

# An Evaluation Model for Mobile Banking Adoption among Agri-Entrepreneurs in Northern Uganda



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# **AN EVALUATION MODEL FOR MOBILE BANKING ADOPTION AMONG AGRICULTURAL ENTREPRENEURS IN NORTHERN UGANDA**

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## **DEDICATION**

I dedicate this thesis to my beloved spouse, Mrs. Ayikoru Zenah, my brothers, Mr. Mawa Emmanuel, Mr. Parimvaniyo Roy, and Mr. Abani Stephen, and my son, Mr. Onzima Jimmy, in appreciation of their unwavering spiritual, emotional, and financial support throughout my academic journey. Their encouragement, sacrifices, and steadfast belief in me have been a constant source of strength and inspiration in the pursuit of my academic goals.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

|        |   |                                                        |
|--------|---|--------------------------------------------------------|
| AVE    | - | Average Variance Extracted                             |
| CAO    | - | Chief Administrative Officer                           |
| CGAP   | - | Consultative Group to Assist the Poor                  |
| GDP    | - | Gross Domestic Product                                 |
| GSMA   | - | Global System for Mobile Communications Association    |
| GUREC  | - | Gulu University Research Ethics Committee              |
| ICF    | - | International Classification of Functioning            |
| ICT    | - | Information and Communication Technology               |
| IDC    | - | International Data Corporation                         |
| IDT    | - | Innovation Diffusion Theory                            |
| IFC    | - | International Finance Corporation                      |
| ITU    | - | International Telecommunication Union                  |
| KMO    | - | Kaiser-Meyer-Olkin                                     |
| MNO    | - | Mobile Network Operators                               |
| MOFPED | - | Ministry of Finance, Planning and Economic Development |
| MSME   | - | Micro, Small, and Medium Enterprises                   |
| MTN    | - | Mobile Telephone Network                               |
| NGO    | - | Non-Governmental Organization                          |
| OLS    | - | Ordinary Least Squares                                 |
| PC     | - | Perceived behavioural Control                          |
| PCA    | - | Principal Component Analysis                           |
| PEOU   | - | Perceived Ease of Use                                  |
| PU     | - | Perceived Usefulness                                   |
| SACCO  | - | Savings and Credit Cooperative Organization            |
| SEM    | - | Structural Equation Modelling                          |
| SIM    | - | Subscriber Identity Module                             |

|       |   |                                                    |
|-------|---|----------------------------------------------------|
| SME   | - | Small and Medium Enterprise                        |
| SMS   | - | Short Message Service                              |
| SPSS  | - | Statistical Package for Social Sciences            |
| TAM   | - | Technology Acceptance Model                        |
| TPB   | - | Theory of Planned Behaviour                        |
| TRA   | - | Theory of Reasoned Action                          |
| UBOS  | - | Uganda Bureau of Statistics                        |
| UNCST | - | Uganda National Council of Science and Technology  |
| USSD  | - | Unstructured Supplementary Service Data            |
| UTAUT | - | Unified Theory of Acceptance and Use of Technology |
| VIF   | - | Variance Inflation Factor                          |

## ABSTRACT

The expansion of mobile banking services has created opportunities for financial inclusion and improved enterprise performance. However, many users continue to rely on basic transactions, with limited uptake of advanced services supporting agricultural enterprises. Globally, research on mobile banking adoption has focused on institutional, technological, behavioural, and socioeconomic determinants, but these dimensions have often been examined independently. This has resulted in limited understanding of their integrated influence on mobile banking adoption among agri-entrepreneurs, particularly in northern Uganda. This study developed an evaluation model of mobile banking adoption by extending the Technology Acceptance Model with institutional, behavioural, and socioeconomic factors. The study employed a positivist paradigm through cross-sectional research design on 480 agri-entrepreneurs to generate primary data. Data were analysed using descriptive statistics, correlation analysis, multiple regression, and Hayes' PROCESS Macro to estimate direct and indirect effects. Results showed that institutional factors significantly influenced mobile banking adoption, with awareness emerging as the strongest direct predictor ( $c' = 0.3238$ ). Knowledge dissemination, sustainability, user protection, coordination, and training exerted significant indirect effects through perceived usefulness. Perceived ease of use had a significant positive total effect on adoption ( $c = 0.4413$ ,  $p < 0.001$ ), demonstrating the importance of usability. Behavioural factors: attitude, trust, and innovativeness, significantly mediated relationships between institutional factors and adoption and were associated with technological perceptions. Among socioeconomic factors, age was the only variable with a significant direct effect on adoption ( $\beta = 0.1050$ ,  $p = 0.047$ ), while other characteristics mainly influenced adoption indirectly through perceived usefulness and perceived ease of use. Overall, mobile banking adoption among agri-entrepreneurs is shaped by the interaction of institutional, technological, behavioural, and socioeconomic factors rather than technological availability alone. The evaluation model provides a comprehensive framework for explaining adoption behaviour in agricultural enterprises. The study recommends strengthening awareness, digital literacy, consumer protection, service usability, and stakeholder collaboration to promote sustainable mobile banking adoption among agri-entrepreneurs in northern Uganda.

**Keywords:** Mobile banking adoption; agri-entrepreneurs; Technology Acceptance Model; institutional factors; behavioural factors; northern Uganda.

## **CHAPTER ONE: Introduction**

### **1.1 Chapter Overview**

Mobile banking adoption among agri-entrepreneurs is influenced by interconnected institutional, technological, behavioural, and socioeconomic factors that shape the acceptance and utilisation of digital financial services. Understanding these factors is essential for explaining adoption, particularly among agricultural enterprises operating in rural and underserved contexts. Against this background, this chapter introduces the study by presenting its background, context, and rationale within global, regional, national, and northern Ugandan perspectives. Attention is given to mobile banking as a digital financial innovation for enhancing financial inclusion and supporting agricultural enterprises, alongside the institutional, technological, behavioural, socioeconomic, financial-sector, mobile money, and regulatory factors relevant to its adoption in Uganda. Particular consideration is given to the agricultural entrepreneurship context of Northern Uganda and its implications for mobile banking adoption. Key components presented in the chapter include the statement of the problem, purpose, objectives, research questions, justification, significance, scope, and operational definitions of concepts. The chapter also outlines the organisation of the thesis and publications arising from the study. Subsequent chapters review the literature, explain the methodology, present and discuss the empirical findings, and develop and empirically validate an integrated evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda.

### **1.2 Background of the Study**

#### **1.2.1 Evolution of Mobile Banking and Digital Financial Services**

The rapid convergence of digital technologies and financial services is reshaping the adoption and utilisation of mobile banking, particularly among agricultural enterprises in the developing world. Digital financial innovations have transformed how individuals and businesses access, manage, and utilize financial resources, creating opportunities to overcome longstanding barriers associated with geographical distance, high transaction costs, and limited banking infrastructure (Demirgüç-Kunt et al., 2022; World Bank, 2022). Mobile banking as a key component of this transformation, has emerged as an important mechanism for extending financial services to underserved populations, particularly smallholder farmers and agri-entrepreneurs operating in

rural areas where access to conventional banking services remains limited (Aker & Mbiti, 2010; Global System for Mobile Communications Association (GSMA), 2024). Through mobile devices, users can perform financial transactions, save money, access credit, receive payments, purchase insurance, and manage business finances conveniently and securely. Consequently, mobile banking is increasingly recognised as a catalyst for financial inclusion, agricultural commercialisation, and rural economic development (Donovan, 2012; Suri & Jack, 2016). These potential benefits make its adoption among agri-entrepreneurs an important area of inquiry, particularly given that access to mobile banking does not necessarily translate into actual or sustained use.

Mobile banking refers to the use of devices such as laptop, smartphones, tablets, and feature phones to access financial services including payments, money transfers, savings, credit, insurance, and account management (Laukkanen, 2016; Shaikh & Karjaluto, 2015). Over the past two decades, mobile banking has evolved from basic Short Message Service (SMS)-based transactions into comprehensive digital financial ecosystems integrating payments, savings, lending, insurance, and investment services within a single platform (Donovan, 2012; GSMA, 2024). This evolution has been facilitated by rapid advances in mobile technologies, expansion of telecommunications infrastructure, increasing internet penetration, declining handset costs, and growing demand for convenient and accessible financial services (GSMA, 2024; World Bank, 2022). These developments have created an increasingly favourable environment for mobile banking adoption, making it important to examine the factors that influence actual uptake and continued utilisation.

The evolution of mobile banking has fundamentally transformed the delivery of financial services worldwide. Historically, access to formal financial services depended largely on physical banking infrastructure such as bank branches and automated teller machines (ATMs), which were predominantly concentrated in urban centres. As a result, rural populations, low-income households, and small-scale entrepreneurs often faced significant challenges in accessing financial services due to long travel distances, high transaction costs, and stringent account requirements (Aker & Mbiti, 2010; Demirgüç-Kunt et al., 2022). Mobile banking has helped overcome these barriers by enabling users to conduct financial transactions remotely through mobile networks, thereby extending financial services to populations that were previously

excluded from the formal financial system. The growing significance of mobile banking has positioned it as a critical instrument for promoting financial inclusion and supporting the achievement of sustainable development goals. Studies indicate that mobile banking facilitates secure savings, access to credit, receipt of remittances, insurance coverage, and participation in commercial activities, thereby contributing to poverty reduction, enterprise growth, improved household welfare, and economic resilience (Demirgüç-Kunt et al., 2022; Suri & Jack, 2016; United Nations, 2015). For agricultural entrepreneurs, mobile banking provides opportunities to access financial services for purchasing agricultural inputs, receiving payments from buyers, managing cash flows, accessing agricultural credit, and reducing transaction costs associated with traditional banking systems (Kikulwe et al., 2014; World Bank, 2022). These potential benefits make mobile banking particularly relevant to agricultural enterprises, but their realisation depends on whether agri-entrepreneurs adopt and consistently utilise the services available to them. This underscores the need to examine the factors that shape mobile banking adoption within the agricultural entrepreneurship context.

The rapid expansion of mobile banking has been particularly evident in Sub-Saharan Africa (SSA), where mobile money and mobile banking services have become important tools for expanding financial inclusion. The region has emerged as the global leader in mobile money adoption, accounting for a substantial share of registered mobile money accounts and transaction volumes worldwide (GSMA, 2024). In countries such as Kenya, Uganda, Tanzania, and Ghana, mobile banking services have enabled millions of previously unbanked individuals and enterprises to access formal financial services (Demirgüç-Kunt et al., 2022; Jack & Suri, 2014). Uganda has experienced substantial growth in digital financial services, driven by increasing mobile phone penetration, expanding mobile network coverage, and policy initiatives supporting digital financial service delivery (Bank of Uganda, 2023). These developments have created a more enabling environment for mobile banking adoption; however, increased access to digital financial infrastructure does not necessarily translate into actual or sustained use of mobile banking services, highlighting the need to examine the factors that influence adoption among Ugandan users, particularly agri-entrepreneurs.

Despite the rapid expansion of mobile financial services, increasing evidence suggests that access alone does not guarantee adoption and sustained use. Having access to or ownership of a

mobile banking account does not necessarily imply active utilization of the services offered. Many individuals register for mobile financial services but remain inactive users or utilize only basic functionalities such as money transfers while underutilizing advanced services such as savings, credit, and merchant payments (Alalwan et al., 2017; Munyegera & Matsumoto, 2016; Oliveira et al., 2016). Consequently, scholarly attention has shifted from expanding access to understanding the factors that influence actual adoption, continued usage, and value realization from mobile banking services.

Existing studies identify technological factors such as perceived ease of use and perceived usefulness; behavioural factors such as trust, attitude, and innovativeness; institutional factors including awareness creation, training, consumer protection; and socioeconomic factors such as age, gender, education, and income as important determinants of mobile banking adoption (Alalwan et al., 2017; Baptista & Oliveira, 2015; Boateng et al., 2018; Shaikh & Karjaluoto, 2015). Understanding how these interrelated determinants influence adoption behaviour has therefore become an important area of inquiry, particularly within rural and agricultural contexts where financial, institutional, technological, and socioeconomic constraints remain significant. This need is especially pronounced in northern Uganda, where agriculture remains the dominant economic activity and where mobile banking has the potential to enhance financial inclusion, enterprise growth, and rural livelihoods, yet adoption and effective utilization remain below expected levels.

### **1.2.2 Global Perspectives on Mobile Banking Adoption**

The influence of technological, behavioural, institutional, and socioeconomic factors is reflected in the differing patterns of mobile banking adoption observed across developed and developing economies. Although mobile banking has achieved global reach, adoption trajectories vary considerably depending on technological infrastructure, regulatory environments, financial systems, and user characteristics.

In developed economies, mobile banking adoption has largely been driven by demand for convenience, efficiency, seamless digital experiences, and integration with broader digital ecosystems. Among agri-entrepreneurs, adoption is similarly influenced by the need for convenient and efficient financial transactions, including receiving payments, transferring funds, managing business cash flows, and facilitating transactions across agricultural value chains.

Increasing integration of mobile banking with e-commerce platforms, digital wallets, and other financial management applications further expands its potential utility for agricultural enterprises. Consequently, studies in developed countries frequently identify perceived usefulness, ease of use, trust, security, and service quality as major determinants of adoption (Alalwan et al., 2017; Zhou, 2012). In developing economies, however, mobile banking serves a broader developmental purpose. In many low- and middle-income countries, mobile banking has emerged as an important mechanism for overcoming structural barriers associated with inadequate banking infrastructure, long travel distances to financial institutions, high transaction costs, and limited access to formal financial services (Aker & Mbiti, 2010; Donovan, 2012). Consequently, mobile banking has become an important catalyst for financial inclusion, poverty reduction, and economic empowerment. Among developing economies, Kenya provides one of the most prominent examples of widespread mobile financial service adoption, particularly through the M-Pesa platform. Its extensive uptake has expanded access to digital financial services among previously underserved individuals and small enterprises, including those engaged in agricultural activities. The Kenyan experience demonstrates how mobile-enabled financial services can gain widespread adoption within developing-country contexts, while also highlighting the importance of examining the institutional, technological, behavioural, and socioeconomic factors that shape adoption among specific user groups such as agri-entrepreneurs. Empirical evidence demonstrates that mobile financial services have improved household welfare, increased savings, strengthened resilience to economic shocks, and supported entrepreneurial activities (Jack & Suri, 2014; Mbiti & Weil, 2016; Suri & Jack, 2016). Similar experiences have been reported in Bangladesh, Mexico, and several countries in West and Central Africa, demonstrating the adaptability of digital financial services across diverse socioeconomic contexts.

Despite these successes, adoption remains uneven even in countries that have achieved substantial mobile money penetration. Studies consistently report that technological barriers, low digital literacy, trust concerns, inadequate institutional support, and socioeconomic inequalities continue to limit adoption among rural populations and small-scale entrepreneurs (Boateng et al., 2018; Kikulwe et al., 2014). These persistent challenges suggest that mobile banking adoption is influenced not only by access to technology but also by broader contextual factors that shape users' willingness and ability to utilize digital financial services effectively.

### **1.2.3 Mobile Banking Adoption in Uganda**

Uganda has experienced substantial growth in digital financial services, driven by increasing mobile phone ownership, expanding telecommunications infrastructure, regulatory reforms, and investments by mobile network operators and financial institutions (Bank of Uganda, 2021; UCC, 2024; World Bank, 2022). Mobile money has become a major component of this ecosystem, facilitating payments, transfers, savings, borrowing, remittances, and business transactions through platforms such as MTN Mobile Money and Airtel Money (Bank of Uganda, 2023; GSMA, 2024). At the same time, commercial banks have expanded mobile banking through applications and USSD-based services, while growing interoperability between banks and mobile money platforms has increased the convenience and functionality of digital financial services (Bank of Uganda, 2023; GSMA, 2024). However, increased access to digital financial infrastructure does not necessarily translate into actual or sustained mobile banking adoption, particularly among agri-entrepreneurs whose financial needs and operating contexts may differ from those of general users. This highlights the need to examine the factors influencing mobile banking adoption among agri-entrepreneurs in Uganda, particularly northern Uganda.

This expansion has supported the uptake and utilisation of mobile banking services in Uganda by reducing barriers related to distance, accessibility, and transaction costs, while also extending digital financial services to individuals and enterprises in rural and underserved areas. Mobile financial services have reduced barriers associated with distance, account maintenance costs, and minimum balance requirements, thereby improving access among previously underserved populations (FinScope, 2024; Munyegera & Matsumoto, 2016). Governments, development partners, and agribusiness organizations increasingly utilize mobile platforms to distribute salaries, social transfers, agricultural payments, grants, and subsidies, further reinforcing their importance within the national economy.

Despite these achievements, evidence indicates that increased access has not necessarily translated into comprehensive adoption and utilization of mobile banking services. Many users continue to utilize mobile platforms primarily for person-to-person transfers and cash withdrawals while making limited use of advanced services such as digital savings, credit, and merchant payments (Ajambo et al., 2023; Eton et al., 2019). Studies conducted in Uganda attribute this gap to a combination of technological challenges, behavioural concerns,

institutional limitations, and socioeconomic constraints (Eton et al., 2019; Kiconco & Babu, 2022). These challenges become particularly important within the agricultural sector, where financial exclusion remains widespread despite increasing access to digital financial services.

#### **1.2.4 Mobile Banking and Agricultural Entrepreneurship**

Agriculture remains a cornerstone of economic development in many developing countries and plays a vital role in employment creation, food security, poverty reduction, and income generation. In Uganda, the sector employs more than 70% of the population and contributes substantially to national output and rural livelihoods UBOS (UBOS, 2021). Within this sector, agri-entrepreneurs, including commercial farmers, produce traders, processors, and agricultural input dealers play an important role in promoting agricultural commercialization, value addition, and market development (Lans et al., 2020). Despite their contribution to economic development, agri-entrepreneurs often face substantial financial challenges. Many operate in rural areas characterized by limited banking infrastructure, inadequate collateral, irregular income flows, information asymmetries, and restricted access to formal financial services (World Bank, 2022). These constraints limit their ability to invest in improved technologies, quality inputs, mechanization, and enterprise expansion. Mobile banking has emerged as a potentially transformative solution to these challenges. Through mobile platforms, agri-entrepreneurs can receive payments, purchase inputs, save securely, access digital credit, and participate more effectively in agricultural value chains (Asongu et al., 2019; Tabetando et al., 2022). Mobile banking also generates digital transaction records that can support credit assessment and facilitate access to formal financial services among previously underserved agricultural actors. Consequently, mobile banking is increasingly viewed as a strategic tool for enhancing agricultural productivity, market participation, enterprise growth, and financial inclusion.

#### **1.2.5 Mobile Banking Adoption among Agri-entrepreneurs in northern Uganda**

The significance of mobile banking is particularly evident in northern Uganda, where agriculture remains a dominant livelihood and source of household income (Wichern et al., 2019). Agri-entrepreneurs engaged in production, processing, marketing, and value addition operate within contexts characterised by limited access to formal financial services, inadequate infrastructure, and vulnerability to economic and climatic shocks (Atube et al., 2021). Mobile banking offers opportunities to facilitate agricultural transactions, improve financial management, strengthen

value-chain participation, and reduce transaction costs. However, there is limited empirical evidence establishing the extent of mobile banking adoption among agri-entrepreneurs in northern Uganda, and no definitive regional adoption rate is currently established. Available evidence suggests that agricultural actors often rely on mobile-enabled financial services primarily for basic transactions, while potentially underutilising services such as digital savings, credit, insurance, merchant payments, and enterprise financial management (Ajambo et al., 2023). This evidence gap makes it difficult to determine the extent of adoption and the factors shaping its uptake and utilisation among agri-entrepreneurs in the region, thereby providing a basis for the present study.

Research on mobile banking adoption suggests that users' decisions are influenced by a combination of institutional, technological, behavioural, and socioeconomic factors (Alkhaldi, 2017; Davis, 1989; Demirgüç-Kunt et al., 2022; Gillwald et al., 2019; Thar et al., 2020). Institutional factors such as awareness creation, training programmes, stakeholder coordination, regulatory support, and user protection mechanisms can facilitate or constrain adoption. Technological factors including perceived usefulness, perceived ease of use, security, reliability, and accessibility influence users' perceptions of the value and practicality of mobile banking services. Behavioural factors such as trust, attitude, and innovativeness are equally important because they shape users' willingness to adopt and utilize digital financial technologies. Similarly, socioeconomic characteristics including age, gender, education level, income, enterprise category, and mobile device ownership may influence adoption behaviour by affecting access to resources, digital literacy, and financial capability. Although these factors have been widely acknowledged as important determinants of technology adoption, existing studies report inconsistent findings regarding their relative influence across different populations and contexts. Such inconsistencies suggest the need for context-specific investigations capable of explaining mobile banking adoption among specific user groups such as agri-entrepreneurs. These gaps and contextual variations underscore the need for a systematic investigation of mobile banking adoption among agri-entrepreneurs in Northern Uganda, providing the basis for the problem addressed in this study.

### **1.3 Statement of the Problem**

Effective mobile banking adoption should enable agri-entrepreneurs to conveniently conduct business transactions, manage finances, access savings and credit, and participate efficiently in agricultural value chains. Such utilisation can reduce transaction costs, improve financial management, and enhance enterprise performance (Kitimbo, 2021; Munyegera & Matsumoto, 2016; Oluoch & Ouma, 2020).

Uganda has made considerable progress in expanding digital financial services through increased mobile network coverage, mobile money and mobile banking accounts, and diversified mobile-enabled financial services (GSMA, 2025; UCC, 2024). However, increased access has not necessarily translated into effective and sustained utilisation. Although about 86% of microentrepreneurs own mobile banking accounts, only approximately 49% actively use the services (Hamdan et al., 2022), while usage remains concentrated on basic transactions rather than savings, credit, insurance, and other enterprise-oriented services (GSMA, 2024).

The challenge is particularly relevant in Northern Uganda, where agriculture is a major economic activity and agri-entrepreneurs play important roles in agricultural value chains. Despite growing availability of mobile banking services, the extent and nature of adoption among agri-entrepreneurs in the region remain insufficiently established, with no definitive regional adoption rate currently available. Consequently, national evidence cannot adequately explain the adoption situation within this specific context.

Although previous studies identify institutional, technological, behavioural, and socioeconomic factors as important determinants of mobile banking adoption (Alalwan et al., 2017; Eton et al., 2019; Kiconco & Babu, 2022), these factors have largely been examined independently or among general users. Limited evidence therefore exists on their combined and interrelated influence among agri-entrepreneurs in Northern Uganda. This gap constrains the development of context-specific interventions to strengthen mobile banking adoption and utilisation.

## **1.4 Objectives of the Study**

### **1.4.1 General Objective**

The main objective of this study was to develop an evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda by integrating institutional, technological, behavioural, and socioeconomic factors.

### **1.4.2 Specific Objectives**

The specific objectives of the study were to:

- I. Examine the effects of socioeconomic, institutional, and technological factors on adoption of mobile banking among agri-entrepreneurs in northern Uganda.
- II. Determine the mediating role of behavioural factors in the relationship between institutional and technological factors and mobile banking adoption among agri-entrepreneurs in northern Uganda.
- III. Design and empirically validate an evaluation model for mobile banking adoption among agri-entrepreneurs by integrating institutional, technological, behavioural, and socioeconomic factors.

## **1.5 Research Questions**

The study was guided by the following research questions:

- I. What are the effects of socioeconomic, institutional, and technological factors on mobile banking adoption among agri-entrepreneurs in northern Uganda?
- II. What is the mediating role of behavioural factors in the relationship between institutional and technological factors and mobile banking adoption among agri-entrepreneurs in northern Uganda?
- III. What structural relationships define the evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda?

## **1.6 Justification of the Study**

The study was justified by the gap between the expanding availability of mobile banking services in Uganda and their limited and inconsistent adoption among agri-entrepreneurs, particularly in

rural settings (FinScope Uganda, 2023; UCC, 2024; GSMA, 2025). Agri-entrepreneurs operate under conditions of seasonal incomes, market uncertainty, infrastructure limitations, and varying digital capabilities, which may influence their adoption decisions. However, existing studies have largely examined institutional, technological, behavioural, and socioeconomic determinants separately, providing fragmented explanations of adoption behaviour. Although the Technology Acceptance Model (TAM) explains adoption through perceived usefulness and perceived ease of use, it may not sufficiently capture the broader contextual factors affecting technology use in rural agricultural settings. This gap justified the development and empirical validation of an integrated model that considers these interrelated determinants of mobile banking adoption among agri-entrepreneurs in Northern Uganda.

### **1.7 Significance of the Study**

This study is significant because it provides empirical, theoretical, methodological, and practical insights into mobile banking adoption among agri-entrepreneurs in northern Uganda. By examining institutional, technological, behavioural, and socioeconomic factors within an integrated framework, the study provides a context-specific understanding of adoption in agricultural settings characterised by seasonal incomes, market uncertainty, and varying access to digital infrastructure.

Empirically, the study contributes evidence from an under-researched population of agri-entrepreneurs in northern Uganda. It extends existing knowledge by examining both the direct and indirect relationships among institutional, technological, behavioural, and socioeconomic determinants, thereby providing a more comprehensive explanation of mobile banking adoption than studies focusing on individual determinants.

Theoretically, the study extends the Technology Acceptance Model (TAM) by incorporating institutional, behavioural, and socioeconomic dimensions relevant to the rural agricultural context. The resulting integrated model provides a broader explanation of how contextual and individual factors influence perceived usefulness, perceived ease of use, and mobile banking adoption.

Methodologically, the study provides an integrated evaluation model for examining mobile banking adoption. The model offers a structured approach for analysing the relationships among

multiple determinants and provides a basis for future research on digital financial technologies in rural and agricultural contexts.

Practically and in policy terms, the findings provide evidence to guide policymakers, financial institutions, mobile network operators, agricultural extension agencies, regulators, and development partners in designing targeted interventions to promote mobile banking adoption. In particular, the findings can inform initiatives aimed at improving awareness and digital financial literacy, strengthening user trust and protection, enhancing service reliability, and developing products that respond to the financial needs of agri-entrepreneurs.

Overall, the study provides a basis for more targeted efforts to promote meaningful use of mobile banking and deepen digital financial inclusion among agricultural enterprises in northern Uganda and similar rural contexts.

## **1.8 Operational Definition of Terms**

*Evaluation Model:* A structured analytical framework used to examine relationships among variables and assess how they jointly explain a particular phenomenon (Creswell & Creswell, 2018). In this study, the evaluation model refers to the integrated framework developed to examine the relationships among institutional, technological, behavioural, and socioeconomic factors influencing mobile banking adoption among agri-entrepreneurs in northern Uganda.

*Mobile Banking:* The provision and use of banking services through mobile devices, enabling customers to access and perform financial transactions remotely (Shaikh & Karjaluoto, 2015). In this study, mobile banking refers to mobile-enabled services provided by formal financial institutions, including account access, funds transfers, payments, savings, and other banking transactions used by agri-entrepreneurs for personal and agricultural business purposes.

*Mobile Money:* A service that enables users to store, send, and receive electronic money through mobile devices, generally within systems operated by mobile network operators and their agents (GSMA, 2024). In this study, mobile money is treated as distinct from mobile banking because the former primarily involves electronic-money services, whereas the latter provides access to services linked to formal bank accounts.

*Adoption:* The decision and subsequent use of an innovation or technology by an individual or organisation (Rogers, 2003). In this study, adoption refers to the extent and intensity with which agri-entrepreneurs use mobile banking in their financial and business activities. It is reflected in the frequency and range of mobile banking services used and the level of engagement with the services.

*Agri-Entrepreneur:* An individual who identifies and exploits opportunities within the agricultural sector by engaging in agricultural production, processing, marketing, trading, or related value-chain activities (McElwee, 2006). In this study, agri-entrepreneurs comprise commercial farmers, agricultural processors, produce dealers, and agricultural input dealers operating in the selected districts of Northern Uganda.

