance with a SACCO linked	
7	Region of where the SACCO is based	
8	Frequently selected SACCOs	
9	Allow SACCO contact to view your Load Profile upon linking to the SACCO.	

APPENDIX B: WIRE FRAMES AND TABLE

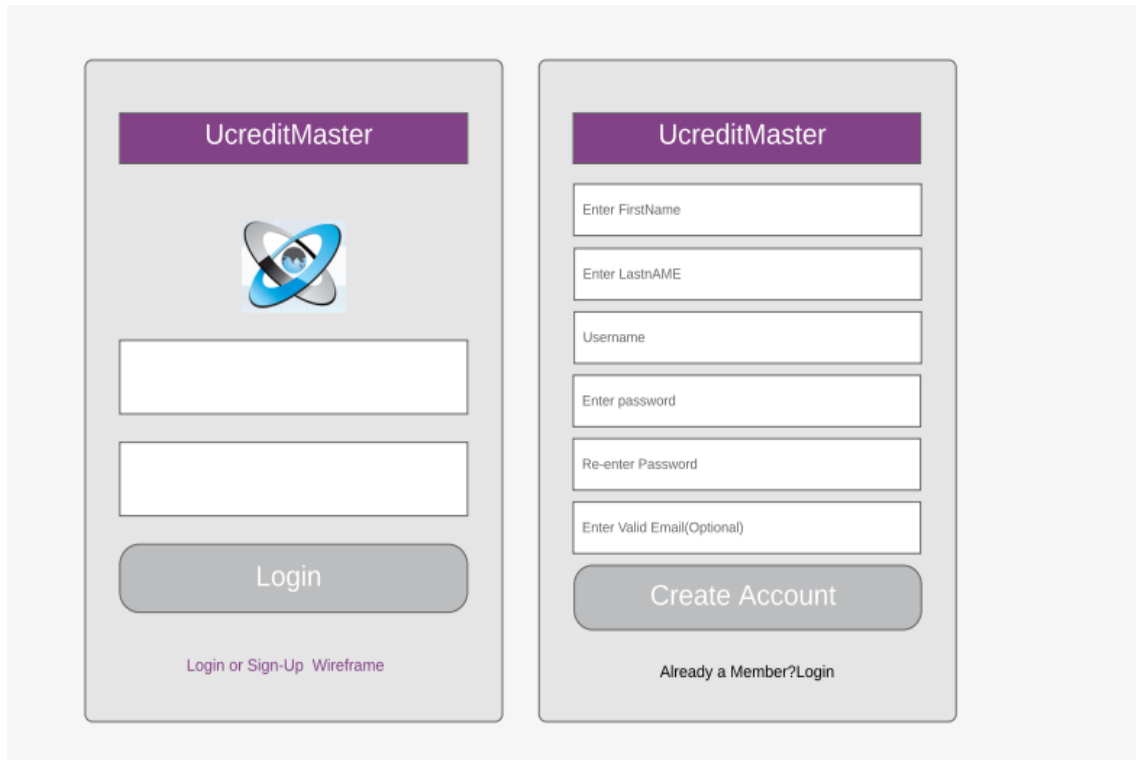


Figure B.1: User Login and Registration interfaces wireframe

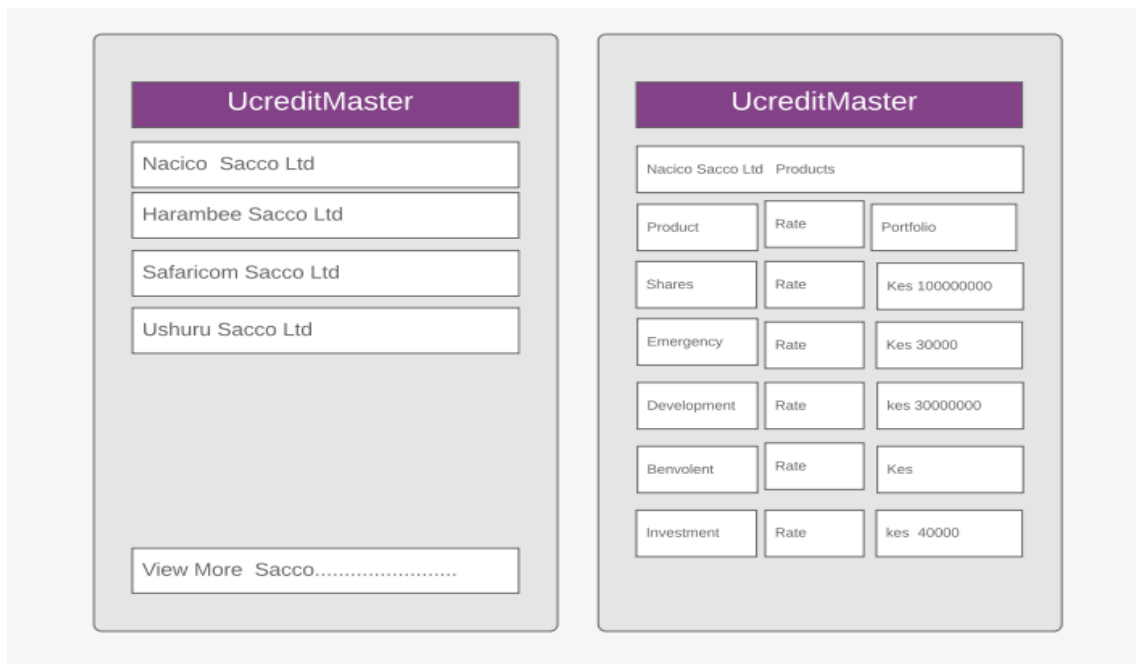


Figure B.2: General SACCO listing and Individual SACCO product List

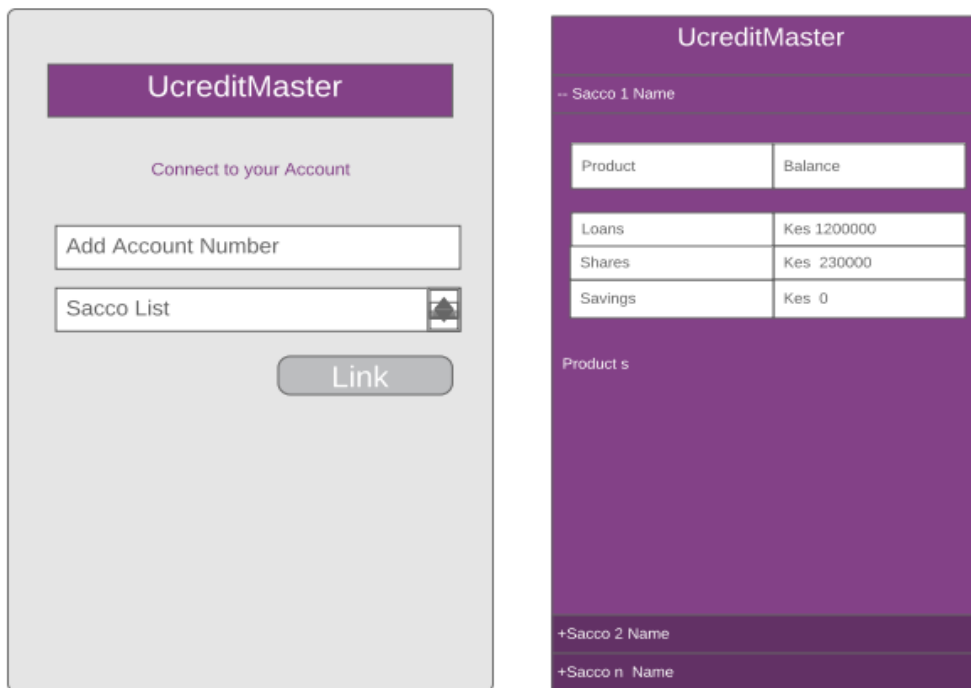


