MOBILE TECHNOLOGY AND PERFORMANCE OF AGRICULTURAL PROJECTS: A CASE OF DIGIFARM SUNFLOWER PROJECT IN MAKUENI COUNTY, KENYA

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A Research Project Report Submitted in Partial Fulfillment of the Requirements of the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi

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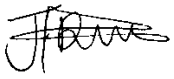
DECLARATION

This research project report is my original work and has not been presented for the award of any degree in any other university.

Signature  Date 10th November 2022

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DEDICATION

To my mother, Mrs. Salinah Ronoh for her support and encouragement throughout my studies. In memory of my late father Mr. Moses Ronoh for believing in my potential in life.

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
CA	Communications Authority
CBOs	Community Based Organizations
CICs	Community Information Centers
CIDP	County Integrated Development Plans
EAC	East African Community
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IICD	International Institute for Communication and Development
INGOs	International Non-Governmental Organizations
KIIs	Key Informant Interviews
AI	Artificial Intelligence
MSRA	Marketing and Social Research Association
NACOSTI	National Commission for Science, Technology, and Innovation
NGO's	Non-Governmental Organizations
OECD	Organization for Economic Co-operation and Development
PLC	Public Limited Company
SIM	Subscriber Identity Module
SMS	Short Messaging Service
SPSS	Statistical Package for Social Sciences
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
USSD	Unstructured Supplementary Service Data

ABSTRACT

Evaluating the level of influence of mobile technology on the performance of projects is critical to shedding new light and contributing knowledge to solve project performance glitches. This research aimed to probe the effect of mobile technology on agricultural projects' performance in Kenya. The research aims were as follows; to establish the effect of mobile applications on the performance of agricultural projects; to deduce the effect of mobile money transfer on the performance of agricultural projects, to assess the effect of mobile loans on the performance of agricultural projects, and to examine the effect of the mobile information sharing platform on the performance of agricultural projects. This research adopted a mixed-methods approach to ensure a comprehensive assembly and triangulation of requisite data to respond to the survey objectives. The target population for this research was all sunflower farmers in Makueni County who subscribed to the DigiFarm platform. The sample size for this research was 208. Questionnaires and key informant interview guides were the main research instruments used in this research. A pilot test was administered using 21 instruments that were issued to farmers in Makueni County. Descriptive statistics such as frequencies, percentages, mean, as well as standard deviation were utilized to evaluate quantitative data. Simple linear regression was used to evaluate the strength and the direction of the association linking the variables and to forecast the variance of the dependent variable centered on the independent variable. It was recognized that mobile applications, mobile money transfer, mobile loans, and the mobile information sharing platform had a positive remarkable effect on the performance of agricultural projects in Makueni County. The research resolved that mobile applications, mobile money transfer, mobile loans, and mobile information-sharing platforms influence the performance of agricultural projects in Makueni County. For further research, the research recommended the adoption of Artificial Intelligence (AI) and machine learning in enhancing the performance and sustainability of agricultural projects.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Globally, mobile technology has disrupted the planning, design, and implementation of agricultural projects. Mairura (2019), defines agricultural projects as farming ventures initiated by farmers or farmer clusters to enhance food security and upgrade their revenues. An agricultural project is generally an investment that uses financial resources to create capital assets that will produce a profit over an extended period. Investment in agriculture is not solely financial; partnerships and knowledge sharing are critical to the success of agricultural projects. According to Bulman et al., (2021), increased private and public sectors' investment in agriculture and food system, is critical to enhancing food security and nutrition, reducing poverty, and adapting to climate change. Techniques have been developed over the years to improve agricultural projects to minimize expenses, maximize production and achieve project goals and mission. Needless to say, agricultural projects are moving away from an input-intensive to a knowledge-based process.

According to El Bilali and Allahyari (2018), the introduction of Information and Communication Technologies (ICT) in 1960, marked a turning point in agricultural projects, enabling a knowledge and information-based approach to projects. The advancement of computers in 1980 contributed to information processing and decision support. Project stakeholders could have access to easy information and use electronic project tools to support projects. However, this was limited to large corporations and developed nations. Recently, the disruption of technology in agriculture, particularly mobile technology has changed the planning, implementation, and management of agricultural projects. Once these disruptive know-hows attain substantial measure, they have the prospect to swiftly hasten the accomplishment of agricultural results and provide surpluses for the smallholder community (Jeehye et al., 2020)

There has been a remarkable increase in food production since the beginning of the 1960s. Food production rose by 140 percent in Africa and 280 percent in Asia, (Food and Agriculture Organization [FAO], 2003). Further, the appetite for agricultural goods globally is anticipated to increase by 15 percent in the coming decade, while agricultural production growth is projected to accelerate somewhat faster (Organization for Economic Co-operation and Development [OECD], 2019). According to Dong, (2021), innovation adoption contributes to improved agricultural

projects leading to a constant supply of food. Besides, increased crop and livestock productivity is strongly driven by the increase in the use of chemicals, agricultural machinery, pesticides, and irrigation water among others. Despite the progress in food output, there is a need for performing agricultural systems. New approaches such as the integration of ecological and biological processes in food production to minimize the non-renewable input that affects the environment are one such way. Farmers and consumers need to make use of skills and knowledge to solve common agricultural problems. Urbanization, rising incomes, and populations are accelerating the local market for food. The export appetite for food is also increasing. Concerning technology, a growing number of farmers use mobile phones (Jeehye et.al, 2020). The adoption of mobile technology that helps improve productivity without causing undue harm to the environment should be adopted for performance benefits.

There are several factors facilitating the adoption of technologies for performing agricultural projects and farming systems. Over the past years, there has been an increase in research and expansion endeavors, improved education and instruction of farmers, faster and more economical ways of distributing, managing, and dispensing evidence and pressures from consumers, non-governmental organizations and media; all these contributing towards the adoption of technologies for performing agricultural projects. The adoption of new technology in agricultural projects leads to enhanced agricultural growth and in turn alleviation of rural poverty (Mottaleb, 2018). Recent policies relating to agriculture, research, environment, and development are also providing incentives for the adoption of mobile technology for performing farming systems. For example, environmental policies are constraining farmers' actions, in order to ensure that they adhere to animal welfare standards and public health policies. Such policies not only promote a performing environment but also improves animal product yields.

However, the adoption of agricultural technology including new machinery is rare because most farmers fear the risks and uncertainties regarding the proper application, suitability with the environment, and their perceptions and expectations (Mottaleb, 2018). Therefore, examining the perceptions of farmers on agricultural technology is essential in scaling up the technologies leading to sustainable growth and productivity in the agricultural sector. Some policies are also too stringent on agriculture, while not taking into account the environmental damages of other sectors. Research shows that many policies get capitalized encouraging bigger intensity of production by

encouraging the adoption of technologies that will increase productivity. Some of these new technologies such as the use of chemicals and fertilizers may cause environmental threats. In this case, some governments enforce environmental restraints on farmers as a prerequisite for getting sustenance but at higher levels than otherwise to recompense for harm triggered by other agricultural guidelines. Kogo et al., (2021) point out other factors that may affect the performance of agricultural projects and they include; climate change, inadequate level of education, lack of access to information on performance, as well as financial resource constraints among farmers, which slow adoption of technology and adoption of performing farming systems, especially those that require high investment.

According to OECD, (2011), industrialized countries are far advanced in agricultural research and the implementation of many new technologies. Globally, agricultural products tariffs are considered higher than average, as contrasted to other sectors. Developed countries have for decades used tariffs to protect their farmers and local produce from imports that may compete with theirs. In addition, developed countries have developed effective subsidies for their farmers for their production as well as exports. This, in turn, increases production.

In contrast to industrialized nations, the evolution, and innovation of agricultural projects in Africa have been slow. Thrall, Bever, and Burdon (2010) point out that agricultural projects in Africa were initiated in the 19th and 20th centuries by the colonial powers in Africa. However, African governments through policy instruments and improved infrastructure are now lowering barriers to entry of technology allowing cloud computing, mobile technology, computing systems, open-source software, connectivity, and other digital tools. Unlike in the past when mobile phones were expensive, mobile technology is now affordable and accessible to most rural farmers. Aerial satellites, which deliver data on mobile phones on weather forecasts, make it possible to receive data in real-time, helping manage agricultural projects. In Kenya, a good example of such technology is UjuziKilimo, a mobile technology that uses data as well as analytics capabilities to enable stakeholders in agriculture to become a knowledge-based community, with a goal of improving project performance and productivity through the precision of information (Thrall, Bever, and Burdon, 2010).

In 2018, Bidco Africa partnered with Makueni County Government and DigiFarm to launch the DigiFarm project; a mobile technology-oriented agricultural project targeting sunflower farmers

in Makueni County. According to the Makueni County Department of Agriculture (2019), the DigiFarm project was piloted among 640 farmers and entailed 941hectares, harvesting 941 metric tons of sunflower seed estimated at approximately 35 million Shillings. Bidco's role in the partnership has been to provide a ready market by purchasing sunflowers from the farmers, for use as raw material in their edible oil manufacturing business. Out of the 10,000 metric tons of sunflower seeds demanded by Bidco yearly, Makueni County has been given a 2,000 allocation by the firm, which displays an incredible opportunity for farmers to increase their production and consequently improve their earnings.

DigiFarm's role in the partnership is to provide the sunflower farmers with agronomical advice, credit facilities, and any other required extension services on their mobile phones, to help increase the farmer's productivity. DigiFarm is a mobile application that was designed out of a partnership between Safaricom, iProcure, and FarmDrive that was launched and piloted among farmers in Makueni County in October 2017. According to Safaricom PLC (2019), the application seeks to offer smallholding farmers the use of a set of evidence and financial amenities, as well as promotional products, tailored data on effective farming approaches, and access to loans and other financial amenities. According to the Makueni County Department of Agriculture (2019), the role of the County Government in the DigiFarm project has been to provide soil testing services and recruit extension officers educated in applying the DigiFarm program in farmer service delivery and equip the extension officers with mobile smartphones to enable adoption of the mobile technology platform, and for training purposes.

1.1.1 Mobile Applications and Agricultural Projects

Mobile technology is one of the fastest-growing technology in transmitting data, voice, and other services. Its impact and use have made it an important tool that we cannot do without in our day-to-day activities (Kumar, 2012). In research conducted by Euromonitor International in 2011, 78 percent of the world's households had a mobile phone. Sub-Saharan Africa had the lowest penetration with 67 percent but this is rapidly changing. According to World Bank records, (2016), 70 percent of the poorest countries in developing countries had access to mobile phones. In Kenya today, more than 20 million people out of a total populace of 42 million have cell phones; a suggestion that over 90 percent of grown-ups own a phone.

The rapid evolution of mobile networks and the internet has facilitated the development of mobile applications, increasing the functions of mobile phones. According to Pyramid Research, mobile applications are a combination of simple solutions and urbane resolutions for mobile devices, that ensure that cell phone users of differing backgrounds profit from cell phone usage (Ommani, 2005). In Kenya, farmers can benefit from mobile applications such as DigiFarm, M-Farm, I-Cow, and M-Kilimo in agricultural projects. These applications provide individual farmers with accessible agricultural extension facilities.

1.1.2 Mobile Money Transfer and Agricultural Projects

Mobile money transfer is another major evolution in mobile technology. By use of the mobile phone, it facilitates various processes including payment of goods and services, receiving salary and money transfers, and borrowing loans for agricultural projects among others. It is a great solution to the challenge of the absence of financial institutions in many rural areas in Africa. While there are few financial institutions, there are more than 74 million SIM Cards in use in Africa (Ajit, Bourgeois, and Mayer, 2015). With the adoption of smartphones and investment in technological infrastructure, there is a significant opportunity for the introduction of mobile technology that connects farmers, governments, and large corporations across the world.

According to research conducted by Jack and Suri (2011), M-Pesa, a mobile money transfer platform, has facilitated the secure storage and transmission of money in Kenya. Consequently, mobile money transfer has had several prospective economic impacts. First, it simplifies trade, making it simpler for farmers to pay for, and to receive money for products and services. Electricity bills can be settled with a click of a few buttons, other than traveling to an often-far office with a lot of cash and waiting in long lines; consumers can quickly purchase mobile phone credit - "airtime" remotely; while taxi drivers can conduct business more securely, without carrying a lot of money, since they are remunerated electronically. Second, by availing a secure storage method, M-Pesa could improve savings for households. Third, since it enables interpersonal connections, it could advance the provision of savings across households and industries by expanding the person-to-person loan industry. This could improve the typical return on investment, thereby providing a response on the magnitude of saving.

1.1.3 Mobile Loans and Agricultural Projects

The mobile revolution has positively impacted the lives of many Kenyans, by enhancing not only communications but also access to finances by means of mobile-based loans, steered by the M-Pesa structure (Demombynes & Thegeya, 2012). At the moment, 93 percent of Kenyans have access to and use mobile phones and 73 percent are customers of mobile electronic money. In addition, 23 percent utilize electronic money at the minimum once a day. An innovative prospective for mobile phone loans has introduced the growth of bank-based mobile phone savings schemes that earn interest, with an example of the integration of the M-KESHO structure.

Access to finance, which is a key tool in agricultural projects, is now easy in many developing African countries. In Kenya, the evolution of mobile loans lending applications such as M-Shwari and more recently, Fuliza and DigiFarm by Kenya's mobile technology provider Safaricom, has led to access of instant loans by farmers to fund their agricultural projects. The increase in the use of mobile phones and the internet has brought benefits including affordability, usability, mobility, instant and convenient service delivery, and voice communication among others.

1.1.4 Mobile Information Sharing Platform and Agricultural Projects

The development of small computers in 1980 contributed to information sharing and decision support in agricultural projects (Ommani, 2005). However, it was only within major cooperatives and large farms because they were expensive. The invention of mobile phones allowed farmers to access and share the information needed because of their information processing capabilities. This created new capacities for farmers and actors in the agricultural sector, who were now able to access and use the information for decision support.

Short-Messaging capabilities of mobile phones, Multimedia Messaging, voice and media mails are used to exchange weather alerts, disease, and pest outbreak controls, geographical data, and changes in market prices among others. Instant message delivery is a useful aspect of agricultural project management. For example, in Kenya, the development of a corn variety SMS service helps farmers get the recommended corn variety in their division by sending the word MAIZE (Ajit, Bourgeois, and Mayer, 2015) Innovation of 3G and 4G connectivity and broadband internet has further elevated web-based services that disseminate new agricultural practices and technologies to farmers.

1.2 Statement of the Problem

Project performance is an integral factor that determines whether a project survives or dies. As a result, project managers and stakeholders have in recent times increasingly considered incorporating the issue of performance in project planning and management. This realization has mainly been necessitated by the large number of projects that end up failing, particularly in African countries. According to (Dugger, 2007), the failure rate of World Bank's projects explains upwards of 50% in Africa, which is larger contrasted to the 40% degree of failure witnessed in additional underprivileged areas globally and shows that projects in Africa are not thriving. Besides, most African markets have been bypassed by those of countries such as South Korea and China that were worse off in the 1960s (Ika, 2012). This lag in development has been happening, even though roughly US$1 trillion of relief has been shifted to Africa since the mid-20th century (Moyo, 2009). According to Moyo (2009), this stagnation in development can largely be attributed to project failure in African countries. Consequently, the lack of performance of projects in Africa has led to controversy and disillusionment among project donors.

In Kenya, nothing short of controversy has marred development projects at national and local levels. The term "white elephant projects" denoting expensive projects that failed to see the light of day has been synonymous with many public projects. According to world bank reports on Kenya, a number of visionary projects such as the sh2 trillion Machakos metropolis, sh6 billion sugar factory in Kisii, sh300 million tea factory in Kericho, sh1 billion fresh produce in Nyeri, sh400 billion Kisumu lake transport project, Homabay's sh560 billion agri-city projects among many others are an illustration of the lack of performance in a most of Kenya's projects.

In the face of despair in executing projects, mobile technology has disrupted the Kenyan status quo by seeking to solve everyday problems facing projects. Innovations such as the mobile money transfer platform-M-Pesa, and the mobile application DigiFarm-an agribusiness solution tailored for small-holder farmers, seek to change the narrative by maximizing efficiency and effectiveness while ensuring transparency in the execution of projects. Evaluating the level of effect of mobile technology on agricultural projects' performance is critical in shedding new light and contributing knowledge to solve project performance problems. Despite the statistics showing that mobile technology can be used and the need for leveraging mobile technology, there does not exist enough research. This research, therefore, seeks to fill the void in research and act as a model for adoption.

1.3 Purpose of the Study

This research aimed to investigate the effect of mobile technology on the performance of agricultural projects in Kenya.

1.4 Objectives of the Study

The objectives of the research were:

i. To establish the effect of mobile applications on the performance of agricultural projects
ii. To determine the effect of mobile money transfer on the performance of agricultural projects
iii. To assess the effect of mobile loans on the performance of agricultural projects
iv. To examine the effect of mobile information sharing platform on the performance of agricultural projects

1.5 Research Questions

This research's research questions were as follows:

i. What is the effect of mobile applications on the performance of agricultural projects?
ii. What is the effect of mobile money transfer on the performance of agricultural projects?
iii. What is the effect of mobile loans on agricultural projects' performance?
iv. What is the effect of mobile information sharing platform on the performance of agricultural projects?