*Institutional Factors:* Conditions and support mechanisms within the institutional environment that can facilitate or constrain technology adoption (Scott, 2014). In this study, institutional factors comprise knowledge dissemination, awareness creation, stakeholder coordination, training, user protection, and sustainability of mobile banking services.

*Technological Factors:* Perceptions about the characteristics of a technology that influence its acceptance and use. Within the Technology Acceptance Model, perceived usefulness and perceived ease of use are central determinants of technology acceptance (Davis, 1989). In this study, technological factors are represented by perceived usefulness and perceived ease of use of mobile banking services.

*Behavioural Factors:* Individual psychological dispositions and perceptions that influence acceptance and use of a technology (Venkatesh et al., 2003). In this study, behavioural factors comprise attitude, trust, and innovativeness as characteristics influencing agri-entrepreneurs' engagement with mobile banking services.

*Socioeconomic Factors:* Demographic, economic, and individual characteristics that may shape individuals' access to, acceptance of, and use of financial and digital technologies (Demirgüç-Kunt et al., 2022). In this study, socioeconomic factors include age, gender, marital status, education level, income level, enterprise category, mobile device ownership, and mobile device category.

*Empirical Model Validation:* The systematic process of assessing whether a proposed model adequately represents the relationships among variables using observed empirical data (Hair et al., 2019). In this study, empirical model validation refers to testing the proposed integrated evaluation model against data collected from agri-entrepreneurs to determine its explanatory adequacy and the extent to which the hypothesised relationships among institutional, technological, behavioural, and socioeconomic factors are supported by the empirical evidence.

## 1.9 Thesis Outline

This section provides an overview of the organization and structure of the thesis. The thesis is arranged into eight chapters, with each chapter addressing a specific component of the study, from the identification of the research problem and theoretical grounding to methodological procedures, empirical analysis, model validation, discussion of findings, and the presentation of conclusions and contributions to knowledge. The sequence of chapters reflects the logical progression of the research process and demonstrates the alignment between the study objectives, analytical approaches, and reported findings. Table 1.1 presents the structure and focus of each chapter.

**Table 1. 1: Thesis Outline**

| <b>Chapter</b>                                                                                        | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chapter One: Introduction</b>                                                                      | Presents the background and context of mobile banking adoption among agri-entrepreneurs, the research problem, objectives, research questions, justification of the study, and operational definitions of key terms, and list of publications from this study.                                                                                                                                   |
| <b>Chapter Two: Literature Review</b>                                                                 | Reviews the theoretical, empirical, and contextual literature related to mobile banking adoption. It presents the Technology Acceptance Model (TAM) as the theoretical foundation, examines relevant extensions incorporating institutional, behavioural, and socioeconomic dimensions, identifies research gaps, and develops the conceptual framework that guides the empirical investigation. |
| <b>Chapter Three: Research Methodology</b>                                                            | Describes the methodological approach, including the research philosophy, design, study area, target population, sampling procedures, data collection methods, measurement of constructs, validity and reliability assessment, data analysis techniques and ethical considerations.                                                                                                              |
| <b>Chapter Four: Direct and Indirect Effects of Institutional and Socioeconomic Factors on Mobile</b> | Examines the direct and indirect effects of institutional and socioeconomic factors on mobile banking adoption. Particular attention is given to the mediating influence of technological                                                                                                                                                                                                        |

|                                                                                               |                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Banking Adoption through Technological Perceptions</b>                                     | perceptions, including perceived usefulness and perceived ease of use.                                                                                                                                                                                                                                     |
| <b>Chapter Five: Mediating Role of Behavioural Factors in Mobile Banking Adoption</b>         | Analyses the mediating role of behavioural factors, including attitude, trust, and innovativeness, in the relationship between institutional and technological factors and mobile banking adoption. The chapter presents mediation pathways and their implications for adoption behaviour.                 |
| <b>Chapter Six: Specification and Empirical Validation of the Integrated Evaluation Model</b> | Specifies the evaluation model incorporating institutional, technological, behavioural, and socioeconomic dimensions. The chapter presents the empirical validation of the model and evaluates its explanatory capacity in predicting mobile banking adoption among agri-entrepreneurs in northern Uganda. |
| <b>Chapter Seven: General Discussion of Findings</b>                                          | Discusses the empirical findings in relation to the study objectives, theoretical perspectives, and existing literature. The chapter highlights implications for theory, policy, and practice, and demonstrates the contribution of the findings to understanding mobile banking adoption.                 |
| <b>Chapter Eight: Conclusions, Recommendations, and Contributions of the Study</b>            | Presents conclusions derived from the study findings, recommendations for relevant stakeholders, limitations of the study, contributions to knowledge, and areas for further research.                                                                                                                     |

### 1.10 List of Publications from this Study

- Abandu, J., Oyo, B., Malinga, G., & Mugonola, B. (2025). Effects of Institutional and Technological Factors on Adoption of Mobile Banking by Agri-entrepreneurs in Northern Uganda. *Agriculture & Food Security*, 14(48). <https://doi.org/10.1186/s40066-025-00569-6>
- Abandu, J., Oyo, B., Malinga, G., & Mugonola, B. (2025). Adoption of Mobile Banking Among Agri-Entrepreneurs in Northern Uganda: Do Socioeconomic Factors Matter? *Food and Humanity*, 2949–8244, 100830. <https://doi.org/10.1016/j.foohum.2025.100830>
- Abandu, J., Oyo, B., Malinga, G. M., & Mugonola, B. (2024). Institutional factors and mobile banking adoption among agri-entrepreneurs in Northern Uganda: exploring the mediating role of behavioural factors. *International Journal of Agriculture Innovation, Technology and Globalisation*, 4(4), 400–422. <https://doi.org/https://doi.org/10.1504/IJAITG.2024.147896>

## **CHAPTER TWO: Literature Review**

### **2.1 Chapter Overview**

This chapter presents a comprehensive review of literature relevant to mobile banking adoption among agri-entrepreneurs. It begins by examining the theoretical perspectives underpinning mobile banking adoption, with particular emphasis on the Technology Acceptance Model (TAM) and complementary insights from the Unified Theory of Acceptance and Use of Technology (UTAUT), Innovation Diffusion Theory (IDT), and the Theory of Planned Behaviour (TPB). The review critically evaluates the applicability, strengths, and limitations of these theories in explaining mobile banking adoption within rural and agricultural contexts and provides justification for the adoption of an extended TAM as the guiding theoretical framework for the study. The chapter then reviews the concept of mobile banking adoption and examines the technological, behavioural, institutional, and socioeconomic factors that influence adoption decisions among agri-entrepreneurs. Drawing on empirical evidence from both developed and developing countries, particularly Sub-Saharan Africa, the review synthesizes existing knowledge, identifies areas of convergence and divergence in the literature, and highlights theoretical, methodological, empirical, and contextual gaps that warrant further investigation. Building on the theoretical and empirical review, the chapter presents the study's conceptual framework, illustrating the relationships among institutional, technological, behavioural, and socioeconomic factors and their influence on mobile banking adoption. Particular attention is given to the mediating role of behavioural factors in explaining how institutional conditions shape adoption outcomes. The chapter concludes by demonstrating how the identified gaps inform the current study and justify the development of an integrated model to evaluate the adoption of mobile banking among agri-entrepreneurs in northern Uganda.

### **2.2 Theoretical Perspectives on Mobile Banking Adoption**

Understanding the factors influencing mobile banking adoption among agri-entrepreneurs in northern Uganda requires a critical examination of the major theories that explain technology acceptance and usage behaviour. Several theoretical frameworks have been employed to explain the adoption of digital financial technologies, including the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), the Innovation Diffusion Theory (IDT), and the Theory of Planned Behaviour (TPB). While each theory

contributes valuable insights into technology adoption, they differ in their explanatory focus, contextual applicability, and suitability for explaining mobile banking adoption in rural and developing-country contexts.

### 2.2.1 Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Davis (1989) and subsequently extended by Venkatesh and Davis (2000) and Venkatesh et al. (2003) (Figure 2.1), is one of the most widely adopted theoretical frameworks for explaining the acceptance and use of information technologies.

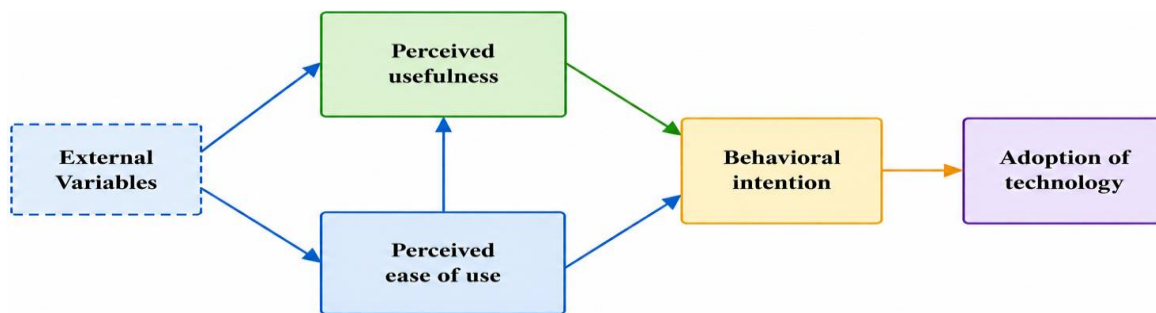


**Figure 2. 1: TAM by Davis (1989) & Venkatesh et al. (2003)**

TAM posits that technology adoption is primarily determined by two cognitive beliefs: perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness refers to the extent to which an individual believes that using a particular technology will enhance task performance, whereas perceived ease of use reflects the degree to which the technology is perceived as effortless to learn and operate (Davis, 1989). These perceptions influence users' attitudes and subsequent adoption behaviour, making TAM a parsimonious and empirically robust model for explaining technology acceptance.

TAM has been extensively applied to explain the adoption of information systems, electronic commerce, internet banking, mobile banking, e-government, and other digital technologies across both developed and developing economies. Empirical studies consistently demonstrate that perceived usefulness and perceived ease of use are significant determinants of mobile banking adoption. For example, Pikkarainen et al. (2004) found that perceived usefulness was the strongest predictor of internet banking adoption in Finland, while Baptista and Oliveira

(2015) established that both perceived usefulness and perceived ease of use significantly influenced mobile banking adoption intentions in developing countries. Similar findings have been reported among low-income populations (Malaquias & Hwang, 2016) and in African contexts, including Senegal, Kenya, and Ghana, where users were more likely to adopt mobile financial services when they perceived them to be useful, reliable, and easy to use (Donner & Tellez, 2008; Boateng et al., 2016; Fall et al., 2020). Collectively, these studies demonstrate the robustness of TAM in explaining technology adoption across diverse contexts.

Despite its widespread application, TAM has been criticized for its emphasis on individual cognitive perceptions while paying limited attention to the broader contextual conditions within which technology adoption occurs (Legris et al., 2003). Technology adoption, particularly in developing countries, is influenced not only by users' perceptions of usefulness and ease of use but also by institutional support, behavioural characteristics, and socioeconomic conditions that shape access to and utilization of digital technologies. Asongu and Nwachukwu (2018), for instance, argue that digital financial technology adoption in Africa is strongly influenced by infrastructure, regulatory environments, financial literacy, and trust in service providers. Likewise, Malaquias and Silva (2020) identify perceived risk, trust, accessibility, and social influence as important determinants of mobile banking adoption that are not explicitly represented in the original TAM.

These limitations are particularly relevant in agricultural settings. Although TAM has been successfully applied in banking, information systems, and other service sectors, agri-entrepreneurs operate within a distinct institutional and socioeconomic environment characterized by dispersed value chains, seasonal incomes, variable digital literacy, limited financial infrastructure, and dependence on agricultural support institutions. Consequently, perceptions of usefulness and ease of use are likely to be shaped by contextual factors such as awareness creation, training, coordination among stakeholders, user protection mechanisms, and sustainability of digital financial services. Furthermore, behavioural characteristics, including trust, attitude, and innovativeness, together with socioeconomic factors such as age, education, income, enterprise category, and ownership of mobile devices, may influence both users' technological perceptions and their actual adoption of mobile banking. These contextual realities

suggest that the original TAM, on its own, may not adequately explain mobile banking adoption among agri-entrepreneurs.

Recognizing these limitations, Davis (1989) and Venkatesh and Davis (2000) recommended incorporating external variables to improve the explanatory power of TAM. Subsequent empirical studies have extended the model by integrating behavioural, institutional, and contextual constructs. For example, Sebayang et al. (2024) found that trust, innovativeness, perceived risk, and social influence significantly enhanced the explanatory power of TAM in explaining mobile banking adoption. Similarly, Alalwan et al. (2017) demonstrated that institutional support, trust, and perceived risk substantially improved the model's ability to explain users' adoption of mobile banking services.

Accordingly, the present study adopts TAM as its theoretical foundation while extending it to reflect the realities of mobile banking adoption among agri-entrepreneurs in northern Uganda. The integrated evaluation model incorporates institutional factors (awareness creation, training, coordination, user protection, knowledge dissemination, and sustainability mechanisms), behavioural factors (trust, attitude, and innovativeness), and socioeconomic characteristics (age, gender, education level, income, enterprise category, and mobile device ownership) as contextual determinants of perceived usefulness and perceived ease of use, which subsequently influence actual mobile banking adoption. Unlike the original TAM, which positions behavioural intention as the immediate antecedent of technology use, this study focuses directly on actual mobile banking adoption. This modification recognizes that, particularly in developing-country agricultural contexts, favorable intentions do not necessarily translate into actual use because of institutional constraints, infrastructural limitations, and socioeconomic barriers. By focusing on actual adoption, the study provides a more contextually relevant and comprehensive explanation of mobile banking utilization among agri-entrepreneurs in northern Uganda.

### **2.2.2 Unified Theory of Acceptance and Use of Technology**

The Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by Venkatesh et al. (2003), integrates constructs from eight prominent technology adoption theories to provide a comprehensive explanation of technology acceptance and use. The model identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as the principal determinants of behavioural intention and actual technology use. Empirical evidence indicates

that UTAUT possesses strong explanatory power, with Venkatesh et al. (2003) reporting that it explained approximately 70% of the variance in behavioural intention, outperforming earlier technology adoption models. Subsequent studies have confirmed its applicability in digital financial services. For example, Mugambe (2017) found that social influence, facilitating conditions, and habit significantly influenced mobile money adoption among Micro, Small, and Medium Enterprises (MSMEs) in Uganda, while Oliveira et al. (2014) reported similar findings for mobile banking adoption in developing economies.

Although UTAUT offers a broader perspective than the original Technology Acceptance Model (TAM), its primary contribution to the present study lies in highlighting the importance of social and facilitating conditions in shaping technology adoption. These contextual factors reinforce the argument that technology acceptance extends beyond users' perceptions of usefulness and ease of use. In particular, facilitating conditions underscore the role of institutional support mechanisms, such as training, awareness creation, coordination, and access to enabling infrastructure, in influencing users' adoption of mobile banking services.

Despite its strengths, UTAUT presents limitations in explaining mobile banking adoption among agri-entrepreneurs in northern Uganda. The model was originally developed within organisational settings and may not adequately capture the realities of informal agricultural enterprises characterised by limited digital literacy, weak institutional support systems, and constrained access to financial services. Furthermore, although UTAUT incorporates facilitating conditions, it gives limited attention to behavioural constructs such as trust and innovativeness, as well as contextual factors such as user protection, knowledge dissemination, and sustainability mechanisms, which are particularly relevant in developing-country agricultural contexts (Alalwan et al., 2017). Consequently, UTAUT is not adopted as the principal theoretical framework for this study. Instead, its emphasis on facilitating conditions provides theoretical support for extending the Technology Acceptance Model with institutional factors that are expected to influence agri-entrepreneurs' perceptions and adoption of mobile banking.

### **2.2.3 Innovation Diffusion Theory**

Innovation Diffusion Theory (IDT), developed by Rogers (2003), provides a comprehensive explanation of how new ideas, technologies, and innovations are introduced, communicated, and adopted within a social system over time. The theory proposes that adoption decisions are

influenced by five perceived attributes of an innovation: relative advantage, compatibility, complexity, trialability, and observability. According to Rogers (2003), innovations that are perceived to provide greater benefits, align with users' existing practices, are easier to understand, can be tested before full adoption, and produce visible results are more likely to be adopted.

IDT has been widely applied in explaining the adoption and diffusion of technological innovations, including digital financial services. For instance, Moore and Benbasat (1991) demonstrated that perceived relative advantage and compatibility significantly influence information technology adoption, while subsequent studies have shown the relevance of innovation characteristics in explaining the acceptance of digital platforms and financial technologies. Within agricultural contexts, IDT has been used to examine the adoption of improved farming technologies, information systems, and digital services, highlighting the importance of compatibility with users' existing practices and perceived benefits of innovations (Adrian et al., 2005).

The relevance of IDT to the present study lies in its recognition that adoption is influenced by users' perceptions of the value and suitability of a technology within their operational environment. In the context of mobile banking adoption among agri-entrepreneurs, factors such as perceived benefits, compatibility with agricultural business activities, and ease of integrating digital financial services into existing financial practices may influence adoption decisions. However, IDT primarily focuses on the characteristics of innovations and the diffusion process rather than the cognitive mechanisms through which users evaluate and accept technologies. Unlike TAM, it provides limited explanation of how perceived usefulness and perceived ease of use shape individual acceptance behaviors.

Furthermore, IDT gives limited attention to the broader institutional, behavioral, and socioeconomic conditions that influence technology adoption, particularly in developing-country agricultural contexts. Factors such as awareness creation, training, stakeholder coordination, trust, user protection, financial literacy, income characteristics, and access to digital devices may determine whether agri-entrepreneurs are able and willing to use mobile banking services. Therefore, while IDT provides useful insights into the role of innovation characteristics in adoption decisions, it is not adopted as the primary theoretical framework in this study. Instead,

its emphasis on perceived innovation attributes complements the adapted TAM framework by supporting the inclusion of contextual factors that shape users' perceptions of mobile banking usefulness and ease of use.

#### **2.2.4 Theory of Planned Behaviour**

The Theory of Planned Behaviour (TPB), proposed by Ajzen (1991), provides a behavioural perspective for explaining individual decision-making and the performance of specific actions. The theory extends the Theory of Reasoned Action by incorporating perceived behavioural control and proposes that behaviour is primarily determined by behavioural intention, which is influenced by three factors: attitude towards the behaviour, subjective norms, and perceived behavioural control. According to TPB, individuals are more likely to engage in a particular behaviour when they have favourable attitudes toward it, perceive social approval or support, and believe they possess the resources, skills, and opportunities required to perform the behaviour.

TPB has been extensively applied in technology adoption research, including studies examining financial technology and digital financial service usage. The theory provides valuable insights into the role of individual attitudes, social influences, and perceived capability in shaping technology-related decisions. For example, perceived behavioural control has been found to influence users' willingness to adopt digital financial services, particularly among populations with different levels of technological knowledge, confidence, and access to enabling resources (Lai, 2017). In the context of mobile banking adoption, TPB contributes to understanding the importance of behavioural factors such as users' attitudes, confidence, and readiness to engage with digital financial platforms.

However, despite its contribution to explaining behavioural processes, TPB has limitations when applied as a standalone framework for examining mobile banking adoption. The theory places greater emphasis on behavioural intentions and social-psychological determinants of action, while providing limited attention to technology-specific perceptions that influence acceptance decisions. Unlike TAM, TPB does not explicitly incorporate perceived usefulness and perceived ease of use, which are central to understanding how users evaluate digital financial technologies. Furthermore, the theory gives limited consideration to institutional and contextual factors, such as awareness creation, training, service reliability, user protection mechanisms, and

socioeconomic conditions, which are particularly influential in developing-country agricultural settings.

Therefore, while TPB provides important theoretical insights regarding the role of attitudes and behavioural characteristics in technology adoption, it is not adopted as the primary theoretical framework in this study. Instead, its emphasis on behavioural determinants informs the inclusion of behavioural factors, particularly attitude, trust, and innovativeness, within the adapted TAM framework. This integration enables the study to retain TAM's focus on technology-related perceptions while incorporating behavioural mechanisms that explain how contextual conditions influence actual mobile banking adoption among agri-entrepreneurs.

**Table 2. 1: Theoretical Foundations and Contributions to the Adapted TAM Framework**

| Theory/Model                                                                        | Key Constructs                                                                             | Contribution to the Study                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh & Davis, 2000)            | Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioural Intention, Actual Use | Provides the primary theoretical foundation for explaining mobile banking adoption through users' technological perceptions, particularly perceived usefulness and perceived ease of use. |
| Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) | Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions       | Supports the inclusion of contextual and enabling conditions, particularly institutional support mechanisms that influence users' perceptions and adoption of mobile banking services.    |
| Innovation Diffusion Theory (IDT) (Rogers, 2003)                                    | Relative Advantage, Compatibility, Complexity, Trialability, Observability                 | Provides insights into how perceived innovation characteristics influence acceptance and diffusion of mobile banking technologies within agricultural communities.                        |
| Theory of Planned Behaviour (TPB) (Ajzen, 1991)                                     | Attitude, Subjective Norms, Perceived Behavioural Control, Behavioural Intention           | Supports incorporation of behavioural dimensions, particularly attitude, trust, and innovativeness, as mechanisms influencing users' acceptance and adoption behaviour.                   |

### 2.2.5 Synthesis of the Theoretical Review

The reviewed theories collectively demonstrate that technology adoption is influenced by technological, behavioural, institutional, and contextual factors. However, TAM provides the most appropriate theoretical foundation for this study because it explicitly explains technology acceptance through perceived usefulness and perceived ease of use. Nevertheless, evidence from the reviewed literature indicates that TAM alone is insufficient to explain mobile banking

adoption among agri-entrepreneurs operating within developing-country agricultural contexts. Guided by recommendations from Davis (1989) and Venkatesh and Davis (2000) regarding the inclusion of external variables, this study adapts TAM by integrating institutional, behavioural, and socioeconomic dimensions into a single theoretical framework. The adapted TAM therefore forms the theoretical basis for specifying and empirically validating the integrated evaluation model presented in this study.

### **2.2.6 Conceptual Review of Mobile Banking Adoption**

Mobile banking refers to the use of mobile devices, particularly mobile phones and smartphones, to access and perform financial services such as money transfers, bill payments, savings, credit transactions, insurance services, balance inquiries, and account management without the need to visit a physical banking facility (Shaikh & Karjaluoto, 2015; Laukkanen, 2016). The rapid expansion of mobile banking has transformed financial service delivery globally by reducing geographical barriers, lowering transaction costs, and increasing access to formal financial services, particularly among underserved and rural populations (Demirgüç-Kunt et al., 2022). In agricultural settings, mobile banking enables agri-entrepreneurs to receive payments from customers, transfer funds to suppliers, save income, access credit, monitor account balances, and manage financial transactions efficiently, thereby supporting agricultural production, value addition, marketing, and risk management activities (Aker & Mbiti, 2010; Asongu et al., 2019).

While mobile banking is often associated with access to financial services, adoption extends beyond mere ownership of a mobile banking account or access to a mobile financial platform. Adoption refers to the extent to which individuals utilize and integrate mobile banking services into their routine financial activities (Davis, 1989; Oliveira et al., 2014). Consequently, having access to mobile banking does not necessarily imply active usage. Users may register for mobile banking services but rarely engage in financial transactions, highlighting the distinction between access and actual adoption. This distinction is particularly important in developing-country contexts where high levels of account ownership may coexist with low levels of active usage. The literature conceptualizes mobile banking adoption as a multidimensional construct encompassing the actual use of various financial services offered through mobile platforms. These dimensions include making and receiving payments, transferring funds, saving money, accessing credit facilities, checking account balances, purchasing airtime, paying utility bills, and

conducting other financial transactions through mobile devices (Shaikh & Karjaluoto, 2015; Baptista & Oliveira, 2015). Accordingly, adoption is not measured solely by registration or intention to use but by the frequency, diversity, and regularity of mobile banking transactions performed by users. For agri-entrepreneurs, effective adoption may therefore be reflected in the use of mobile banking services for receiving agricultural payments, purchasing farm inputs, transferring funds, saving business proceeds, accessing agricultural credit, and monitoring account balances to support enterprise operations. Despite the recognized benefits of mobile banking, adoption among agricultural actors remains uneven across regions and user groups. One perspective argues that expanding access to mobile financial services naturally promotes adoption and enhances financial inclusion by making financial services more convenient and affordable (Donovan, 2012; GSMA, 2024). This view suggests that increasing the availability of mobile banking infrastructure and services is sufficient to stimulate greater usage among rural populations. However, an alternative perspective contends that access alone does not guarantee adoption. Rather, actual use is shaped by a combination of technological factors, behavioural characteristics, institutional support mechanisms, and socioeconomic conditions that influence users' willingness and ability to engage with mobile banking services (Alalwan et al., 2017; Eton et al., 2019). Individuals may have access to mobile banking services but fail to use them due to low digital literacy, lack of trust, inadequate training, poor network connectivity, limited awareness, or financial constraints. This debate underscores the importance of distinguishing between the availability of mobile banking services and their actual utilization. It further highlights the need for a comprehensive evaluation of the technological, behavioural, institutional, and socioeconomic factors that influence the adoption of mobile banking among agri-entrepreneurs. Understanding these factors is essential for explaining variations in usage behaviour and for designing interventions that promote meaningful and sustained adoption of mobile banking services in northern Uganda.

### **2.2.7 Empirical Studies on Mobile Banking Adoption among Agricultural Actors**

Empirical studies examining mobile banking adoption among agricultural actors have increased considerably over the past decade, reflecting the growing importance of digital financial services in agricultural transformation. Existing evidence suggests that digital financial services can improve agricultural productivity, facilitate market participation, enhance access to credit, reduce transaction costs, and promote financial inclusion among farmers and agri-entrepreneurs (Aker &

Mbiti, 2010; Asongu et al., 2019). These benefits have stimulated interest in understanding the factors that influence the adoption and continued use of mobile banking services within agricultural value chains.

Studies conducted in developing countries consistently demonstrate that mobile banking adoption among agricultural actors is shaped by technological, behavioural, institutional, and socioeconomic factors. Technological factors, particularly perceived usefulness, perceived ease of use, security, reliability, and accessibility, have been identified as key determinants of adoption (Baptista & Oliveira, 2015; Alalwan et al., 2017). Agricultural actors are more likely to adopt mobile banking when they perceive it as convenient, secure, and capable of improving financial management and supporting their farming and business activities.

Behavioural factors also play a significant role in influencing adoption decisions. Trust in financial institutions and mobile service providers, favourable attitudes towards digital financial technologies, and individual innovativeness have been found to positively influence mobile banking adoption (Malaquias & Hwang, 2016; Sebayang et al., 2024). Trust is particularly important because financial transactions involve sensitive personal and business information, requiring users to have confidence in the security, reliability, and integrity of digital financial platforms.

Institutional support has likewise emerged as an important determinant of adoption. Awareness campaigns, user training, regulatory frameworks, consumer protection mechanisms, financial literacy initiatives, and agricultural extension services have been shown to increase knowledge, reduce uncertainty, and build confidence in the use of mobile financial services (Fall et al., 2020; Eton et al., 2019). In rural agricultural settings, where digital literacy and access to formal financial services remain uneven, these institutional interventions are often critical in enabling farmers and agri-entrepreneurs to adopt and effectively utilize mobile banking technologies.

Socioeconomic characteristics further influence adoption behaviour. Factors such as age, gender, education level, income, enterprise type, and ownership of mobile devices have been widely reported as significant determinants of mobile banking adoption (Oliveira et al., 2014; Asongu & Nwachukwu, 2018). Individuals with higher levels of education and income generally possess greater digital literacy, financial capability, and access to mobile technologies, thereby increasing

their likelihood of adopting mobile banking. Conversely, lower educational attainment, limited financial resources, and inadequate access to digital devices often constrain adoption.