Figure B.3: Linking Account to the SACCO

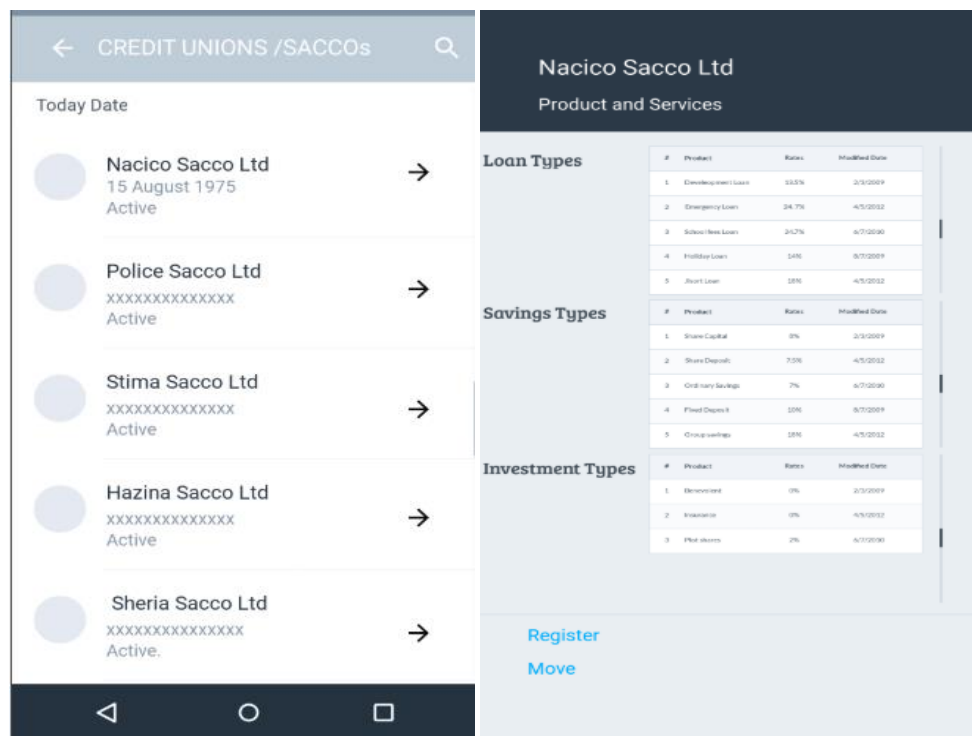


Figure B.4: Wireframe showing regional SACCOs and option to Register

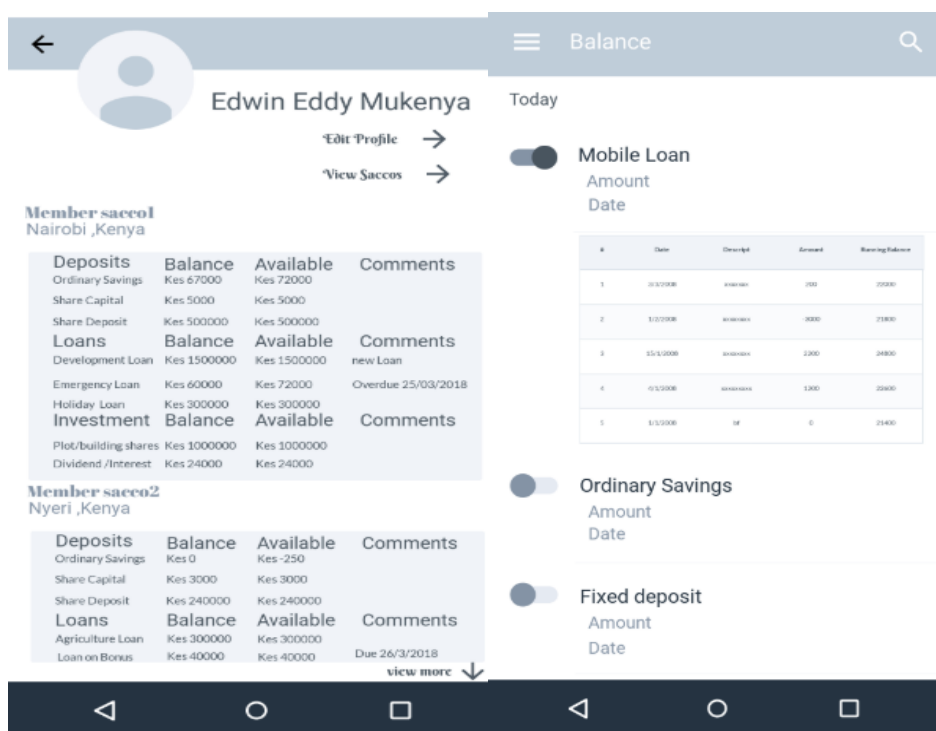


Figure B.5: Details of individual Member registered

Deposit Cluster	No of saccos	Deposits	Loans	Total Assets	Members
Over Ksh. 1Billion	6	11,046,483,449	10,139,335,505	12,468,118,790	28,150
Between Ksh.500Mn-1Bn	13	8,962,015,276	9,143,308,086	16,757,326,314	119,567
Between Ksh.200Mn-500Bn	31	8,193,104,880	8,959,459,720	12,308,224,006	52,220
Between Ksh.100Mn-200Mn	60	8,306,913,313	8,239,405,015	12,540,267,646	97,070
Between Kshs.20Mn-100Mn	365	14,766,141,167	14,433,677,945	19,279,991,675	177,928
Below Kshs. 20Mn	1,208	7,453,953,926	7,531,560,511	11,741,088,218	984,238
<b>TOTAL</b>	<b>1,683</b>	<b>58,728,612,011</b>	<b>58,446,746,782</b>	<b>85,095,016,650</b>	<b>1,459,173</b>

Table B.1: Shows performance by Non Deposit taking SACCOs as at 31<sup>st</sup> December 2017 (SASRA, 2019)