1.6 Research Hypotheses

This research verified the below study suppositions;

1. **H_0:** There is no significant relationship between mobile applications and the performance of agricultural projects.
2. **H_0:** There is no significant relationship between mobile money transfer and the performance of agricultural projects.
3. **H_0:** There is no significant relationship between mobile loans and the performance of agricultural projects.
4. **H_0:** There is no significant relationship between mobile information sharing platforms and the performance of agricultural projects

1.7 Significance of the Study

Development practitioners such as International Non-Governmental Organizations (INGOs) need research data to inform their development decisions. The data generated from this research might be crucial in informing international, national, and grass-root development practitioners on how to go about incorporating mobile technology in their projects, and an idea of what to anticipate to ensure prior and prompt planning.

This research hopes to enable the Government of Kenya to make evidence-based decision-making on policies, laws, and procedures relating to mobile technology in programmes and projects. Since donors typically exercise prudence in determining programmes and projects to sponsor, the findings of this research hope to enrich donors' partnership engagement decisions, particularly relating to donor funding for organizations that incorporate mobile technology in their projects.

The data generated from this research may be helpful for future students who would want to research mobile technology in projects, in that they might have access to secondary data to enrich the literature review, consequently enhancing their primary research. The data would also provide a knowledge pool to boost innovation and motivate students and faculty to engage in more technology-centered approaches to solving everyday challenges.

In addition, the findings of this research hope to provide learning opportunities for mobile technology practitioners in Kenya to find out what works and what does not regarding mobile technology in projects to enrich their work and provide more innovative and pragmatic mobile technology solutions. The findings of this research might also have a positive trickle-down effect on farmers since their feedback hopes to be crucial in developing better solutions to further promote innovation and the effectiveness of mobile technology in agriculture.

1.8 Delimitations of the Study

In terms of delimitation, the research was delimited to Makueni County, as it was likely to provide a statistically sufficient sample size contrasted to other Counties, given the fact that the DigiFarm Platform which incorporates mobile technology in agriculture was first piloted here and is implemented across the Sub Counties. In addition, the DigiFarm platform has been implemented in agricultural projects for a longer period in Makueni County, making it ideal for exploring this research's area of investigation.

The research exclusively targeted sunflower farmers who have adopted the DigiFarm platform and other facets of mobile technology as defined in this research. Incorporating unsubscribed farmers would not provide answers to this research's research questions. Delimiting the informants is therefore critical in accomplishing this research's objectives.

1.9 Limitations of the Study

Rains that are typically experienced around the time the investigator carried out this research were a challenge during data collection. The investigator anticipated this challenge and overcame it by ensuring that during fieldwork, she stayed warm and dry with the help of warm and protective clothing. The investigator also relied on the local weather forecast to plan her field trips and movement. Unfamiliarity with the terrain of the area was also a limitation that the investigator anticipated and overcame by doing prior exploratory research of the area through researching maps to establish the geographical boundaries and terrain and inquiring from friends who are area locals.

1.10 Basic Assumptions of the Study

The first assumption is that the informants would respond to questions and matters in the research instruments. This was warranted by assuring informants of their anonymity and confidentiality during data collection. Since the items of investigation in this research are not considered sensitive subjects, the second assumption is that the informants gave honest responses. Considering that a considerable number of farmers in Makueni County have incorporated mobile technology in their agricultural projects, the third assumption was that the selected sample would be representative of the studied population.

1.11 Definition of Significant Terms Used in the Study

The below meanings of key terms used in this research represent the investigator's understanding of the terms in the framework of this research:

Agricultural Projects- This denotes projects entailing farming activities such as crop farming, livestock farming, and poultry farming.

Mobile Applications-This refers to the m-Agri software programs that are designed for mobile phones and seek to meet specific objectives targeting farmers and practitioners in agriculture.

Mobile Information Sharing Platform- This refers to the exchange of agriculture-related messages via the mobile phone, by use of standardized communication protocols.

Mobile Loans-This refers to loans for agricultural projects that are applied for, reviewed, awarded, and paid back using a mobile phone.

Mobile Money Transfer-This refers to electronic money that is stored in computer systems and is wired electronically by use of a mobile phone. With mobile money transfer, farmers can use their mobile phones to deposit, withdraw, send money, access loans, and pay bills for their agricultural projects.

Mobile Technology-This refers to using the mobile phone as a tool to apply scientific knowledge for practical purposes. In this research, mobile technology will signify mobile money transfer, mobile loans, mobile information sharing platform, and mobile applications.

DigiFarm Projects-This refers to the carefully planned and executed set of agricultural activities carried out by sunflower farmers in Makueni County, geared towards attaining a specific goal.

1.12 Organization of the Study

The research was structured in five sections described as follows; the first chapter focused on the overview and contains the background to the study, problem declaration, reason for the research, research aims, research questions, and suppositions of the research. The section contains importance, limitations, and demarcations of the investigation, basic expectations, an explanation of important words as used in the research, and lastly, the organization of the research. Chapter two addresses the literature review and contains key areas established from the aims of the research, the theoretical framework with which the research was hinged on the conceptual framework, knowledge gaps, and the literature review summary. The third chapter addresses the methodology and emphasizes the study design, study population, sample scope and sampling techniques, study tools from which pilot testing, validity, and dependability of the research instrument were addressed; procedures in data gathering, data scrutiny measures, and ethical consideration. The fourth chapter discourses the examination of data, exhibition, explanation, and discussion of the findings, whereas the fifth chapter focused on a synopsis of results, deductions, and commendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The section served as the secondary guide towards the primary research in exploring the effect of mobile technology on the performance of agricultural projects.

2.2 Performance of Agricultural Projects

Agriculture is the pillar of the Kenyan economy, contributing significantly to the annual Gross Domestic Product (GDP). According to Simiyu (2018), agriculture contributes about 25% of the Gross Domestic Product and hires approximately 75% of the countrywide working population. Besides, more than 80% of the population in Kenya reside in remote areas and enhance their incomes through agriculture. Therefore, the performance of agricultural projects leads to the reduction of poverty through improved standards of living especially among vulnerable individuals such as the elderly, the pastoralists, subsistence farmers, and the disabled, who depend on agriculture being the major source of income. The performance and growth of the agricultural sector are crucial for the holistic development of the economy.

The performance of projects is highly dependent on their ability to meet set goals within a period and is perceived to be satisfying the project objectives. The performance of agricultural projects is critical to enhancing their continued success over the years. With technological advancement and stiff competition, agricultural projects are tasked with the responsibility of ensuring that they keep up with the market demands to gain a competitive advantage. An agricultural project is perceived to be performing when it achieves its set objectives within assigned time, and within a budget, leading to the satisfaction of client needs.

The performance of agricultural projects in Kenya has been inconsistent but faced a major decline during the 2007 post-election violence. According to a report released by the Ministry of Agriculture in 2011, the country had a deficit of 10 million bags of maize, being the country's staple food. Following the massive decline, the government introduced community-based organizations to enhance agricultural production. The community-based organizations worked with communities in identifying and taking up agribusiness opportunities by advocating for value addition, innovation, connecting farmers with markets, and ensuring access to information (Simiyu, 2018).

Factors such as the weather, demand, access to the market, pests, and available resources, determine the performance of agricultural projects in Kenya. Analysis of these factors contributes to the identification of measures that increase productivity. Weather plays a central role in determining agricultural yield and productivity. Unusual weather patterns, which include but are not limited to drought, persistent rains, and early or late frosts can affect crop growth and reduce yield (Kogo et al., 2021). The fact that human beings cannot take control of weather patterns makes it a major challenge that farmers face. However, the adoption of smart farming techniques such as mobile technology contributes to the incorporation of innovative ideas such as researching weather patterns over certain periods and planning effectively.

Access to the market is important in meeting set targets related to the performance of agricultural projects. According to Nyoro (2019), farmers adjust their productivity based on the demand and access to a market. When there is huge demand, farmers produce huge quantities to cater to the needs of consumers. However, when there is low demand, production will also drop. Besides, when farmers have a ready market, they enhance their production as contrasted to when they have to find a market, which can be difficult amidst high competition.

According to Farooq and Pisante (2019), the increased demand in food production poses a challenge to farmers who face numerous challenges including poor soil health, climate change, and pests and diseases. Pests and diseases are a significant hindrance to improved agricultural yield in Kenya. Pests not only alter production but also increase the cost of growing agricultural produce since farmers invest in pesticides. Controlling pests may require techniques that include fencing, use of chemicals, and crop rotation, which lead to improved yields.

Processes and activities such as defining project boundaries and acquiring approval from stakeholders on the execution of the project are critical to the performance of agricultural projects. Agricultural projects require the involvement of stakeholders who connect farmers to a ready market and offer financial support (Kumar, 2012). Hence, at the initiation stage, identifying relevant stakeholders and defining the process of the project is essential to the performance of agricultural projects, because it leads to a foundation of focus and clarity in executing the project. The goals and objectives set at the initiation stage also contribute to the identification of a roadmap that guides the project.

The phase of implementation entails actualizing the plans developed in the initiation phase. Implementation explains a higher percentage of project performance since it determines whether there are adequate resources and labor to conduct various roles. According to Rossokha et al., (2021), the main challenge in project implementation is the lack of financing, hence the success of agricultural projects relies upon an effective strategy of cash flow limiting the tendency to exceed the intended limits. Hence, there is a need for monitoring, control, and coordination of the techniques of project management. Activities carried out in the implementation stage, such as training personnel, assigning tasks, and the rules or standards to be observed, directly impact the performance of agricultural projects. The project implementation process should be flexible in design, to ensure that factors that are likely to affect the deliverables are minimized in the implementation of project plans. The implementation phase is therefore critical to measuring performance as it determines whether all the activities are carried out effectively.

Monitoring is critical in enhancing the performance of agricultural projects performance since it entails frequent assessment of its implementation (Wanyama et al., 2020). The assessment of the project concerning the agreed goals, standards, and inputs leads to the eradication of barriers that hinder its performance. Besides, monitoring provides farmers, stakeholders, and other beneficiaries with constant feedback on successes and problems at an early stage to enhance timely adjustments. Monitoring works towards providing regular oversight on project performance on matters of input delivery and targeted outcome. Effective monitoring and evaluation require proper planning, performance indicators, and effective implementation mechanisms, for instance, stakeholder meetings, field visits, and reporting. Monitoring and Evaluation are integral in shedding light on how a project doing with regard to efficiency, effectiveness, and impact. This ensures that project objectives are achieved and that scheduled activities are implemented accordingly.

2.3 Mobile Applications and Agricultural Projects

There are various empirical and theoretical literature identifying determinants of agricultural performance in differing contexts (Udry, 2010; Foster and Rosenzwig, 2010). Differing studies highlight the contributions of mobile applications to individuals, organizations, and countries' economies. According to Steinke et al., (2021) the digital revolution has enhanced agricultural production since access to mobile telephones has facilitated a seamless flow of information. Besides, mobile applications provide up-to-date, relevant information to farmers that will positively affect their yields and profitability. In one of their mobile development reports, Nokia recommends that to enhance development in rural areas, there is a need for the provision of access to information, interaction with institutions, communities, and other users to facilitate consumption of media and interaction with systems (Sood, 2006).

Socially, mobile applications change the livelihoods of families. Smartphones have the capability of high-resolution based maps in their applications such as Google maps. These applications are available to fishermen who can use the map in watersheds to locate their exact position. They can also communicate with their families and locate breeding grounds for fish. In one of the studies by Salia, Nsowah, and Steel, (2011) the use of mobile applications in Ghana enables fishermen to feel safer at the sea, remain in communication with both their families and other fishermen, increase their income, and expand their market. There are bigger efficiencies that can be obtained from the use of mobile applications in agriculture in terms of cost, time, quality of services, and products attained.

Mobile applications have led to the transformation of extension services. This has resulted in the alteration of the management and sharing of agricultural information. In the past two decades, mobile applications have transformed the flow of agricultural extension services. According to Baumüller (2017), the adoption of mobile technology has facilitated farming and increased productivity. Before the adoption of mobile technology, the transfer of agricultural information was a linear process. Information from the investigators and research institutions was through extension officers to the farmers. The development of radios introduced the broadcasting of agricultural information. It was followed by television allowing face-to-face customizable information. However, all these forms were costly in terms of logistical, human, and financial constraints and were not performing. The invention of mobile applications overcame limitations

of broadcast such as passive communication providing an on-demand, customized, and active communication of information (De Silva, Ratnadiwakara, and Zainudeen, 2011).

Mobile applications have also played a big role in facilitating stakeholder participation. Mobile applications are bringing in a revolutionary change for the stakeholders in the agricultural sector. Multiple actors and stakeholders in the agricultural market chains and agricultural production can now participate as a community. Stakeholders, suppliers, farmers, processors, wholesalers, and consumers can share information that is useful in the improvement of the efficiency of the agricultural value chain and contributes to innovation. Stakeholder engagement has been made easy by the use of smartphone forums and applications such as blogs, Wikis, social media support groups, and podcasts among others which provide information to farmers (De Silva Ratnadiwakara and Zainudeen, 2011).

2.4 Mobile Money Transfer and Agricultural Projects

In a research, Ayoung, and Abbott (2021) note that the failure of Community Information Centres (CICs) to involve community members affects technological interventions, leading to a design reality gap. Rural informatics practitioners develop Information Communication Technology (ICT) solutions based on what they perceive as challenges to the end-user, rather than exploring the rural community's information needs. This is one of the reasons for the underutilization of mobile money transfer platforms in rural areas. Without establishing a needs assessment model before implementing any kind of technology, a project will be unprepared to anticipate and address any challenges in the adoption process. As Mutinda, Gatotoh, and Keiyoro (2019) point out, there is a substantial positive affiliation between the level of technology preparedness and intent to use the system.

Bridging the design gap entails the development of an ICT intervention to be deployed across communities so that efforts undertaken by rural communities are addressed (Ayoung & Abbott, 2021). Ensuring that communities have strategic ICT-based facilities leads to easy access to information and eliminates marginalization. Lwoga, Ngulube, and Stilwell (2010) confirm that regular research should be done and local people considered the design and development of agricultural technologies to increase the use and adoption rate. Engagement with the farmers and understanding their information needs leads to better technologies that will serve them better.

The government of Kenya has made efforts in recent years to improve its policies on ICT. The lack of clear ICT policies and poor harmonization in the past years led to the adoption of different systems and standards, duplication of effort in ICT, and a waste of national resources. According to the World Bank report, (2008), the lack of strategies and ICT policies in developing countries is one of the reasons for the slow development of ICT in Africa in comparison to other industrialized nations. The report articulates policy areas toward harnessing ICT in Kenya, including legal regulatory framework, strategic ICT leadership, ICT infrastructure, human capital, and universal access.

According to the East African Community (EAC) report (2009), a key task in the adoption of cell phone technology, including mobile cash transfer is the lack of ownership in the implementation of existing ICT policies. Usually, the policy framework does not well articulate the institutional and governance structures for implementation. There is also a lack of capacity for coordination of policies among government ministries because of competition for resources among government agencies, departments, and ministries. Therefore, there is a need for a review of policies to address the weaknesses in the ICT sector. A review will build synergies and foster regional cooperation in the development and implementation of ICT policies, including those touching on mobile technology.

Attitude is a critical psychological concept that contributes to technology adoption (Gatotoh, Gakuu, and Keiyoro, 2017). Ensuring that farmers have the right attitude towards technology will go a long way in facilitating its adoption. There is a perceived inability to demonstrate a linkage between the profitability of technological adoption and performing production at farm levels. Demonstrations and instructions of new technology benefits in a controlled setting such as university research farms may not be enough to demonstrate to farmers the benefits of mobile technology in productivity and performing farming. Profitability is a major concern for most farmers (Siyao, 2012). However, due to the uncertainty of the effects, policy, and market context of technologies, it is difficult for farmers to consider whether to invest in them. The opportunity for farmers to witness profitability in a technological investment by a fellow farmer with similar resources and facilities may be helpful in decision-making and adoption of mobile technology, (Siyao, 2012).

According to Krell et al., (2021), failure to recognize the psychological component of technology adoption is a barrier to the adoption of technology in agriculture. There is a need for the education process to take place on the farmer's land to showcase the real-time benefits of mobile technology. In addition, the educational process should recognize the importance of the psychological component, as the generation of knowledge is not equal to the diffusion and adoption of knowledge. The adoption process requires recognition of cultural, social, personal, and institutional factors. Scientists and innovators should adopt a systematic adoption process from creating awareness, provisioning information and knowledge to farmers, evaluation, trial, and finally adoption.

2.5 Mobile Loans and Agricultural Projects

Kenya's increasing mobile adoption and usage is an indispensable tool for empowering citizens especially those in rural areas. Policymakers, scholars, and mobile phone companies view mobile technology as a poverty eradication tool since it has helped small and large holder farmers in enhancing productivity (Issahaku, Abu, & Nkegbe, 2018). However, mobile technology cannot achieve remarkable objectives if environmental factors are not put into consideration. According to Zastrow, Kirst-Ashman, and Hessenauer (2019), the social environment has a significant impact on human behavior such that the desired behavior cannot be achieved if the set conditions within the environment do not facilitate the desired behavior. Therefore, an assessment of the conditions of the environment is the first step toward any successful use of technology in agricultural projects.