Despite the growing body of literature, several important gaps remain. First, much of the existing research focuses on mobile money rather than mobile banking. Although the two concepts are closely related, mobile money primarily facilitates basic financial transactions such as cash transfers, deposits, withdrawals, airtime purchases, and bill payments, whereas mobile banking provides a broader suite of bank-linked financial services, including savings, credit, account management, balance inquiries, fund transfers, loan applications, and payments. Consequently, findings from mobile money studies may not adequately explain the determinants of mobile banking adoption, particularly among agri-entrepreneurs whose financial activities extend beyond basic transactions to include savings mobilization, credit access, business payments, and financial management.

Second, previous studies have largely focused on the general population, urban consumers, or small and medium-sized enterprises, with relatively limited empirical attention given to agri-entrepreneurs. Agricultural enterprises operate under unique conditions characterised by seasonal incomes, production risks, dispersed markets, and substantial financing needs, which may influence the adoption and utilisation of mobile banking differently from other user groups.

Third, although technological and behavioural determinants have received considerable empirical attention, relatively few studies have examined how institutional, technological, behavioural, and socioeconomic factors jointly influence mobile banking adoption. Most existing studies investigate these factors in isolation, providing only a partial understanding of the complex relationships through which institutional support and socioeconomic characteristics shape technological perceptions and, ultimately, adoption behaviour.

Finally, empirical evidence from northern Uganda remains limited despite the region's substantial agricultural potential, continued economic transformation, and increasing availability of digital financial services. The socioeconomic and institutional characteristics of the region may shape mobile banking adoption differently from other parts of Uganda, highlighting the need for context-specific evidence.

These gaps justify the need for this study, which developed and empirically validated an evaluation model that explains mobile banking adoption among agri-entrepreneurs in northern Uganda by integrating institutional, technological, behavioural, and socioeconomic dimensions within a single analytical framework.

### **Institutional Factors**

Institutional factors refer to the formal and informal support mechanisms that facilitate or constrain technology adoption, including awareness creation, training, coordination, regulatory support, and user protection mechanisms (Scott, 2014). Existing studies consistently acknowledge the importance of institutions in influencing technology adoption behaviour. A key debate concerns whether awareness alone is sufficient to drive adoption. Some scholars argue that increasing awareness significantly improves adoption because potential users become more knowledgeable about available services and their benefits (Rogers, 2003). Others contend that awareness must be accompanied by training and continuous support to translate knowledge into actual usage, particularly among rural populations with limited digital literacy (Nandhi, 2019; World Bank, 2020). Similarly, scholars disagree on the extent to which institutional support directly influences adoption. While some studies emphasize the role of government policies, financial institutions, SACCOs, and mobile network operators in creating enabling environments (CGAP, 2020), others argue that institutional interventions are only effective when they positively influence users' perceptions and behavioural intentions (Aboelmaged & Gebba, 2013). Despite growing evidence on institutional influences, limited studies have examined how these factors operate within agricultural settings or interact with behavioural mechanisms to influence mobile banking adoption among agri-entrepreneurs.

### **Technological Factors**

Technological factors relate to characteristics of the technology itself that influence users' adoption decisions. Commonly cited factors include perceived usefulness, perceived ease of use, security, reliability, accessibility, and compatibility (Davis, 1989; Venkatesh et al., 2003). One of the most enduring debates in technology adoption research concerns whether perceived usefulness or perceived ease of use is the stronger predictor of adoption. Davis (1989) argues that users are more likely to adopt technologies they perceive as beneficial to their performance. Conversely, other scholars contend that ease of use is more critical because complex systems

discourage adoption regardless of their potential benefits (Venkatesh et al., 2003). Another debate concerns the role of security and privacy. While some researchers identify security concerns as major barriers to mobile banking adoption (Baptista & Oliveira, 2015), others argue that advancements in authentication and digital security technologies have reduced these concerns, shifting attention toward service quality and reliability (Alalwan et al., 2017). Within agricultural contexts, empirical evidence remains inconclusive regarding the relative importance of different technological factors among agri-entrepreneurs operating in rural environments.

### **Socioeconomic Factors and Mobile Banking Adoption**

Socioeconomic factors encompass demographic and economic characteristics that influence technology adoption behaviour, including age, gender, education level, income, enterprise category, and access to mobile devices (Demirgüç-Kunt et al., 2022). The influence of age on adoption remains contested. Some studies suggest that younger individuals are more likely to adopt digital technologies because of greater familiarity with mobile devices (Venkatesh et al., 2003). However, other studies report diminishing age effects as mobile technologies become increasingly widespread across all age groups (Baptista & Oliveira, 2015). Gender differences in technology adoption also remain debated. While some scholars identify persistent gender disparities arising from unequal access to resources and technology (GSMA, 2023), others argue that these disparities are narrowing as digital financial services become more accessible and affordable. Similar disagreements exist regarding education and income. Some researchers consider them critical determinants of adoption, whereas others suggest that simplified technologies and lower transaction costs reduce their influence (Demirgüç-Kunt et al., 2022). These mixed findings indicate the need for further investigation within agricultural contexts where socioeconomic conditions may differ significantly from those of the general population.

### **Behavioural Factors**

Behavioural factors reflect users' psychological dispositions toward technology and include attitude, trust, and innovativeness. These factors are widely recognized as important predictors of technology adoption (Ajzen, 1991; Rogers, 2003). A major debate concerns whether behavioural factors independently drive adoption or merely reflect the effects of institutional and technological influences. Some studies suggest that positive attitudes and trust directly determine adoption intentions (Aboelmaged & Gebba, 2013). Others argue that behavioural factors are

shaped by external influences such as awareness programmes, training, system reliability, and regulatory protection, implying that their effects may be indirect rather than direct (Venkatesh et al., 2003). Innovativeness has also generated differing views. While some researchers regard personal innovativeness as a key determinant of adoption, others emphasize contextual influences such as peer networks, institutional support, and exposure to technology. These debates highlight the importance of understanding behavioural factors not only as predictors of adoption but also as potential mechanisms through which other factors influence adoption outcomes. The relationship between institutional factors and mobile banking adoption has traditionally been examined through direct-effect models. However, emerging literature suggests that institutional support may influence adoption indirectly through behavioural mechanisms such as trust, attitude, and innovativeness. Awareness campaigns, training programmes, user protection initiatives, and institutional coordination may strengthen trust, improve attitudes, and encourage innovativeness, thereby increasing adoption likelihood (Aboelmaged & Gebba, 2013; Alalwan et al., 2017). Despite increasing recognition of these indirect pathways, empirical evidence on behavioural mediation remains limited and inconclusive. Most studies have focused on direct relationships, while relatively few have investigated behavioural factors as mediators, within agricultural and rural settings. The mechanisms through which institutional factors influence mobile banking adoption among agri-entrepreneurs remain insufficiently understood.

**Table 2. 2: Summary of Factors Influencing Adoption of Mobile Banking**

| Category                     | Constructs              | Source (s)                                                                                                                                                                  |
|------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Institutional factors</b> | Knowledge dissemination | (Rogers, 2003), (Oliveira et al., 2014), (Aker & Mbiti, 2010), (Bvuma & Marnewick, 2020), (Bhatt & Bhatt, 2016), (Gillwald et al., 2019).                                   |
|                              | Coordination            | (Omwansa & Waema, 2014), (Suri & Jack, 2016), (Lwanga & Adong, 2016; Wanyoike et al., 2012), (Mbiti & Weil, 2011), (Nwani et al., 2022), (Donovan, 2012; Suri & Jack, 2016) |
|                              | Awareness               | (Shaikh & Karjaluoto, 2014), (Mbiti & Weil, 2011), (Alkhaldi, 2017; Thar et al., 2020), (Jaganathan et al., 2018; Elhajjar & Quaida, 2019),                                 |
|                              | Training                | (Aker et al., 2016), (Chitungo & Munongo, 2013), (Liébana-Cabanillas et al., 2020), (Suri & Jack, 2016), (Bhattacharya & Lymperopoulos,                                     |

|                              |                        |                                                                                                                                                                                         |
|------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              |                        | 2018)                                                                                                                                                                                   |
|                              | User protection        | (Bongomin et al., 2018), (Moghavvemi et al., 2012), (Fadila et al., 2022), (Gefen, Karahanna & Straub, 2003; Boateng et al., 2016).                                                     |
|                              | Sustainability         | (Chen et al., 2016), (Marus et al., 2021), (Liébana-Cabanillas et al., 2020), (Munyegera & Matsumoto, 2016), (Mbogo, 2020), (Vartanova & Gladkova, 2019), (Deka, 2018; Hu et al., 2019) |
| <b>Technological factors</b> | Perceived usefulness   | (Davis, 1989), (Prastiawan et al., 2021), (Alam, 2014), (Milly et al., 2021)                                                                                                            |
|                              | Perceived ease of use  | (Davis, 1989), (Alalwan et al., 2016), (Changchit et al., 2018)                                                                                                                         |
| <b>Behavioural factors</b>   | Attitude               | (Davis, 1989), (Venkatesh et al., 2003), (Aboelmaged & Gebba, 2013),                                                                                                                    |
|                              | Trust                  | (Ha et al., 2023; Jafri et al., 2024; Zhao et al., 2024),                                                                                                                               |
|                              | Innovativeness         | (Rogers, 2003), (Agarwal & Prasa, 1998), (Thakur & Srivastava (2014), (Fabregas et al., 2019), (Nwankwo & Ajemunigbohun, 2013).                                                         |
| <b>Socioeconomic factors</b> | Age                    | (Pucer et al., 2025), (Oliveira & Martins, 2010), (Venkatesh et al., 2003), (Baptista & Oliveira, 2015), (Demirgüç-Kunt et al., 2022).                                                  |
|                              | Gender                 | (Demirgüç-Kunt et al., 2022), (Balehegn et al., 2020) Biernatowska et al. (2017) (Aduwo et al., 2019)                                                                                   |
|                              | Marital status         | (Morris et al., 2000) (Biernatowska et al., 2017) (Brown & Venkatesh, 2012) (Venkatesh & Davis, 2000; Yang & Forney, 2013)                                                              |
|                              | Education level        | (Abu-Shanab, 2011). (Hargittai, 2010) Riddell & Song (2017) Poushter (2016) (Aker et al., 2016; Boateng et al., 2016; Jack & Suri, 2014).                                               |
|                              | Income level           | (Oke et al., 2014) (Aker & Mbiti, 2010; Mwangi & Brown, 2015) (Demirgüç-Kunt et al., 2018), (Shaikh & Karjaluoto, 2015)                                                                 |
|                              | Mobile device category | (Tscherning & Mathiassen, 2010) GSMA (2024)                                                                                                                                             |

|  |                         |                                                                                                   |
|--|-------------------------|---------------------------------------------------------------------------------------------------|
|  |                         | Kim et al. (2015)                                                                                 |
|  | Enterprise category     | (Juniarti & Omar, 2022).<br>(International Data Corporation (DC), 2024)<br>(Kikulwe et al., 2014) |
|  | Mobile device ownership | (Aker et al., 2016; Boateng et al., 2016).<br>(Jack & Suri, 2014; Mbiti & Weil, 2011).            |

### 2.2.8 Synthesis of Literature and Research Gap

The reviewed literature demonstrates that mobile banking adoption is a multidimensional phenomenon influenced by interacting institutional, technological, behavioural, and socioeconomic factors. Existing studies consistently highlight the importance of technological perceptions, particularly perceived usefulness and perceived ease of use, in shaping adoption decisions. Similarly, evidence from digital financial service studies indicates that institutional support mechanisms, behavioural characteristics such as trust and attitude, and socioeconomic conditions contribute to users' ability and willingness to adopt mobile banking services.

Despite these insights, several theoretical and empirical gaps remain. First, most existing studies have examined individual determinants of mobile banking adoption independently, with limited attention to the interconnected relationships among institutional conditions, technological perceptions, behavioural mechanisms, and socioeconomic characteristics. Consequently, the pathways through which external contextual factors influence adoption, particularly through users' perceptions and behavioural responses, remain insufficiently understood. Second, while behavioural factors such as trust, attitude, and innovativeness have been identified as important predictors of digital financial technology adoption, limited empirical evidence exists regarding their mediating role between institutional factors and actual mobile banking adoption.

Furthermore, much of the existing mobile banking adoption literature focuses on general consumer populations, banking customers, or urban users, with relatively limited attention to agri-entrepreneurs operating in rural and agricultural environments. This represents an important contextual gap because agricultural enterprises often face unique challenges, including dispersed value chains, seasonal income patterns, limited digital literacy, inadequate financial

infrastructure, and dependence on institutional support systems. These contextual characteristics may influence how agri-entrepreneurs perceive and utilise mobile banking services.

The identified gaps highlight the need for an integrated theoretical and empirical approach that extends the Technology Acceptance Model by incorporating relevant institutional, behavioural, and socioeconomic dimensions. Therefore, this study develops and validates an adapted TAM-based evaluation model to examine the direct and indirect pathways through which these factors influence actual mobile banking adoption among agri-entrepreneurs in northern Uganda. By integrating these dimensions, the study contributes to a more comprehensive understanding of mobile banking adoption within rural agricultural contexts and provides context-specific evidence for improving digital financial inclusion initiatives.

### **2.3 Conceptual Framework for the Study**

This study adapts the Technology Acceptance Model (TAM) to develop an integrated conceptual framework for explaining mobile banking adoption among agri-entrepreneurs in northern Uganda. While retaining the core TAM constructs of perceived usefulness (PU) and perceived ease of use (PEOU), the framework extends the original model by incorporating institutional, behavioural, and socioeconomic factors that reflect the contextual realities of digital financial service adoption in agricultural settings. The institutional dimension comprises knowledge dissemination, awareness creation, coordination among stakeholders, training, user protection mechanisms, and sustainability of mobile banking services. These factors are conceptualised as external conditions that influence agri-entrepreneurs' technological perceptions by shaping their understanding, confidence, accessibility, and ability to utilise mobile banking platforms. The behavioural dimension includes attitude, trust, and innovativeness, which represent users' psychological readiness and adaptive responses towards mobile banking technologies. The socioeconomic dimension incorporates age, gender, marital status, education level, income level, mobile device category, mobile device ownership, and enterprise category as contextual characteristics that may influence users' access to, perceptions of, and engagement with mobile banking services.

The framework recognizes that mobile banking adoption is not determined solely by the availability of digital financial services or technological functionality. Rather, adoption emerges from the interaction between technological perceptions, institutional enabling conditions,

behavioural dispositions, and socioeconomic circumstances. In this regard, perceived usefulness and perceived ease of use serve as central mechanisms through which contextual factors influence users' adoption behaviour. As illustrated in Figure 2.2, the study modifies the original TAM structure by excluding behavioural intention and focusing directly on actual mobile banking adoption as the dependent variable. This modification is theoretically and contextually justified because intention-based measures may not always translate into actual technology use, particularly in rural agricultural environments where structural constraints, including limited network reliability, affordability challenges, inadequate digital skills, and restricted access to suitable mobile devices, may prevent users from acting on their intentions (Straub et al., 1995). Consequently, examining actual adoption provides a more realistic assessment of mobile banking utilisation among agri-entrepreneurs.

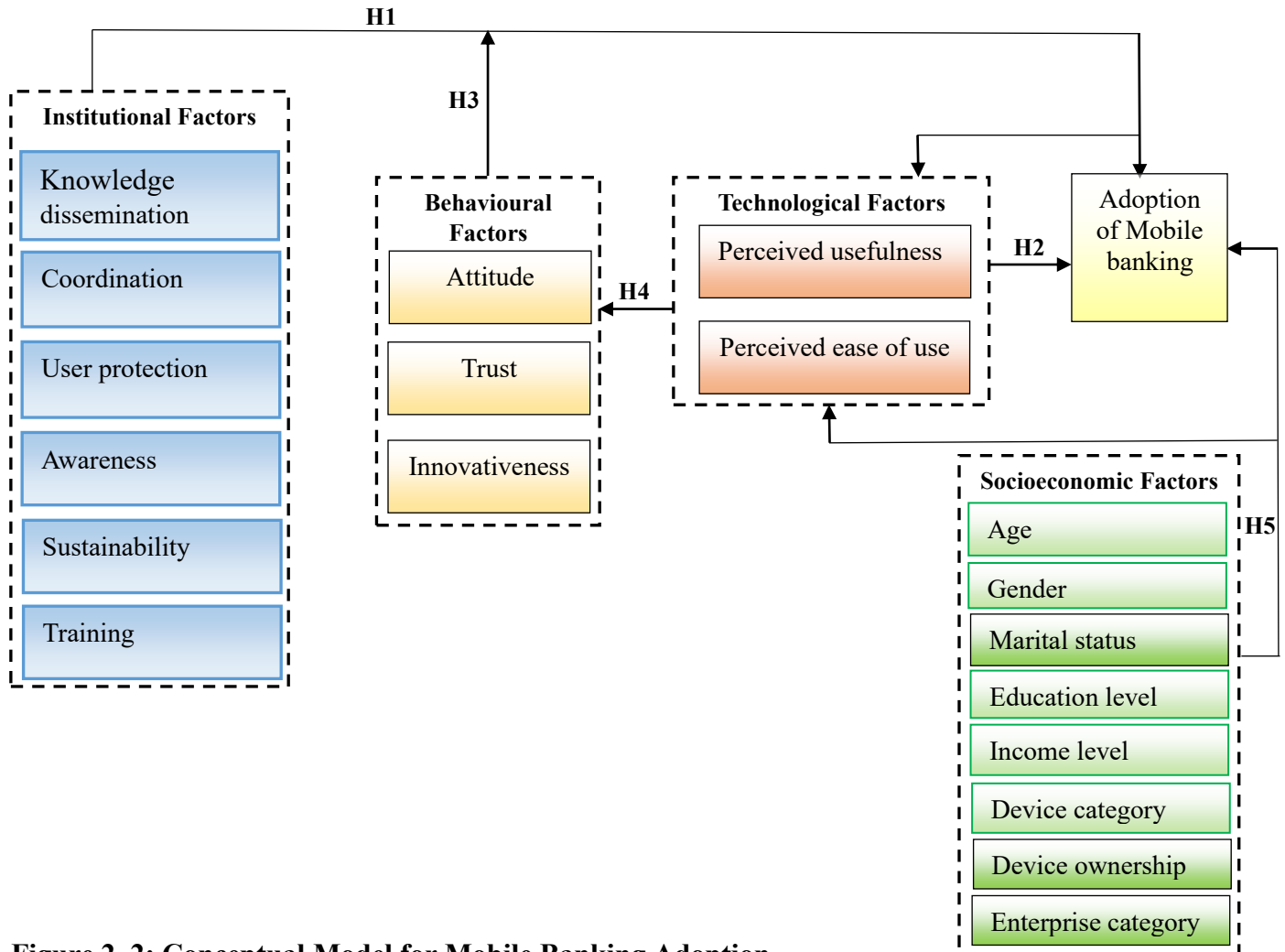


**Figure 2. 2: Conceptual Model for Mobile Banking Adoption**

**Source:** Modified from TAM by Davis (1989) & Venkatesh et al. (2003).

The conceptual framework of this study integrates four dimensions of mobile banking adoption among agri-entrepreneurs in northern Uganda: institutional, technological, behavioural, and socioeconomic factors. Institutional factors represent the external support environment that facilitates technology acceptance through awareness creation, knowledge dissemination, training, user protection, coordination, and sustainability mechanisms. Technological factors are derived from the Technology Acceptance Model (TAM), which identifies perceived usefulness (PU) and perceived ease of use (PEOU) as the primary determinants of technology adoption (Davis, 1989). Behavioural factors extend TAM by incorporating users' psychological characteristics, including attitude, trust, and innovativeness, while socioeconomic factors capture individual, household, and enterprise characteristics that shape access to, perceptions of, and ability to utilize mobile banking services. Tables 2.3–2.6 summarize the study constructs, hypotheses, descriptions, and supporting literature.

**Table 2. 3: Institutional Constructs, Hypotheses, Descriptions and Supporting Literature**

| <b>Construct</b>        | <b>Hypothesis</b>                                                                                                                          | <b>Description</b>                                                                                                                                                                   | <b>Supporting Literature</b>                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Knowledge dissemination | <b>H1<sub>a</sub></b> : Direct effect on adoption. <b>H1<sub>b</sub></b> : Effect through PU. <b>H1<sub>c</sub></b> : Effect through PEOU. | Communication of information on mobile banking features, benefits and usage procedures to improve awareness, reduce uncertainty and strengthen perceived usefulness and ease of use. | Rogers (2003); Davis (1989); Oliveira et al. (2014); Aker & Mbiti (2010); Venkatesh & Davis (2000). |
| Coordination            | <b>H1<sub>e</sub></b> : Direct effect. <b>H1<sub>f</sub></b> : Through PU. <b>H1<sub>g</sub></b> : Through PEOU.                           | Collaboration among government, financial institutions, mobile network operators and other stakeholders to improve accessibility, service delivery and user support.                 | Omwansa & Waema (2014); Suri & Jack (2016); Mbiti & Weil (2011); Bongomin & Munene (2020).          |
| Awareness               | <b>H1<sub>h</sub></b> : Direct effect. <b>H1<sub>i</sub></b> : Through PU. <b>H1<sub>j</sub></b> : Through PEOU.                           | Users' familiarity with the availability, functions and benefits of mobile banking services.                                                                                         | Rogers (2003); Shaikh & Karjaluoto (2014); Mbiti & Weil (2011); Kabirigi et al. (2023).             |
| Training                | <b>H1<sub>k</sub></b> : Direct effect. <b>H1<sub>l</sub></b> : Through PU. <b>H1<sub>m</sub></b> : Through PEOU.                           | Development of users' knowledge and practical skills to operate mobile banking effectively.                                                                                          | Davis (1989); Venkatesh & Davis (2000); Boateng et al. (2016); Jack & Suri (2014).                  |
| User protection         | <b>H1<sub>n</sub></b> : Direct effect. <b>H1<sub>o</sub></b> : Through                                                                     | Institutional mechanisms for security, privacy, fraud prevention and dispute                                                                                                         | Gefen et al. (2003); Bongomin et al.                                                                |

|                |                                                                                                                           |                                                                                       |                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                | PEOU. <b>H1<sub>p</sub></b> :<br>Through PU.                                                                              | resolution that reduce perceived risk.                                                | (2018); Slade et al.<br>(2015); Mbiti & Weil<br>(2011).                                             |
| Sustainability | <b>H1<sub>q</sub></b> : Direct effect.<br><b>H1<sub>r</sub></b> : Through PU.<br><b>H1<sub>s</sub></b> : Through<br>PEOU. | Long-term reliability, affordability<br>and continuity of mobile banking<br>services. | Donovan (2012);<br>Munyegeera &<br>Matsumoto (2016);<br>Jack & Suri (2014);<br>Mbiti & Weil (2011). |

**Table 2. 4: Technological Constructs, Hypotheses, Descriptions and Supporting Literature**

| Construct                    | Hypothesis                                        | Description                                                                                                                                   | Supporting Literature                                                                               |
|------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Perceived usefulness (PU)    | <b>H2<sub>a</sub></b> : PU influences adoption.   | Degree to which agri-entrepreneurs believe that mobile banking improves financial transactions, business efficiency and financial management. | Davis (1989); Venkatesh & Davis (2000); Alam (2014); Prastiawan et al. (2021); Milly et al. (2021). |
| Perceived ease of use (PEOU) | <b>H2<sub>b</sub></b> : PEOU influences adoption. | Degree to which users perceive mobile banking as simple, understandable and requiring minimal effort.                                         | Davis (1989); Venkatesh & Davis (2000); Alalwan et al. (2016); Changchit et al. (2018).             |

**Table 2. 5: Behavioural Constructs, Hypotheses, Descriptions and Supporting Literature**

| Construct      | Hypothesis                                                                                                                                           | Description                                                                                           | Supporting Literature                                                                       |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Attitude       | <b>H3<sub>a</sub></b> : Mediates institutional factors and adoption. <b>H4<sub>a</sub></b> : Influences PEOU. <b>H4<sub>b</sub></b> : Influences PU. | Users' positive or negative evaluation of mobile banking based on perceived benefits and ease of use. | Davis (1989); Venkatesh et al. (2003); Marikyan et al. (2023).                              |
| Trust          | <b>H3<sub>b</sub></b> : Mediates institutional factors and adoption. <b>H4<sub>c</sub></b> : Influences PEOU. <b>H4<sub>d</sub></b> : Influences PU. | Confidence in the security, reliability and credibility of mobile banking services.                   | Gefen (2000); Ha et al. (2023); Jafri et al. (2024); Zhao et al. (2024).                    |
| Innovativeness | <b>H3<sub>c</sub></b> : Mediates institutional factors and adoption. <b>H4<sub>e</sub></b> : Influences PEOU. <b>H4<sub>f</sub></b> : Influences PU. | Individual willingness to experiment with and adopt new technologies.                                 | Rogers (2003); Agarwal & Prasad (1998); Thakur & Srivastava (2014); Fabregas et al. (2019). |

**Table 2. 6: Socioeconomic Constructs, Hypotheses, Descriptions and Supporting Literature**

| <b>Construct</b>        | <b>Hypothesis</b>                                                                        | <b>Description</b>                                                                                          | <b>Supporting Literature</b>                                                  |
|-------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Age                     | <b>H5a:</b> Influences adoption. <b>H5b:</b> Influences PU. <b>H5c:</b> Influences PEOU. | Age influences digital literacy, technology familiarity and willingness to adopt mobile banking.            | Oliveira & Martins (2010); Venkatesh et al. (2003); Czaja et al. (2006).      |
| Gender                  | <b>H5d:</b> Influences adoption. <b>H5e:</b> Influences PU. <b>H5f:</b> Influences PEOU. | Gender differences influence technology access, experience and perceptions of usefulness and ease of use.   | Morris & Venkatesh (2000); Balehegn et al. (2020); Aduwo et al. (2019).       |
| Marital status          | <b>H5g:</b> Influences adoption. <b>H5h:</b> Through PU. <b>H5i:</b> Through PEOU.       | Household responsibilities and social support influence mobile banking adoption.                            | Venkatesh & Davis (2000); Aker et al. (2016); Jack & Suri (2014).             |
| Education level         | <b>H5j:</b> Influences adoption. <b>H5k:</b> Through PU. <b>H5l:</b> Through PEOU.       | Education enhances digital literacy, awareness and ability to use mobile banking services.                  | Abu-Shanab (2011); Hargittai (2010); Boateng et al. (2016).                   |
| Income level            | <b>H5m:</b> Influences adoption. <b>H5n:</b> Through PU. <b>H5o:</b> Through PEOU.       | Income determines affordability of devices, connectivity and transaction costs.                             | Aker & Mbiti (2010); Demirgüç-Kunt et al. (2018); Shaikh & Karjaluoto (2015). |
| Mobile device category  | <b>H5p:</b> Influences adoption. <b>H5q:</b> Through PEOU. <b>H5r:</b> Through PU.       | Device capability determines access to applications, usability and advanced mobile banking functions.       | Tscherning & Mathiassen (2010); Kim et al. (2015); GSMA (2024).               |
| Enterprise category     | <b>H5s:</b> Influences adoption. <b>H5t:</b> Through PEOU. <b>H5u:</b> Through PU.       | Enterprise type influences transaction frequency, financial needs and relevance of mobile banking services. | Juniarti & Omar (2022); Kikulwe et al. (2014); Aker et al. (2016).            |
| Mobile device ownership | <b>H5v:</b> Influences adoption. <b>H5w:</b> Through PEOU. <b>H5x:</b> Through PU.       | Ownership provides direct access to mobile banking, increasing familiarity and perceived benefits.          | Aker & Mbiti (2010); Malaquias & Hwang (2016); Boateng et al. (2016).         |

In summary, the conceptual framework developed from the reviewed literature integrates institutional, technological, behavioural, and socioeconomic factors to provide a comprehensive explanation of mobile banking adoption among agri-entrepreneurs in northern Uganda. The framework illustrates the hypothesized direct, indirect, and mediating relationships among the study variables, with perceived usefulness and perceived ease of use serving as the central technological mechanisms through which several constructs influence adoption. This integrated framework provides the theoretical basis for the formulation of the study hypotheses and guides

the empirical investigation presented in the subsequent chapters. The next section discusses the significance of the study.