Mobile phone access is a key factor in accessing mobile loans. Subscription rates are indicators of mobile phone access in a country. According to Makau (2012), the subscription rates in Kenya are unique and 37 percent lower than the total subscription rates in other African countries. However, access to mobile phones in the country is more common through sharing. In a nationally representative survey in 2009, 85 percent of the informants at one point used a phone, although 44 percent owned a phone (Wesolowski, Eagle, and Noor, 2012). A majority of farmers in the rural areas are low-income, thus phone sharing is more prevalent among farmers who are within low-income groups. In another research of Kenyan agriculturalists, one-third of the population possessed a handset and 84 percent had operated a phone (Okello, Okello, and Ofwona, 2010). Although ownership of a mobile phone in rural areas is not as high contrasted to urban areas, the use of mobile phones is more or less the same as that in urban areas.

According to a GeoPoll Survey Report (2018), of the mobile owning population in Kenya, 53 percent own a smartphone, with the Android system being the most common operating system. It was observed that younger farmers were more likely to own and use smartphones than their older counterparts. An increase in the use of smartphones is an indicator of the use of mobile loans in agriculture. Farmers with smartphones have access to mobile lending and banking services, WhatsApp farming groups, and farming applications. GeoPoll observes that mobile lending and banking services are the most prevalent services used by farmers; perhaps due to the M-Pesa connectivity throughout the country (GeoPoll, 2018).

While infrastructure remains a major challenge in Africa, one significant milestone is mobile phone coverage over the past decade. The adoption and coverage rate of mobile technology exceeds the coverage of other technologies including landlines, newspapers, and radios (Jensen, 2010). According to Gatotoh, Gakuu, and Keiyoro (2017), mobile telephony has indeed transformed interpersonal communication and the way individuals interact with their social-economic environment. In the past decade, the number of mobile phones per 100 people has outnumbered the existing technologies in developing countries (Aker and Mbiti, 2010). In 1999, fewer than 10 percent of Sub-Saharan Africa had coverage of cell phones, rising to 60 percent in 2008 (Aker and Mbiti, 2010). Despite the development, there is limited growth of mobile coverage in rural areas due to poor infrastructure and high prices of mobile phones. According to Ramburn and van Belle (2011), Mauritius, which is one of the most advanced countries technologically, has not yet registered 100 percent mobile subscribers.

In Kenya, the adoption and usage of mobile technology are spontaneously growing. According to the Communications Authority of Kenya (CAK), by the end of June 2011, Kenya had 25.27 million registered mobile phone users (CA, 2011). Souter, Scott, and Garforth (2005), in a survey conducted in Tanzania, Mozambique and India present insightful experimental data on the utilization of handset technology in the mentioned nations. The outcomes specify the significance of mobile technology in disseminating information, as well as its impact on livelihoods, economic performance, and relations with the government.

2.6 Mobile Information Sharing Platform and Agricultural Projects

According to Vijay et al., (2017), information sources are critical because they impact how the audience perceives information. In the wake of technological advancements, most consumers depend on online reviews when purchasing products. The characteristics of good information sources include; relevance, accuracy, usability, aggregation level, trustworthiness, cost-effectiveness, and exhaustiveness. The selection of an information source is important as it contributes to the usefulness of the information. Furthermore, the selection of information sources is dependent on several factors at the user level, including education level, level of income, geographical location, age, and farm size. Another factor that impacts the choice of information source is the intention of the user to minimize the loss that may be incurred by the cost and time spent in gaining access to the necessary information (Bronstein, Michel, and Paragios, 2010).

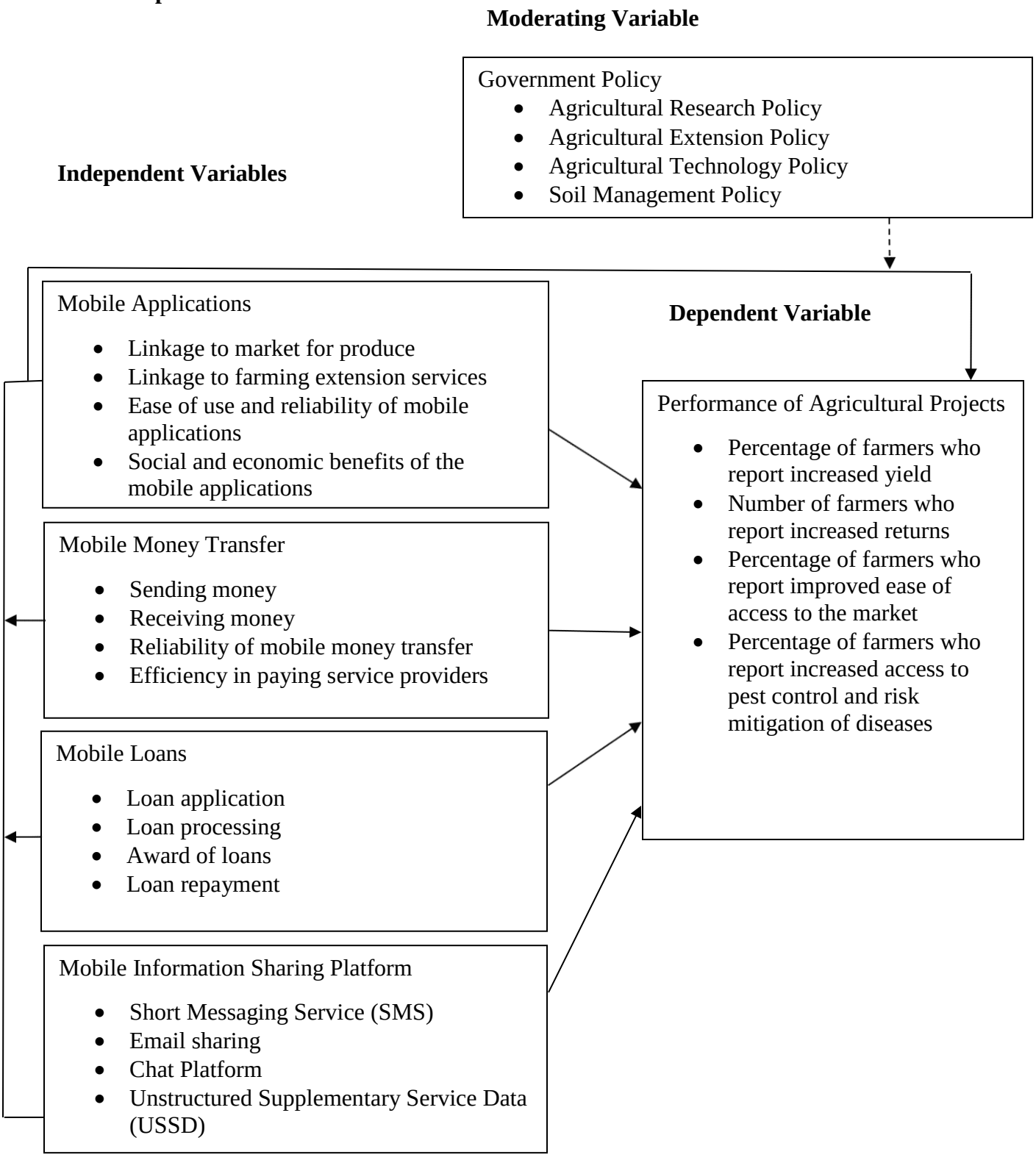
A research conducted by Bachhav (2012) lays out some of the information that can be shared using information-sharing platforms to improve productivity in agriculture and sustain agricultural projects. Some of this information includes information on best practices in farming, weather patterns, access to timely market information, help in decision making on which crop and inputs to buy, plant, and market availability for farmer's products. According to the International Institute for Communication and Development (IICD), information is a key aspect of the success of a development project. Individuals with the ability to access information increase their chances of productivity and performance. The innovation and development of telecommunication technologies such as information sharing platforms, as well as the availability of a range of information sources, have influenced the choices of information sources by different users for efficient use of information (Bronstein and Baruchson, 2010). However, despite the growth in information services, agricultural sources of information are said to be inadequate, untimely, and mostly inaccurate (Babu, Singh, and Gothandam, 2012).

Further research shows that information-sharing platforms that are easily available and accessible are frequently used, as contrasted to platforms that are considered less accessible (Daudu, Chado, and Igbashal, 2009). In most instances, accessibility refers to the perceived cost incurred with the use of an information-sharing platform. Thus, the cost is directly related to the frequency of use of an information-sharing platform, as contrasted with the quality of information. This explains the preference of farmers to use accessible and easy sources such as word of mouth and other informal communications as contrasted to formal communication channels such as mobile technology. A

research by Mtega, Bernard, and Msungu, (2012), reports farmers' preference for using televisions, extension officers, posters, bulletins, community leaders, journals, newspapers, farm groups, and radios as their main sources of information.

Hertzum and Clemmensen (2012), on the other hand, argue that the perceived quality of information is the determinant of the level to which one is willing to place trust in that information. Hertzum and Clemmensen (2012) define trust as the assumption of risk depending on the nature of risk trustworthiness. In this regard, trust involves assessment by the user on whether the information-sharing platform possesses the required level of knowledge to fulfill the need for information (Daudu, Chado, and Igbashal, 2009). Therefore, the accessibility of information and quality of information are two important criteria in the selection of an information-sharing platform.

2.7 Conceptual Framework



2.8 Theoretical Framework

The research was centered on three models: Diffusion of Innovations Theory, Actor-Network Theory as well as Theory of Reasoned Action (TRA).

2.8.1 Diffusion of Innovations Theory

The theory examines how societal members adopt an innovative idea and their decision toward it. It examines and explains the determinants of the technology adoption process. According to Everett Roger (2003), diffusion is the communication of an innovation to members of a social system over time. According to the theory, innovations should be adopted for performance and development in society. In regards to technology adoption, the theory assumes that adoption of technology can be culturally and technologically sound but it can be hindered by behavioral jurisdiction (Dearing & Cox, 2018). Besides behavioral jurisdiction, adopters' perception of the technology can also impact the adoption behavior of adopter units. In the context of the adoption of mobile technology in agriculture, this means that, although scientists and innovators may understand the benefits of a technological product, farmers can subjectively evaluate and perceive the technology differently from the innovators. Generally, this implies that the adopter's characteristics are key determinants of the adoption process. Although technology may be remarkable, unless many users adopt it, it may contribute little to the livelihoods and well-being of the community. Understanding the theory and the mechanisms of diffusion is necessary as it informs how technology adoption happens and what slows it.

2.8.2 Actor-Network Theory

The Actor-Network Theory was developed by Latour, (2005) and is used to explore collective processes. The theory recognizes the key roles that each stakeholder plays in any technological performance. It recognizes infrastructure surrounding technological performance and considers stakeholders as the key actors, as each link and node is networked independently. The Actor Network Theory is concerned with how each networked group overcome resistance and strengthens coherence. According to the theory, technological acceptance and adoption in any project depend on both technical and social aspects. The theory argues that technical excellence does not guarantee the social acceptance of a technology (Latour, 2005). Concerning this research, for mobile technology to have an impact on agricultural projects, all stakeholders must be involved. The prevalence of mobile technology such as farming applications will not guarantee

the success of an agricultural project. However, the main stakeholders who are the mass users are the determinants of its success.

2.8.3 Theory of Reasoned Action (TRA)

The primary aim of the Theory of Reasoned Action (TRA) is to understand a person's intended mannerisms by assessing the essential motivation to perform an action (Doswell, Betty, and EunSeok, 2011). As an adaptation of the TRA, this research will be premised on the Technology Acceptance Model (TAM), which redisplays the user reception of information systems. According to Gatotoh, Gakuu, and Keiyoro (2017), the TAM postulates that authentic system utilization is established by behavioral intent to use and that on the other hand, purpose to use is set by a frame of mind and supposed practicality. End-user attitude is identified as one of the psychological determinants of technology adoption (Mutinda, Gatotoh, and Keiyoro, 2019). Therefore, for farmers to fully embrace mobile technology in agriculture, they must be motivated to do so based on their pre-existing attitudes and behavioral intentions.

2.8.4 Theory of Constraints

This theory was promoted by Eliyahu M. Goldratt (1990) as an essential project management philosophy. The theory argues that the strength of any chain is only as good as its frailest link. The theory plays a critical role in determining the factors that hinder the performance of projects (Izmailov et al., 2016). Once the constraints are identified, it is systematically and progressively improved until it is no longer a hindrance. For any agricultural project to perform, it is essential to minimize the constraints that inhibit its success. The constraints that hinder performance include pests and diseases, poor management, stiff competition, and lack of adequate finances. The theory contributes to the realization of effective practices that enhance the performance of agricultural projects.

2.9 Knowledge Gaps

Despite the studies done by different scholars in an attempt to clarify the fundamentals of agricultural project performance, only a few authors have defined the concept. Ning, Zhang, and Li (2009), in their definition attempt to emphasize the need to undertake agricultural activities without negatively affecting the future by diminishing the existing resources. Another scholar, Deland (2009), emphasizes the minimization of the use of both resources and labor in a project. Silvius & Schipper, (2010) define project and project management as the development, delivery,

and management of project organizes change in policies, resources, assets organization, or process. The definition insists on six clear principles for the performance of a project. However, in all these definitions, few authors reflect on the principles of an agricultural project. In addition, there is limited literature on the use of mobile technology in agriculture and its effect on the performance of agricultural projects. Hence, this research will try to contribute to the literature by redefining performing agricultural project management using the fundamental principles of a project, while examining the effect of mobile technology on the performance of agricultural projects.

2.10 Summary of Knowledge Gaps

Table 2.1 below displays a synopsis of the knowledge gaps.

Table 2.1: Synopsis of the Knowledge Gaps

Variables	Writer and date	Emphasis of the research	Methodology	Results	Gaps in knowledge	Concentration of present research
1. Mobile Applications	Salia, Nsowah and Steel, (2011)	Effects of mobile handset utilization on artisanal fishing industry competence and incomes in Ghana	Quantitative	The use of mobile applications enables fishermen to feel more secure at the sea and connect with both their families and other fishermen, increasing their income levels.	The research primarily focused on aquaculture	This research intends to research mobile applications in agricultural projects
2. Mobile Money Transfer	Mutinda, Gatotoh and Keiyoro (2019)	Attitudinal and Technological Determinants of iTax system acceptance	Mixed methods approach	Attitude contributes towards technology adoption	The research addresses the behavioral aspect of technology adoption in Kenya Revenue Authority	This research tested the proposition of mobile money transfer and performance of agricultural projects
3. Mobile Loans	Souter, Scott and Garforth (2005)	The Economic Impact of Telecommunications on Rural Livelihoods and Poverty Reduction	Quantitative approach, survey design	The outcomes specify the importance of mobile technology in disseminating information, as well as its impact on livelihoods, economic performance and relations with government.	The research was quantitative in nature and failed to incorporate qualitative research to advance multiple realities through triangulation	The current research adopted a mixed methods approach and triangulated the data
4. Mobile Information Sharing Platform	Bronstein et al, (2010)	The application of cost benefit and least effort theories in studies of information seeking behavior of humanities scholars	Quantitative approach	Choice of information source is impacted by user intention to minimize the loss that may be incurred by the cost and time spent in gaining access to the necessary information.	The research focused on the cost benefit analysis between choice of information and users in technology adoption	This research addressed the effect of mobile information sharing platform on the performance of agricultural projects.

2.11 Summary of Literature Review

The literature highlighted in this chapter shows the importance and impact of mobile technology on the economy, agricultural sector, livelihoods, and development. Socially, mobile applications have changed the livelihoods of agricultural families by facilitating communication among farmers, while facilitating efficiency in the access to market for agricultural produce and vital information such as weather patterns and modern farming techniques. Research has also revealed the vital role which applications have played in facilitating stakeholder engagement in the agricultural sector. This stakeholder engagement has led to a seamless flow of information from input suppliers, farmers, processors, and wholesalers to consumers.

Mobile money transfer solutions have become a great solution to the challenge of absence of financial institutions in many rural areas in Africa. Indeed, mobile money transfer has revolutionized safety in the storage as well as the transfer of money in Kenya. It has enhanced trade in agriculture, allowing farmers to reimburse for, and to obtain compensation for, products and amenities. Mobile money transfer solutions in agriculture best meet the needs of the end-users when they are customized to meet their needs. The development of a needs assessment model before implementing any kind of mobile money transfer technology is critical in ensuring that any challenges in its implementation are anticipated and addressed.

With the strides made in providing access to mobile technology, access to financing in the form of mobile loans, which is a key tool in agricultural projects, has been made easy in many developing African countries. Farmers with smartphones have access to mobile lending and banking services at the touch of a button. With the access of instant loans by farmers to fund their agricultural projects, farmers can manage their agricultural projects more effectively, all the way from obtaining inputs, to transporting their produce to the market, thereby obtaining returns for their investments.

In a nutshell, mobile technology has quickly become the world's most adopted form of technology, thereby becoming the ultimate form of information transmission, through information sharing platforms. These mobile information-sharing platforms have played a great role in advancing development in the agricultural sector. Stakeholder partnership, the flow of information, and instant access to information are some of the factors with which information-sharing platforms have impacted the performance of agricultural projects.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This segment describes the procedure of the research. It details the study plan, target populace, the technique for selection, as well as methods used in data assembly and scrutiny.

3.2 Research Design

The study implemented the descriptive investigation strategy, which incorporated the mixed methods approach to ensure the triangulation of data to respond to the survey objectives. Almeida (2018), define the mixed methods approach as a design that combines quantitative and qualitative methods into a single research aimed at providing an in-depth and comprehensive vision of a research. This research, therefore, adopted the pragmatism paradigm, which applies to mixed methods (Gatotoh, Gakuu, and Keiyoro, 2018)

3.3 Target Population

The select populace for the research was all 217,000 sunflower project farmers in Makueni County subscribed to the DigiFarm Platform, as well as five Digifarm experts.

Table 3.1: Target Population

Ward	Frequency	Percentage (%)
Kisau Kiteta	79,600	36.7
Mbooni	33,400	15.4
Kithungo Kitundu	66,000	30.4
Kaiti	38,000	17.5
Total	**217,000**	**100.0**

3.4 Sample Size and Sampling Procedure

The study adopted the probability selection method where samples were distributed randomly in proportion to the county and sub-county populations. This was through a multistage cluster sampling technique. The multistage cluster sampling was implemented in three stages; the first step involved dividing the target population, along strata delineated along Makueni County. The second step identified the sub-counties (formerly districts) within the county. The third step divided the sub-counties into wards. These wards formed the clusters to sample the survey

informants. After sampling the clusters, the investigator sampled informants from the clusters that had been selected.

The informants in the qualitative research (Key Informant Interviews) were selected purposively. According to Sharma (2017), the purposive selection procedure, is the intentional selection of an informer, because of the abilities the informer holds. It is a type of non-probability sampling that is most effective when one needs to research a phenomenon, by incorporating experts who will offer specialist opinions on the subject of investigation. The purposively selected informants for the Key Informant Interviews were assumed to be highly knowledgeable in the area of mobile technology and agricultural projects.

3.4.1 Sample Size

According to the Safaricom PLC DigiFarm website, Makueni County has the highest number of registered farmers who adopt mobile technology in agriculture, with over 217,000 farmers having registered. The sample size (n) for this research was 208 and was established as follows:

n = X 2NP (1− P) ÷ d2 (N −1) + X 2P (1− P)

Where:

n = selected sample scope.

X2 = the table value of chi-square for 1 rate of freedom at the assurance level of 95%.

N = the populace scope.

P = the population share (presumed to be 50% for this would deliver the maximum sample scope).

d = the rate of precision articulated as a portion (6.8 %).

The following table redisplays how the sample will be distributed across the wards of Makueni County:

Table 3.2: Sample Size

Ward	Population	Proportion	Sample Size
Kisau Kiteta	79,600	0.367	76
Mbooni	33,400	0.154	32
Kithungo Kitundu	66,000	0.304	64
Kaiti	38,000	0.175	36
Total	**217,000**		**208**

For qualitative research, this research sampled five (5) key informants drawn from the county government as well as DigiFarm experts.

3.5 Research Instruments

The research tools captured demographic data which helped in disaggregating the findings by age, gender, region, location, educational level, and occupation. A structured research tool comprises closed-ended questions, where the closed questions are pre-coded and the interviewee will select a response among the several listed in the research tool.

Key informant interviews were conducted through the use of a pre-designed key informant interview guide. The questions in the key informant guide were designed to capture specific, specialized knowledge on the subject of the research. The questions were concise in capturing the key areas of concern in order to keep the interviews as short as possible.

3.5.1 Piloting the Questionnaire

According to Bloor and Wood (2006), piloting denotes the act of introductory investigation, before the actual research that offers a chance for knowledgeable decisions on the study plan, the study tools, pricing, scheduling, and investigator safety. Before the primary data collection, a pilot research was conducted among the non-sampled clusters within Makueni County. The pilot population represented 10% of this research's sample. The piloting helped identify the possible challenges and logistical technicalities that would be encountered during the data collection exercise while providing a chance to assess the quality of the survey tool to make any adjustments that were necessary to enhance the quality of the data.

3.5.2 Validity of Research Instruments

Conferring to Mohajan (2017), validity and reliability are critical aspects in the evaluation of measurement instruments for effective research. The soundness of the tools was ensured through a 100% research tool check by the investigator's project supervisor to ensure that the tool is a reliable measure of the concepts being determined in this research. Upon return from the field each day, all the research tools were checked and verified by the investigator to ensure that data was captured appropriately.

3.5.3 Reliability of Research Instruments

Consistency is related to reliability (Mohajan, 2017). Consistency is the degree to which a survey, assessment, or monitoring, produces the same outcomes on repeated trials. The Cronbach alpha

correlation coefficient, which provides an indication of stability over time was used. Table 3.3 displays the outcomes of the reliability test.

Table 3.3: Reliability Coefficient Table

Variable	Number of items	Cronbach Reliability Coefficient(α)
Mobile Applications	7	0.735
Mobile Money Transfer	7	0.783
Mobile Loans	7	0.823
Mobile Information Sharing	7	0.771
Performance of Agricultural Projects	7	0.764
Average Coefficient		**0.775**

The research utilized the split-half consistency technique. This method was applied whereby the tool was divided into odd-numbered as well as even-number interrogations. The outcomes of the two splits were interrelated. Relationship coefficients for both were attained using Cronbach's Alpha which determined the inner reliability of the tool by assessing whether some matters in a scale evaluate a similar concept. According to Creswell (2014), an instrument is believed to be dependable if the alpha coefficient is at least 0.7 or more. Having attained an alpha coefficient of 0.775, the research's instrument was therefore accepted as reliable.

3.6 Data Collection Procedure

The research tools were transmitted via face-to-face interviews with the target informants. The research tools targeted both male and female informants who were above 18 years of age. Using the research tool, the investigator collected data by interviewing the selected informants.

The key informant interviews were conducted using a pre-designed key informant interview guide. Before participating in the interview process, the informants first read and signed the consent forms and then the interviewer went ahead and took notes and recorded the responses, verbatim. The responses were later transcribed and eventually analyzed.

3.7 Data Analysis Technique

Quantitative analysis was done with the usage of the Statistical Package for Social Sciences (SPSS edition 28.0) to classify the quantitative data assembled from the informants into malleable evidence that was recognized. The data scrutiny was founded on the study aims. Descriptive data including frequencies, percentages, and means were utilized to analyze the data, which will be

displayed in the form of numbers and tables. Data was analyzed using frequencies, percentages, averages, normal deviation, correlation, regression, and ANOVA.

The qualitative data was analyzed using the thematic method of analysis. Each key informant interview was transcribed with the help of the notes and audio records acquired from the field. Thereafter, discussions of similar recurrent and vital themes were contrasted and their correlation to variables within the sample population was examined. Categories, patterns, and themes that arose were identified for each objective question. Ultimately, patterns and suggestions about the data were established to inform the research in generating conclusions and recommendations.

3.7.1 Hypotheses Testing

Table 3.4 displays how the supposition was tested and the acceptance levels.

Table 3.4: Hypotheses Testing

Objective	Suppositions	Design for testing Proposition	Outcomes Interpretation
1. To establish the effect of mobile applications on performance of agricultural projects.	1. **H_0:** There is no significant relationship between mobile applications and performance of agricultural projects.	$y= \beta_0+\beta_1X_1+e$ y= performance of agricultural projects β_0= constant, β_1= beta coefficient, X_1= mobile applications e= error term	$p< 0.05$ dismiss $H_01>$ accept otherwise
2. To assess the effect of mobile money transfer on performance of agricultural projects.	2. **H_0**: There is no significant relationship between mobile money transfer and performance of agricultural projects.	$y= \beta_0+\beta_2X_2+e$ y= performance of agricultural projects β_0= constant, β_2= beta coefficient, X_2= mobile money transfer e= error term	$p <0.05$ dismiss $H_02>$ accept else
3. To assess the effect of mobile loans on performance of agricultural projects.	3. **H_0**: There is no significant relationship between mobile loans and performance of agricultural projects.	$y= \beta_0+\beta_3X_3+e$ y= performance of agricultural projects β_0= constant, β_3= beta coefficient, X_3= mobile loans e= error term	p-value <0.05 dismiss $H_03>$ accept else
4. To examine the effect of mobile information sharing platform on performance of agricultural projects.	4. **H_0:** There is no significant relationship between mobile information sharing and performance of agricultural projects.	$y= \beta_0+\beta_4X_4+e$ y= performance of agricultural projects β_0= constant, β_4= beta coefficient, X_4= mobile information sharing e= fault term	p-value <0.05 dismiss $H_04>$accept else

3.8 Ethical Consideration

The investigator in this study ensured that all requirements and permissions are met, including obtaining a license from the National Commission for Science, Technology, and Innovation. In addition, the investigator adopted the ethical guidelines endorsed by the Marketing and Social Research Association (MSRA) of Kenya. To begin with, the investigator obtained consent to interview the participants by ensuring that the informants read and sign the consent forms. In addition, the investigator held in confidence all information given to her by the research informants and listened to and valued all informants' views during interviews and meetings. Finally, the investigator respected the anonymity of informants while analyzing data and reporting the findings.

3.9 Operationalization Table of Variables

Table 3.5 below displays how the variables were operationalized.

Objectives	Variable	Indicator	Research Instrument	Measurement Scale	Type of analysis	Tools of Analysis
1. To establish the effect of mobile applications on the performance of agricultural projects.	Mobile applications	• Linkage to market for produce • Linkage to farming extension services • Ease of use and reliability of mobile applications • Social and economic benefits of the mobile applications	Research tool Interview Guide	Interval	Descriptive Statistics Inferential	Mean, normal deviation, Correlation, Regression, ANOVA
2. To determine the effect of mobile money transfer on performance of agricultural projects	Mobile money transfers	• Sending Money • Receiving Money • Reliability of mobile money transfer • Efficiency in paying service providers	Research tool Interview Guide	Interval	Descriptive Statistics Inferential statistics	Mean, normal deviation, Correlation, Regression, ANOVA
3. To assess the effect of mobile loans on performance of agricultural projects.	Mobile Loans	• Loan Application • Loan processing • Award of Loans • Loan Repayment	Research tool Interview Guide	Interval	Descriptive Data Inferential Data	Averages, normal deviation, Association, Retrogression, ANOVA
4. To examine the effect of mobile information sharing platform on performance of agricultural projects.	Mobile Information Sharing Platform	• Short Messaging Service (SMS) • Email sharing • Chat Platform • Unstructured Supplementary Service Data (USSD)	Research tool Interview Guide	Interval	Descriptive Data Inferential Data	Averages, normal deviation, Correlation, Regression, ANOVA
5. Performance of agricultural projects		• Increased yield • Increased returns • Ease of access to the market • Pest control and risk mitigation of diseases	Research tool Interview Guide	Interval	Descriptive Statistics Inferential statistics	Mean, normal deviation, Correlation, Regression, ANOVA

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1 Introduction

This section outlines the outcomes that were analyzed in accordance with the research aims. The subject areas comprise the research tool return degree, the demographic features of informants, mobile applications, mobile money transfer, mobile loans, mobile information-sharing platforms, and performance of agricultural projects.

4.2 Questionnaire Return Rate

The sample size derived from the goal populace was 208 who were issued the research tool, out of which 192 questionnaires were suitably filled and brought back. The outcomes of the research tool return rate are displayed in Table 4.1.

Table 4.1: Questionnaire Return Rate

Return Rate	Frequency	Percentage
Responses	192	92.3
Non-responses	16	7.7
Total	**208**	**100.0**

The research tool return degree realized was 92.3% which is satisfactory as reinforced by Cooper and Schindler (2000) who endorse that for social sciences, a return degree of 75% and above of the research is suitable for data analysis to continue.

4.3 Demographic Characteristics of the Respondents

The research investigated the demographic features of the research participants grounded on the dispersal of the sample size by ward, gender, age, level of schooling, farming standing, and involvement in other farming practices. These demographic characteristics were significant in the analysis and interpretation of the outcomes of the research.

4.3.1 Distribution of Respondents by Ward

Table 4.2 displays data findings on the distribution of informants by ward representation.

Table 4.2: Distribution of Respondents by Ward

Ward	Frequency	Percentage
Kisau Kiteta	72	37.5
Kithungo Kitundu	60	31.3
Kaiti	32	16.7
Mbooni	28	14.6
Total	**192**	**100.0**

From the findings, 72(37.5%) represented farmers from Kisau Kiteta ward, 60(31.3%) were from Kithungo Kitundu ward, and 32(16.7%) from Kaiti, while 28(14.6%) hailed from Mbooni ward. This specifies that the most of participant farmers from Kisau Kiteta engage in agricultural projects. This implies that the most of active agricultural practices are conducted in Kisau-Kiteta ward.

4.3.2 Distribution of Respondents by Gender

The findings of the gender distribution in this research are as revealed in table 4.3 below:

Table 4.3: Distribution of Respondents by Gender

Gender	Frequency	Percentage
Male	89	46.4
Female	103	53.6
Total	**192**	**100.0**

The outcomes show that 103(53.6%) of the informants were females while 89(46.4%) of the informants were males. This implies that most of the informants taking part in agricultural projects are females who spend most of their time on the farms cultivating, an indication that gender could contribute to the performance of agricultural schemes in Makueni County.

4.3.3 The Distribution of Respondents by Age

Table 4.4 displays data on the dispersal of informants by age

Table 4.4: Distribution of Respondents by Age

Age	Frequency	Percentage
18- 24 years	4	2.1
25- 29 years	22	11.5
30- 34 years	18	9.4
40- 44 years	38	19.8
45- 49 years	40	20.8
50+ years	70	36.5
Total	**192**	**100.0**

The informants falling in the age bracket between 18 – 24 were 4(2.1%), between 25 – 29 years were 22(11.5%), between 30 – 34years were 18(9.4%), between 40 – 44 years were 38(19.8%), between 45 – 49 years 40(20.8%) and finally those above 50 years were 70(36.5%). The findings specify that agricultural projects attracted informants of diverse age categories but a significant population were above fifty years of age.

4.3.4 Distribution of Respondents by Level of Education

To determine the distribution of informants by the stage of education, the following Table 4.5 displays the data obtained from the research.

Table 4.5: Distribution of Respondents by Level of Education

Education	Frequency	Percentage
Never went to school	5	2.6
Primary not completed	25	13.0
Completed primary	32	16.7
Secondary not completed	30	15.6
Completed secondary	70	36.5
College/University not completed	12	6.3
Completed college/University	18	9.4
Total	**192**	**100.0**

Out of 192 informants, 5(2.6%) had never gone to school, 25(13.0%) had not completed primary education, 32(16.7%) had completed primary level education while 30(15.6%) of the informants had not completed secondary school education. Further, 70(36.5%) had completed secondary school education while 12(6.3%) of the informants had not completed college or university education, and finally, 18(9.4%) had completed either university or college education. This suggests that the majority of the informants had inadequate academic knowledge.

4.3.5 Distribution of Respondents by Farming Status

The research further endeavored to determine the distribution of informants by farming status. The findings are displayed in Table 4.6.

Table 4.6: Distribution of Respondents by Farming Status

Farming Status	Frequency	Percentage
Full-time farmer (Exclusively)	121	63.0
Part-time farmer (with another source of income)	67	34.9
Part-time farmer and student	4	2.1
Total	**192**	**100.0**

In various categories endeavored in the research on the farming status, 121(63.0%) of the informants were exclusively full-time farmers, 67(34.9%) were part-time farmers with other sources of income while 4(2.1%) were part-time farmers, and students at the same time. Most of the farmers spend their time on agricultural projects indicating that the majority of the informants rely on agriculture as their source of livelihood.

4.3.6 Distribution of Respondents by other Farming Practices

Table 4.7 displays information on the distribution of the sample size according to farming practices.

Table 4.7: Distribution of Respondents by other Farming Practices

Other farming Practices	Frequency	Percentage
Livestock farming	84	43.7
Poultry farming	81	42.2
Other crop farming	27	14.1
Total	**192**	**100.0**

The findings obtained from the research observed that most of the alternative farming practices involved in the county were livestock 87(43.7%) and poultry farming initiatives 81(42.2%) while alternative crop farming other than sunflower farming accounted for 27 informants at (14.1%)

4.4 Mobile Applications and Performance of Agricultural Projects

The first objective endeavored to determine the degree to which mobile applications impact the performance of agricultural projects in Kenya.

4.4.1 Descriptive Analysis for Mobile Applications and Performance of Agricultural Projects

Mobile applications were determined by the following indicators; linkage to market for produce, linkage to farming extension services, ease of use and reliability of mobile applications, and social and economic benefits of the mobile applications. The research utilized the five-point Likert scale as follows: 1= Strongly Disagree (SD), 2= Disagree (D), 3= Neutral (N), 4= Agree (A) and 5= Strongly Agree (SA). The outcomes are revealed in Table 4.8.

Table 4.8: Mobile Applications and Performance of Agricultural Projects

Declarations		**5**	**4**	**3**	**2**	**1**		
	n	**F (%)**	**F (%)**	**F (%)**	**F (%)**	**F (%)**	**Mean**	**Std. Dev.**
1. Using mobile applications in my agricultural projects is easy.	192	103 (53.6)	80 (41.7)	0 (0.0)	5 (2.6)	4 (2.1)	4.42	0.808
2. Using mobile applications in my agricultural projects is reliable (I can use them whenever I want).	192	157 (81.8)	26 (13.5)	2 (1.0)	7 (3.6)	0 (0.0)	4.73	0.661
3. I have witnessed the social and economic benefits of using mobile applications in my agricultural projects.	192	69 (35.9)	61 (31.8)	53 (27.6)	8 (4.2)	1 (0.5)	3.98	0.924
4. It is difficult to use mobile applications for my agricultural projects.	192	12 (6.3)	7 (3.6)	0 (0.0)	137 (71.4)	36 (18.8)	2.07	0.946
5. Using mobile applications in my agricultural projects has made my work faster.	192	90 (46.9)	92 (47.9)	0 (0.0)	10 (5.2)	0 (0.0)	4.36	0.740
6. Using mobile applications in my agricultural projects has enabled effective access to farming extension services.	192	34 (17.7)	64 (33.3)	85 (44.3)	8 (4.2)	1 (0.5)	3.64	0.836
7. Using mobile applications has facilitated efficient access to the market for my agricultural produce.	192	142 (74.0)	48 (25.0)	0 (0.0)	2 (1.0)	0 (0.0)	4.72	0.516
Composite average and SDV							**3.98**	**0.775**

The descriptive data endeavored to obtain information on the ease of use of mobile applications in agricultural projects. Out of 192 informants who partook in the research, 183(95.3%) concurred that mobile applications are easy to use in their projects, none of the informants were neutral, whereas 9(4.7%) differed. The responses realized an average of 4.42 bigger than the composite average (3.98) and SD = (0.775). Thus, ease of use of mobile applications positively contributes to the performance of agricultural projects.