## **CHAPTER THREE: Research Methodology**

### **3.1 Chapter Overview**

The research methodology chapter aims to provide a structured approach to developing a model for the evaluation of the adoption of mobile banking services among agri-entrepreneurs in northern Uganda. The chapter involves key components, including research philosophy, research approach, research strategy, research design, and research methods used in this strategy to accomplish the research objectives.

### **3.2 Research Philosophy**

Research philosophy refers to the set of assumptions concerning the nature of reality (ontology), the generation of knowledge (epistemology), the role of values in research (axiology), and the procedures through which knowledge is acquired (methodology) (Creswell & Creswell, 2018; Saunders et al., 2019). It provides the philosophical foundation that guides the formulation of research questions, the selection of research methods, the interpretation of findings, and the development of scientific knowledge.

This study was anchored in the positivist research philosophy. Positivism assumes that reality exists independently of the researcher and that phenomena can be objectively observed, measured, and explained through empirical investigation (Karupiah, 2022). Knowledge is generated by testing theoretically derived hypotheses using systematic observation and statistical analysis, with the aim of establishing generalizable relationships among variables (Bryman, 2016; Creswell & Creswell, 2018). Consequently, positivist research emphasizes objectivity, quantification, replicability, and the use of standardized research procedures to minimize researcher bias. The adoption of positivism was appropriate because this study sought to develop an evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda. The study was guided by the Technology Acceptance Model (TAM) and an extensive review of empirical literature, from which hypotheses were formulated regarding the relationships among institutional, technological, behavioural, and socioeconomic factors, perceived usefulness, perceived ease of use, and mobile banking adoption. Consistent with the positivist tradition, these hypothesised relationships were examined using quantitative data collected through a structured questionnaire and analysed using statistical techniques to determine the magnitude, direction, and significance of the relationships among the study variables.

Ontologically, the study assumes that mobile banking adoption is an objective and measurable phenomenon influenced by identifiable institutional, technological, behavioural, and socioeconomic factors. Epistemologically, knowledge is generated through the collection of observable and quantifiable data from agri-entrepreneurs and the empirical testing of hypothesised relationships. Axiologically, the study maintained research objectivity through the use of standardized data collection instruments, uniform data collection procedures, and established statistical techniques, while adhering to recognised ethical principles, including voluntary participation, informed consent, confidentiality, and anonymity. Methodologically, the positivist philosophy justified the adoption of a quantitative, deductive, cross-sectional survey design, enabling the empirical validation of the proposed evaluation model and facilitating the generalisation of findings to the wider population of agri-entrepreneurs in northern Uganda.

**Table 3. 1: Positivist Philosophical Orientation and Its Alignment with the Study**

| <b>Philosophical Dimension</b> | <b>Positivist Orientation</b>                                                                                        | <b>Alignment with the Present Study</b>                                                                                                                                                                                                                                                         |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ontology</b>                | Reality exists independently of the researcher and can be objectively observed and measured.                         | <ul style="list-style-type: none"> <li>Mobile banking adoption is regarded as an objective and measurable phenomenon influenced by institutional, technological, behavioural, and socioeconomic factors.</li> </ul>                                                                             |
| <b>Epistemology</b>            | Knowledge is generated through empirical observation, objective measurement, and hypothesis testing.                 | <ul style="list-style-type: none"> <li>Empirical data were collected from agri-entrepreneurs using a structured questionnaire to test hypothesised relationships among the study constructs through statistical analysis.</li> </ul>                                                            |
| <b>Axiology</b>                | Research is value-neutral; the researcher maintains objectivity throughout the research process.                     | <ul style="list-style-type: none"> <li>Standardised instruments, uniform data collection procedures, and established analytical techniques were employed to minimise researcher bias, while ethical principles ensure the credibility and integrity of the findings.</li> </ul>                 |
| <b>Methodology</b>             | Deductive, quantitative, and theory-driven, employing hypothesis testing to establish relationships among variables. | <ul style="list-style-type: none"> <li>The study applied the Technology Acceptance Model (TAM) to formulate hypotheses, employed a quantitative cross-sectional survey design, and used statistical modelling to validate the proposed evaluation model for mobile banking adoption.</li> </ul> |

**Source:** Adapted from Bryman (2016), Creswell and Creswell (2018), and Saunders et al. (2019).

### **3.4 Research Approach**

A research approach provides the logical framework that links theory to empirical investigation by guiding how knowledge is generated, hypotheses are formulated, and evidence is collected and analysed (Haque, 2022). This study adopted the deductive research approach, which begins with an established theoretical framework, derives hypotheses from theory and existing empirical evidence, and subsequently tests these hypotheses using systematically collected data (Casula et al., 2021).

The deductive approach was appropriate because this study sought to develop an evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda. The study was grounded in the TAM framework, which provided the theoretical basis for explaining the relationships among perceived usefulness, perceived ease of use, and mobile banking adoption. Building upon TAM and previous empirical studies, additional institutional, technological, behavioural, and socioeconomic factors were incorporated into the conceptual framework, from which the study hypotheses were formulated.

Consistent with the deductive approach, the study translated theoretical constructs into measurable variables through the operationalisation of each construct using validated measurement items adapted from previous studies. Primary data were collected from agri-entrepreneurs using a structured questionnaire, and the hypothesised relationships among the constructs were examined using appropriate statistical modelling techniques. The empirical findings were then used to confirm or reject the proposed hypotheses and to validate the integrated evaluation model for mobile banking adoption.

The deductive approach was therefore appropriate because it provided a systematic process for testing theory-derived propositions, objectively examining the relationships among the study variables, and generating findings that can be generalised to the wider population of agri-entrepreneurs in northern Uganda. Furthermore, it ensured methodological alignment between the study's positivist philosophical stance, quantitative research design, hypothesis-testing procedures, and the objective of developing a robust and empirically validated evaluation model.

**Table 3. 2: Application of the Deductive Research Approach in the Study**

| Step                                           | Application in the Study                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Identification of Theoretical Framework</b> | <ul style="list-style-type: none"><li>• The study was anchored in the TAM, extended by incorporating institutional, technological, behavioural, and socioeconomic factors to explain mobile banking adoption among agri-entrepreneurs in northern Uganda.</li></ul>                                                                                              |
| <b>Formulation of Hypotheses</b>               | <ul style="list-style-type: none"><li>• Hypotheses were developed from TAM and empirical literature, specifying relationships between institutional, technological, behavioural, and socioeconomic factors, mediating variables (e.g., perceived usefulness, perceived ease of use, attitude, trust, and innovativeness), and mobile banking adoption.</li></ul> |
| <b>Operationalisation of Variables</b>         | <ul style="list-style-type: none"><li>• Constructs were operationalised into measurable indicators using validated multi-item Likert-scale instruments adapted from previous studies. Socioeconomic variables (e.g., age, education level, income, and mobile device ownership) were measured using structured categorical and ordinal formats.</li></ul>        |
| <b>Data Collection</b>                         | <ul style="list-style-type: none"><li>• Data were collected using a structured questionnaire administered to agri-entrepreneurs in selected districts of northern Uganda under a cross-sectional survey design.</li></ul>                                                                                                                                        |
| <b>Data Analysis</b>                           | <ul style="list-style-type: none"><li>• Data were analysed using appropriate statistical techniques, including PROCESS Macro regression and mediation analysis, to test hypotheses and evaluate relationships among variables.</li></ul>                                                                                                                         |
| <b>Interpretation and Conclusion</b>           | <ul style="list-style-type: none"><li>• Findings were interpreted to determine whether hypotheses were supported or rejected, and to assess the extent to which the extended TAM explains mobile banking adoption in the study context.</li></ul>                                                                                                                |

### 3.5 Research Strategy

A research strategy refers to the overall plan of action that guides the process of answering research questions by specifying how data are generated, collected, and analysed in relation to the study objectives (Johannesson & Perjons, 2021). It provides the procedural framework that links the research philosophy, approach, and design to empirical investigation.

This study adopted a quantitative survey research strategy, which is appropriate for examining relationships among multiple variables influencing mobile banking adoption among agri-entrepreneurs in northern Uganda. The survey strategy is particularly suitable for positivist and deductive studies where the aim is to collect standardized data from a relatively large sample in order to test hypotheses and generalise findings to a wider population (Planing, 2014).

In this study, the survey strategy facilitated the collection of structured quantitative data on institutional, technological, behavioural, and socioeconomic factors, as well as key mediating constructs such as perceived usefulness, perceived ease of use, attitude, trust, and innovativeness. The use of a survey enabled the measurement of these constructs in a consistent and comparable manner across respondents, thereby supporting statistical analysis and model validation using appropriate multivariate techniques.

The strategy was further justified by the need to develop and empirically validate an integrated evaluation model of mobile banking adoption, which requires data from a broad cross-section of agri-entrepreneurs rather than in-depth qualitative exploration of individual cases. Accordingly, the survey strategy aligns with the study's positivist philosophy, deductive approach, and cross-sectional research design, and provides a robust basis for hypothesis testing and generalisation of findings within the study context.

**Table 3. 3: Alignment of Research Objectives, Strategy, and Analytical Procedures**

| Study Objective                                                                                                           | Strategy/Method Used                                                          | Key Application in the Study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Examine the socioeconomic factors influencing mobile banking adoption among agri-entrepreneurs in northern Uganda.        | Cross-sectional survey design with regression analysis and diagnostic testing | <ul style="list-style-type: none"> <li>Socioeconomic data (age, gender, marital status, education level, income, mobile device ownership, and enterprise category) were collected using a structured questionnaire.</li> <li>Descriptive statistics were used to summarise respondent characteristics.</li> <li>Regression analysis was conducted to examine the direct and indirect effects of socioeconomic factors on mobile banking adoption.</li> <li>Prior to estimation, multicollinearity diagnostics (Variance Inflation Factor and tolerance values) were assessed to ensure independence among predictor variables.</li> </ul> |
| Assess the institutional and technological factors affecting mobile banking adoption among agri-entrepreneurs in northern | Cross-sectional survey design with PCA and regression analysis                | <ul style="list-style-type: none"> <li>Institutional factors (knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability) and technological factors (perceived usefulness and perceived ease of use) were measured using validated</li> </ul>                                                                                                                                                                                                                                                                                                                                               |

|                                                                                                                                                                      |                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Uganda.                                                                                                                                                              |                                                                          | <p>Likert-scale items.</p> <ul style="list-style-type: none"> <li>• Construct validity was assessed using Principal Component Analysis (PCA) with Varimax rotation, while reliability was tested using Cronbach's alpha.</li> <li>• Multicollinearity diagnostics were conducted prior to regression analysis.</li> <li>• Regression analysis was then applied to estimate the direct and indirect effects of institutional and technological factors on mobile banking adoption.</li> </ul>                                                                    |
| Examine the mediating influence of behavioural factors (attitude, trust, and innovativeness) on mobile banking adoption among agri-entrepreneurs in northern Uganda. | Cross-sectional survey and mediation analysis using PROCESS Macro (SPSS) | <ul style="list-style-type: none"> <li>• Behavioural constructs were measured using standardised Likert-scale instruments.</li> <li>• Mediation analysis was conducted using PROCESS Macro with bootstrapping to test the indirect effects of attitude, trust, and innovativeness on the relationship between institutional factors and mobile banking adoption.</li> <li>• Multicollinearity diagnostics were assessed prior to mediation analysis to ensure stability of regression estimates.</li> </ul>                                                     |
| Design and empirically validate an integrated evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda.                              | Cross-sectional survey with regression and PROCESS Macro outputs         | <ul style="list-style-type: none"> <li>• An integrated evaluation model was designed based on the Technology Acceptance Model (TAM) and empirical literature.</li> <li>• The model was empirically validated using statistically significant results from regression and PROCESS Macro mediation analysis.</li> <li>• The final framework integrates institutional, technological, behavioural, and socioeconomic determinants of mobile banking adoption in northern Uganda, supported by diagnostic testing and statistical validation procedures.</li> </ul> |

### **3.6 Research Design**

Research design refers to the overall blueprint that guides the integration of research philosophy, approach, strategy, data collection, and analysis procedures into a coherent framework (Myers et al., 2013). It ensures that the research problem is systematically addressed in a valid and reliable manner.

This study adopted a quantitative cross-sectional survey design aimed at examining and explaining the relationships among institutional, technological, behavioural, and socioeconomic factors influencing mobile banking adoption among agri-entrepreneurs in northern Uganda. The cross-sectional nature of the design allowed data to be collected at a single point in time from a relatively large sample, enabling the analysis of patterns and associations among the study variables (Wang & Cheng, 2020). The design is appropriate because it facilitates the measurement of predefined constructs derived from the Technology Acceptance Model (TAM) and its extensions, using structured questionnaires. This enables the systematic collection of standardized data on respondents' perceptions, behaviours, and socioeconomic characteristics, which are suitable for statistical analysis. In line with the study objectives, the design supports hypothesis testing through regression analysis and mediation analysis using PROCESS Macro. While the study does not establish causality in a strict experimental sense, it provides empirical evidence of statistically significant relationships and explanatory pathways among the variables (Van der Stede, 2014).

Overall, the quantitative cross-sectional survey design ensures alignment with the positivist philosophy, deductive approach, and survey strategy, providing a robust framework for model development and empirical validation of mobile banking adoption.

### 3.6 Study Area

The study was conducted in four districts in northern Uganda, namely Gulu and Amuru in the Acholi sub-region, and Arua and Maracha in the West Nile sub-region (**Figure 3.1**).

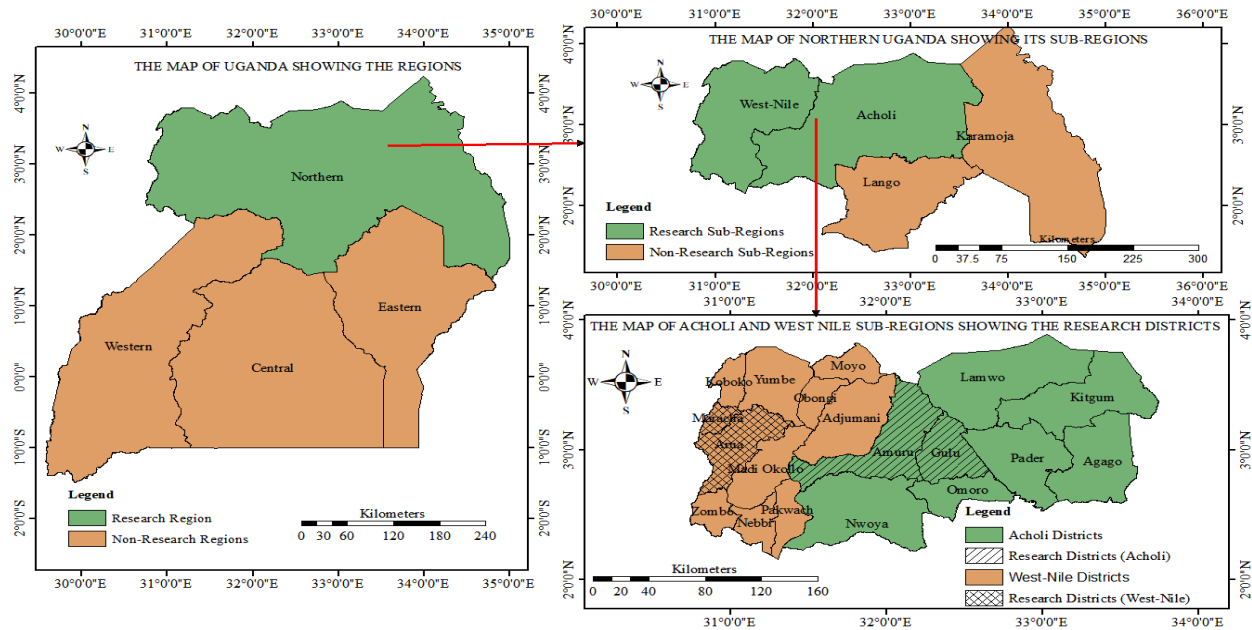


**Figure 3. 1: Location of the Study Area in Northern Uganda**

These four districts (Gulu, Amuru, Arua and Maracha) were purposively selected due to their representation of two major sub-regional contexts within northern Uganda, which exhibit distinct yet comparable socioeconomic, agricultural, and technological characteristics relevant to mobile banking adoption among agri-entrepreneurs.

Northern Uganda is predominantly agrarian, with agriculture serving as the main economic activity and source of livelihood for the majority of households (Rockmore, 2020). However, the region continues to experience relatively low levels of formal financial inclusion and uneven adoption of digital financial services compared to other parts of Uganda (Agencies, 2026; UBOS, 2023). This makes it an appropriate setting for examining how institutional, technological, behavioural, and socioeconomic factors influence mobile banking adoption.

The selected districts differ in geographic and socio-economic composition yet share a common reliance on smallholder agriculture. Gulu and Amuru, located in the Acholi sub-region, are characterised by post-conflict recovery dynamics, expanding agricultural commercialisation, and increasing integration into formal and informal financial systems (Ssali, 2022). Arua and

Maracha, located in the West Nile sub-region, are border districts with active cross-border trade, diverse market structures, and growing engagement in agro-based enterprises (Hengsdijk et al., 2019). The inclusion of these districts provides a more comprehensive and heterogeneous empirical context for analysing mobile banking adoption behaviour. Northern Uganda lies within a tropical savannah climate, characterised by annual rainfall ranging between 800 mm and 1,200 mm and temperatures between 20°C and 35°C (MOFPED, 2020; UBOS, 2020). It exhibits a bimodal rainfall pattern, with a wet season from April to October and a dry season from November to March. These seasonal variations significantly influence agricultural productivity, household income flows, and financial decision-making among rural communities. In particular, income seasonality creates conditions that are relevant to the uptake and use of mobile banking services, which are often utilised to manage liquidity constraints and facilitate routine financial transactions (MCash Uganda, n.d.). According to UBOS (2023), the region has an estimated population of approximately 4.7 million people, the majority of whom are rural smallholder farmers. The population exhibits diverse socioeconomic characteristics, including variations in education, income levels, gender, and digital literacy, all of which are critical determinants of technology adoption behaviour (MOFPED, 2020).

In terms of financial and technological infrastructure, the four selected districts have experienced increased mobile network coverage facilitated by major service providers such as MTN, Airtel, and Uganda Telecom. The expansion of mobile money service including transfers, savings, payments, and credit has significantly improved access to financial services, particularly in rural areas where formal banking institutions remain limited. However, disparities persist in access, usage intensity, and trust in digital financial systems. This heterogeneity makes Gulu, Amuru, Arua, and Maracha suitable for examining the multidimensional determinants of mobile banking adoption and for developing an empirically grounded evaluation model applicable to northern Uganda.

### **3.7 Research Population, Unit of Analysis, Unit of inquiry, Inclusion Criteria**

The target population comprised small- and medium-scale agri-entrepreneurs operating in Gulu and Amuru districts in the Acholi sub-region, and Arua and Maracha districts in the West Nile sub-region of northern Uganda. An agri-entrepreneur in this study refers to an individual engaged in agricultural production, agro-processing, value addition, agricultural input supply, or

agricultural marketing as a commercial activity undertaken for income generation and livelihood improvement.

The selection of the four districts was informed by their strong agricultural base, increasing participation in agri-based enterprises, and expanding access to mobile network infrastructure and digital financial services. Despite these developments, the extent to which mobile banking services are integrated into agri-entrepreneurial operations varies considerably. This variation provided an appropriate context for examining factors influencing the intensity of mobile banking usage among agri-entrepreneurs.

The unit of analysis was the individual agri-entrepreneur because the study examined variations in how individual entrepreneurs integrate and utilise mobile banking services within their agricultural enterprises. In this study, mobile banking adoption was operationalised as the extent and intensity of mobile banking usage in agri-entrepreneurial operations, including enterprise-related activities such as receiving and making payments, transferring funds, saving, and conducting other financial transactions associated with agricultural production and marketing.

The unit of inquiry was also the individual agri-entrepreneur, who provided primary data through a structured questionnaire. The respondents were considered appropriate because they directly manage financial transactions within their agricultural enterprises and therefore possess firsthand experience regarding the use and intensity of mobile banking services in business operations.

The inclusion criteria required respondents to meet the following conditions: (i) be aged 18 years and above; (ii) be actively engaged in agricultural value-chain activities, including farming, agro-processing, value addition, agricultural input supply, or marketing; (iii) operate within the selected districts of Gulu, Amuru, Arua, or Maracha; and (iv) have experience using mobile banking services for enterprise-related financial transactions. These criteria ensured that the study captured actual mobile banking usage behaviour and intensity of utilisation within agricultural enterprises rather than general mobile banking ownership, willingness to adopt, or intention to use mobile banking services in the future.

### **3.8 Sampling Strategies, Sample Size Determination, and Response Rate**

A multistage stratified sampling technique was employed to select respondents from the study area. The approach was appropriate because agri-entrepreneurs were geographically dispersed across different districts and engaged in diverse agricultural value chain activities. Multistage sampling enabled the study to capture variations across geographical locations while ensuring adequate representation of relevant categories of agri-entrepreneurs. The technique also improved the feasibility of data collection by allowing sampling to be conducted systematically across districts, sub-counties, and respondent categories (Okello, 2019; Tashakkori & Teddlie, 2003). The target population comprised agri-entrepreneurs distributed across four purposively selected districts in northern Uganda, namely Gulu, Amuru, Arua, and Maracha. These districts were selected because they represented the geographical scope of the study and contained identifiable populations of agri-entrepreneurs involved in agricultural production, processing, marketing, and input supply activities relevant to the study objectives.

#### **Stage 1: Selection of Study Districts**

The first stage involved the purposive selection of the four study districts: Gulu, Amuru, Arua, and Maracha. The selection was guided by the need to include districts from the Acholi and West Nile sub-regions where active agri-entrepreneurship activities were evident. These districts provided the contextual setting for examining institutional, technological, behavioural, and socioeconomic factors influencing mobile banking adoption.

#### **Stage 2: Selection of Sub-counties**

The second stage involved the selection of sub-counties within each district. All sub-counties constituted the second-stage sampling units. Two sub-counties were selected from each district using simple random sampling, resulting in eight selected sub-counties. This approach ensured that the selection of sub-counties was objective and reduced the possibility of researcher selection bias.

### **Stage 3: Sample Size Determination and Proportionate Allocation**

The minimum sample size for the study was determined using the Krejcie and Morgan (1970) sample size determination table. For a target population of 690 agri-entrepreneurs, the table recommends a minimum sample size of 248 respondents at a 95% confidence level and a 5% margin of error. However, the study involved examining the direct and indirect relationships among institutional, technological, behavioural, and socioeconomic factors influencing mobile banking adoption through multivariate and mediation analysis. Therefore, the minimum sample was increased by 232 respondents, resulting in a planned sample of 480 respondents.

The increase in sample size was based on specific methodological considerations, particularly the need to provide adequate statistical power for the planned multivariate and mediation analysis, improve the precision and stability of parameter estimates, and ensure adequate representation across the study strata. The larger sample also provided a buffer against non-response, incomplete questionnaires, and sampling variability associated with the multistage stratified sampling design. Given the relatively manageable target population of 690 agri-entrepreneurs and the available time and resources, it was feasible to include a substantially larger proportion of the population. Thus, increasing the sample from 248 to 480 respondents strengthened the basis for estimating the direct, indirect, and mediated relationships among the study constructs and improved representation across the four study districts and categories of agri-entrepreneurs. Increasing sample size beyond the minimum requirement is also consistent with recommendations that larger samples enhance the reliability and stability of estimates in quantitative studies involving multiple predictors and complex analytical models (Bryman, 2016; Cochran, 1977; Hair et al., 2019).

Following the determination of the planned sample size, the 480 respondents were proportionately allocated to the four study districts according to each district's share of the total target population. Proportionate allocation was used to ensure that districts with larger populations contributed correspondingly more respondents, while smaller districts remained adequately represented. The allocation was computed using Cochran's (1977) proportional allocation approach for stratified sampling, after which respondents were selected using the specified sampling procedures:

### Equation 3. 1: Cochran's (1977) Allocation Formula for Stratified Sampling

$$n_h = \frac{N_h}{N} \times n \dots\dots\dots 3.1$$

$n_h$  = sample allocated to district h;

$N_h$  = target population of agri-entrepreneurs in district h;

$N$  = total target population (690); and

$n$  = overall sample size (480).

The proportional allocation ensured that each district contributed respondents according to its share of the total population. Consequently, districts with larger populations received larger sample allocations, thereby improving sample representativeness and reducing possible over- or under-representation.

The distribution of the target population and the corresponding sample allocation by district and selected sub-counties is presented in Table 3.4.

**Table 3. 4: Target Population and Sample Allocation by District and Selected Sub-counties**

| Sub-region | District | Sub-county | Population (N) | Percentage (%) | Sample (n = 480) | Subtotal |
|------------|----------|------------|----------------|----------------|------------------|----------|
| Acholi     | Gulu     | Pece       | 83             | 12.0           | 58               | 122      |
|            |          | Bardege    | 92             | 13.3           | 64               |          |
|            | Amuru    | Amuru      | 76             | 11.0           | 53               | 124      |
|            |          | Pabo       | 102            | 14.8           | 71               |          |
| West Nile  | Arua     | Aroi       | 93             | 13.5           | 65               | 127      |
|            |          | Arua Hill  | 90             | 13.0           | 62               |          |
|            | Maracha  | Kijomoro   | 75             | 10.9           | 52               | 107      |
|            |          | Nyadri     | 79             | 11.4           | 55               |          |
| Total      |          |            | 690            | 100.0          | 480              | 480      |

**Source:** Researcher's compilation from district records (2025); sample size determined using Krejcie and Morgan (1970), with proportional allocation based on Cochran's (1977) formula

As presented in Table 3.4, the total sample of 480 respondents was distributed across the four study districts, with Gulu contributing 122 respondents, Amuru 124 respondents, Arua 127 respondents, and Maracha 107 respondents. The allocation reflected the relative size of each district's agri-entrepreneur population within the study area. After district-level allocation, the

sample was further distributed proportionately among the selected sub-counties based on the number of agri-entrepreneurs in each sub-county. Respondents were then selected through simple random sampling from the available sampling frames of commercial farmers, agricultural processors, produce dealers, and agricultural input dealers.

The final sample was stratified into four categories of agri-entrepreneurs: commercial farmers (201 respondents; 42.0%), processors (39 respondents; 8.0%), produce dealers (224 respondents; 47.0%), and input dealers (16 respondents; 3.0%). The stratification was applied to enhance representation of key actors within the agricultural value chain rather than to facilitate comparative analysis among categories. Therefore, the study analysed the data at the aggregate level to establish the factors influencing mobile banking adoption among agri-entrepreneurs in Northern Uganda.

### **Response Rate and Valid Responses**

Based on the sampling procedure, 480 agri-entrepreneurs were selected to participate in the study. Following data collection, all questionnaires were screened for completeness. Three questionnaires were excluded because they contained substantial missing data and/or incomplete responses that could not be reliably analysed. Consequently, 477 valid questionnaires were retained for statistical analysis, representing a 99.4% valid response rate (Table 3.5).