In the case of reliability of using mobile applications in agricultural projects, the research obtained the following outcomes; 183(95.3%) concurred that mobile applications are reliable, 2(1.0%) were

neutral and 7(3.6%) differed, realizing an average of 4.73 against a composite average of 3.98 and normal deviation of 0.661 sequentially. This infers that the responses drew concurrent views from the informants as reinforced by 95.3% of the informants.

On the aspect of benefitting socially and economically through the use of mobile applications in agricultural projects, the findings were as follows; 69(35.9%) strongly concurred, 61(31.8%) agreed, 53(27.6%) drew neutral responses, 8(4.29%) differed and 1(0.5%) firmly disagreed, with an average and normal deviation of 3.98 and 0.924 sequentially. The outcomes specify that the declaration had contrasting views that affected the line item average which was equal to the composite mean.

Regarding the fourth declaration under the research variable; the difficulty of use of mobile applications in agricultural projects, the outcomes specify that 19(9.9%) concurred that they faced difficulties in utilization of mobile applications, whereas 173(90.2%) disagreed. The responses realized an average of 2.07 which was lesser contrasted to the composite average (3.98), implying that a significant most do not find the use of mobile applications difficult.

Under the fifth response on whether using mobile applications has made work faster, the responses were as follows; 90(46.9%) listed strongly agree, 92(47.9%) listed agree and 10(5.2) disagreed. The average line item was 4.36 which was larger contrasted to the composite average (3.98) and normal deviation of 0.775 sequentially. The outcome suggested that mobile applications enable faster working in agricultural projects as reinforced by 94.8% of the responses.

Opinion on the use of mobile applications enabling effective access to farming extension services was positively suggested by 98(51%) informants who concurred while 85(44.3%) were neutral and did not take either side while 9(4.7%) disagreed with an average and normal deviation of 3.64 and 0.836 sequentially. The declaration average was lesser contrasted to the composite average(M=3.98) and the normal deviation was 0.775 implying that there were significantly more neutral cases that did not take sides therefore the response needs to be evaluated further.

Declaration number seven of the first predictor variable endeavored to find out whether using mobile applications has facilitated efficient access to the market for agricultural produce. The findings are as follows; 142(74.0%) listed strongly agree, 48(25.0%) listed agree, none of the informants were neutral and 2(1.0%) listed disagree. The declaration drew an average as well as a normal deviation of 4.72 and 0.516 sequentially. When collated to the composite average of 3.98,

the findings specify that most of the informants had concurrent opinions about the use of mobile applications in enhancing effective access to markets as reinforced by 99% of the informants.

4.4.2 Correlational Analysis on the Relationship Between Mobile Applications and Performance of Agricultural Projects

The research endeavored to establish the association linking mobile applications and the performance of agricultural projects using the Pearson Correlation Coefficient. This was critical in establishing the strength and magnitude of the association linking mobile applications and the performance of agricultural projects. The correlation outcomes are displayed in Table 4.9.

Table 4.9: Correlation Analysis between Mobile Applications and Performance of Agricultural Projects

Variable		Mobile Applications	Performance of Agricultural Projects
Mobile Applications	Pearson Correlation	1	0.294**
	Sig. (2-Tailed)		0.000
	n	192	192
Performance of Agricultural Projects	Pearson Correlation	0.294**	1
	Sig. (2-Tailed)	0.000	
	n	192	192

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

Table 4.9 displays the outcomes that determine the association between mobile applications and the performance of agricultural projects. There was a weak positive correlation of 0.294 between mobile applications and performance of agricultural projects indicating a substantial affiliation with a p-value of 0.000. The value was lower than the test statistic of 0.05. This listed that mobile applications effect the performance of agricultural projects.

4.4.3 Regression Analysis of Mobile Applications and Performance of Agricultural Projects.

The following proposition was established using a simple linear regression model to satisfy the requirements of the first objective of the research.

1. **H_0:** There is no substantial association between mobile applications and the accomplishment of agricultural projects.
   H_1: There is a substantial association linking mobile applications and the accomplishment of agricultural projects.

The first proposition was verified using the following model;

$y= \beta_0 +\beta_1 X_1 + e$

y= performance of agricultural projects;

β_0= constant,

β_1= beta coefficient,

X_1= Mobile Applications

e= error term

Table 4.10: Regression Analysis for Mobile Applications and Performance of Agricultural Projects

Factor	Sum of Squares	d.f	Average Square	F	Sig.
Regression	141.055	1	141.055	18.017	0.000[b]
Residual	1487.523	190	7.175		
Total	**1628.578**	**191**			

a. Dependent Variable: Performance of Agricultural Projects.
b. Predictors: (Constant) Mobile Applications

Table 4.10 displays the regression analysis using Analysis of variance (ANOVA) outcomes that explain the power of the regression model and the goodness of acceptability of the regression model. The research established the F-significance rate at 0.000 was lower than 0.05 (0.000<0.05). The F-calculated (18.017) was substantially bigger than the F-critical value at $F_{(1, 190)} = 4.03$, thus the model was deemed significant.

Table 4.11: Model Summary for Mobile Applications and Performance of Agricultural Projects.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.294[a]	0.087	0.082	2.798

a. Predictors (Constant), Mobile Applications

The model summary outcomes revealed in Table 4.11 explain the level to which mobile applications as the explanatory variable explains the general variance of the model. The R^2 is given as 0.087 indicating that mobile applications contribute 8.7% of the dissimilarity of the response variable; the performance of agricultural projects in Kenya. The outcomes specify that there could be other factors that the research did not consider in the model that accounted for 91.3%. The conclusion was that there was a substantial association between mobile applications and the performance of agricultural projects.

Table 4.12: Coefficients of Mobile Applications and Performance of Agricultural Projects

	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
Variables	**B**	**Std. Error**	**Beta**		
(Constant)	15.675	1.983		7.906	0.000
Mobile Applications	0.300	0.071	0.294	4.245	0.000

a. Dependent Variable: Performanceof Agricultural Projects

The output from Table 4.12 displayed a standardized beta value of 0.294 indicating that a unit increase in mobile applications contributed to a 29.4% increase in the dissimilarity of performance of agricultural projects. The research observed that the overall model was sound to forecast the performance of agricultural projects given mobile applications at $p<0.05$. The regression model in the form $y= \beta_0+\beta_1X_1+e$ would be;

Performance of agricultural projects = 15.675+0.294 (Mobile applications) + e; t = 4.245; p<0.05.

From the findings, the research observed that the null proposition was rejected and the alternative proposition accepted.

4.4.4 Qualitative Analysis of Mobile Applications and Performance of Agricultural Projects

The research gathered qualitative data regarding mobile applications and the performance of agricultural projects in Makueni County, Kenya. Information in the form of transcriptions was obtained from the interviews with experts under the DigiFarm agricultural project. A key informant's opinion on how enthusiastic farmers were about the future outlook of mobile technology in agriculture in Kenya was recorded as follows;

> *I would say it is very effective. It has shaped farming, largely because farmers these days use their mobile phones to acquire information on ways of advancing their agricultural projects, through applications such as YouTube. The future is headed towards adopting smart agricultural farming techniques; particularly through adopting mobile technology in agriculture.*

When asked about the availability and accessibility of mobile applications, one of the agriculture project members narrated the following;

> *We have different groups of participants who are engaged in farming in this area. Smallholder farmers, county agriculture extension workers, non-governmental organizations that advocate for food and environmental issues, and county administrators in charge of agriculture. These groups consult using mobile*

communication on techniques to improve farming in the arid areas of Kisau-Kiteta, Mbooni, Kaiti, and Kithungo Kitundu in the larger Makueni County.

The outcome from the qualitative and quantitative data shows that there is a significant weak positive relationship between mobile applications and the performance of agricultural projects among agriculturalists. This justified the importance of conducting this research on a mixed-method study approach in Makueni County, Kenya.

4.5 Mobile Money Transfer and Performance of Agricultural Projects

The second objective endeavored to establish the degree to which mobile money transfer effects the performance of agricultural projects in Kenya.

4.5.1 Descriptive Analysis for Mobile Money Transfer and Performance of Agricultural Projects

Mobile Money Transfer was measured by the following indicators to develop declarations in the Likert scale; sending money, receiving money, reliability of mobile money transfer, and efficiency in paying service providers. To measure the indicators in the declaration form, the research employed the use of a five-point Likert scale as follows: 1= Strongly Disagree (SD), 2= Disagree (D), 3= Neutral (N), 4= Agree (A) and 5= Strongly Agree (SA). The findings are revealed in Table 4.13.

Table 4.13: Mobile Money Transfer and Performance of Agricultural Projects

Declarations		**5**	**4**	**3**	**2**	**1**		
	n	**F (%)**	**F (%)**	**F (%)**	**F (%)**	**F (%)**	**Mean**	**Std. Dev.**
1. Using mobile money transfer in my agricultural projects is secure.	192	157 (81.8)	30 (15.6)	5 (2.6)	0 (0.0)	0 (0.0)	4.79	0.467
2. Using mobile money transfer in my agricultural projects is simple.	192	171 (89.1)	15 (7.8)	5 (2.6)	1 (0.5)	0 (0.0)	4.85	0.457
3. Using mobile money transfer in my agricultural projects has made my work faster.	192	131 (68.2)	52 (27.1)	9 (4.7)	0 (0.0)	0 (0.0)	4.64	0.572
4. Using mobile money transfer is adaptable and relevant for use in my agricultural projects.	192	113 (58.9)	62 (32.3)	17 (8.9)	0 (0.0)	0 (0.0)	4.50	0.655
5. Using mobile money transfer in my agricultural projects is reliable (I can use it whenever I want).	192	164 (85.4)	21 (10.9)	5 (2.6)	2 (1.0)	0 (0.0)	4.80	0.584
6. Mobile money transfer services are readily available for use in my agricultural projects.	192	166 (86.5)	12 (6.3)	9 (4.7)	5 (2.6)	0 (0.0)	4.77	0.657
7. It is not simple to use mobile money transfer in my agricultural projects.	192	1 (0.5)	0 (0.0)	9 (4.7)	119 (62.0)	63 (32.8)	1.73	0.594
Composite average and SDV							**4.30**	**0.569**

The first declaration on whether utilization of mobile money transfer in agricultural projects was secure obtained the following descriptive findings; 187(97.4%) concurred, whereas only 5(2.6%) were neutral with the declaration drawing an average along with a normal deviation of 4.79 and 0.467 sequentially. The discoveries specify that most of the informants affirmed that the utilization of mobile money transfer was secure thus most informants had concurrent views on the declaration as reinforced by 97.4% of the informants.

The informants further concurred that the use of mobile money transfer in agricultural projects was simple. As listed in Table 4.13, the composite average of the variable was 4.30 which was lower than the line item declaration at 4.85. The descriptive findings obtained were that 186(96.9%) agreed that the use of mobile money transfer was simple while 5(2.6%) were neutral and did not take either side whereas 1(0.5%) differed. This suggests that the declaration had significant informants whose views were concurrent as contrasted with the composite average of 4.30. This can also be reinforced by 96.9% of informants who agreed.

On whether the use of mobile money transfer in their agricultural projects made their work faster, 183(95.3%) of the informants concurred that it made their work faster in the projects, while 9(4.7%) were neutral and did not take any sides. The declaration line item obtained an average score of 4.64 and a normal deviation of 0.572, which when contrasted to the composite average was bigger (M=4.64>M=4.30) sequentially. The outcomes show that a large number of the responses and views were positive and reinforced that the utilization of mobile money transfer enables faster working in agricultural projects.

Declaration number four of the variable endeavored to establish whether the use of mobile money transfer is adaptable and relevant for use in agricultural projects. The outcomes from the Table 4.14 listed that 113(58.9%) listed strongly agree, 62(32.3%) listed agree, and 17(8.9%) listed neutral with no respondent indicating disagree about the declaration having an average and a normal deviation of 4.50 and 0.655 sequentially. The declaration when associated with the composite average (4.30), infers that the line item had concurrent views emanating from the informants. This is reinforced by 175(91.2%) of the informants.

Informants further gave their views on the reliability of using mobile money transfer in agricultural projects. The following findings were captured: 164(85.4%) listed strongly agree, 21(10.9%) listed agree, 5(2.6%) were neutral, and1.0%) differed. The declaration obtained an average of 4.80 which

was bigger than the composite average (4.30) and normal deviation (0.569). Most of the informants had similar views regarding the declaration as reinforced by 185(96.3%).

Concerning the availability of mobile cash transfer facilities, the findings show that 178(92.8%) of the informants concurred with the declaration that mobile money transfer facilities were readily available, 9(4.7) were neutral, while 5(2.6%) differed. The declaration obtained an average as well as a normal deviation of 4.77 and 0.657 sequentially. The outcomes imply that the line item affirmatively contributes to the variable and that a significant most of the informants were in agreement 178(92.8%) that mobile money transfer is readily available for their use in agricultural projects.

Declaration seven of the variable endeavored to find out whether it was not simple to use mobile money transfer in agricultural projects. The findings are displayed as follows; 1(0.5%) listed strongly agree, 9(4.7%) neutral 9(4.7%) listed neutral, 119(62.0%) listed disagree, while 63 (32.8%) listed strongly disagree. The declaration drew an average as well as a normal deviation of 1.73 and 0.594 sequentially. Contrasting the average of the declaration to the composite averagespecifys that most of the informants were of the opposite opinion with the declaration hence the low line item mean. The main challenges associated with mobile money transfer were high transaction costs and vulnerability to fraud. Easy access to money is also associated with impulse expenditures.

4.5.2 Correlational Analysis of the Relationship between Mobile Money Transfer and Performance of Agricultural Projects

The research endeavored to establish the affiliation linking mobile money transfer and the performance of agricultural projects using the Pearson Correlation Coefficient. This helps in establishing the strength and magnitude of the affiliation between mobile money transfer and the performance of agricultural projects in Kenya. The correlation outcomes are displayed in Table 4.14.

Table 4.14: Correlation Analysis between Mobile Money Transfers and Performance of Agricultural Projects

Variable		Mobile Money Transfers	Performance of Agricultural Projects
Mobile Money Transfers	Pearson Correlation	1	0.624**
	Sig. (2-Tailed)		0.000
	n	192	192
Performance of Agricultural Projects	Pearson Correlation	0.624**	1
	Sig. (2-Tailed)	0.000	
	n	192	192

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

The outcomes displayed in Table 4.14 reveals that there is a moderate positive correlation of 0.624 between mobile money transfer and performance of agricultural projects, indicating a noteworthy association with a p-value of 0.000 that is lower than the test level of an implication of 0.05. This specifies that mobile money transfer effects the performance of agricultural projects.

The research further conducted proposition testing on the affiliation between mobile money transfer and the performance of agricultural projects, done to satisfy the requirements of the second objective of the research. These were stated as follows;

1. **H_0:** There is no significant relationship between mobile money transfer and the performance of agricultural projects.
   H_1: There is a significant relationship between mobile money transfer and the performance of agricultural projects.

Table 4.15 provides a summary of the association between mobile money transfer and the performance of agricultural projects.

Table 4.15: Model Summary for Mobile Money Transfer and Performance of Agricultural Projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.624[a]	0.389	0.381	4.20044

a. Predictors (Constant), Mobile Money Transfers

The research outcomes revealed in Table 4.15 explains the level to which mobile money transfer as an explanatory variable and explains the general variance of the model. The R Square is specified as 0.389 demonstrating that mobile money transfer contributes to 38.9% of the variations in the performance of agricultural projects. This shows that additional issues which were not taken into account in this model explained for 61.1%. The research resolved that there was a noteworthy effect linking mobile money transfer and the performance of agricultural projects.

4.5.3 Regression Analysis of Mobile Money Transfer and Performance of Agricultural Projects

Regression analysis was done to determine the affiliation linking mobile money transfer and the performance of agricultural projects in Kenya.

The regression model was as follows;

$y = \beta_0 + \beta_2 X_2 + e$

y= performance of agricultural projects;

β_0= constant,

β_2= beta coefficient,

X_2= Mobile Money Transfer

e= error term

Table 4.16: Regression Analysis for Mobile Money Transfer and Performance of Agricultural Projects

Factor	Sum of Squares	d.f	Average Square	F	Sig.
Regression	581.666	1	581.666	105.564	0.000[b]
Residual	1046.912	190	5.510		
Total	**1628.578**	**191**			

a. Dependent Variable: performance of agricultural projects.
b. Predictors: (Constant) Mobile money transfer

ANOVA was utilized to determine the soundness of fit of the regression model in Table 4.16. It was recognized that the F-significance value of 0.000 was lower contrasted to 0.05 ($p<0.05$). The F-ratio was remarkable, $F_{(1, 190)} = 105.564$ was considerably bigger than the critical value of F=4.03. The listed demonstrates that the model was substantial.