**Table 3. 5: Response Rate and Valid Responses**

| <b>Description</b>                | <b>Number</b> |
|-----------------------------------|---------------|
| Target sample size                | 480           |
| Questionnaires administered       | 480           |
| Invalid/incomplete questionnaires | 3             |
| Valid questionnaires analysed     | 477           |
| Valid response rate               | 99.4%         |

### **3.9 Data Collection and Data Collection Tools**

Data collection methods refer to the systematic procedures used to obtain information from study participants, whereas data collection tools are the instruments used to collect the required data

(Creswell & Creswell, 2018; Saunders et al., 2019). Consistent with the positivist research philosophy, deductive research approach, survey research strategy, and quantitative cross-sectional research design adopted in this study, primary data were collected using the survey method.

The survey method was considered appropriate because it enables the collection of standardized quantitative data from a relatively large number of respondents within a single period, thereby facilitating hypothesis testing and statistical analysis of relationships among variables (Bryman, 2016; Creswell & Creswell, 2018). It was particularly suitable for examining how institutional, technological, behavioural, and socioeconomic factors influence mobile banking adoption, operationalised in this study as the intensity of mobile banking usage in agri-entrepreneurial operations.

The primary data collection tool was a structured questionnaire (Appendix B), developed from the study's conceptual framework and adapted from previously validated measurement scales based on the Technology Acceptance Model (TAM) and related technology adoption studies (Davis, 1989; Venkatesh et al., 2003). The questionnaire consisted predominantly of closed-ended questions to ensure standardisation of responses and facilitate quantitative analysis.

The questionnaire was organised into five sections. Section A collected respondents' socioeconomic characteristics, including age, gender, marital status, education level, income level, mobile device ownership, and enterprise category. Section B measured institutional factors, namely knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability. Section C assessed behavioural factors comprising attitude, trust, and innovativeness. Section D measured the technological constructs of perceived usefulness and perceived ease of use. Section E measured the dependent variable, mobile banking adoption, operationalised as the intensity of mobile banking usage in agri-entrepreneurial operations. Except for the demographic characteristics, all constructs were measured using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

Before the main survey, the questionnaire was pre-tested among 30 agri-entrepreneurs outside the study sample to evaluate the clarity, relevance, sequencing, and comprehensibility of the questionnaire items. Feedback obtained during the pre-test informed revisions to the wording, structure, and layout of the instrument before the final survey was administered.

The quality of the research instrument was further assessed through reliability and validity testing before hypothesis testing. Internal consistency reliability was evaluated using Cronbach's alpha, while construct validity was established through Principal Component Analysis (PCA) with Varimax rotation. In addition, content validity was assessed through expert review by specialists in information and communication technology, agricultural economics, and research methodology to ascertain the relevance and adequacy of the questionnaire items in measuring the intended constructs. The detailed procedures and results of the reliability and validity assessments are presented in Section 3.10, with the supporting statistical outputs provided in Appendix C.

### **3.10 Measurement of Constructs**

The measurement of study constructs was guided by the conceptual framework and hypotheses developed from the Technology Acceptance Model (TAM) and related technology adoption literature (Davis, 1989; Venkatesh et al., 2003). Consistent with the positivist philosophy and deductive research approach, each construct was operationalised using measurable indicators to facilitate empirical testing of the hypothesised relationships among institutional, technological, behavioural, socioeconomic, and mobile banking adoption variables.

Institutional, technological, behavioural, and mobile banking adoption constructs were measured using multi-item five-point Likert scales ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The measurement items were adapted from previously validated instruments and contextualised to reflect mobile banking adoption among agri-entrepreneurs in northern Uganda. The five-point Likert scale was considered appropriate because it provides adequate sensitivity for measuring perceptions and behavioural responses, while reducing respondent burden and supporting quantitative analysis (Joshi et al., 2015; Krosnick & Presser, 2010).

Unlike the latent constructs, socioeconomic factors were treated as observed variables and measured using categorical response options. These included age, gender, marital status, education level, income level, enterprise category, mobile device ownership, and mobile device category. Since these variables were categorical in nature, they were transformed into dummy variables during data analysis to enable their inclusion in regression and mediation models. Dummy coding involved assigning binary values (0 and 1) to represent membership in specific categories relative to a selected reference category. For example, gender was coded as male = 0

and female = 1, while mobile device ownership was coded as no ownership = 0 and ownership = 1. For variables with more than two categories, such as enterprise category, education level, income level, and mobile device category, multiple dummy variables were created, with one category designated as the reference group. This approach enabled estimation of the direct effects of socioeconomic characteristics on mobile banking adoption and their indirect effects through technological perceptions.

The dependent variable, mobile banking adoption, was operationalised as the intensity of mobile banking usage in agri-entrepreneurial operations. Adoption was conceptualised as the extent to which agri-entrepreneurs integrated mobile banking into routine business activities such as purchasing agricultural inputs, receiving customer payments, savings, loan transactions, money transfers, and enterprise financial management. Accordingly, adoption was measured using indicators reflecting frequency of use, reliance on mobile banking for enterprise transactions, integration into agribusiness operations, and willingness to recommend mobile banking services to fellow agri-entrepreneurs. Responses were aggregated to generate composite scores representing the intensity of mobile banking usage, which were subsequently analysed as continuous variables using PROCESS Macro regression analysis (Hayes, 2018b). The operationalisation of all study variables and measurement scales is presented in Table 3.5.

**Table 3. 6: Operationalisation and Measurement of Study Constructs**

| Variable Category            | Construct               | Measurement Indicators                                                                                                      | Measurement Scale |
|------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Institutional factors</b> | Knowledge dissemination | Availability, accessibility, and clarity of mobile banking information                                                      | 5-point Likert    |
|                              | Coordination            | Coordination among financial institutions, telecommunication operators, extension agencies, and other relevant stakeholders | 5-point Likert    |
|                              | User protection         | Perceived security, privacy, consumer protection mechanisms, and availability of grievance resolution channels              | 5-point Likert    |
|                              | Awareness creation      | Awareness of available mobile banking products, services, and their applications in agribusiness activities                 | 5-point Likert    |
|                              | Training                | Adequacy of training, demonstrations, and technical support for using mobile banking services                               | 5-point Likert    |

|                                  |                         |                                                                                                                              |                                               |
|----------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
|                                  | Sustainability          | Reliability, continuity, and long-term availability of mobile banking services and support mechanisms                        | 5-point Likert                                |
| <b>Technological perceptions</b> | Perceived usefulness    | Extent to which mobile banking improves transaction efficiency, financial management, productivity, and business performance | 5-point Likert                                |
|                                  | Perceived ease of use   | Extent to which mobile banking is perceived as easy to learn, understand, operate, and navigate                              | 5-point Likert                                |
| <b>Behavioural factors</b>       | Attitude                | Positive or negative disposition towards adopting and using mobile banking services                                          | 5-point Likert                                |
|                                  | Trust                   | Confidence in the security, reliability, and integrity of mobile banking services and providers                              | 5-point Likert                                |
|                                  | Innovativeness          | Willingness to experiment with and adopt new digital financial technologies                                                  | 5-point Likert                                |
| <b>Socioeconomic factors</b>     | Age                     | Respondent age category (years)                                                                                              | Ordinal (dummy coded for regression analysis) |
|                                  | Gender                  | Male/Female                                                                                                                  | Nominal (dummy coded for regression analysis) |
|                                  | Marital status          | Marital status category                                                                                                      | Nominal (dummy coded for regression analysis) |
|                                  | Education level         | Highest educational attainment                                                                                               | Ordinal (dummy coded for regression analysis) |
|                                  | Income level            | Monthly income category                                                                                                      | Ordinal (dummy coded for regression analysis) |
|                                  | Enterprise category     | Type of agri-enterprise (commercial farming, agro-processing, produce marketing, input supply, or mixed enterprise)          | Nominal (dummy coded for regression analysis) |
|                                  | Mobile device ownership | Ownership of a personal mobile device                                                                                        | Nominal (dummy coded for regression analysis) |

|                                | Mobile device category  | Type of device used (feature phone, smartphone, or both)                                                                                                                                      | Nominal (dummy coded for regression analysis) |
|--------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <b>Mobile banking adoption</b> | Mobile banking adoption | Frequency of use, reliance on mobile banking for business transactions, integration into agribusiness, use of mobile financial services, and willingness to recommend mobile banking services | 5-point Likert (Composite Index)              |

**Source:** Adapted from Davis (1989), Venkatesh et al. (2003), and related mobile banking adoption studies.

### 3.11 Model Specification

The current research aimed at developing a model that systematically evaluates how institutional, technological, behavioural, and socioeconomic factors interact to affect mobile banking adoption among agri-entrepreneurs in northern Uganda. The model is specified in a reduced form as:  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_{12} (X_1.X_2) + \beta_{13} (X_1.X_3) + \beta_{23} (X_2.X_3) + \beta_{24} (X_2.X_4) + \text{error}$ , where  $Y$  represents the intensity of mobile banking adoption,  $X_1$  are institutional factors influencing adoption,  $X_2$  captures technological factors (TAM constructs),  $X_3$  are behavioural factors, and  $X_4$  represent socioeconomic factors.  $B_0$  is the intercept,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ , and  $\beta_4$  reflect the expected direction and magnitude of influence of the respective factors on adoption. A positive coefficient is anticipated for all variables, suggesting that enhancements in institutional, technological, behavioural, and socioeconomic environments are likely to promote mobile banking adoption.

### 3.12 Data Management and Analysis

#### 3.12.1 Data Management

Following data collection, the completed questionnaires were examined for completeness before data entry. The collected data were coded and entered into the Statistical Package for the Social Sciences (SPSS) version 25 for data cleaning and analysis. Data screening involved checking for missing values and data entry errors to enhance the quality and reliability of the dataset.

Data management procedures were undertaken to ensure that the dataset was accurate, complete, and suitable for statistical analysis. Composite scores were generated for multi-item constructs by averaging responses from the respective measurement items. Since the study employed multi-item Likert-scale measures to assess latent constructs, the resulting composite scores were

treated as continuous variables for regression-based analysis (Carifio & Perla, 2008; Sullivan & Artino, 2013).

### **3.12.2 Descriptive and Preliminary Data Analysis**

Descriptive statistics were used to summarise the characteristics of the respondents and provide an overview of the study variables. Frequencies and percentages were used to describe categorical socioeconomic characteristics, including gender, age category, marital status, education level, income level, mobile device category, and enterprise category.

Before conducting regression and mediation analyses, preliminary diagnostic tests were performed to assess whether the data met the assumptions required for multivariate analysis. Normality of the composite variables was assessed using skewness and kurtosis statistics. The results of the normality assessment are presented in Appendix D. Although some variables showed deviations from normality, the relatively large sample size and the use of bootstrapping procedures in PROCESS Macro reduced concerns associated with non-normality (Hayes, 2018a; Lumley et al., 2002).

Multicollinearity among predictor variables was assessed using the Variance Inflation Factor (VIF) and tolerance statistics. This test was conducted to determine whether high correlations existed among institutional, technological, behavioural, and socioeconomic predictors that could distort regression estimates (Yang & Wu, 2016). Variables with acceptable VIF values ( $< 5$ ) were retained for subsequent regression and mediation analyses (Yang & Wu, 2016).

### **3.12.3 Construct Reliability and Validity Assessment**

Prior to hypothesis testing, the measurement properties of the research instrument were evaluated to establish the reliability and validity of the study constructs. Internal consistency reliability was assessed using Cronbach's alpha coefficients, where values approaching or exceeding the recommended threshold of 0.70 were considered indicative of acceptable reliability (Nunnally & Bernstein, 1994).

Construct validity was assessed using Principal Component Analysis (PCA) with Varimax rotation. PCA was conducted to examine the underlying factor structure of the measurement items and to determine whether items appropriately loaded onto their intended constructs. Factor loadings were examined to establish the extent to which individual items represented their

respective constructs, while the extracted components were assessed to confirm the distinctiveness of the study variables (Maskey et al., 2018).

#### **3.12.4 Hypothesis Testing and Model Estimation**

The hypothesised relationships among institutional, technological, behavioural, and socioeconomic factors and mobile banking adoption were tested using PROCESS Macro for SPSS version 4.2 (Hayes, 2018a). PROCESS Macro was selected because it provides a regression-based framework for estimating direct and indirect effects and is appropriate for examining mediation mechanisms through bootstrapping procedures.

The analysis was conducted in accordance with the study objectives. First, regression analysis was performed to determine the direct effects of institutional factors, technological factors, and socioeconomic factors on mobile banking adoption, operationalised as the intensity of mobile banking usage in agri-entrepreneurial operations.

Second, mediation analysis was conducted to examine the mechanisms through which predictor variables influence mobile banking adoption. In line with the extended Technology Acceptance Model (TAM), perceived usefulness (PU) and perceived ease of use (PEOU) were examined as mediating variables in the relationship between institutional and socioeconomic factors and mobile banking adoption. This analysis assessed whether institutional conditions and socioeconomic characteristics influence usage intensity indirectly by shaping agri-entrepreneurs' perceptions of the usefulness and ease of using mobile banking services.

Third, mediation analysis was conducted to determine the mediating influence of behavioural factors, namely attitude, trust, and innovativeness, on the relationship between institutional factors and mobile banking adoption. This extended the TAM perspective by recognising that adoption behaviour is influenced not only by technological perceptions but also by users' psychological responses towards mobile banking services.

The indirect effects were estimated using 5,000 bootstrap samples with 95% bias-corrected confidence intervals. Mediation effects were considered statistically significant when the confidence interval for the indirect effect did not include zero (Hayes, 2018a; Preacher & Hayes, 2008).

Finally, significant direct and indirect effects obtained from the regression and mediation analysis were integrated to design and empirically validate the evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda. The validated model illustrates the pathways through which institutional, technological, behavioural, and socioeconomic factors interact to influence the intensity of mobile banking usage in agricultural enterprise operations.

### **3.13 Ethical Considerations**

Ethical principles were observed throughout the research process to protect the rights, dignity, privacy, and welfare of the study participants. Prior to data collection, ethical clearance and research registration were obtained from the Uganda National Council for Science and Technology (UNCST), and permission to conduct the study was obtained from the respective district authorities through the offices of the Chief Administrative Officers (CAOs). These approvals ensured that the research complied with national research governance requirements.

Participation in the study was voluntary, and respondents were provided with adequate information regarding the purpose of the study, the nature of their participation, and their rights before data collection. Informed consent was obtained from each participant prior to administering the questionnaire. Participants were informed that they had the right to decline participation or withdraw from the study at any stage without any negative consequences.

Confidentiality and anonymity were maintained throughout the study. No personally identifying information was collected or reported, and completed questionnaires were assigned identification codes rather than participants' names. The collected data were securely stored and accessed only by the researcher for academic purposes. The findings were presented in aggregate form to ensure that individual respondents or enterprises could not be identified.

The study involved minimal risk to participants, as respondents were only required to provide information regarding their experiences, perceptions, and usage of mobile banking services in their agri-entrepreneurial activities. Care was taken to avoid questions that could cause unnecessary discomfort or expose sensitive personal information. The researcher also ensured that participation did not interfere with respondents' normal business activities.

Furthermore, participants were assured that the information provided would be used exclusively for academic purposes and would contribute to understanding factors influencing mobile banking

usage among agri-entrepreneurs in northern Uganda. These ethical procedures enhanced the credibility, integrity, and trustworthiness of the research process.

### **3.14 Conclusion**

The methodology section provided a systematic framework for generating empirical evidence to develop an integrated mobile banking adoption model among agri-entrepreneurs in northern Uganda. The research design, sampling procedures, data collection methods, measurement of constructs, and analytical techniques were selected to examine the direct, indirect, and mediating relationships specified in the conceptual framework. The empirical chapters and their corresponding published papers are consequently linked through the study's methodological and analytical progression, with each contributing evidence on specific dimensions or relationships within the proposed model. Collectively, the methodological approach enabled the findings from the different empirical components to be integrated into a coherent explanation of how institutional, technological, behavioural, and socioeconomic factors influence mobile banking adoption. This methodological foundation provides the basis for presenting and interpreting the empirical findings in the subsequent chapters and for establishing the final integrated model developed from the study.

## **CHAPTER FOUR: Effects of Socioeconomic, Institutional, and Technological Factors on Mobile Banking Adoption**

### **4.1 Chapter Overview**

This chapter presents the empirical findings on the effects of socioeconomic and institutional factors on mobile banking adoption and their indirect effects through technological perceptions among agri-entrepreneurs in northern Uganda. It begins with an analysis of respondents' socioeconomic characteristics and the key study variables, followed by the analytical approach used to examine the hypothesized relationships. The chapter then presents the sub-model specification and corresponding conceptual framework, together with the results of correlation, regression, and Hayes' PROCESS Macro mediation analyses. The findings are interpreted in relation to the Technology Acceptance Model (TAM) and relevant empirical literature, highlighting the roles of institutional support, socioeconomic characteristics, and technological perceptions in influencing mobile banking adoption. The chapter concludes by discussing the implications of the findings for the development of the integrated evaluation model for mobile banking adoption among agri-entrepreneurs in northern Uganda.

### **4.2 Data Screening and Valid Responses**

A total of 480 questionnaires were administered to sampled agri-entrepreneurs in Northern Uganda based on the predetermined sample size. After data collection, the completed questionnaires were screened to assess completeness, consistency, and suitability for statistical analysis. Three questionnaires were excluded due to substantial missing responses that limited their inclusion in subsequent analyses. Therefore, 477 valid responses were retained, representing a valid response rate of 99.4%. The final dataset of 477 respondents was used for all analysis, including the assessment of respondents' socioeconomic and enterprise characteristics, descriptive statistics, correlation analysis, regression analysis, and mediation analysis. The valid sample provided an adequate empirical basis for examining the relationships among institutional factors, socioeconomic characteristics, technological perceptions, and mobile banking adoption among agri-entrepreneurs in Northern Uganda.

### **4.3 Socioeconomic and Enterprise Characteristics of Respondents**

The socioeconomic and enterprise characteristics of respondents are presented (Table 4.1) to provide contextual understanding of the sampled agri-entrepreneurs and their potential variations

in mobile banking adoption. The analysis considers characteristics such as age, gender, education level, income level, enterprise category, mobile device ownership, and other relevant attributes. These characteristics provide insights into possible differences in access to, perceptions of, and engagement with mobile banking services, thereby establishing the background for interpreting the subsequent empirical findings.

**Table 4. 1: Socioeconomic and Enterprise Characteristics of Respondents**

| <i>Characteristics</i> | <i>Category</i> | <i>Male (178)</i> | <i>Female (299)</i> | <i>Total (N = 477)</i> | <i>%</i> |
|------------------------|-----------------|-------------------|---------------------|------------------------|----------|
| Age group              | 18-24           | 22                | 30                  | 52                     | 10.9     |
|                        | 25-54           | 135               | 257                 | 392                    | 82.2     |
|                        | 55-64           | 16                | 12                  | 28                     | 5.9      |
|                        | =>65            | 5                 | 0                   | 5                      | 1.0      |
| Education level        | Primary         | 76                | 165                 | 241                    | 50.5     |
|                        | Secondary       | 63                | 73                  | 136                    | 28.5     |
|                        | Institution     | 37                | 19                  | 56                     | 11.7     |
|                        | None            | 2                 | 42                  | 44                     | 9.2      |
| Marital status         | Single          | 24                | 34                  | 58                     | 12.2     |
|                        | Married         | 148               | 198                 | 346                    | 72.5     |
|                        | Divorced        | 5                 | 38                  | 43                     | 9.0      |
|                        | widowed         | 1                 | 29                  | 30                     | 6.3      |
| Enterprise category    | Commercial      | 92                | 109                 | 201                    | 42.1     |
|                        | farmer          |                   |                     |                        |          |
|                        | Processor       | 33                | 6                   | 39                     | 8.2      |
|                        | Produce dealer  | 45                | 179                 | 224                    | 47.0     |
| Income (UGX, 000)      | Input dealer    | 8                 | 5                   | 13                     | 2.7      |
|                        | <150            | 22                | 76                  | 98                     | 20.5     |
|                        | 150-290         | 51                | 82                  | 133                    | 27.9     |
|                        | 300-500         | 40                | 87                  | 127                    | 26.6     |
| Device category        | >500            | 65                | 54                  | 119                    | 24.9     |
|                        | Ordinary phone  | 106               | 187                 | 293                    | 61.4     |
|                        | Feature phone   | 39                | 62                  | 101                    | 21.2     |
|                        | Smartphone      | 45                | 48                  | 93                     | 19.5     |
|                        | Tablet          | 2                 | 1                   | 3                      | 0.6      |
| Device ownership       | Laptop          | 7                 | 1                   | 8                      | 1.7      |
|                        | Yes             | 169               | 265                 | 434                    | 91.0     |
|                        | No              | 9                 | 34                  | 43                     | 9.0      |

The surveyed respondents were mainly young and middle-aged adults, aged 25 to 54, a demographic that is both productive and economically active, likely engaged in business and open to digital innovations. There is a notable female predominance in agri-entrepreneurship, reflecting traditional gender roles in agriculture, particularly in Africa (Frimpong et al., 2025). While many agri-entrepreneurs have at least a primary education, higher education levels are less

common, with most stopping at secondary school. A significant gender disparity exists among those without formal education, disproportionately affecting women. This gap has critical implications for digital literacy and the effective use of mobile banking services. Most agri-entrepreneurs are married, which underscores their household financial responsibilities and the increased need for financial services such as mobile banking. Widowed and divorced women are notably prevalent than their male counterparts, indicating potential socioeconomic vulnerabilities that mobile banking could help mitigate. Produce dealers and commercial farmers represent the largest group of agri-entrepreneurs, highlighting a strong presence of market-oriented actors who may require mobile transactions. Most female respondents fall into lower income brackets, which may limit their access to mobile financial services and advanced mobile devices. While the majority of respondents own mobile phones, many use basic models compatible with USSD (Unstructured Supplementary Service Data), restricting access to app-based banking. Despite strong potential for mobile banking access, a significant number of those without devices are women, revealing a gender-based digital divide that could hinder equitable adoption.

#### 4.4 Descriptive Statistics of Study Variables

Table 4.2 presents the descriptive statistics of the study variables, including institutional factors, technological perceptions, and mobile banking adoption among agri-entrepreneurs in northern Uganda. The results are based on 477 valid observations and provide an overview of the central tendency and variability of the study constructs.

**Table 4. 2: Descriptive Statistics of Study Variables**

| Variable                | Minimum | Maximum | Mean | Std. Deviation |
|-------------------------|---------|---------|------|----------------|
| Knowledge dissemination | 1.00    | 5.00    | 2.07 | 0.81           |
| Coordination            | 1.00    | 4.00    | 1.72 | 0.64           |
| Awareness               | 1.00    | 4.25    | 1.47 | 0.65           |
| User protection         | 1.00    | 5.00    | 1.79 | 0.68           |
| Training                | 1.00    | 5.00    | 2.40 | 0.77           |
| Sustainability          | 1.00    | 4.25    | 1.77 | 0.65           |
| PEOU                    | 1.00    | 5.00    | 1.97 | 0.89           |
| PU                      | 1.00    | 5.00    | 1.78 | 0.75           |
| Adoption                | 1.00    | 5.00    | 1.59 | 0.76           |

Among the institutional factors, training recorded the highest mean score ( $M = 2.40$ ,  $SD = 0.77$ ), followed by knowledge dissemination ( $M = 2.07$ ,  $SD = 0.81$ ), user protection ( $M = 1.79$ ,  $SD = 0.68$ ), sustainability ( $M = 1.77$ ,  $SD = 0.65$ ), coordination ( $M = 1.72$ ,  $SD = 0.64$ ), and awareness creation ( $M = 1.47$ ,  $SD = 0.65$ ). The results suggest that training and knowledge dissemination were relatively more prominent aspects of institutional support experienced by agri-entrepreneurs, although the overall mean scores indicate that institutional support mechanisms for mobile banking adoption remained relatively limited. Awareness creation recorded the lowest mean score, suggesting potential gaps in communicating information and promoting awareness of mobile banking services among agri-entrepreneurs. The technological perception variables also recorded relatively low mean scores. Perceived ease of use (PEOU) had a mean score of 1.97 ( $SD = 0.89$ ), while perceived usefulness (PU) recorded a mean score of 1.78 ( $SD = 0.75$ ). These findings indicate that respondents generally had limited positive perceptions regarding the ease of using and usefulness of mobile banking services. The relatively higher standard deviation for PEOU suggests greater variation among respondents in their experiences and perceptions concerning the usability of mobile banking platforms. Mobile banking adoption recorded the lowest mean score among all study variables ( $M = 1.59$ ,  $SD = 0.76$ ), indicating a low level of adoption intensity among agri-entrepreneurs. This suggests that despite the availability and expansion of mobile banking services, their integration into agri-entrepreneurial activities remains limited. The standard deviations ranged from 0.64 to 0.89, indicating moderate variability in respondents' perceptions across the study constructs. This variation suggests that agri-entrepreneurs differ in their exposure to institutional support, technological perceptions, and actual use of mobile banking services. These descriptive findings provide an initial understanding of the study variables and establish the basis for further analysis of the direct and indirect relationships among institutional factors, socioeconomic factors, technological perceptions, and mobile banking adoption.

#### **4.5 Mobile Banking Adoption Intensity Scores**

To effectively evaluate the level of engagement with mobile banking among agri-entrepreneurs in northern Uganda, it was essential to define adoption intensity thresholds. Adoption intensity encompasses not only the mere use of mobile banking but also factors such as frequency,

reliance, integration, and advocacy related to its usage. The average responses across five-point Likert items were computed to generate composite adoption scores (see Table 4.2).

**Table 4. 3: Mobile Banking Adoption Intensity Scores**

| <b>Adoption Intensity Category</b>             | <b>Frequency</b> | <b>Percentage</b> |
|------------------------------------------------|------------------|-------------------|
| Very low adoption intensity (1.00 – 1.75)      | 280              | 58.7              |
| Low-Moderate adoption intensity (1.76 – 2.50)  | 148              | 31.0              |
| Moderate-High adoption intensity (2.51 – 3.25) | 27               | 5.7               |
| Very High adoption intensity (3.26 – 5.00)     | 22               | 4.6               |
| <b>Total</b>                                   | <b>477</b>       | <b>100</b>        |

The majority of agri-entrepreneurs fall in the very low adoption category, showing limited intensity in using mobile banking. 31% demonstrate Low-Moderate adoption, indicating partial but not fully integrated use. Only 10.3% combined (Moderate-High+Very High) show strong adoption. This highlights the complex challenges impeding the integration of mobile banking in this sector. To effectively tackle these issues, it is crucial to assess the interplay of institutional, technological, behavioural, and socioeconomic factors that influence mobile banking adoption among agri-entrepreneurs in northern Uganda.

#### **4.6 Assessment of Validity and Statistical Assumptions**

This section presents the assessment of validity and statistical assumptions necessary for analysing the direct and indirect effects of institutional and socioeconomic factors on mobile banking adoption through technological perceptions.

##### *Validity Measurement*

Reliability of the measurement instrument was established during the pre-testing phase before data collection, as reported in Appendix C. The current section focuses on construct validity assessment and evaluation of assumptions required for subsequent statistical analyses. Construct validity was assessed using exploratory factor analysis (EFA) through principal component analysis with Varimax rotation. In addition, regression and mediation assumptions, including normality (in Appendix D) and multicollinearity, were examined to ensure the appropriateness of the analytical procedures. The results of the validity, and assumption tests are presented in the

subsequent tables and interpreted to establish the adequacy of the study constructs and the suitability of the dataset for examining the hypothesized relationships.

**Table 4. 4: Validity Coefficients of Construct Items**

| Construct               | Item Code | Factor Loadings | Average Variance Extracted (AVE) |
|-------------------------|-----------|-----------------|----------------------------------|
| Knowledge dissemination | KW1       | 0.73            | 0.45                             |
|                         | KW2       | 0.68            |                                  |
|                         | KW4       | 0.67            |                                  |
|                         | KW5       | 0.58            |                                  |
| Coordination            | CO_1      | 0.58            | 0.43                             |
|                         | CO_3      | 0.72            |                                  |
|                         | CO_4      | 0.66            |                                  |
| Awareness               | AW_1      | 0.56            | 0.38                             |
|                         | AW_3      | 0.53            |                                  |
|                         | AW_4      | 0.72            |                                  |
|                         | AW_5      | 0.64            |                                  |
| Sustainability          | SU_1      | 0.48            | 0.23                             |
|                         | SU_3      | 0.49            |                                  |
|                         | SU_4      | 0.48            |                                  |
| Training                | TR_1      | 0.75            | 0.49                             |
|                         | TR_2      | 0.78            |                                  |
|                         | TR_3      | 0.54            |                                  |
| User protection         | PR_2      | 0.68            | 0.45                             |
|                         | PR_4      | 0.61            |                                  |
|                         | PR_5      | 0.71            |                                  |
| PU                      | PU_1      | 0.66            | 0.51                             |
|                         | PU_2      | 0.74            |                                  |
|                         | PU_3      | 0.72            |                                  |
|                         | PU_5      | 0.73            |                                  |
| PEOU                    | PEOU_1    | 0.67            | 0.49                             |
|                         | PEOU_2    | 0.73            |                                  |
|                         | PEOU_4    | 0.70            |                                  |
| Mobile banking adoption | AD_1      | 0.78            | 0.67                             |
|                         | AD_2      | 0.87            |                                  |
|                         | AD_3      | 0.80            |                                  |
|                         | AD_4      | 0.83            |                                  |

Table 4.4 presents the factor loadings and Average Variance Extracted (AVE) for the latent constructs included in the study following exploratory factor analysis. Factor loadings were examined to determine the extent to which individual measurement items represented their respective constructs, while AVE was used to assess convergent validity by indicating the proportion of variance in the observed indicators explained by each underlying construct.

The factor loadings ranged from 0.48 to 0.87, with the majority of items meeting or exceeding the recommended threshold of 0.50. This indicates that most measurement items demonstrated satisfactory associations with their respective constructs. The mobile banking adoption construct recorded the strongest factor loadings ( $AD\_2 = 0.87$ ,  $AD\_4 = 0.83$ ,  $AD\_3 = 0.80$ , and  $AD\_1 = 0.78$ ), demonstrating strong representation of the adoption construct. Similarly, items measuring training, perceived usefulness (PU), perceived ease of use (PEOU), knowledge dissemination, coordination, awareness, and user protection exhibited acceptable factor loadings, confirming their contribution to the measurement of the intended constructs.

However, the sustainability construct recorded comparatively lower factor loadings, ranging from 0.48 to 0.49. Although these values are slightly below the conventional threshold of 0.50, the items were retained because sustainability represents a theoretically important dimension of institutional support within the proposed evaluation model. In social science research, constructs related to institutional and behavioural phenomena are often complex and may not always achieve high empirical homogeneity. Therefore, items with loadings close to 0.50 may be retained when they demonstrate theoretical relevance and contribute to the overall conceptual representation of the construct (Hair et al., 2019; Kline, 2023).

The AVE results indicate that mobile banking adoption ( $AVE = 0.67$ ) and perceived usefulness ( $AVE = 0.51$ ) achieved the recommended threshold of 0.50, demonstrating adequate convergent validity. Perceived ease of use ( $AVE = 0.49$ ) and training ( $AVE = 0.49$ ) were marginally below the recommended threshold but remained close to the acceptable level when considered alongside their satisfactory factor loadings. Knowledge dissemination ( $AVE = 0.45$ ), user protection ( $AVE = 0.45$ ), coordination ( $AVE = 0.43$ ), awareness ( $AVE = 0.38$ ), and sustainability ( $AVE = 0.23$ ) recorded AVE values below 0.50, suggesting that these constructs explained less than half of the variance in their respective indicators. The sustainability construct demonstrated the weakest measurement properties, with an AVE of 0.23 and a Cronbach's alpha coefficient of 0.616 obtained during the pre-testing phase. These results suggest moderate internal consistency and limited convergent validity. Nevertheless, the construct was retained because it captures an essential institutional dimension of long-term support and continuity of mobile banking initiatives among agri-entrepreneurs. Given the exploratory nature of the study and the

theoretical importance of the construct, sustainability was retained with caution, and findings involving this construct are interpreted while acknowledging its measurement limitations.

Overall, the validity assessment provides sufficient evidence that the retained items adequately represented the latent constructs of institutional factors, technological perceptions, and mobile banking adoption. Although some constructs recorded AVE values below the recommended threshold, their theoretical relevance, acceptable factor loadings for most items, and contribution to the integrated evaluation model supported their retention. Socioeconomic factors were treated as observed characteristics and were therefore excluded from the construct validity assessment. The validated constructs provided the basis for subsequent correlation, regression, and mediation analyses examining the direct and indirect effects of institutional and socioeconomic factors on mobile banking adoption through technological perceptions.

#### *Assessment of Multicollinearity among Variables*

This section presents the assessment of multicollinearity among the explanatory variables included in the analysis of the direct and indirect effects of institutional and socioeconomic factors on mobile banking adoption through technological perceptions among agri-entrepreneurs in northern Uganda. Multicollinearity assessment was necessary to determine whether the independent variables were highly correlated to the extent that they could distort regression estimates, inflate standard errors, and affect the interpretation of the relationships among the study variables. Multicollinearity was assessed using the Variance Inflation Factor (VIF) and tolerance statistics obtained from the regression analysis. Lower VIF values and higher tolerance values indicate the absence of problematic multicollinearity among explanatory variables. The assessment considered institutional factors, socioeconomic characteristics, and technological perception variables included in the sub-model. The results of the multicollinearity assessment are presented in the subsequent table and interpreted based on established threshold values. Variables with VIF values below 5 and tolerance values above 0.20 are generally considered to indicate acceptable levels of collinearity (Hair et al., 2019). The findings provide evidence on whether the explanatory variables were sufficiently distinct to allow reliable estimation of the direct and indirect effects on mobile banking adoption through regression and mediation.

**Table 4. 5: Variance Inflation Factor and Tolerance**

| <i>Category</i>                                    | <i>Explanatory Variables</i> | <i>Variance Inflation Factor<br/>(VIF)</i> | <i>Tolerance<br/>(1/VIF)</i> |
|----------------------------------------------------|------------------------------|--------------------------------------------|------------------------------|
| Institutional factors                              | Knowledge dissemination      | 1.619                                      | 0.618                        |
|                                                    | Coordination                 | 1.518                                      | 0.659                        |
|                                                    | Awareness                    | 2.369                                      | 0.422                        |
|                                                    | Sustainability               | 2.555                                      | 0.391                        |
|                                                    | Training                     | 1.261                                      | 0.793                        |
|                                                    | User protection              | 1.484                                      | 0.674                        |
| Technological factors                              | PU                           | 2.127                                      | 0.470                        |
|                                                    | PEOU                         | 1.284                                      | 0.779                        |
| Socioeconomic factors                              | Age                          | 1.146                                      | 0.872                        |
|                                                    | Gender                       | 1.146                                      | 0.872                        |
|                                                    | Education level              | 1.190                                      | 0.840                        |
|                                                    | Marital status               | 1.067                                      | 0.937                        |
|                                                    | Enterprise category          | 1.149                                      | 0.871                        |
|                                                    | Income level                 | 1.092                                      | 0.915                        |
|                                                    | Mobile device ownership      | 1.125                                      | 0.889                        |
|                                                    | Mobile device category       | 1.351                                      | 0.740                        |
| <b>Dependent variable: Mobile Banking Adoption</b> |                              |                                            |                              |

Table 4.5 presents the Variance Inflation Factor (VIF) and tolerance statistics used to assess multicollinearity among the explanatory variables included in the analysis of mobile banking adoption. The assessment covered institutional factors, technological factors, and socioeconomic factors to determine whether high correlations among predictors could affect the reliability of the regression estimates.

The results indicate that all explanatory variables recorded VIF values ranging from 1.067 to 2.555, which are below the commonly accepted threshold of 5.00. Similarly, tolerance values ranged from 0.391 to 0.937, exceeding the minimum acceptable threshold of 0.20. These results indicate that multicollinearity was not a concern among the explanatory variables and that each predictor provided sufficient unique information for explaining variations in mobile banking adoption.

Among the institutional factors, sustainability recorded the highest VIF value (2.555) and the lowest tolerance value (0.391), followed by awareness (VIF = 2.369; tolerance = 0.422). Although these variables exhibited relatively higher levels of association compared with other

institutional factors, their values remained within acceptable limits, indicating no problematic overlap among the institutional dimensions. Training recorded the lowest VIF among institutional factors (VIF = 1.261; tolerance = 0.793), suggesting limited correlation with other predictors.

The technological factors also demonstrated acceptable levels of multicollinearity. Perceived usefulness (PU) recorded a VIF of 2.127 and tolerance of 0.470, while perceived ease of use (PEOU) recorded a VIF of 1.284 and tolerance of 0.779. This indicates that although PU and PEOU are theoretically related components of technological acceptance, they represent sufficiently distinct constructs in the model.

The socioeconomic factors recorded the lowest levels of multicollinearity, with VIF values ranging from 1.067 to 1.351 and tolerance values from 0.740 to 0.937. This indicates that demographic and enterprise characteristics, including age, gender, education level, marital status, income level, enterprise category, mobile device ownership, and device category, contributed independently to explaining differences in mobile banking adoption. Overall, the multicollinearity diagnostics confirm that the explanatory variables satisfied the regression assumption of independence among predictors. Therefore, the variables were retained for subsequent correlation, regression, and mediation analyses examining the direct and indirect effects of institutional and socioeconomic factors on adoption through technological perceptions.

#### **4.7 Sub-Model Specification of the Direct and Indirect Effects of Socioeconomic and Institutional Factors on Mobile Banking Adoption through Technological Perceptions**

This study assessed the direct and indirect effects of institutional and socioeconomic factors on mobile banking adoption through technological perceptions among agri-entrepreneurs in northern Uganda. The sub-model comprises socioeconomic and institutional factors as independent variables ( $X_1$  and  $X_2$ ), perceived ease of use (PEOU) and perceived usefulness (PU) as mediating variables ( $M_1$  and  $M_2$ ), and mobile banking adoption as the dependent variable ( $Y$ ). The simplified structural relationship is expressed in equation 4.1:

##### **Equation 4. 1: Institutional, Socioeconomic, and Technological Factors Model**

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_{n+1} M_1 + \beta_{n+2} M_2 + \varepsilon \dots\dots\dots 4.1$$

Where  $Y$  = Mobile banking adoption,  $B_0$  = Intercept (constant term),  $X_1, X_2$  = Socioeconomic and institutional factors,  $M_1 = \text{PEOU}$ ,  $M_2 = \text{PU}$ ,  $B_1, \beta_2$  = Direct effects of the socioeconomic and institutional factors on adoption,  $B_{n+1}$  and  $\beta_{n+2}$  = Effects of the technological perceptions (PEOU and PU) on mobile banking adoption, representing the mediated pathways, and  $\varepsilon$  = error term.

The sub-model examines how institutional factors, including coordination, awareness creation, knowledge dissemination, training, user protection, and sustainability, together with socioeconomic characteristics such as age, gender, marital status, education level, mobile device category, device ownership, and enterprise category, influence mobile banking adoption directly and indirectly through technological perceptions. The indirect pathways capture how institutional support and socioeconomic characteristics shape users' perceptions of the ease of use and usefulness of mobile banking, which subsequently influence adoption behaviour. As illustrated in Figure 4.1, the sub-model extends the Technology Acceptance Model (TAM) by positioning institutional and socioeconomic factors as external determinants of technological perceptions and subsequent mobile banking adoption. While TAM provides the foundational mechanism for explaining adoption through perceived ease of use and perceived usefulness, the extended sub-model incorporates the contextual conditions within which technology acceptance occurs. Specifically, institutional factors and socioeconomic characteristics are incorporated as antecedents that influence users' perceptions of mobile banking, thereby providing a more comprehensive explanation of adoption behaviour among agri-entrepreneurs. Therefore, the sub-conceptual framework represents a context-specific extension of TAM that integrates technological, institutional, and socioeconomic dimensions of mobile banking adoption. It provides the analytical basis for examining both direct and mediated relationships among the study variables and explains how institutional conditions and individual characteristics jointly shape mobile banking adoption among agri-entrepreneurs.

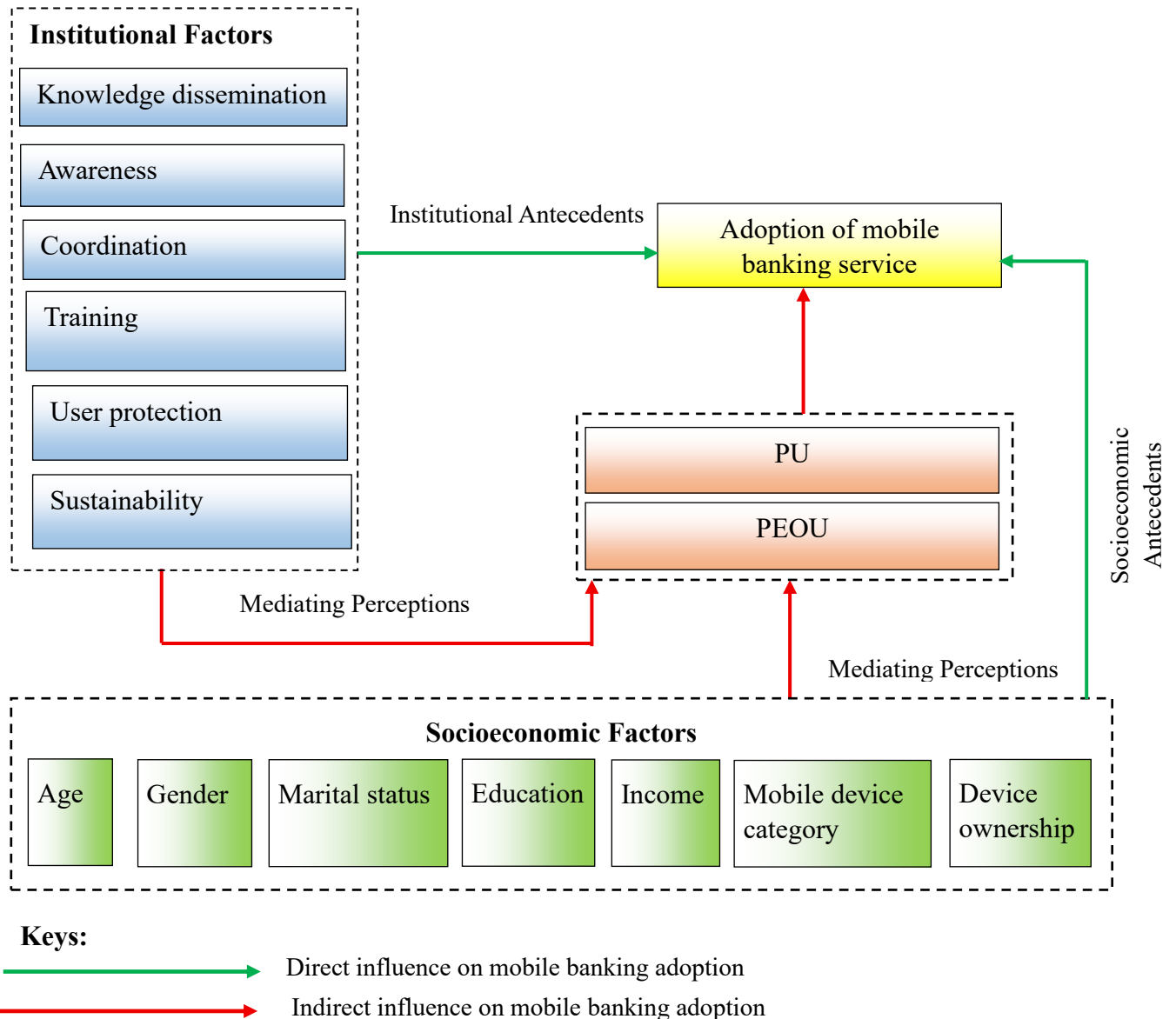


**Figure 4. 1: Relating Institutional, Socioeconomic, & Technological Factors to Mobile Banking Adoption**

#### 4.8 Direct and Indirect Effects of Socioeconomic Factors on Mobile Banking Adoption through Technological Perceptions

This section presents the inferential analysis of the direct and indirect effects of socioeconomic factors on mobile banking adoption among agri-entrepreneurs in northern Uganda. The analysis examines the extent to which selected socioeconomic characteristics influence mobile banking adoption directly, as well as indirectly through the technological perception constructs of perceived ease of use (PEOU) and perceived usefulness (PU). The socioeconomic variables

considered include age, gender, marital status, education level, income level, enterprise category, mobile device ownership, and mobile device category. The mediation analysis was conducted using Hayes' PROCESS Macro with bootstrapping to estimate both direct and indirect effects. Direct effects indicate the independent influence of each socioeconomic factor on mobile banking adoption after accounting for the mediating technological perceptions, whereas indirect effects represent the extent to which socioeconomic characteristics influence adoption through PEOU and PU. The findings are presented in two tables. Table 4.6 reports the direct effects of the socioeconomic factors on mobile banking adoption, including the regression coefficients, standard errors, t-values, significance levels, and confidence intervals. Table 4.7 presents the indirect effects through technological perceptions, together with the bootstrapped estimates and confidence intervals used to determine the statistical significance of the mediation effects. The results provide empirical evidence on whether technological perceptions mediate the relationship between socioeconomic characteristics and mobile banking adoption among agri-entrepreneurs.

**Table 4. 6: Direct Effects of Socioeconomic Factors**

| Socioeconomic factor (X)                                                       | Direct Effect (c' or $\beta$ ) | p-value       |
|--------------------------------------------------------------------------------|--------------------------------|---------------|
| Age                                                                            | 0.1050                         | <b>0.0470</b> |
| Gender                                                                         | 0.0345                         | 0.4882        |
| Marital status                                                                 | 0.0439                         | 0.2158        |
| Education level                                                                | -0.0258                        | 0.2917        |
| Income level                                                                   | -0.0332                        | 0.1367        |
| Device category                                                                | 0.0937                         | 0.4106        |
| Enterprise category                                                            | -0.0137                        | 0.5505        |
| Device ownership                                                               | 0.1646                         | 0.0654        |
| <b>X: Independent variable Y: Dependent variable (mobile banking adoption)</b> |                                |               |

**Table 4. 7: Indirect Effects of Socioeconomic Factors**

| <b>Socioeconomic Factor (X)</b>                                                                                                                                                                     | <b>Mediator (M)</b> | <b>Path a (X-M)</b> | <b>Path b (M-Y)</b> | <b>Indirect Effect (a*b)</b> | <b>Bootstrap 95% CI</b> | <b>Indirect Sig</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|------------------------------|-------------------------|---------------------|
| Age                                                                                                                                                                                                 | PEOU                | 0.2721              | 0.2247              | 0.0611                       | (0.0214, 0.1098)        | <b>0.0023</b>       |
|                                                                                                                                                                                                     | PU                  | 0.2915              | 0.5514              | 0.1607                       | (0.0680, 0.2749)        | <b>0.0002</b>       |
| Gender                                                                                                                                                                                              | PEOU                | -0.2677             | 0.2324              | -0.0622                      | (-0.1029, -0.0257)      | <b>0.0015</b>       |
|                                                                                                                                                                                                     | PU                  | -0.0123             | 0.5581              | -0.0069                      | (-0.1011, 0.0699)       | 0.8692              |
| Marital status                                                                                                                                                                                      | PEOU                | 0.1167              | 0.2269              | 0.0265                       | (0.0020, 0.0589)        | <b>0.0540</b>       |
|                                                                                                                                                                                                     | PU                  | 0.0894              | 0.5578              | 0.0498                       | (-0.0107, 0.1229)       | 0.0950              |
| Education level                                                                                                                                                                                     | PEOU                | 0.0633              | 0.2316              | 0.0147                       | (-0.0084, 0.0394)       | 0.1309              |
|                                                                                                                                                                                                     | PU                  | -0.0016             | 0.5583              | -0.0009                      | (-0.0518, 0.0435)       | 0.9655              |
| Income level                                                                                                                                                                                        | PEOU                | -0.1148             | 0.2236              | -0.0257                      | (-0.0451, -0.0100)      | <b>0.0024</b>       |
|                                                                                                                                                                                                     | PU                  | -0.0452             | 0.5594              | -0.0253                      | (-0.0675, 0.0107)       | 0.1784              |
| Device category                                                                                                                                                                                     | PEOU                | 0.6823              | 0.2263              | 0.1544                       | (0.0486, 0.7918)        | <b>0.0004</b>       |
|                                                                                                                                                                                                     | PU                  | 0.4970              | 0.5576              | 0.2771                       | (0.1373, 1.1972)        | <b>0.0034</b>       |
| Enterprise category                                                                                                                                                                                 | PEOU                | -0.0390             | 0.2282              | -0.0089                      | (-0.0255, 0.0086)       | 0.3219              |
|                                                                                                                                                                                                     | PU                  | -0.0077             | 0.5602              | 0.0043                       | (-0.0354, 0.0424)       | 0.8250              |
| Device ownership                                                                                                                                                                                    | PEOU                | 1.0733              | 0.2144              | 0.2301                       | (0.1364, 0.3473)        | <b>0.0000</b>       |
|                                                                                                                                                                                                     | PU                  | 0.7569              | 0.5502              | 0.4165                       | (0.2246, 0.6587)        | <b>0.0000</b>       |
| <b>X:</b> Independent variable<br><b>M:</b> Mediating Variable,<br><b>Y:</b> Dependent variable (Mobile Banking Adoption),<br><b>PEOU:</b> Perceived ease of use<br><b>PU:</b> Perceived usefulness |                     |                     |                     |                              |                         |                     |

The direct and indirect effects of socioeconomic factors on mobile banking adoption are presented in Tables 4.6 and 4.7, respectively. The results indicate that socioeconomic factors influenced mobile banking adoption through both direct and mediated pathways involving perceived ease of use (PEOU) and perceived usefulness (PU).

### Age

Age was the only socioeconomic factor that demonstrated a significant direct effect on mobile banking adoption ( $\beta = 0.1050$ ,  $p = 0.0470$ ). This indicates that a one-unit increase in the coded age category was associated with a 0.105-unit increase in mobile banking adoption after controlling for technological perceptions. In addition, age demonstrated significant indirect effects through both perceived ease of use (PEOU) ( $ab = 0.0611$ ; 95% CI = 0.0214, 0.1098) and perceived usefulness (PU) ( $ab = 0.1607$ ; 95% CI = 0.0680, 0.2749). The indirect effect through PU was larger than that through PEOU, indicating that age influenced adoption more strongly through changes in perceptions regarding the usefulness of mobile banking for agri-enterprise

activities, such as receiving payments from buyers, paying suppliers, and managing business transactions.

### **Gender**

Gender did not demonstrate a significant direct effect on mobile banking adoption ( $\beta = 0.0345$ ,  $p = 0.4882$ ). However, it demonstrated a significant negative indirect effect through PEOU ( $ab = -0.0622$ ; 95% CI =  $-0.1029, -0.0257$ ). This indicates that gender differences influenced mobile banking adoption through perceptions of ease of use. The indirect effect through PU was not significant ( $ab = -0.0069$ ; 95% CI =  $-0.1011, 0.0699$ ), suggesting that gender did not significantly influence perceptions regarding the usefulness of mobile banking for agricultural business activities.

### **Marital Status**

Marital status did not demonstrate a significant direct effect on mobile banking adoption ( $\beta = 0.0439$ ,  $p = 0.2158$ ). However, it showed a significant indirect effect through PEOU ( $ab = 0.0265$ ; 95% CI =  $0.0020, 0.0589$ ). The indirect effect through PU was not statistically significant ( $ab = 0.0498$ ; 95% CI =  $-0.0107, 0.1229$ ). This indicates that marital status influenced adoption through perceptions of ease of using mobile banking services rather than through perceptions of their usefulness for agricultural enterprise transactions.

### **Education Level**

Education level did not demonstrate a significant direct effect on mobile banking adoption ( $\beta = -0.0258$ ,  $p = 0.2917$ ). It also showed no significant indirect effects through PEOU ( $ab = 0.0147$ ; 95% CI =  $-0.0084, 0.0394$ ) or PU ( $ab = -0.0009$ ; 95% CI =  $-0.0518, 0.0435$ ). These findings indicate that differences in educational attainment were not associated with variations in mobile banking adoption among agri-entrepreneurs, either directly or through technological perceptions.

### **Income Level**

Income level did not demonstrate a significant direct effect on mobile banking adoption ( $\beta = -0.0332$ ,  $p = 0.1367$ ). However, it showed a significant negative indirect effect through PEOU ( $ab = -0.0257$ ; 95% CI =  $-0.0451, -0.0100$ ). The indirect effect through PU was not significant ( $ab = -0.0253$ ; 95% CI =  $-0.0675, 0.0107$ ). This indicates that income level influenced adoption

primarily through perceptions of ease of use rather than through perceptions of the usefulness of mobile banking for agricultural enterprise operations.

### **Device Category**

Device category did not demonstrate a significant direct effect on mobile banking adoption ( $\beta = 0.0937, p = 0.4106$ ). However, it exhibited significant indirect effects through both PEOU ( $ab = 0.1544; 95\% \text{ CI} = 0.0486, 0.7918$ ) and PU ( $ab = 0.2771; 95\% \text{ CI} = 0.1373, 1.1972$ ). The larger indirect effect through PU indicates that differences in mobile device capability influenced adoption mainly by affecting perceptions of the benefits and usefulness of mobile banking. For agri-entrepreneurs, this suggests that access to more capable devices may enhance the ability to use mobile banking features relevant to business transactions, such as monitoring payments and managing financial records.

### **Device Ownership**

Device ownership did not demonstrate a statistically significant direct effect on mobile banking adoption ( $\beta = 0.1646, p = 0.0654$ ), although the coefficient was relatively larger than most other socioeconomic factors. However, it demonstrated the strongest indirect effects through both PEOU ( $ab = 0.2301; 95\% \text{ CI} = 0.1364, 0.3473$ ) and PU ( $ab = 0.4165; 95\% \text{ CI} = 0.2246, 0.6587$ ). The larger indirect effect through PU indicates that device ownership influenced adoption primarily by improving users' perceptions of the value and usefulness of mobile banking. Among agri-entrepreneurs, ownership provides opportunities to use mobile banking for activities such as receiving agricultural payments, paying suppliers, and transferring funds within value-chain networks.

### **Enterprise Category**

Enterprise category did not demonstrate a significant direct effect on mobile banking adoption ( $\beta = -0.0137, p = 0.5505$ ). Similarly, it showed no significant indirect effects through PEOU ( $ab = -0.0089; 95\% \text{ CI} = -0.0255, 0.0086$ ) or PU ( $ab = 0.0043; 95\% \text{ CI} = -0.0354, 0.0424$ ). This indicates that differences among commercial farmers, processors, produce dealers, and input dealers were not associated with variations in mobile banking adoption after considering technological perceptions.

The findings indicate that socioeconomic factors influenced mobile banking adoption among agri-entrepreneurs through different pathways and with varying magnitudes. Age was the only factor demonstrating both direct and mediated effects, while device ownership and device category exhibited the strongest indirect effects, particularly through perceived usefulness. This suggests that access to and familiarity with appropriate mobile technologies played a more substantial role in shaping adoption than most demographic characteristics.

The results further show that most socioeconomic factors operated through technological perceptions rather than directly influencing adoption. Specifically, perceived usefulness emerged as the stronger pathway for device ownership, device category, and age, whereas perceived ease of use mediated the effects of gender, marital status, and income level. Education level and enterprise category showed no meaningful influence through either direct or indirect pathways. Overall, the findings demonstrate that socioeconomic characteristics affect mobile banking adoption among agri-entrepreneurs mainly by shaping how users perceive the usefulness and usability of mobile banking technologies within their agricultural business activities.