Table 4.17: Coefficients of Mobile Money Transfer and Performance of Agricultural Projects

	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
Variables	**B**	**Std. Error**	**Beta**		
(Constant)	11.223	5.816		1.929	0.000
Mobile Money Transfers	0.467	0.143	0.624	3.266	0.000

a. Dependent Variable: Performance of Agricultural Projects

The outcomes in Table 4.17 gave a standardized beta value of 0.624 indicating that a unit increase in mobile money transfer contributes to a 62.4% upsurge in the variations of the performance of

agricultural projects. The overall model was sound to forecast the performance of agricultural projects given mobile money transfer at $p<0.05$. The regression model $y= \beta_0 +\beta_2 X_2+e$ would be represented as;

Performance of agricultural projects = 11.223+0.624 (Mobile Money Transfer) + e; t = 3.266; p<0.05.

Thus, the null proposition was rejected and the alternative accepted, concluding that there was a noteworthy affiliation between mobile money transfer and the performance of agricultural projects in Makueni County.

4.5.4 Qualitative Analysis for Mobile Money Transfer and Performance of Agricultural Projects

The research further gathered qualitative data regarding mobile money transfer and the performance of agricultural projects among farmers in Makueni County. Results generated from the consultations with the DigiFarm experts were taken. The informants were asked to state whether the use of mobile technology had any social and economic benefits in agricultural projects. A respondent shared the following sentiments;

> *Yes. The farmers have benefitted through the exchange of information on farming techniques. The age of mobile phones and the easy access to information has transformed agriculture for many, from being a subsistence-based activity to being an income-generating business. So definitely there have been social benefits, especially for women and the youth who are taking advantage of the information age to diversify agriculture and maximize yields, thereby improving their livelihoods and by extension, that of their communities.*

When asked whether farmers achieved high returns from the use of mobile technology, a farmer interviewed gave the following opinion;

> *The presence of digital lending companies has enabled farmers to take up small loans to advance their farming practices. The digital lending companies for instance 'Fuliza', 'Tala', and 'O-Kash' have enabled farmers to access credit at very affordable interest rates. However, debt is what most farmers are afraid of falling into.*

The discoveries from the qualitative and quantitative data specify that there exists an affiliation linking mobile money transfer and the performance of agricultural projects among farmers. This gives a positive indication of the significance of triangulating instruments through conducting a mixed methods research approach.

4.6 Mobile Loans and Performance of Agricultural Projects

The third aim of the research endeavored to scrutinize how mobile loans impact the performance of agricultural projects in Kenya.

4.6.1 Descriptive Analysis for Mobile Loans and Performance of Agricultural Projects

The variable mobile loans were measured using the following indicators; loan Application, loan processing, award of loans, and loan Repayment. The research employed the use of a Likert scale as follows: 1=Strongly Disagree (SD), 2=Disagree (D), 3= Neutral (N), 4= Agree (A) and 5=Strongly Agree (SA). Table 4.18 displays the findings.

Table 4.18: Mobile Loans and Performance of Agricultural Projects

Declarations		**5**	**4**	**3**	**2**	**1**		
	n	**F (%)**	**F (%)**	**F (%)**	**F (%)**	**F (%)**	**Mean**	**Std. Dev.**
1. I can easily apply for and repay mobile loans for my agricultural projects.	192	109 (56.8)	42 (21.9)	24 (12.5)	16 (8.3)	1 (0.5)	4.26	1.005
2. Using mobile loans in my agricultural projects is secure.	192	0 (0.0)	1 (0.5)	31 (16.1)	19 (9.9)	141 (73.4)	1.44	0.777
3. Using mobile loans in my agricultural projects has given me control over my finances.	192	36 (18.8)	63 (32.8)	64 (33.3)	28 (14.6)	1 (0.5)	3.55	0.975
4. Mobile loan services have enabled convenience in loan processing and award of loans for my agricultural projects.	192	110 (57.3)	52 (27.1)	28 (14.6)	1 (0.5)	1 (0.5)	4.40	0.793
5. Using mobile loans in my agricultural projects is private and confidential.	192	122 (63.5)	31 (16.1)	31 (16.1)	3 (1.6)	5 (2.6)	4.36	0.983
6. Using mobile loans in my agricultural projects has made my work faster.	192	109 (56.8)	52 (27.1)	28 (14.6)	2 (1.0)	1 (0.5)	4.39	0.811
7. It is insecure to use mobile loans in my agricultural projects.	192	69 (35.9)	85 (44.3)	24 (12.5)	12 (6.3)	2 (1.0)	1.92	0.909
Composite average and SDV							**3.47**	**0.893**

In the case of ease of application and repayment of mobile loans, the findings obtained listed that 151(78.7%) of the informants concurred that it is easy to apply and repay mobile loans, 24(12.5%) neither agreed nor disagreed whereas 17(8.8%) differed with an average of 4.26 along with a normal deviation of 1.005 consecutively. The discoveries illustrate that the line item drew similar views from farmers participating in agricultural projects indicating that most of them can easily apply for and repay mobile loans as reinforced by 151(78.7%) of the informants.

On whether using mobile loans in agriculture was secure, the data obtained were as follows; 1(0.5%) listed agree, 31(16.1%) were neutral, 19(9.9%) listed disagree, and informants who strongly disagreeed141(73.4%) with an average as well as a normal deviation of 1.44 and 0.777 consecutively. This infers that most of the informants were of a contrary opinion as pertains to the declaration drawing contrasting views from a significant proportion of the informants as listed by 160(83.3%) who differed.

The findings obtained from the third declaration on the ability to use mobile loans in agricultural projects to give farmers control over their finances were as follows; 36(18.8%) of the informants listed strongly agree, 63(32.8%) listed agree, 64(33.3%) were neutral, 28(14.9%) listed disagree and 1(0.5%) listed strongly disagree with an average as well as a normal deviation of 3.55 and 0.975 consecutively. The outcomes connote that informants who disagreed accounted for 15.1% of the informants. The declaration in correlation to the composite average(M=3.47) connotes that the assertion had a significant number of responses that were neither for nor against the use of mobile loans in agricultural projects.

The fourth declaration on mobile loan services enabling convenience in loan processing and award of loans for agricultural projects elicited the following responses as revealed in table 4.20; 162(84.4%) listed agree, 28(14.6%) were neutral, 2(1.0%) listed disagree with an average as well as a normal deviation of 4.40 and 0.793 sequentially. The declaration in comparison to the composite average (3.47), implies that most of the farmers were in agreement that mobile loan services have enabled convenience in loan processing and awards of agricultural loans as reinforced by 84.4% of the informants.

On whether using mobile loans in agricultural projects was private and confidential; the research obtained the following outcomes; 122(63.5%) listed strongly agree, 31(16.1%) listed agree, 31(16.1%) were neutral, 3(1.6%) listed disagree and 5(2.6%) listed strongly disagree with an average of 4.36 along with a normal deviation of 0.983 sequentially. The declaration when contrasted to the composite average (3.47), implies that using mobile loans in agricultural projects was private and confidential and had similar responses as reinforced by 79.6% of the informants.

When asked whether mobile loans made work faster in their agricultural projects, the descriptive findings obtained were; 109(56.8%) listed strongly agree, 52(27.1%) agree, 28(14.6%) were neutral, 2(1.0%) listed disagree, whereas responses that strongly disagreed embodied 1(0.5%) with

an average as well as a normal deviation of 4.39 and 0.811 consecutively. The line item declaration was bigger than the composite average(M=3.47) implying that most of the responses had concurrent views on the use of mobile loans making agricultural projects work faster as reinforced by 83.9% of the informants.

The seventh declaration on whether the use of mobile loans in agricultural projects was insecure obtained the following outcomes; 69(35.9%) listed strongly agree, 85(44.3%) listed agree, 24(12.5%) listed neutral and 12(6.3%) listed disagree and 2(1.0%) strongly disagree sequentially. This implies that most of the farmers thought that mobile loan services are not secure.

4.6.2 Correlational Analysis of the Relationship between Mobile Loans and Performance of Agricultural Projects

The investigator endeavored to determine the affiliation between mobile loans and the performance of agricultural projects using the Pearson Correlation Coefficient. This is critical in establishing the strength and magnitude of the affiliation between mobile loans and the performance of agricultural projects. The correlation outcomes are displayed in Table 4.19.

Table 4.19: Correlation Analysis between Mobile Loans and Performance of Agricultural Projects

Variable		Mobile Loans	Performance of Agricultural Projects
Mobile Loans	Pearson Correlation	1	0.384**
	Sig. (2Tailed)		0.000
	n	192	192
Performance of Agricultural Projects	Pearson Correlation	0.384**	1
	Sig. (2-Tailed)	0.000	
	n	192	192

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

Correlation outcomes between mobile loans and the performance of agricultural projects are revealed in Table 4.19. The outcomes showed the existence of a weak positive association of 0.384 on the affiliation between mobile loans and the performance of agricultural projects, indicating a considerable association with a p-value of 0.000 lower as contrasted to the test level significance of 0.05. The findings specify that mobile loans effect the performance of agricultural projects.

The following proposition was further tested to satisfy the requirements of the affiliation between mobile loans and the performance of agricultural projects;

1. **H_0:** There is no significant relationship between mobile loans and the performance of agricultural projects.

   H_1: There is a significant relationship between mobile loans and the performance of agricultural projects.

Table 4.20 displays the model summary of the association between mobile loans and the performance of agricultural projects.

Table 4.20: Model Summary for Mobile Loans and Performance of Agricultural Projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.384[a]	0.148	0.143	2.703

a. Predictors (Constant), Mobile Loans

The research outcomes revealed in Table 4.20 provides an account of the level to which the predictor variable explains the overall variance of the model. The R^2 is given as 0.148 signifying that mobile loans contribute to 14.8% of the variations of the dependent variable performance of agricultural projects. The research resolved that there was a significant affiliation between mobile loans and the performance of agricultural projects.

4.6.3 Regression Analysis of Mobile Loans and Performance of Agricultural Projects

Regression analysis was done to determine the affiliation between mobile loans and the performance of agricultural projects. The proposition was tested using a simple linear regression model listed as follows;

$y= \beta_0 +\beta_3 X_3+e$

y= performance of agricultural projects;

β_0= constant,

β_3= beta coefficient,

X_3= Mobile loans

e= error term

Table 4.21: Regression Analysis for Mobile Loans and Performance of Agricultural Projects

Factor	Sum of Squares	d.f	Average Square	f	Sig.
Regression	240.620	1	240.620	32.939	0.000[b]
Residual	1387.958	190	7.305		
Total	**1628.578**	**191**			

a. Dependent Variable: Performance of Agricultural Projects.
b. Predictors: (Constant) Mobile Loans

The application of ANOVA was utilized to determine the power of the regression model in Table 4.21. The research determined that the Fishers-significance rate of 0.000 was lower than 0.05 ($p<0.05$). The F-proportion was noteworthy, $F_{(1, 190)} = 32.939$ was meaningfully bigger contrasted to the critical rate of F=4.03. The mentioned demonstrates that the model was noteworthy.

Table 4.22: Coefficients of Mobile Loans and Performance of Agricultural Projects

	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
Variables	**B**	**Std. Error**	**Beta**		
(Constant)	12.989	1.937		6.707	0.000
Continuous Improvement	0.455	0.079	0.384	5.739	0.000

a. Dependent Variable: Performance of Agricultural Projects

The outcomes in Table 4.22 gave a standardized beta value of 0.384 signifying that a unit increase in mobile loans contributes to a 38.4% increase in the variations of performance of agricultural projects. The overall model was fit to predict the performance of agricultural projects given continuous improvement at $p<0.05$. The regression model $y= \beta_0 +\beta_3 X_3+e$ would be represented by;

Performance of agricultural projects= 12.989+0.384 (Mobile Loans) + e; t = 5.739; p<0.05

The research findings thus specify that the null proposition was rejected and the alternative proposition was accepted concluding that there was a substantial affiliation between mobile loans and the performance of agricultural projects.

4.6.4 Qualitative Analysis for Mobile Loans and Performance of Agricultural Projects

For the research to have a deeper and more elaborate understanding of the variable, qualitative information was gathered in form of opinions through key informant interviews. The informants were requested to give their views on the level to which they agree with the declaration that mobile technology is holistic, pragmatic, and relevant in being used across the agriculture continuum. A key informant provided the following narrative with regards to crop farming, livestock farming, and poultry farming.

> *I agree that mobile technology is very practical and relevant across the agriculture continuum. No matter the agricultural activity you choose to engage in, you simply cannot escape from the effect of mobile technology. With the ease of access to mobile loans and unlimited applications that one can download to learn and engage with experts, mobile technology in agriculture is here to stay.*

The quantitative data corroborated with qualitative data specify that there is a noteworthy correlation linking mobile loans and the performance of agricultural projects in Makueni County, Kenya. Data triangulation is very significant in providing objective outcomes, thus justifying the affiliation between mobile loans and the performance of agricultural projects in Makueni County, Kenya.

4.7 Mobile Information Sharing Platform and Performance of Agricultural Projects

The fourth aim of the research endeavored to examine how the mobile information sharing platform effects the performance of agricultural projects in Kenya.

4.7.1 Descriptive Analysis for Mobile Information Sharing Platform and Performance of Agricultural Projects

The variable mobile information-sharing platform was measured using the following indicators; Short Messaging Service (SMS), email sharing, chat platform, and the unstructured supplementary service data (USSD) The research utilized the Likert scale as follows: 1=Strongly Disagree (SD), 2=Disagree (D), 3= Neutral (N), 4= Agree (A) and 5=Strongly Agree (SA). Table 4.23 displays the findings.

Table 4.23: Mobile Information Sharing Platform.

Declarations		5	4	3	2	1		
	n	F (%)	F (%)	F (%)	F (%)	F (%)	Mean	Std. Dev
1. I can easily use the USSD mobile information sharing platform to receive and share information for my agricultural projects.	192	105 (54.7)	68 (35.4)	10 (5.2)	8 (4.2)	1 (0.5)	4.40	0.812
2. Using the SMS mobile information sharing platform in my agricultural projects is reliable (I can use it whenever I want).	192	165 (85.9)	9 (4.7)	10 (5.2)	8 (4.2)	0 (0.0)	4.72	0.746
3. I can securely use chat platforms for my agricultural projects.	192	125 (65.1)	35 (18.2)	28 (14.6)	4 (2.1)	0 (0.0)	4.46	0.818
4. Using the information-sharing platform in my agricultural projects is relevant and effective.	192	112 (58.3)	48 (25.0)	10 (5.2)	21 (10.9)	1 (0.5)	4.30	1.018
5. The use of the mobile information sharing platform for my agricultural projects is readily accessible.	192	173 (90.1)	1 (0.5)	14 (7.3)	3 (1.6)	1 (0.5)	4.78	0.690
6. Using the mobile email sharing platform in my agricultural projects has made my work faster.	192	36 (18.8)	29 (15.1)	64 (33.3)	48 (25.0)	15 (7.8)	3.12	1.207
7. It is not effective to use mobile information-sharing platforms in my agricultural projects.	192	33 (17.2)	28 (14.6)	10 (5.2)	77 (40.1)	44 (22.9)	2.63	1.423
Composite average and SDV							**4.06**	**0.959**

The first declaration endeavored to find out whether farmers can easily use the USSD mobile information sharing platform to receive and share information for their agricultural projects. The outcomes were as follows; 173(90.1%) agreed, 10(5.2%) were neutral and 9(4.7%) differed. The average and normal deviation of the line item 4.40 and 0.812 sequentially were bigger than the composite average(M=4.06) signifying that the declaration drew responses that were similar and concurrent as reinforced by most of the informants being represented by 90.1%. The findings also specify that the use of USSD mobile information is instrumental in agricultural projects.

The second declaration highlighted whether using the SMS mobile information sharing platform in agricultural projects is reliable. The research gathered the following findings; 165(85.9%) listed strongly agree, 9(4.7%) listed agree, 10(5.2%) were neutral, 8(4.2%) listed disagree with an average as well as a normal deviation of 4.72 and 0.746 sequentially. The discoveries infer that the views of most of the informants concurred with the response declaration as reinforced by 90.6% of informants who agreed that the SMS mobile information sharing platform is reliable for use in agricultural projects.

The security of chat platforms was analyzed and the responses obtained were as follows; 160(83.3%) agreed that they can securely use chat platforms in their agricultural projects, 28(14.6%) were neutral about the declaration, while 4(2.1%) differed. The mean, as well as the normal deviation of the declaration (M=4.46, SD = 0.818), was bigger contrasted to the composite average of 4.06 and 0.959 sequentially. The results specify that the declaration had a positive influence on the variable. This implies that the farmers had similar sentiments about the importance of chat platforms in communicating about emerging issues in agricultural projects as reinforced by 83.3% of the informants.

The research obtained the following information as to whether using the mobile information sharing platform in agricultural projects is relevant and effective; 112(58.3%) listed strongly agree, 48(25.0%) listed agree, 10(5.2%) were neutral, 21(10.9%) listed disagree and 1(0.5%) listed strongly disagree, with an average along with a normal deviation of 4.30 and 1.018 consecutively. The declaration when contrasted to the composite average (4.06), suggests that the use of mobile information-sharing platforms is relevant and effective for farmers involved in agricultural projects. Similarly, the declaration drew a significant number of informants 160(83.3%) who had concurrent views about the declaration.

Response number 5 on the ease of access to mobile information-sharing platforms for agricultural projects obtained the following outcomes; 173(91.5%) listed agree, 14(7.3%) listed neutral while 4(2.1%) disagree with the declaration that drew an average and normal deviation of 4.78 and 0.690 sequentially. The discoveries specify that use of the mobile information-sharing platforms is readily available in agricultural projects. This is apparent when contrasting the line item (M=4.78) average against the composite average(M=4.06) which is less than the line item mean. This was reinforced by 86.9% of the informants.

The sixth account on the variable endeavored to find out whether using the mobile email sharing platform in agricultural projects has made work faster. The outcomes specify that 36(18.8%) listed strongly agree, 29(15.1%) listed agree, 64(33.3%) were neutral, 48(25.0%) listed disagree, and 15(7.8%) listed strongly disagree with a mean, and a normal deviation of 3.12 and 1.207 sequentially. The declaration in comparison to the composite average (4.06), infers that a substantial number of informants were not cognizant of the existence of mobile email sharing platforms as evidenced by 64(33.3%) of neutral responses.

The final declaration of the variable gathered data on whether it is ineffective to use mobile information sharing platforms in agricultural projects. The findings displayed specify that; 61(31.8%) agreed, 10(5.2%) were neutral whereas 121(63.0%) differed drawing an average as well as a normal deviation of 2.63 and 1.423 consecutively. This inference was that the declaration had disagreeing opinions on the effectiveness of using mobile information sharing platforms in agricultural projects. Further, the composite average was bigger than the line item declaration (M=4.06>2.63).

4.7.2 Correlational Analysis of the Relationship between Mobile Information Sharing Platform and Performance of Agricultural Projects

The investigator endeavored to determine the affiliation linking the mobile information sharing platform and the performance of agricultural projects using the Pearson Correlation Coefficient. This establishes the strength and direction of the affiliation between mobile information sharing platform and the performance of agricultural ventures. The correlation outcomes are displayed in Table 4.24.

Table 4.24: Correlation Analysis between Mobile Information Sharing Platform and Performance of Agricultural Projects

Variable		Mobile Information Sharing Platform	Performance of Agricultural Projects
Mobile Information Sharing Platform	Pearson Correlation	1	-0.182*
	Sig. (2-Tailed)		0.000
	n	192	192
Performance of Agricultural Projects	Pearson Correlation	-0.182*	1
	Sig. (2-Tailed)	0.000	
	n	192	192

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

The outcomes in table 4.24 revealed that there is a weak negative correlation of -0.182 between mobile information sharing platform and the performance of agricultural projects, which specifies a noteworthy correlation with a p-value of 0.000 that is lower than the test level of significance of 0.05.

The following proposition was further tested to satisfy the requirements of the affiliation between mobile information sharing platform and the performance of agricultural projects;

1. **H_0:** There is no significant relationship between mobile information sharing platform and the performance of agricultural projects.

H_1: There is a significant relationship between mobile information sharing platform and the performance of agricultural projects.

Table 4.25 displays the model summary of the association between the mobile information sharing platform and the performance of agricultural projects.

Table 4.25: Model Summary for Mobile Information Sharing Platform and Performance of Agricultural Projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.182[a]	0.033	0.028	2.879

a. Predictors (Constant), Mobile Loans

The research outcomes revealed in Table 4.25 offers an account of the level to which the predictor variable explains for the overall variance of the model. The R^2 is given as 0.033 representing that mobile information-sharing platforms contribute to 3.3% of the variations of the performance of agricultural projects. The research settled that there was a significant affiliation between mobile information-sharing platforms and the performance of agricultural projects.

4.7.3 Regression Analysis of Mobile Information Sharing Platforms and Performance of Agricultural Projects

Regression analysis was done to determine the affiliation between mobile information sharing platform and the performance of agricultural projects. The proposition was verified using a simple linear regression model listed as follows;

$y= \beta_0 +\beta_4 X_4+e$

y= performance of agricultural projects ;

β_0= constant,

β_4= beta coefficient,

X_4= Mobile information sharing platforms

e= error term

Table 4.26: Regression Analysis for Mobile Information Sharing Platforms and Performance of Agricultural Projects

Factor	Sum of Squares	d.f	Average Square	F	Sig.
Regression	550.928	1	550.928	107.059	0.000[b]
Residual	1077.650	190	5.146		
Total	**1628.578**	**191**			

a. Dependent Variable: Performance of Agricultural Projects.
b. Predictors: (Constant) Mobile Information Sharing Platforms

The application of ANOVA showed the power of the regression model in Table 4.26. The research recognized that the Fishers-significance value of 0.000 was lower contrasted to 0.05 ($p<0.05$). The F-ratio was substantial, $F_{(1, 190)} = 107.059$ was considerably bigger than the critical value of F=4.03. This demonstrates that the model was significant.

Table 4.27: Coefficients of Mobile Information Sharing Platforms and Performance of Agricultural Projects

	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
Variables	**B**	**Std. Error**	**Beta**		
(Constant)	27.840	1.504		18.514	0.000
Continuous Improvement	- 0.134	0.052	-0.182	-2.547	0.012

a. Dependent Variable: Performance of Agricultural Projects

The outcomes in Table 4.27 gave a standardized beta value of -0.182 signifying that a unit increase of mobile information-sharing platforms contributes to an 18.2% increase in the variations of performance of agricultural projects. The overall model was sound to forecast the performance of agricultural projects given continuous improvement at $p<0.05$. The regression model $y= \beta_0 +\beta_4 X_4 + e$ would be;

Performance of agricultural projects = 27.840 – 0.182 (Mobile information sharing platforms) + e; t = -2.547; p<0.05.

Thus, the null proposition was rejected and the alternative accepted, concluding that there was a significant affiliation between mobile information-sharing platforms and the performance of agricultural projects in Makueni County.

4.7.4 Qualitative Analysis for Mobile Information Sharing Platforms and Performance of Agricultural Projects

Outcomes of interviews with mobile technology experts and farmers listed that mobile information-sharing platforms affected the performance of agricultural projects in Makueni County. The outcomes of the interviews were similar to the quantitative data. Results obtained from the consultations with the experts were obtained. The research endeavored the informants' opinions on whether there existed barriers or challenges facing the acceptance and usage of mobile technology in agriculture in Kenya and how the barriers could be overcome. One of the informants had this to say in an interview;

> *Yes, there are challenges. Lack of internet connection in remote areas, lack of electricity, and lack of awareness among most farmers who still engage in small-scale and traditional agriculture, like relying on rain and being uneducated on disease control. This should change by engaging community-based organizations to mobilize farmers and build the capacity of farmers through training and extension services.*

Opinion was also sought from farmers on any recommendations they could give to the government in improving the use of mobile technology in agriculture. A respondent had this to say;

> *The government should enhance network and power connectivity in remote areas. Mobile technology practitioners should carry out massive sensitization on the importance of adopting mobile technology in agriculture.*

The outcomes from the qualitative along with the quantitative data show that there was an affiliation between the mobile information sharing platform and the performance of agricultural projects in Makueni County, Kenya. The adoption of a mixed-method approach justified the need for data triangulation in the research.

4.8 Performance of Agricultural Projects

The data collected on the performance of agricultural projects in Makueni County, Kenya was descriptively analyzed in quantitative form. The variable was measured using the following indicators: increased yield, increased returns, ease of access to the market, pest control, and risk mitigation of diseases. The informants were required to give their responses as per the declarations provided. The response variable was measured employing a 5-point Likert scale as follows: 1= Strongly Disagree (SD), 2= Disagree (D), 3= Neutral (N), 4= Agree (A) and 5= Strongly Agree (SA). Table 4.28 displays the outcomes.

Table 4.28: Performance of Agricultural Projects

Declarations	n	5 F (%)	4 F (%)	3 F (%)	2 F (%)	1 F (%)	Mean	Std. Dev.
1. The DigiFarm sunflower agricultural project has increased my agricultural yield	192	40 (20.8)	46 (24.0)	15 (7.8)	76 (39.6)	15 (7.8)	3.10	1.334
2. The DigiFarm sunflower agricultural project has improved my return on investment in my agricultural projects	192	17 (8.9)	52 (27.1)	36 (18.8)	49 (25.5)	38 (19.8)	2.80	1.280
3. The DigiFarm sunflower agricultural project has made it easy for me to access the market for my agricultural projects	192	103 (53.6)	58 (30.2)	0 (0.0)	31 (16.1)	0 (0.0)	4.21	1.069
4. The DigiFarm sunflower agricultural project has promoted pest control and has mitigated diseases in my agricultural projects	192	65 (33.9)	57 (29.7)	12 (6.3)	55 (28.6)	3 (1.6)	3.66	1.256
5. The DigiFarm sunflower agricultural project has not increased my agricultural yield	192	72 (37.5)	21 (10.9)	5 (2.6)	69 (35.9)	25 (13.0)	3.24	1.564
6. The DigiFarm sunflower agricultural project has improved my standard of living	192	43 (22.4)	32 (16.7)	29 (15.1)	50 (26.0)	38 (19.8)	2.96	1.457
7. The DigiFarm sunflower agricultural project has reduced the time that I take in planning and implementing my agricultural projects	192	82 (42.7)	73 (38.0)	13 (6.8)	18 (9.4)	6 (3.1)	4.08	1.073
Composite average and SDV							**3.44**	**1.290**

The first declaration endeavored to find out whether the DigiFarm sunflower agricultural project had increased farmers' agricultural yield. The outcomes are listed as follows; 40(20.8%) listed strongly agree, 46(24.0%) listed agree, 15(7.8%) listed neutral, and 91(47.4%) listed disagree with an average along with a normal deviation of 3.10 and 1.334 consecutively. The composite average (3.44) that is bigger than the declaration line item average specifies that the declaration had disagreeing responses on the effectiveness of the DigiFarm project on yield.

The research obtained responses on whether the DigiFarm sunflower agricultural project had improved return on investment towards farmers' agricultural projects. The outcomes show that 69(8.9%) listed agree, 36(18.8%) were neutral and 87(45.3%) listed disagree with an average along with a normal deviation of 2.80 and 1.280 sequentially. The declaration when associated with the composite average of 3.44, suggests that responses under this declaration were contrasting and some undecided being represented by 18.8%. The declaration average when related to the composite average infers that most of the informants had contrasting views as reinforced by 45.3% of the informants.

The third declaration endeavored to find out whether the DigiFarm sunflower agricultural project had made it easy for farmers to access the market for their agricultural projects. The research obtained the following outcomes; 103(53.6%) listed strongly agree, 58(30.2%) listed agree, and 31(16.1%) listed disagree with an average along with a normal deviation of 4.21 and 1.069 sequentially. This infers that the declaration had a significant number of informants who had concurrent views about the line item. This is apparent when contrasting the composite average(M=3.44) with the line item average(M=4.21).

The findings for the fourth declaration listed that the DigiFarm sunflower agricultural project had promoted pest control and mitigated diseases in farmers' agricultural projects. The descriptive findings from Table 4.28 specify that 122(63.6%) listed agree, 12(6.3%) listed neutral about the declaration, and 30.2%) listed disagree. The declaration drew an average as well as a normal deviation of 3.66 and 1.256 consecutively. This suggests that 63.6% of the informants had similar sentiments concerning the declaration, 30.2% had contrasting views while 6.3%% were neutral contributing to an average that was slightly bigger than the composite mean.

When asked whether the DigiFarm sunflower agricultural project had not increased their agricultural yield, the outcomes from Table 4.30 specify that 72(37.5%) listed strongly agree, 21(10.9%) listed agree, 5(2.6%) were neutral, 69(35.9%) and 25(13.0%) strongly disagree with an average along with a normal deviation of 3.24 and 1.564 sequentially. The composite average was bigger than the line item (M=4.44>M=3.24) implying that there were several contrasting views from the informants.

Declaration number six investigated whether the DigiFarm sunflower agricultural project had improved farmers' standard of living. The outcomes obtained were as follows; 43(22.4%) listed strongly agree, 32(16.7%) listed agree, 29(15.1%) were neutral, 50(26.0%) disagree, and 38(19.8%) listed strongly disagree sequentially. The declaration had an average as well as a normal deviation of 2.96 and 1.457 sequentially. The discoveries specify that the responses to the declaration had disagreeing views as reinforced by 88(45.8%) of the informants.

In the case of whether the DigiFarm sunflower agricultural project had reduced the time taken in planning and implementing agricultural projects, out of 192 informants, the outcomes obtained were as follows; 82(42.7%) listed strongly agree, 73(38.0%) listed agree, 13(6.8%) listed neutral, 18(9.4%) differed and 6(3.1%) strongly disagreed with an average along with a normal deviation

of 4.08 and 1.073 consecutively. This suggests that the declaration drew concurrent views from the informants. This is apparent considering the declaration average was bigger than the composite average(M=4.08>M=3.44).

4.9 Summary of the Results of the Test Hypotheses

Table 4.29 displays a summary of the outcomes of the test of supposition from the analyzed data.

Table 4.29: Summary of Results of Test Hypotheses

Objective	Proposition	Regression Model	Outcomes	Interpretation
1. To establish the effect of mobile applications on the performance of agricultural projects.	1. **H_0:** There is no significant relationship between mobile applications and the performance of agricultural projects.	$y= \beta_0+\beta_1X_1+e$	{R=0.294, R^2=0.087, β=15.675, t= 4.245, F $(_{1,190})$ = 18.017, p<0.05}	Reject H_0 **Accept H_1**
2. To determine the effect of mobile money transfer on the performance of agricultural projects	2. **H_0**: There is no significant relationship between mobile money transfer and the performance of agricultural projects.	$y= \beta_0+\beta_2X_2+e$	{R=0.624, R^2=0.389, β=11.223, t=3.226, F $(_{1,190})$ = 105.564, p<0.05}	Reject H_0 **Accept H_1**
3. To assess the effect of mobile loans on the performance of agricultural projects.	3. **H_0**: There is no significant relationship between mobile loans and the performance of agricultural projects.	$y= \beta_0+\beta_3X_3+e$	{R=0.384, R^2=0.148, β=12.989, t=5.739, F $(_{1,190})$ = 32.939, p<0.05}	Reject H_0 **Accept H_1**
4. To evaluate the effect of mobile information sharing platform on the performance of agricultural projects.	4. **H_0:** There is no significant relationship between mobile information sharing platforms and the performance of agricultural projects.	$y= \beta_0+\beta_4X_4+e$	{R=-0.182, R^2=0.033, β=27.840, t=-2.547.686, F $(_{1,190})$ = 32.939, p<0.05}	Reject H_0 **Accept H_1**

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

In this section, the investigator describes the synopsis of results, discussions and deductions, along with the commendations for additional studies.

5.2 Summary of Findings

The synopsis is premised on outcomes attained from the variables in the fourth chapter.

5.2.1 Mobile Applications and Performance of Agricultural Projects

The first aim of the research endeavored to determine the level to which mobile applications effect the performance of agricultural projects in Kenya. The research rejected the null proposition and concluded that mobile applications have a substantial effect on the performance of agricultural projects in Makueni County. This is reinforced by Sridhar and Sridhar (2006) who argue that mobile applications provide up-to-date, relevant information to farmers which positively affects their yields and profitability.

5.2.2 Mobile Money Transfer and Performance of Agricultural Projects

The second goal of the investigation endeavored to demonstrate the effect of mobile cash transmission on the performance of agricultural projects in Makueni County, Kenya. The alternative proposition was accepted and settled that mobile money transfer has a substantial effect on the performance of agricultural projects in Makueni County. According to Siyao, (2012) profitability is a major concern for most farmers. The implication here is that mobile money transfer is a great tool to empower farmers since it impacts the performance of their agricultural projects through increased yields. This way, farmers have enough for subsistence and sale, and subsequently, they get to have more disposable income.

5.2.3 Mobile Loans and Performance of Agricultural Projects

Aim number three of the research endeavored to establish the impact of mobile loans on the performance of agricultural ventures in Makueni County, Kenya. The research rejected the null proposition and accepted the alternative proposition, concluding that mobile loans have a noteworthy effect on the performance of agricultural projects in Makueni County. This

corroborates with a GeoPoll Survey Report (2018) that farmers with smartphones have access to mobile lending and banking services. Consequently, mobile loans support farmers to scale up production, therefore increasing yield.

5.2.4 Mobile Information Sharing Platform and Performance of Agricultural Projects

The fourth variable endeavored to examine the impact of the mobile information sharing platform on the performance of agricultural projects in Makueni County. The null supposition was dismissed and the research resolved that the mobile information sharing platform has a noteworthy effect on the performance of agricultural projects in Makueni County, Kenya. This is in agreement with Gatotoh, Gakuu, and Keiyoro (2017), that mobile telephony has indeed changed how individuals interrelate with each other and with their social-economic settings. Interaction among farmers is critical for peer support, sharing of information, and enhancing evidence-based agricultural practices.

5.3 Discussions

The research used the findings from the analyzed data to discuss alongside an empirical review of the literature addressing each variable.