#### **4.9 Direct and Indirect Effects of Institutional Factors on Mobile Banking Adoption through Technological Perceptions**

This section presents the results of the analysis examining how institutional factors influence mobile banking adoption among agri-entrepreneurs in northern Uganda, both directly and indirectly through technological perceptions. The analysis considers the extent to which institutional conditions shape adoption behaviour through perceived ease of use (PEOU) and perceived usefulness (PU), which serve as the mediating mechanisms in the relationship between institutional factors and mobile banking adoption. Institutional factors assessed in the analysis include coordination, knowledge dissemination, awareness creation, training, user protection, and sustainability. Within the mediation framework, these factors are treated as explanatory variables, PEOU and PU as mediating variables, and mobile banking adoption as the outcome variable. Direct effects represent the independent influence of institutional factors on adoption after accounting for technological perceptions, whereas indirect effects capture the extent to which institutional factors affect adoption by influencing users' perceptions of the ease of use and usefulness of mobile banking services. Results on the direct effects of institutional factors on mobile banking adoption are presented in Table 4.9, while Table 4.10 presents the indirect effects

mediated through PEOU and PU. These findings provide empirical evidence on the pathways through which institutional support mechanisms influence mobile banking adoption among agri-entrepreneurs and form the basis for subsequent interpretation of the direct and mediated relationships.

**Table 4. 8: Direct Effects of Institutional Factors**

| Institutional factor (X)                                                | Direct Effect (c' or $\beta$ ) | p-value       |
|-------------------------------------------------------------------------|--------------------------------|---------------|
| Knowledge dissemination                                                 | 0.2750                         | <b>0.0000</b> |
| Awareness                                                               | 0.3238                         | <b>0.0000</b> |
| Coordination                                                            | 0.1074                         | <b>0.0124</b> |
| Training                                                                | 0.0253                         | 0.4080        |
| User protection                                                         | 0.2689                         | <b>0.0000</b> |
| Sustainability                                                          | 0.2281                         | <b>0.0000</b> |
| X: Independent variable Y: Dependent variable (mobile banking adoption) |                                |               |

**Table 4. 9: Indirect Effects of Institutional Factors**

| Factor (X)                                                                                                                                                                                          | Mediator (M) | Path a (X-M) | Path b (M-Y) | Indirect Effect (ab) | Bootstrap 95% CI  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|----------------------|-------------------|
| Knowledge dissemination                                                                                                                                                                             | PEOU         | 0.5226       | 0.2667       | 0.1394               | (0.0923, 0.1986)  |
|                                                                                                                                                                                                     | PU           | 0.4781       | 0.5258       | 0.2514               | (0.1634, 0.3532)  |
| Awareness                                                                                                                                                                                           | PEOU         | 0.4535       | 0.3041       | 0.1379               | (0.0868, 0.1997)  |
|                                                                                                                                                                                                     | PU           | 0.7601       | 0.5030       | 0.3823               | (0.2377, 0.5441)  |
| Coordination                                                                                                                                                                                        | PEOU         | 0.0257       | 0.4372       | 0.0112               | (-0.0502, 0.0755) |
|                                                                                                                                                                                                     | PU           | 0.4548       | 0.6398       | 0.2910               | (0.1906, 0.4121)  |
| Training                                                                                                                                                                                            | PEOU         | 0.3564       | 0.3822       | 0.1362               | (0.1901, 0.0897)  |
|                                                                                                                                                                                                     | PU           | 0.2380       | 0.6639       | 0.1580               | (0.0960, 0.2182)  |
| User protection                                                                                                                                                                                     | PEOU         | 0.6053       | 0.2702       | 0.1635               | (0.1067, 0.2318)  |
|                                                                                                                                                                                                     | PU           | 0.7295       | 0.5255       | 0.3833               | (0.2536, 0.5209)  |
| Sustainability                                                                                                                                                                                      | PEOU         | 0.5029       | 0.3073       | 0.1545               | (0.0991, 0.2221)  |
|                                                                                                                                                                                                     | PU           | 0.5987       | 0.5552       | 0.3324               | (0.2049, 0.4935)  |
| <b>X:</b> Independent variable<br><b>M:</b> Mediating Variable,<br><b>Y:</b> Dependent variable (Mobile Banking Adoption),<br><b>PEOU:</b> Perceived ease of use<br><b>PU:</b> Perceived usefulness |              |              |              |                      |                   |

The direct and indirect effects of institutional factors on mobile banking adoption are presented in Tables 4.8 and 4.9, respectively. The findings indicate that institutional factors influenced

mobile banking adoption through both direct and indirect pathways involving perceived ease of use (PEOU) and perceived usefulness (PU).

Knowledge dissemination demonstrated a significant positive direct effect on mobile banking adoption and also exerted significant indirect effects through both PEOU and PU. Accordingly, the null hypotheses of no significant direct and indirect effects were rejected for knowledge dissemination.

Awareness had the strongest positive direct effect on mobile banking adoption among the institutional factors examined. It also demonstrated significant indirect effects through both PEOU and PU. Consequently, the null hypotheses of no significant direct and indirect effects were rejected for awareness.

Coordination had a significant positive direct effect on mobile banking adoption and a significant indirect effect through PU. However, its indirect effect through PEOU was not statistically significant because the bootstrap confidence interval included zero. Therefore, the null hypothesis of no significant direct effect was rejected for coordination, while the null hypothesis of no significant indirect effect was rejected for the PU pathway but not rejected for the PEOU pathway.

Training did not demonstrate a significant direct effect on mobile banking adoption. However, it exerted significant indirect effects through both PEOU and PU. Accordingly, the null hypothesis of no significant direct effect was not rejected for training, whereas the null hypothesis of no significant indirect effect was rejected for both technological perception pathways.

User protection demonstrated significant positive direct and indirect effects on mobile banking adoption. Significant mediated effects were observed through both PEOU and PU. Therefore, the null hypotheses of no significant direct and indirect effects were rejected for user protection.

Similarly, sustainability demonstrated a significant positive direct effect on mobile banking adoption and significant indirect effects through both PEOU and PU. Consequently, the null hypotheses of no significant direct and indirect effects were rejected for sustainability.

Overall, the findings indicate that institutional factors influenced mobile banking adoption through both direct and mediated pathways. Knowledge dissemination, awareness, user

protection, and sustainability exhibited significant direct and indirect effects, while coordination demonstrated significant direct and partial indirect effects through PU only. Training influenced mobile banking adoption exclusively through the technological perception pathways, as its direct effect was not statistically significant. These findings therefore provide evidence that institutional factors affect mobile banking adoption both independently and through technological perceptions.

#### **4.10 Discussion of Findings**

##### **Direct and Indirect Effects of Socioeconomic Factors through Technological Perceptions**

The findings demonstrate that socioeconomic factors exerted differential influences on mobile banking adoption among agri-entrepreneurs in northern Uganda. Consistent with the literature reviewed, socioeconomic characteristics did not uniformly determine adoption behaviour. Instead, their influence varied depending on whether they directly affected adoption or operated indirectly through perceived ease of use (PEOU) and perceived usefulness (PU). These findings support the Technology Acceptance Model (TAM), which posits that external variables influence technology adoption primarily through users' cognitive evaluations of technology rather than through direct behavioural effects (Davis, 1989). They further validate the integrated evaluation model developed in this study by demonstrating that technological perceptions constitute the principal mechanisms linking socioeconomic characteristics with mobile banking adoption.

##### **Age**

Age differences among agri-entrepreneurs influenced not only the likelihood of mobile banking adoption but also the way users evaluated its relevance to agricultural business operations. The significant mediation through perceived usefulness suggests that age-related variations were more strongly associated with perceptions of the business value of mobile banking than with perceptions of its ease of operation. For instance, differences across age groups may reflect variations in experience with digital financial services, familiarity with mobile-based transactions, and the extent to which entrepreneurs integrate mobile banking into activities such as receiving payments from produce buyers, paying agricultural input suppliers, transferring funds to workers, and managing transactions across geographically dispersed markets. The stronger indirect effect through perceived usefulness indicates that age contributes more to shaping perceptions of how mobile banking supports enterprise activities than merely reducing

the effort required to use the technology. This finding supports previous studies identifying age as a consistent determinant of technology adoption (Oliveira & Martins, 2010; Venkatesh et al., 2003; Baptista & Oliveira, 2015; Demirgüç-Kunt et al., 2022; Pucer et al., 2025). However, this study extends existing evidence by demonstrating that age influences mobile banking adoption among agricultural entrepreneurs through both a direct pathway and indirect cognitive pathways. Within the context of agri-enterprises, age may capture differences in accumulated business experience, exposure to evolving financial technologies, readiness to incorporate digital solutions into enterprise management, and confidence in using mobile banking for commercial transactions.

## **Gender**

The findings indicate that gender did not independently determine mobile banking adoption among agri-entrepreneurs after accounting for technological perceptions. Instead, its influence operated indirectly through perceived ease of use, suggesting that gender-related differences were associated primarily with how users experienced and evaluated the usability of mobile banking platforms. This implies that variations in confidence, familiarity with digital technologies, and comfort in navigating mobile financial services may explain differences in adoption rather than gender itself.

This finding is particularly relevant within the agricultural context, where male and female agri-entrepreneurs often engage in similar value-chain activities, including farming, produce trading, processing, and input supply. However, they may differ in their exposure to digital financial services, access to appropriate mobile devices, prior experience with mobile applications, or involvement in financial decision-making. For example, a female produce dealer or processor who has limited experience with mobile applications may perceive mobile banking platforms as more difficult to use, reducing adoption even where the service offers clear benefits such as receiving payments from customers, paying suppliers, or managing business transactions. Conversely, reducing usability barriers through user-friendly platforms, digital literacy support, and practical training may minimise gender-related differences in adoption.

The finding aligns with studies reporting mixed evidence regarding gender and digital financial inclusion (Demirgüç-Kunt et al., 2022; Balehegn et al., 2020). However, the present study extends this literature by demonstrating that gender does not function as a direct constraint to

mobile banking adoption among agri-entrepreneurs. Rather, gender influences adoption through technological perceptions, particularly perceived ease of use, highlighting the importance of addressing usability and digital confidence barriers instead of focusing solely on gender characteristics.

### **Marital Status**

Marital status did not directly influence mobile banking adoption but demonstrated a small indirect effect through perceived ease of use ( $ab = 0.027$ ). This suggests that marital status affects adoption by influencing users' familiarity and confidence with mobile banking systems rather than directly affecting their willingness to adopt the technology.

Among agri-entrepreneurs, household responsibilities may shape exposure to financial management activities. For instance, married entrepreneurs involved in farming, produce trading, or processing may frequently coordinate household and enterprise financial obligations, including payments to suppliers, labourers, and customers. Such experiences may increase familiarity with mobile financial transactions and improve perceptions of ease of use. However, because marital status did not influence adoption through perceived usefulness, it appears that household circumstances do not substantially alter the perceived business value of mobile banking. This finding supports earlier studies suggesting that family roles and social contexts can influence technology usage behaviour (Morris et al., 2000; Brown & Venkatesh, 2012; Yang & Forney, 2013), while demonstrating that these effects occur mainly through usability perceptions.

### **Education Level**

Education level did not demonstrate significant direct or indirect effects on mobile banking adoption. This indicates that differences in formal education among agri-entrepreneurs did not significantly influence adoption either directly or through perceptions of usefulness and ease of use. Although previous studies associate education with digital literacy and technology adoption (Abu-Shanab, 2011; Hargittai, 2010; Riddell & Song, 2017), the findings suggest that formal education may be less important in an environment where mobile financial services have become widespread and simplified. For agri-entrepreneurs, practical engagement with mobile technologies may matter more than academic qualifications. For example, a produce dealer with

limited formal education but regular experience receiving payments through mobile money may demonstrate higher adoption than a more educated entrepreneur who rarely uses digital financial services. Therefore, in northern Uganda's agricultural sector, exposure, experience, and operational need appear to substitute for formal education in facilitating mobile banking adoption.

### **Income Level**

Income level exerted a significant indirect negative effect on mobile banking adoption through perceived ease of use ( $ab = -0.026$ , 95% Bootstrap CI =  $-0.0451$  to  $-0.0100$ ). Because the confidence interval excludes zero, the indirect effect is statistically significant, indicating that income influenced mobile banking adoption through users' perceptions of the ease with which the technology could be used. Specifically, the negative indirect effect suggests that changes in income level were associated with lower adoption through perceived ease of use, subject to the direction in which the income variable was coded.

Among agri-entrepreneurs, income shapes access to smartphones, internet connectivity, and other digital resources that facilitate interaction with mobile banking platforms. However, financial capacity alone is insufficient to promote adoption. Rather, the influence of income operates through technological perceptions, particularly whether users consider mobile banking easy to learn and integrate into their business operations. For example, processors or produce dealers with greater financial resources may own more sophisticated mobile devices, yet sustained adoption depends on perceiving the technology as convenient, user-friendly, and compatible with routine business transactions.

This finding partially supports previous studies that identify financial capacity as an important determinant of digital technology adoption (Oke et al., 2014; Aker & Mbiti, 2010; Shaikh & Karjaluoto, 2015). However, the present study extends this evidence by demonstrating that the effect of income on mobile banking adoption is transmitted through perceived ease of use rather than operating directly, underscoring the central role of technological perceptions in translating socioeconomic resources into actual adoption behaviour.

## **Device Category**

Device category was among the strongest socioeconomic predictors of mobile banking adoption through mediation. Although its direct effect was insignificant, it demonstrated substantial indirect effects through perceived ease of use ( $ab = 0.154$ ) and perceived usefulness ( $ab = 0.277$ ). This finding is particularly relevant for agri-entrepreneurs because the type of device available determines the extent to which they can utilise mobile banking features. Entrepreneurs using smartphones may access application-based banking services, transaction records, digital receipts, and integrated financial tools, whereas users relying on basic phones may primarily use simple USSD-based services. For example, a processor managing payments from multiple suppliers may find smartphone-based banking applications more useful because they allow easier tracking of transactions and account information. The stronger pathway through perceived usefulness indicates that advanced devices contribute mainly by expanding the business value entrepreneurs obtain from mobile banking rather than only making the technology easier to operate.

## **Device Ownership**

Device ownership demonstrated the largest mediated effects among all socioeconomic factors, with significant indirect effects through perceived ease of use ( $ab = 0.230$ ) and perceived usefulness ( $ab = 0.417$ ). These results indicate that owning an appropriate mobile device substantially increases adoption by improving users' technological perceptions. For agri-entrepreneurs, ownership provides continuous access to mobile financial services and opportunities to integrate mobile banking into enterprise activities. A commercial farmer who owns a smartphone, for example, can receive payments directly from buyers, transfer funds to input suppliers, monitor transactions, and participate in digital agricultural marketplaces. Similarly, a produce dealer can use mobile banking to make quick payments during produce collection seasons without relying entirely on cash transactions. The stronger effect through perceived usefulness demonstrates that ownership matters because it enables entrepreneurs to recognise the practical advantages of mobile banking for enterprise management. This finding extends previous research on digital financial inclusion (Aker et al., 2016; Boateng et al., 2016; Jack & Suri, 2014; Mbiti & Weil, 2011) by showing that access alone is insufficient; ownership must translate into meaningful technological engagement.

## **Enterprise Category**

Enterprise category did not demonstrate significant direct or indirect effects on mobile banking adoption. This indicates that commercial farmers, processors, produce dealers, and input dealers showed similar adoption patterns after accounting for technological perceptions. Although different agricultural enterprises involve different operational activities, mobile banking appears to provide similar value across categories. For example, farmers may use mobile banking to receive payments from produce buyers, processors may use it to pay suppliers, produce dealers may use it for trader transactions, and input dealers may use it to receive payments from farmers. Therefore, the transactional benefits of mobile banking may cut across enterprise categories, reducing differences in adoption behaviour. This finding suggests that adoption is driven more by users' perceptions of technological value and usability than by the specific type of agricultural enterprise operated.

Overall, socioeconomic factors influenced mobile banking adoption among agri-entrepreneurs through different pathways and with varying magnitudes. Age was the only factor with both direct and indirect effects, while device ownership and device category produced the largest mediated effects, particularly through perceived usefulness. These findings indicate that access to appropriate digital devices and the ability to recognise their business value are more influential than demographic characteristics alone. The results provide strong support for TAM by demonstrating that socioeconomic characteristics primarily affect adoption through perceived usefulness and perceived ease of use. More importantly, they strengthen the integrated evaluation model developed in this study by showing that technological perceptions are the mechanisms through which socioeconomic conditions translate into mobile banking adoption among agri-entrepreneurs. From a practical perspective, improving mobile banking adoption in northern Uganda requires interventions that enhance access to suitable devices, improve digital confidence, and demonstrate the relevance of mobile banking to agricultural business activities. For example, training programmes should not only explain how to conduct mobile transactions but also demonstrate how mobile banking can support payment collection, supplier payments, record keeping, and financial management within agricultural value chains. Such approaches are likely to generate greater adoption effects than interventions focused solely on demographic characteristics.

## **Direct and Indirect Effects of Institutional Factors through Technological Perceptions**

The findings demonstrate that institutional factors significantly influence mobile banking adoption among agri-entrepreneurs in northern Uganda through both direct and indirect pathways. Specifically, institutional factors influenced adoption by shaping users' technological perceptions, particularly perceived ease of use (PEOU) and perceived usefulness (PU). These findings are consistent with the literature reviewed, where institutional factors, including knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability, are identified as important determinants of digital financial technology adoption. The findings further support the extended Technology Acceptance Model (TAM), which proposes that external factors influence adoption behaviour by shaping users' cognitive evaluations of technology (Davis, 1989). Therefore, the results suggest that mobile banking adoption among agri-entrepreneurs is not determined solely by technological characteristics but is embedded within an institutional environment that facilitates knowledge acquisition, builds confidence, reduces uncertainty, and enhances perceived value.

## **Knowledge dissemination**

The findings indicate that knowledge dissemination significantly influenced mobile banking adoption both directly and indirectly through technological perceptions. This finding supports the literature where knowledge dissemination is recognised as a critical factor in technology diffusion and financial inclusion (Rogers, 2003; Oliveira et al., 2014; Aker & Mbiti, 2010; Bvuma & Marnewick, 2020; Bhatt & Bhatt, 2016; Gillwald et al., 2019). Rogers' (2003) diffusion of innovation theory emphasises that information availability reduces uncertainty regarding innovations and increases users' willingness to adopt new technologies. The significant mediated effects through PEOU and PU suggest that knowledge dissemination operates by improving users' understanding of mobile banking processes and benefits. When agri-entrepreneurs receive information regarding transaction procedures, security measures, and potential applications for agricultural activities, they are more likely to perceive mobile banking as easy to use and useful. This finding extends previous studies by demonstrating that knowledge dissemination does not only facilitate awareness of service availability but also shapes the cognitive evaluations that precede adoption. In the context of northern Uganda, where agricultural entrepreneurs may have varying levels of exposure to formal financial technologies,

institutional information-sharing mechanisms appear essential for transforming mobile banking from an unfamiliar innovation into a practical business tool.

### **Coordination**

Coordination significantly influenced mobile banking adoption through technological perceptions. This finding is consistent with studies which highlight the importance of institutional collaboration in expanding digital financial services (Omwansa & Waema, 2014; Wanyoike et al., 2012; Mbiti & Weil, 2011; Donovan, 2012; Suri & Jack, 2016; Nwani et al., 2022). Previous research suggests that effective coordination among financial institutions, mobile network operators, government agencies, and development organisations improves service accessibility, reliability, and user support. The indirect effects through PEOU and PU indicate that coordination enhances adoption by creating an enabling environment in which users experience fewer technological barriers and perceive greater value from mobile banking. For example, coordinated efforts between agricultural organisations, financial service providers, and mobile operators may improve access to demonstrations, customer support, and tailored financial products for agri-entrepreneurs. Thus, the findings extend existing literature by showing that coordination is not only an institutional arrangement for service delivery but also a mechanism that influences users' perceptions of technological usability and usefulness.

### **Awareness**

Awareness creation was found to significantly influence mobile banking adoption, supporting previous studies that identify awareness as a critical driver of digital financial technology uptake (Shaikh & Karjaluoto, 2014; Mbiti & Weil, 2011; Alkhalidi, 2017; Thar et al., 2020; Jaganathan et al., 2018; Elhajjar & Quaida, 2019). These studies emphasise that lack of awareness regarding available services, benefits, and usage procedures remains a major barrier to digital financial inclusion. The mediated relationship through technological perceptions indicates that awareness influences adoption by improving users' understanding of the functional benefits and operational requirements of mobile banking. Awareness initiatives may increase perceived usefulness by demonstrating how mobile banking can facilitate faster payments, improve transaction records, and reduce the costs associated with handling cash. Similarly, awareness improves perceived ease of use by providing users with knowledge about how to perform transactions and resolve common challenges. Therefore, the findings suggest that awareness creation should not be

limited to promoting service availability but should focus on practical demonstrations relevant to agricultural enterprises.

### **Training**

Training demonstrated significant indirect effects on mobile banking adoption through technological perceptions. This finding agrees with the studies which identify training as an important institutional factor for improving digital financial capability and technology acceptance (Aker et al., 2016; Chitungo & Munongo, 2013; Liébana-Cabanillas et al., 2020; Suri & Jack, 2016; Bhattacharya & Lymperopoulos, 2018). Training enhances users' skills, reduces uncertainty, and increases confidence in interacting with digital platforms. The influence of training through PEOU indicates that training reduces perceived complexity associated with mobile banking usage. Furthermore, the pathway through PU suggests that training enables users to recognise the relevance of mobile banking for agricultural enterprises. This finding reinforces TAM by confirming that external support mechanisms influence adoption through changes in cognitive perceptions. In rural agricultural settings, where digital literacy limitations may restrict effective use of mobile financial services, continuous user training represents a critical institutional intervention.

### **User protection**

The findings demonstrate that user protection significantly influenced mobile banking adoption through technological perceptions. This finding is consistent with the literature which identifies security, privacy, and trust mechanisms as essential determinants of digital financial service adoption (Bongomin et al., 2018; Moghavvemi et al., 2012; Gefen et al., 2003; Boateng et al., 2016; Fadila et al., 2022). The indirect effects through PEOU and PU suggest that institutional protection mechanisms reduce perceived risks associated with mobile banking. When users believe that service providers have effective measures for preventing fraud, protecting personal information, and resolving transaction disputes, they are more likely to perceive mobile banking as reliable and beneficial. These findings are particularly important in agricultural contexts where financial losses can significantly affect enterprise sustainability. Therefore, user protection should be considered not only as a regulatory requirement but also as a strategic mechanism for strengthening technology acceptance.

## **Sustainability**

Sustainability significantly influenced mobile banking adoption through technological perceptions. This finding corresponds with the studies which emphasise the importance of service continuity, reliability, and long-term institutional commitment in sustaining digital financial adoption (Chen et al., 2016; Marus et al., 2021; Liébana-Cabanillas et al., 2020; Munyegera & Matsumoto, 2016; Mbogo, 2020; Vartanova & Gladkova, 2019; Deka, 2018; Hu et al., 2019). The mediated effects indicate that sustainability enhances adoption by strengthening users' perceptions that mobile banking is dependable and valuable over time. Reliable networks, consistent service availability, and continued institutional support increase users' confidence in integrating mobile banking into routine agricultural transactions. This finding extends previous studies by demonstrating that sustainability influences not only continued usage but also initial adoption decisions through improved technological perceptions.

Overall, the findings confirm the importance of institutional factors while providing additional insight into the mechanisms through which these factors influence mobile banking adoption. Previous studies largely examined institutional factors as direct determinants of adoption; however, this study demonstrates that their influence is primarily transmitted through technological perceptions. Knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability contribute to adoption by enhancing users' perceptions of usefulness and ease of use.

These findings provide empirical support for the integrated evaluation model developed in this study by demonstrating that institutional conditions form the foundation upon which technological acceptance is constructed. In particular, the results extend TAM by showing that perceived usefulness and perceived ease of use are not formed independently of users' institutional environment but are shaped by information availability, institutional support, security assurance, and service reliability.

Consequently, improving mobile banking adoption among agri-entrepreneurs in northern Uganda requires interventions that strengthen the broader institutional ecosystem rather than focusing only on technological availability. Expanding awareness programmes, strengthening stakeholder coordination, providing user-centred training, improving consumer protection mechanisms, and ensuring sustainable service delivery are essential strategies for enhancing favourable

technological perceptions and increasing meaningful mobile banking adoption. These findings contribute to the mobile banking adoption literature by demonstrating the central mediating role of technological perceptions in linking institutional support mechanisms with adoption behaviour among agricultural entrepreneurs in a developing country context.

#### **4.11 Conclusion**

The findings demonstrate that mobile banking adoption among agri-entrepreneurs in northern Uganda is influenced by both socioeconomic and institutional factors through direct and mediated pathways involving perceived ease of use (PEOU) and perceived usefulness (PU). Socioeconomic factors exhibited varied effects, with age showing both direct and indirect influence, while most factors, particularly device ownership and device category, affected adoption mainly through technological perceptions. In contrast, education level and enterprise category showed limited influence after accounting for technological perceptions.

Institutional factors, including knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability, significantly influenced adoption by shaping users' perceptions of the usefulness and ease of using mobile banking services. These findings highlight the importance of institutional support in reducing uncertainty, improving digital confidence, and enhancing user acceptance.

Overall, the results validate the extended Technology Acceptance Model by confirming that external factors influence mobile banking adoption primarily through cognitive perceptions of technology. The findings suggest that promoting mobile banking adoption among agri-entrepreneurs requires not only access to digital financial services but also interventions that enhance digital knowledge, usability, trust, service reliability, and institutional support systems.

## **CHAPTER FIVE: Mediating Role of Behavioural Factors in the Relationship between Institutional and Technological Factors and Mobile Banking Adoption**

### **5.1 Chapter Overview**

This chapter examines the mediating role of behavioural factors (attitude, trust, and innovativeness) in the relationship between institutional and technological factors and mobile banking adoption among agri-entrepreneurs in northern Uganda. It presents the assessment of data validity, statistical assumptions, multicollinearity, and the behavioural sub-model specification before analysing mediation effects using bootstrap confidence intervals. The findings are interpreted within the Technology Acceptance Model (TAM) framework to demonstrate how behavioural mechanisms translate institutional support and technological perceptions, particularly perceived usefulness and perceived ease of use, into adoption behaviour. The chapter concludes by highlighting the contribution of behavioural factors to explaining mobile banking adoption and informing the integrated evaluation model developed in the subsequent chapter.

### **5.2 Assessment of Validity and Statistical Assumptions**

Validity assessment is essential for confirming that the measurement items accurately capture the intended constructs and provide a reliable basis for subsequent statistical analysis. Since the validity and reliability assessments for institutional factors, technological perceptions, and mobile banking adoption were presented in the preceding chapter, this section focuses specifically on the behavioural constructs examined in this chapter, namely attitude, trust, and innovativeness. The validity of the behavioural constructs was assessed using Principal Component Analysis (PCA) with Varimax rotation. PCA was employed to evaluate the underlying factor structure of the measurement items and to confirm whether the observed items appropriately loaded onto their respective behavioural dimensions. The Varimax rotation method was applied to improve factor interpretability by achieving a clearer distinction among the extracted components.