5.3.1 Mobile Applications and Performance of Agricultural Projects

Objective number one endeavored to establish the effect of mobile applications on the performance of farming ventures in Makueni County, Kenya. The mean of mean along with the standard error of the variable were 3.98 and 0.775 consecutively. The null proposition of the research which stated that mobile applications have no substantial effect on the performance of agricultural projects in Makueni County revealed the following: $R=0.294$, $R^2=0.087$, $\beta=15.675$, $t= 4.245$, $F_{(1,190)} = 18.017$, $p<0.05$. The outcomes from the analysis revealed that mobile applications explained 8.7% of the variations in the performance of agricultural projects in Makueni County. The research found that there was statistical significance in terms of correlation between mobile applications and the performance of agricultural projects in Makueni County, Kenya. These research outcomes are in line with the research done by Salia, Nsowah and, Steel, (2011) on the use of cell phone applications that established that mobile applications enabled fishermen to be safer at the ocean and also stay connected by contacting their relatives as well as their colleagues hence increasing and expanding their income levels at the market. Similar findings are reinforced by Steinke et al., (2021) that the digital revolution has enhanced agricultural production, and that

mobile applications provide up-to-date, relevant information to farmers that will positively affect their yields and profitability. The implication from the thematic analysis of the qualitative data highlighted the critical role of adopting smart agricultural farming techniques; particularly, mobile applications in agriculture to improve the performance of agricultural projects. Indeed, mobile applications have great potential to improve the performance of agricultural projects and improve farmers' livelihoods, particularly women, youth, and small-scale farmers in Kenya.

5.3.2 Mobile Money Transfer and Performance of Agricultural Projects

The second aim of the research endeavored to assess the impact of mobile money transmission on the performance of agricultural projects. The composite average along with the standard error of the variable were 4.30 and 0.569 sequentially. The study evaluated the null supposition; mobile money transfer has no significant effect on the performance of agricultural projects in Makueni County, and revealed the following outcomes: $R=0.624$, $R^2=0.389$, $\beta=11.223$, $t=3.226$, $F_{(1,190)} = 105.564$, $p<0.05$. It was found that mobile money transfer accounted for 38.9% of the discrepancies in the performance of agricultural ventures in Makueni County. To respond to the second study query, the research linked the findings from the quantitative and qualitative analysis to previous empirical literature to support the significant affiliation between mobile money transfer and the performance of agricultural projects in Makueni County. These findings corroborate Mutinda, Gatotoh, and Keiyoro's (2019) findings who specify the existence of a significant positive affiliation between the level of technology preparedness and intent to use the system. Further research findings by Gakuu et. al, (2017) advance the importance of attitude as a psychological construct that contributes to technology acceptance. This implies that mobile technologies such as mobile money transfer effect the performance of agricultural projects. The implication of the qualitative research suggested the critical role of capacity building at the local levels to empower farmers on the use of mobile technology in agriculture. Needless to say, communities must have strategic ICT-based facilities to ensure that farmers take advantage of mobile money transfer to improve the performance of their agricultural projects.

5.3.3 Mobile Loans and Performance of Agricultural Projects

The third aim of the study assessed the effect of mobile loans on the performance of agricultural ventures. The mean of mean, as well as the standard error of the variable, were 3.47 and 0.893 consecutively. The correlation between mobile loans and the performance of agricultural projects

showed that there existed a weak positive association of 0.384. The research also discovered the following; R=0.384, R^2=0.148, β=12.989, t=5.739, F ($_{1,190}$) = 32.939, p<0.05. The outcomes specify that mobile loans accounted for 14.8% of the disparities in the performance of agricultural projects in Makueni County. The research linked the findings from the qualitative and quantitative analysis to previous empirical research findings. These outcomes when contrasted to other empirical findings conducted by Souter, Scott, and Garforth (2005), in a survey conducted in Tanzania, Mozambique and India support the use of mobile technology in agriculture. However, the findings fail to specify the level to which mobile loan service providers effect farmer practices in agriculture. On the other hand, a GeoPoll Survey Report (2018) observes that mobile lending and banking services are the most prevalent services used by farmers; perhaps due to the M-Pesa connectivity throughout the country. The thematic analysis of the qualitative data listed that mobile technology such as mobile loans is relevant in today's technologically advanced world, particularly with the multitude of mobile loan applications at farmers' disposal. This implies that mobile loans are critical in providing access to finances required to implement modern agricultural practices, hence improving the performance of agricultural projects.

5.3.4 Mobile Information Sharing Platform and Performance of Agricultural Projects

The fourth aim endeavored to investigate the effect of the mobile information sharing platform on the performance of agricultural projects in Makueni County, Kenya. The mean of mean along with the normal deviation of the variable were 4.06 and 0.959 sequentially. The research verified the null supposition of the research and found that mobile information-sharing platforms have a substantial effect on agricultural projects. The research obtained the following outcomes: R=-0.182, R^2=0.033, β=27.840, t=-2.547.686, F ($_{1,190}$) = 32.939, p<0.05. The research established that the mobile information sharing platform explained 3.3% of the variations in the performance of agricultural ventures in Makueni County. The research, therefore, established that there existed a statistically significant relationship between mobile information-sharing platforms and the performance of agricultural projects in Makueni County, Kenya. This agrees with a GeoPoll Survey Report (2018) that farmers with smartphones have access to WhatsApp farming groups and farming applications. In addition, Vijay et al., (2017), argue that information sources are critical because they impact how the audience perceives information, and that in the wake of technological advancements, most consumers depend on online reviews when purchasing products. The outstanding theme from the qualitative research was the use of cell phone technology

to facilitate access to the exchange of data and evidence on farming techniques, thus transforming many farmers from practicing subsistence-based agriculture to it being an income-generating business. Information sharing platforms are therefore relevant now, more than never before in ensuring that farmers make informed decisions when sourcing critical products such as farming inputs and pesticides.

5.4 Conclusions

The research focused on establishing the impact of mobile know-how on the performance of agricultural ventures in Makueni County, Kenya. The first objective to establish the impact of mobile applications on the performance of agricultural ventures in Makueni County, Kenya, deduced that there existed a weak positive association linking mobile applications and the performance of agricultural projects in Makueni County. This implies that mobile applications effect the performance of agricultural projects in Makueni County, Kenya. The conclusion as reinforced by the findings is that farmers found mobile applications to be reliable, efficient, easy to use and enabling in facilitating access to markets for their agricultural produce and improving their socioeconomic status.

The second aim of the research endeavored to establish the effect of cell phone cash transfer on the performance of agricultural projects in Makueni County. The outcomes show the presence of a moderate positive association linking mobile money transfer and the performance of agricultural ventures in Makueni County, Kenya. The implication as reinforced by the findings is that farmers found mobile money transfer to be readily available, simple, efficient, adaptable, relevant, and reliable. The conclusion is that mobile money transfer effects the performance of agricultural projects in Makueni County.

Aim number three of the research endeavored to research the effect of mobile loans on the performance of agricultural projects in Makueni County, Kenya. The outcomes showed a weak positive association linking mobile loans and the performance of agricultural ventures, inferring that mobile loans effect the performance of agricultural projects in Makueni County, Kenya. The implication as reinforced by the findings is that farmers find it easy to apply for and repay mobile loans. Another implication is that farmers find that mobile loan services have enabled convenience in loan processing and award of loans for their agricultural projects. In addition, farmers find mobile loans to be private and that access to mobile loans has made their work faster. Implications

from the findings also suggest that farmers find the use of mobile loans to have given them control over their finances.

The fourth aim of the research endeavored to examine the impact of the cell phone information sharing platform on the performance of agricultural projects in Makueni County, Kenya. It was concluded that the ease of use and interpretation of the unstructured supplementary service data (USSD) to share information, secure mobile chatting platforms, ease of access, relevance, and effectiveness of mobile information-sharing platforms contribute to the mobile information sharing platform influencing the performance of agricultural projects in Makueni County, Kenya. However, the weak negative correlation implies that there may be other underlying issues that were not addressed by the research and should be investigated further.

5.5 Recommendations

The research recommended the following;

- The research determined that mobile applications have a positive effect on the performance of agricultural projects. However, the findings suggest a gap in the availability and access to agricultural extension facilities, given the majority of the informants gave neutral responses when asked about access to agricultural extension utilities. The government should consider partnerships with mobile technology practitioners, farmers, and agriculture experts to adopt a robust agricultural mobile technology policy that is all-encompassing. The government can achieve much more and reach more farmers by incorporating mobile technology to fast-track other policies such as the agricultural extension policy to offer information to farmers on financing, soil health, pests and diseases, farm inputs, harvesting, and market access.
- Having established a moderate positive association linking mobile money transfer and performance of agricultural ventures, mobile technology stakeholders should promote their agricultural technology policies and encourage innovations such as DigiFarm to reach as many farmers as possible in order to exploit the gains. The Implications from emerging themes in the qualitative research also recommend the need for capacity building and empowerment efforts for farmers. Farmers should therefore be continuously trained on these emerging technologies in agriculture, both at the micro and macro levels.

- While the research revealed that mobile loans positively influence the performance of agricultural projects, an interesting finding gives the implication that farmers perceive mobile loans to be insecure, given the majority of the informants who mentioned that mobile loans are insecure. The government of Kenya, spearheaded by the Central Bank should prioritize policies on the transparency and accountability of mobile loan processes and the adherence of all stakeholders, in order to earn the trust of farmers.
- The research established that mobile information-sharing platforms do impact the performance of agricultural projects. Being the majority of the small-scale farmers may not be able to afford mobile phones with such information-sharing capabilities, agricultural institutions in partnership with mobile companies and local farmers should provide affordable mobile phones that are pre-installed with agriculture-based information-sharing platforms.

5.6 Recommendations for Further Research

The following proposals were forwarded for additional research;

1. Adoption of Artificial Intelligence (AI) machine learning in enhancing the performance and sustainability of agricultural projects through such AI innovations as intelligent spraying, automatic weeding, aerial survey and imaging and grading and sorting of produce.
2. Promotion of monitoring as well as evaluation procedures in the implementation of mobile technology in agricultural projects in Kenya, in order to ensure best practice.

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APPENDICES

Appendix I: Questionnaire for the Farmers

PART A: General Information

Serial Number: _____

Introduction

Good morning / afternoon / evening. My name is Juliet Ronoh. I am a Master's student at the University of Nairobi. Today, I am carrying out a survey across Makueni County to establish the influence of mobile technology on the performance of agricultural projects. I would be grateful if you could assist me in my research by availing me ten minutes of your time. Your views shall not under any circumstance be revealed to anyone. Thank you.

P1. Are you subscribed to the DigiFarm platform? (If no, thank and terminate)

Yes……...……1

No…….……2

P2. Are you a Sunflower farmer subscribed to DigiFarm under the Makueni County and Bidco partnership? (If no, thank and terminate)

Yes…….…..1

No……....2

P3. Constituency…….

Ward……..

P4. Location

Peri-urban…….…....1

Rural…….2

P5. Gender

Male……...….1

Female....……2

P6. Level of Education

Never went to school…….....1

Primary not completed…….……2

Completed primary…….……3

Secondary not completed…….……4

Completed secondary…….……5

College/ University not completed…….……6

Completed College/ University……....7

P7. Age of Respondent

18 – 24 years.....1

25 – 29 years.....2

30 – 34 years.....3

35 – 39 years.....4

40 – 44 years.....5

45 – 49 years.....6

50+ years.....7

P8. Farming Status

Full-time Farmer (Exclusively) .....……..1

Part-time Farmer (with another source of income) …….2

Part-time farmer and Student.....……...…3

Other (specify)…….……....4

P9. Other than Sunflower farming, what other kind of farming do you practice?

Other Crop Farming.…….……...……...….1

Livestock Farming…….....2

Poultry Farming…….....….3

Other (Specify)……...….4

Part B: Mobile Applications

Instruction

As a farmer who incorporates the mobile application in your agricultural projects, to what extent do you agree with the following statements? (Use a scale of 1-5 where 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree and 5 is strongly agree)

No.	Statement	SA	A	U	D	SD
1.	Using the mobile application in my agricultural projects is easy					
2.	Using the mobile application in my agricultural projects is reliable (I can use it whenever I want)					
3.	I have witnessed the social and economic benefits of using the mobile application in my agricultural projects					
4.	It is difficult to use the mobile application for my agricultural projects					
5.	Using the mobile application in my agricultural projects has made my work faster					
6.	Using the mobile application in my agricultural projects has enabled effective access to farming extension services					
7.	Using the mobile application has facilitated efficient access to the market for my agricultural produce.					

8. What are some of the challenges of mobile applications and how can they be improved?

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Part C: Mobile Money Transfer

Instruction

As a farmer who incorporates mobile money transfer in your agricultural projects, to what extent do you agree with the following statements? (Use a scale of 1-5 where 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree and 5 is strongly agree)

No.	**Statement**	SA	A	U	D	SD
1.	Using mobile money transfer in my agricultural projects is secure					
2.	Using mobile money transfer in my agricultural projects is simple					
3.	Using mobile money transfer in my agricultural projects has made my work faster					
4.	Using mobile money transfer is adaptable and relevant for use in my agricultural projects					
5.	Using mobile money transfer in my agricultural projects is reliable (I can use it whenever I want)					
6.	Mobile money transfer services are readily available for use in my agricultural projects					
7.	It is not simple to use mobile money transfer in my agricultural projects					

8. What are some of the disadvantages of mobile money transfer and what recommendations do you give to improve its use in agriculture?

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Part D: Mobile Loans

Instruction

As a farmer who incorporates mobile loans in your agricultural projects, to what extent do you agree with the following statements? (Use a scale of 1-5 where 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree and 5 is strongly agree)

	Statement	**5**	**4**	**3**	**2**	**1**
1.	I can easily apply for and repay mobile loans for my agricultural projects					
2.	Using mobile loans in my agricultural projects is secure					
3.	Using mobile loans in my agricultural projects has given me control over my finances					
4.	Mobile loan services have enabled convenience in loan processing and award of loans for my agricultural projects					
5.	Using mobile loans in my agricultural projects is private and confidential					
6.	Using mobile loans in my agricultural projects has made my work faster					
7.	It is insecure to use mobile loans in my agricultural projects.					

8. What barriers have you encountered when using mobile loans and what recommendations do you give to improve its use in agriculture?

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Part E: Mobile Information Sharing Platform

Instruction

As a farmer who incorporates the mobile information sharing platform in your agricultural projects, to what extent do you agree with the following statements? (Use a scale of 1-5 where 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree and 5 is strongly agree)

	Statement	**5**	**4**	**3**	**2**	**1**
1.	I can easily use the USSD mobile information sharing platform to receive and share information for my agricultural projects					
2.	Using the SMS mobile information sharing platform in my agricultural projects is reliable (I can use it whenever I want)					
3.	I can securely use chat platforms for my agricultural projects					
4.	Using the information-sharing platform in my agricultural projects is relevant and effective					
5.	The use of the mobile information sharing platform for my agricultural projects is readily accessible					
6.	Using the mobile email sharing platform in my agricultural projects has made my work faster					
7.	It is not effective to use the mobile information sharing platforms in my agricultural projects					

8. What are some of the advantages and disadvantages of using the mobile information sharing platform in agriculture and what can be done to make it better?

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Part F: Performance of Agricultural Projects

Instruction

As a farmer participating in the DigiFarm sunflower agricultural project to what extent do you agree with the following statements? (Use a scale of 1-5 where 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree and 5 is strongly agree)

	Statement	**5**	**4**	**3**	**2**	**1**
1.	The DigiFarm sunflower agricultural project has increased my agricultural yield					
2.	The DigiFarm sunflower agricultural project has improved my return on investment in my agricultural projects					
3.	The DigiFarm sunflower agricultural project has made it easy for me to access the market for my agricultural projects					
4.	The DigiFarm sunflower agricultural project has promoted pest control and has mitigated diseases in my agricultural projects					
5.	The DigiFarm sunflower agricultural project has not increased my agricultural yield					
6.	The DigiFarm sunflower agricultural project has improved my standard of living					
7.	The DigiFarm sunflower agricultural project has reduced the time that I take in planning and implementing my agricultural projects					

8. What recommendations do you give to maximize the overall success of the DigiFarm sunflower agricultural project?

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Appendix II: Key Informant Interview Guide for the Experts

Mode of Interview (e.g. Personal, Telephone, Email administered) _____

Designation of Respondent (Title) _____

Sector (e.g. Professional Association, Government, Private Sector-Mobile Technology or Agribusiness) _____

Date of Interview_____

Interview Questions

1. How do you feel about the role of mobile technology in the performance of agricultural projects in Kenya-is it effective, how enthusiastic are you about it and what is your opinion on the future outlook of mobile technology in agriculture in Kenya? (Probe the four spheres of mobile technology i.e. mobile applications, mobile money transfer, mobile loans, and the mobile information sharing platform)
2. Would you say that there have been any social and economic benefits of using mobile technology in agricultural projects? Who have been the major beneficiaries and in what ways have they benefited?) (Probe on the four spheres of mobile technology)
3. To what extent do you agree with the statement that mobile technology is holistic, pragmatic, and relevant in being used across the agriculture continuum? (Crop farming, livestock farming, and poultry farming) Explain your answer (Probe the four spheres of mobile technology)
4. Would you say that there are any barriers or challenges facing the adoption and use of mobile technology in agriculture in Kenya? What are those barriers and how can they be overcome? (Probe the four spheres of mobile technology)
5. What recommendations do you give to improve the use of mobile technology in agriculture? (Probe policy recommendations to government, mobile technology practitioners, and Kenyans)

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