**Table 5. 1: Validity Coefficients of Construct Items**

| <b>Factors</b>               | <b>Loadings</b> | <b>Average Variance Extracted (AVE)</b> |
|------------------------------|-----------------|-----------------------------------------|
| <b>Behavioural Factors</b>   |                 |                                         |
| Factor 9<br>(Innovativeness) |                 | 0.44                                    |
| Inno_1                       | 0.742           |                                         |
| Inno_3                       | 0.632           |                                         |
| Inno_4                       | 0.696           |                                         |
| Inno_5                       | 0.610           |                                         |
| Inno_7                       | 0.689           |                                         |
| Inno_8                       | 0.583           |                                         |
| Factor 10 (Trust)            |                 | 0.55                                    |
| Trust_1                      | 0.672           |                                         |
| Trust_2                      | 0.738           |                                         |
| Trust_3                      | 0.770           |                                         |
| Trust_5                      | 0.770           |                                         |
| Factor 11 (Attitude)         |                 | 0.50                                    |
| Att_2                        | 0.479           |                                         |
| Att_4                        | 0.732           |                                         |
| Att_5                        | 0.768           |                                         |

Table 5.1 presents the validity assessment of the behavioural constructs included in the mediation model, namely innovativeness, trust, and attitude. Since the validity assessments for institutional factors, technological perceptions, and mobile banking adoption were presented in the preceding chapter, this analysis focuses specifically on the behavioural constructs introduced in the current chapter. Construct validity was assessed using factor loadings and Average Variance Extracted (AVE) obtained from Principal Component Analysis (PCA) with Varimax rotation.

The results indicate that the measurement items adequately represented the respective behavioural constructs. For innovativeness, all six items recorded acceptable factor loadings ranging from 0.583 to 0.742, indicating that each item contributed meaningfully to measuring the construct. The construct recorded an AVE value of 0.44, implying that approximately 44% of the variance in the observed items was explained by the underlying innovativeness construct.

Although the AVE value was slightly below the commonly recommended threshold of 0.50, the factor loadings exceeded the acceptable minimum level of 0.50, demonstrating adequate item representation and supporting the retention of the construct for subsequent mediation analysis. For trust, the results demonstrate stronger evidence of convergent validity. The factor loadings ranged from 0.672 to 0.770, indicating strong associations between the observed items and the underlying trust construct. The construct achieved an AVE value of 0.55, meaning that more than half of the variance in the measurement items was explained by trust. This confirms that the selected items provided a reliable representation of respondents' confidence in the reliability, security, and dependability of mobile banking services. Similarly, attitude demonstrated acceptable construct validity, with factor loadings ranging from 0.479 to 0.768 and an AVE value of 0.50. Although one item (Att\_2) recorded a relatively lower loading of 0.479, the remaining items demonstrated strong loadings above the recommended threshold. The AVE value of 0.50 indicates that the construct explained approximately half of the variance in its measurement items, providing sufficient evidence of convergent validity.

Overall, the validity assessment confirms that the behavioural constructs of attitude, trust, and innovativeness were adequately measured and suitable for inclusion as mediating variables in the analysis of mobile banking adoption. The results provide empirical support that these constructs appropriately capture the behavioural mechanisms through which institutional factors and technological perceptions influence mobile banking adoption among agri-entrepreneurs in northern Uganda.

### **5.3 Assessment of Multicollinearity among Behavioural Variables**

Multicollinearity assessment was conducted to determine whether the behavioural variables included in the mediation model exhibited high correlations that could affect the stability and accuracy of the estimated regression coefficients. High levels of multicollinearity can inflate standard errors, reduce the precision of parameter estimates, and make it difficult to distinguish the individual contribution of each predictor variable. Therefore, Variance Inflation Factor (VIF) and Tolerance ( $1/VIF$ ) values were computed for the behavioural variables, namely attitude, trust, and innovativeness, as presented in Table 5.2. The assessment was undertaken to confirm that the behavioural constructs were sufficiently distinct and suitable for inclusion as mediating variables in the analysis of the relationships between institutional factors, technological

perceptions, and mobile banking adoption. Acceptable VIF and tolerance values indicate the absence of problematic multicollinearity, thereby ensuring that each behavioural variable provides unique explanatory information within the mediation model.

**Table 5. 2: Variance Inflation Factor and Tolerance**

| Constructs                                         | Collinearity statistics |            |
|----------------------------------------------------|-------------------------|------------|
|                                                    | <i>1/VIF</i>            | <i>VIF</i> |
| Attitude                                           | 0.463                   | 2.161      |
| Trust                                              | 0.346                   | 2.890      |
| Innovativeness                                     | 0.568                   | 1.761      |
| <b>Dependent variable:</b> Mobile Banking Adoption |                         |            |

Table 5.2 presents the multicollinearity assessment among the behavioural variables included in the mediation model, namely attitude, trust, and innovativeness, with mobile banking adoption as the dependent variable. Multicollinearity was assessed using the Variance Inflation Factor (VIF) and Tolerance ( $1/VIF$ ) values to determine whether the behavioural constructs exhibited excessive correlation that could affect the reliability of regression estimates. The results indicate that all behavioural variables recorded VIF values below the commonly accepted threshold of 10 and tolerance values above the minimum acceptable level of 0.10, suggesting the absence of problematic multicollinearity among the constructs. Specifically, attitude recorded a VIF value of 2.161 with a tolerance value of 0.463, trust recorded a VIF value of 2.890 with a tolerance value of 0.346, while innovativeness recorded the lowest VIF value of 1.761 with a tolerance value of 0.568. These findings demonstrate that although the behavioural variables are conceptually related, they capture distinct dimensions of user behaviour and do not exhibit excessive overlap. Therefore, attitude, trust, and innovativeness were considered statistically suitable for inclusion as mediating variables in the subsequent mediation analysis examining the pathways through which institutional factors and technological perceptions influence mobile banking adoption among agri-entrepreneurs in northern Uganda.

#### 5.4 Sub-Model Specification of Mediating Role of Behavioural Factors in the Relationship between Institutional and Technological factors and Mobile Banking Adoption

The behavioural sub-model was specified to examine the mediating role of attitude, trust, and innovativeness in the relationship between institutional and technological factors and mobile banking adoption. The sub-model is anchored on the Technology Acceptance Model (TAM), which posits that users' acceptance of technology is influenced by their perceptions of its usefulness and ease of use. In this study, TAM is extended by incorporating behavioural factors as mediating mechanisms through which institutional support and technological perceptions influence adoption behaviour. As illustrated in Figure 6.1, institutional factors (knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability) and technological factors (perceived usefulness and perceived ease of use) influence mobile banking adoption through the behavioural constructs of attitude, trust, and innovativeness. The behavioural sub-model statistically represents these relationships by estimating both the direct effects of institutional and technological factors on mobile banking adoption and the indirect effects transmitted through the behavioural mediators.

The mediation relationships were estimated using the following regression equations:

##### Equation 4. 2: Behavioural Mediation Model

$$M = aX + \varepsilon_M \dots\dots\dots(i)$$

$$Y = c'X + bM + \varepsilon_Y \dots\dots\dots(ii)$$

Where:

X = institutional or technological factor

M = behavioural mediator

Y = mobile banking adoption

a = effect of X on the mediator

b = effect of the mediator on Y, controlling for X

c' = direct effect of X on Y, controlling for M

ab = indirect/mediated effect

$\varepsilon_M, \varepsilon_Y$  = error terms

**Equation (i)** tests whether the institutional/technological factor significantly influences the behavioural mediator.

**Equation (ii)** tests whether the mediator significantly influences adoption X.

The significance of the mediation effects was determined using bootstrap confidence intervals. This modelling approach enabled the study to establish whether attitude, trust, and innovativeness significantly transmit the effects of institutional support and technological perceptions to mobile banking adoption, as conceptualised in Figure 5.1.

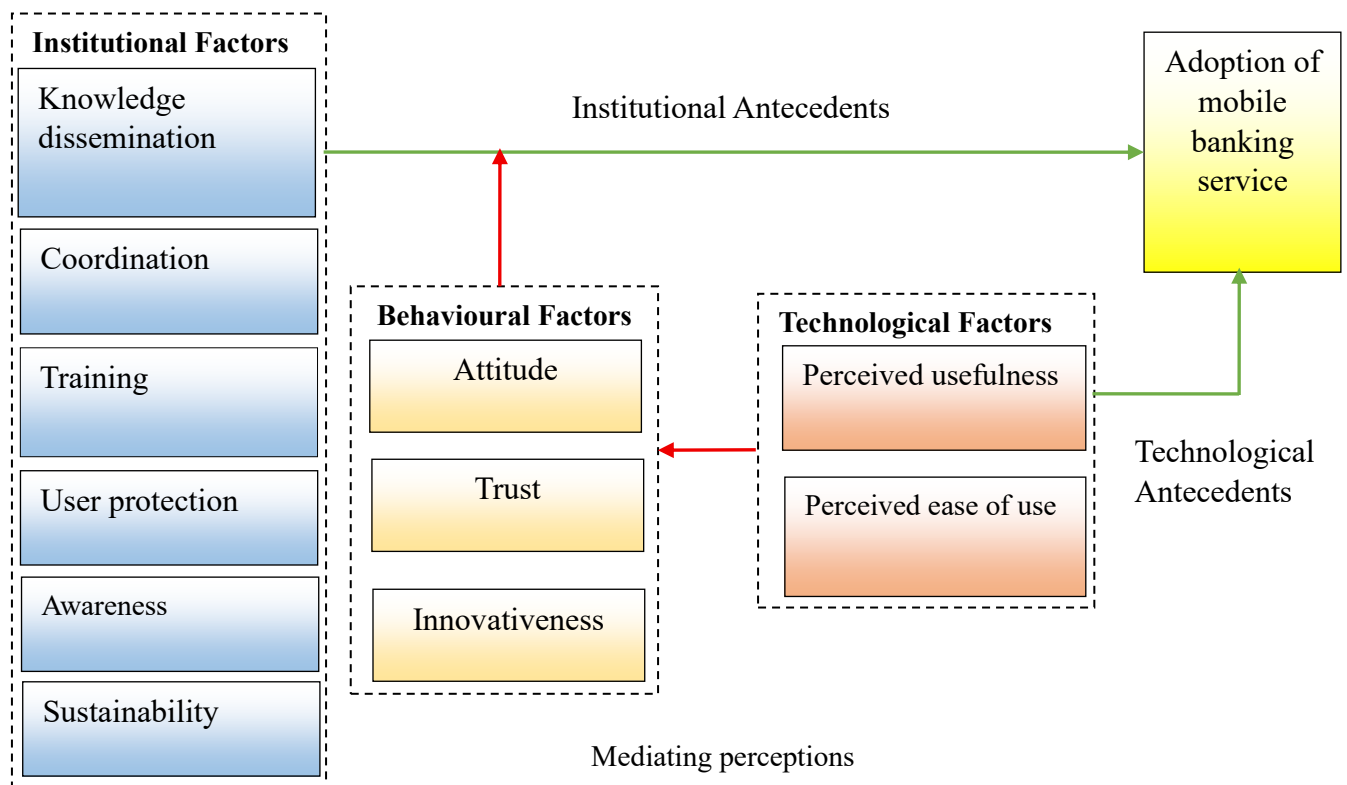


**Figure 5. 1: Relating Institutional, Behavioural, and Technological Factors to Mobile Banking Adoption**

### 5.5 Mediating Role of Behavioural Factors in the Relationship between Institutional and Technological Factors and Mobile Banking Adoption

Table 5.3 presents the mediation analysis examining the extent to which attitude, trust, and innovativeness mediate the relationships between institutional and technological factors and

mobile banking adoption among agri-entrepreneurs in northern Uganda. The mediation effects were assessed using the indirect effect (ab), bootstrap CI, and significance values.

**Table 5. 3: Mediating Role of Behavioral Factors in the Relationship between Institutional and Technological Factors and Mobile Banking Adoption**

| <b>Institutional Factors (X)</b> | <b>Mediator (M)</b> | <b>Path a (X-M)</b> | <b>Path b (M-Y)</b> | <b>Direct Effect (c')</b> | <b>Indirect Effect (ab)</b> | <b>Total Effect (c)</b> | <b>Bootstrap 95% CI</b> | <b>Sig</b>    |
|----------------------------------|---------------------|---------------------|---------------------|---------------------------|-----------------------------|-------------------------|-------------------------|---------------|
| Knowledge dissemination          | Attitude            | 0.6266              | 0.0817              | 0.0987                    | 0.0512                      | 0.1499                  | (0.0113, 0.1260)        | 0.0110        |
|                                  | Trust               | 0.5648              | 0.4155              | 0.0987                    | 0.2347                      | 0.3334                  | (0.1539, 0.3138)        | 0.0000        |
|                                  | Innovativeness      | 0.5316              | 0.2669              | 0.0987                    | 0.1419                      | 0.2406                  | (0.0890, 0.2005)        | 0.0000        |
| Coordination                     | Attitude            | 0.5498              | 0.0935              | 0.0328                    | 0.0514                      | 0.0842                  | (0.0144, 0.1019)        | 0.0037        |
|                                  | Trust               | 0.4355              | 0.4442              | 0.0328                    | 0.1934                      | 0.2262                  | (0.1100, 0.2938)        | 0.0000        |
|                                  | Innovativeness      | 0.4120              | 0.2933              | 0.0328                    | 0.1208                      | 0.1536                  | (0.0717, 0.1793)        | 0.0000        |
| Training                         | Attitude            | 0.2730              | 0.0996              | -0.0302                   | 0.0272                      | -0.0030                 | (0.0091, 0.0530)        | 0.0018        |
|                                  | Trust               | 0.2491              | 0.4524              | -0.0302                   | 0.1127                      | 0.0825                  | (0.0626, 0.1695)        | 0.0000        |
|                                  | Innovativeness      | 0.2437              | 0.3023              | -0.0302                   | 0.0737                      | 0.0435                  | (0.0418, 0.1134)        | 0.0000        |
| Awareness                        | Attitude            | 0.8329              | 0.0739              | 0.1780                    | 0.0616                      | 0.2396                  | (0.0031, 0.1617)        | 0.0208        |
|                                  | Trust               | 0.7968              | 0.3803              | 0.1780                    | 0.3030                      | 0.4810                  | (0.1918, 0.4072)        | 0.0000        |
|                                  | Innovativeness      | 0.5892              | 0.2776              | 0.1780                    | 0.1635                      | 0.3415                  | (0.1011, 0.2316)        | 0.0000        |
| User protection                  | Attitude            | 0.8170              | 0.0753              | 0.1271                    | 0.0615                      | 0.1886                  | (0.0046, 0.1540)        | 0.0207        |
|                                  | Trust               | 0.6949              | 0.4168              | 0.1271                    | 0.2896                      | 0.4167                  | (0.1934, 0.3835)        | 0.0000        |
|                                  | Innovativeness      | 0.6527              | 0.2666              | 0.1271                    | 0.1740                      | 0.3011                  | (0.1092, 0.2467)        | 0.0000        |
| Sustainability                   | Attitude            | 0.6995              | 0.0858              | 0.0767                    | 0.0600                      | 0.1367                  | (0.0108, 0.1460)        | 0.0079        |
|                                  | Trust               | 0.6151              | 0.4276              | 0.0767                    | 0.2630                      | 0.3397                  | (0.1518, 0.3951)        | 0.0000        |
|                                  | Innovativeness      | 0.5778              | 0.2780              | 0.0767                    | 0.1606                      | 0.2337                  | (0.0955, 0.2422)        | 0.0000        |
| PEOU                             | Attitude            | 0.4236              | 0.0928              | 0.1119                    | 0.0393                      | 0.1512                  | (0.0114, 0.0946)        | <b>0.0032</b> |
|                                  | Trust               | 0.4236              | 0.4126              | 0.1119                    | 0.1771                      | 0.2890                  | (0.1095, 0.2462)        | <b>0.0000</b> |
|                                  | Innovativeness      | 0.4416              | 0.2561              | 0.1119                    | 0.1131                      | 0.2250                  | (0.0697, 0.1613)        | <b>0.0000</b> |
| PU                               | Attitude            | 0.7920              | 0.0332              | 0.2738                    | 0.0263                      | 0.3001                  | (-0.0338, 0.1058)       | 0.2991        |
|                                  | Trust               | 0.6975              | 0.3348              | 0.2738                    | 0.2336                      | 0.5074                  | (0.1488, 0.3095)        | <b>0.0000</b> |
|                                  | Innovativeness      | 0.5555              | 0.2471              | 0.2738                    | 0.1373                      | 0.4111                  | (0.0879, 0.1916)        | <b>0.0000</b> |

**M:** Dependent variable (Mobile banking adoption)

### **Attitude as a Mediator**

The results indicate that attitude significantly mediated the relationships between most institutional factors and mobile banking adoption. Knowledge dissemination (indirect effect = 0.0512,  $p = 0.0110$ ), coordination (0.0514,  $p = 0.0037$ ), training (0.0272,  $p = 0.0018$ ), awareness

(0.0616,  $p = 0.0208$ ), user protection (0.0615,  $p = 0.0207$ ), and sustainability (0.0600,  $p = 0.0079$ ) all demonstrated significant indirect effects through attitude, as evidenced by bootstrap confidence intervals that excluded zero. These findings indicate that institutional interventions contribute to mobile banking adoption by fostering more favourable user attitudes toward mobile banking services. Similarly, perceived ease of use (PEOU) significantly influenced mobile banking adoption through attitude (indirect effect = 0.0393,  $p = 0.0032$ ), indicating that users who perceive mobile banking as easy to use are more likely to develop positive attitudes, which subsequently enhance adoption. However, perceived usefulness (PU) did not significantly influence adoption through attitude (indirect effect = 0.0263, 95% CI = -0.0338 to 0.1058,  $p = 0.2991$ ), since the bootstrap confidence interval included zero. This suggests that although perceived usefulness directly influenced mobile banking adoption, its effect was not transmitted through users' attitudes. Overall, attitude served as a significant but relatively weaker mediator compared with trust and innovativeness.

### **Trust as a Mediator**

The findings demonstrate that trust was the strongest behavioural mediator across all institutional and technological factors. All institutional factors exhibited statistically significant indirect effects through trust. Knowledge dissemination produced an indirect effect of 0.2347 ( $p < 0.001$ ), coordination 0.1934 ( $p < 0.001$ ), training 0.1127 ( $p < 0.001$ ), awareness 0.3030 ( $p < 0.001$ ), user protection 0.2896 ( $p < 0.001$ ), and sustainability 0.2630 ( $p < 0.001$ ). In each case, the bootstrap confidence intervals excluded zero, confirming significant mediation. Among the technological factors, PEOU significantly influenced mobile banking adoption through trust (indirect effect = 0.1771,  $p < 0.001$ ), while PU also demonstrated a significant indirect effect through trust (0.2336,  $p < 0.001$ ). These results indicate that both institutional support and favourable technological perceptions strengthen users' trust in mobile banking, which subsequently increases adoption. Trust consistently produced the largest indirect effects among the three behavioural mediators, indicating that it represents the principal behavioural mechanism through which institutional and technological factors influence mobile banking adoption among agri-entrepreneurs.

### **Innovativeness as a Mediator**

The results further indicate that innovativeness significantly mediated the relationships between all institutional factors and mobile banking adoption. Significant indirect effects were observed for knowledge dissemination (0.1419,  $p < 0.001$ ), coordination (0.1208,  $p < 0.001$ ), training (0.0737,  $p < 0.001$ ), awareness (0.1635,  $p < 0.001$ ), user protection (0.1740,  $p < 0.001$ ), and sustainability (0.1606,  $p < 0.001$ ). The bootstrap confidence intervals for all relationships excluded zero, confirming statistically significant mediation. Likewise, both technological factors significantly influenced mobile banking adoption through innovativeness. PEOU demonstrated an indirect effect of 0.1131 ( $p < 0.001$ ), while PU exhibited an indirect effect of 0.1373 ( $p < 0.001$ ). These findings suggest that users who perceive mobile banking as useful and easy to use are more likely to develop innovative tendencies toward adopting new financial technologies, thereby increasing their likelihood of adopting mobile banking. Although innovativeness consistently mediated all institutional and technological relationships, its mediation effects were generally smaller than those of trust but larger than those of attitude. This indicates that innovativeness represents an important behavioural pathway linking institutional support and technological perceptions with mobile banking adoption.

Overall, the findings provide strong evidence that behavioural factors significantly mediate the effects of institutional and technological factors on mobile banking adoption. Among the three behavioural constructs, trust emerged as the strongest mediator, followed by innovativeness, while attitude exhibited comparatively weaker mediation effects. The only non-significant mediation relationship was between perceived usefulness and mobile banking adoption through attitude, suggesting that users' perceptions of the usefulness of mobile banking translate into adoption primarily by strengthening trust and innovativeness rather than by altering their attitudes. These findings confirm that behavioural factors play a critical role in transmitting the effects of institutional support and technological perceptions to actual mobile banking adoption among agri-entrepreneurs in northern Uganda.

### **5.5 Discussion of Findings**

The findings demonstrate that behavioural factors constitute important mechanisms through which institutional and technological factors influence mobile banking adoption among agri-entrepreneurs in northern Uganda. Consistent with the integrated evaluation model developed in

this study, attitude, trust, and innovativeness mediated the relationships between institutional support mechanisms, technological perceptions, and mobile banking adoption. These behavioural constructs have been widely recognised as important determinants of technology adoption within the Technology Acceptance Model (TAM) and related behavioural theories. The present findings extend this body of literature by demonstrating that behavioural factors not only directly influence adoption but also transmit the effects of institutional and technological factors to actual mobile banking adoption.

### **Attitude as a mediator**

The findings indicate that attitude significantly mediated the relationships between almost all institutional factors and mobile banking adoption. Specifically, knowledge dissemination, coordination, training, awareness creation, user protection, and sustainability significantly influenced adoption through attitude. Furthermore, perceived ease of use significantly influenced adoption through attitude, whereas perceived usefulness did not demonstrate a significant indirect effect through this behavioural construct.

These findings are broadly consistent with literature, where attitude is identified as a central determinant of technology adoption (Davis, 1989; Venkatesh et al., 2003; Aboelmaged & Gebba, 2013). TAM proposes that favourable evaluations of technology increase users' willingness to adopt and use information systems. Similarly, the Unified Theory of Acceptance and Use of Technology (UTAUT) suggests that users develop favourable behavioural intentions when they perceive technology as simple and beneficial (Venkatesh et al., 2003).

The significant mediation between institutional factors and adoption suggests that institutional support contributes to mobile banking adoption by creating positive user evaluations of mobile banking services. Knowledge dissemination, awareness campaigns, training, and coordination provide users with information and practical experience that reduce uncertainty and encourage favourable attitudes toward mobile banking. Likewise, user protection and sustainability initiatives increase users' confidence that mobile banking is dependable, thereby strengthening positive evaluations of the technology.

The finding that perceived ease of use significantly influenced adoption through attitude is consistent with TAM, which proposes that technologies perceived as easy to use generate more

favourable attitudes towards adoption (Davis, 1989). However, the non-significant mediation between perceived usefulness and adoption through attitude differs from the traditional TAM proposition that usefulness shapes attitudes before influencing behavioural outcomes. This suggests that among agri-entrepreneurs in northern Uganda, recognising the usefulness of mobile banking alone is insufficient to change users' attitudes. Instead, perceived usefulness appears to influence adoption through other behavioural mechanisms, particularly trust and innovativeness. This finding extends previous studies by suggesting that in agricultural entrepreneurial settings, practical benefits may encourage adoption even when they do not substantially alter users' affective evaluations of the technology.

Overall, although attitude significantly mediated most institutional relationships, its indirect effects were consistently smaller than those of trust and innovativeness, indicating that attitude plays a supportive rather than dominant role in explaining mobile banking adoption.

### **Trust as a mediator**

Among the three behavioural constructs, trust emerged as the strongest mediator of mobile banking adoption. All institutional factors significantly influenced adoption through trust, while both perceived ease of use and perceived usefulness also demonstrated significant indirect effects through trust.

These findings strongly support literature, where trust is identified as a critical determinant of digital financial service adoption (Ha et al., 2023; Jafri et al., 2024; Zhao et al., 2024). Previous studies consistently argue that users' confidence in the security, reliability, and integrity of digital financial systems reduces perceived risk and encourages technology adoption. The present findings provide further empirical evidence that trust represents the principal behavioural mechanism linking institutional support with mobile banking adoption.

Knowledge dissemination, awareness campaigns, and training appear to strengthen trust by improving users' understanding of how mobile banking operates, reducing uncertainty regarding digital transactions, and increasing confidence in service providers. Similarly, user protection mechanisms directly enhance trust by assuring users that their financial resources and personal information are adequately safeguarded. Coordination among financial institutions, mobile network operators, and government agencies further reinforces trust by improving service

reliability and institutional credibility. Sustainability initiatives also contribute to trust by demonstrating long-term institutional commitment to reliable service provision.

The significant mediation of both perceived ease of use and perceived usefulness through trust further extends TAM by demonstrating that technological perceptions alone are insufficient to drive adoption unless they also strengthen users' confidence in the technology. Even when users perceive mobile banking as useful and easy to operate, adoption becomes more likely when these perceptions are accompanied by trust in the system and its service providers.

These findings are particularly important within the context of northern Uganda, where agri-entrepreneurs frequently depend on mobile banking for high-value financial transactions associated with agricultural production and marketing. In such contexts, concerns regarding fraud, transaction errors, and service reliability may substantially influence adoption decisions. Consequently, trust becomes the behavioural mechanism through which institutional and technological factors translate into actual mobile banking usage.

### **Innovativeness as a mediator**

The findings further demonstrate that innovativeness significantly mediated the relationships between all institutional and technological factors and mobile banking adoption. Significant mediation effects were observed for knowledge dissemination, coordination, training, awareness, user protection, sustainability, perceived ease of use, and perceived usefulness.

These findings correspond with the literature, where innovativeness is recognised as an important determinant of technology adoption (Rogers, 2003; Agarwal & Prasad, 1998; Thakur & Srivastava, 2014; Fabregas et al., 2019; Nwankwo & Ajemunigbohun, 2013). Diffusion of Innovation Theory argues that individuals possessing stronger innovative tendencies are more willing to experiment with new technologies, tolerate uncertainty, and adopt innovations earlier than less innovative individuals (Rogers, 2003).

The present findings suggest that institutional interventions foster innovative behaviour by exposing agri-entrepreneurs to new digital financial solutions through awareness programmes, training initiatives, and knowledge dissemination. Institutional coordination and sustainability further encourage innovativeness by creating an enabling environment in which experimentation with mobile banking is perceived as beneficial and relatively risk-free. Likewise, effective user

protection reduces the uncertainty associated with digital financial transactions, thereby encouraging users to adopt innovative financial practices.

The significant mediation of both perceived ease of use and perceived usefulness indicates that users who perceive mobile banking as simple and beneficial become more willing to embrace technological innovations. These findings reinforce previous studies demonstrating that favourable technological experiences stimulate innovative behaviour, which subsequently facilitates technology adoption. Although innovativeness consistently mediated all institutional and technological relationships, its indirect effects were generally smaller than those of trust but larger than those of attitude. This indicates that while innovative tendencies substantially encourage adoption, they are less influential than trust in determining whether agri-entrepreneurs ultimately adopt mobile banking.

Overall, the findings provide strong empirical support for the behavioural dimension of the integrated evaluation model. Consistent with the literature, attitude, trust, and innovativeness each contributed to explaining mobile banking adoption, although their relative influence differed considerably. Trust emerged as the strongest behavioural mediator, followed by innovativeness, while attitude demonstrated comparatively weaker mediation effects. The only exception was the relationship between perceived usefulness and adoption through attitude, which was not statistically significant.

These findings extend previous mobile banking adoption studies in several important ways. First, whereas much of the literature treats behavioural factors primarily as direct predictors of adoption, this study demonstrates that they also function as critical mediating mechanisms linking institutional support and technological perceptions with actual adoption behaviour. Second, the findings indicate that institutional interventions, including knowledge dissemination, coordination, awareness creation, training, user protection, and sustainability do not influence adoption directly alone; rather, they shape users' behavioural responses that subsequently determine adoption decisions. Third, the results show that favourable technological perceptions increase adoption most effectively when they strengthen users' trust and willingness to embrace innovation.

## **5.6 Conclusion**

Collectively, these findings validate the behavioural component of the integrated evaluation model and extend the Technology Acceptance Model by demonstrating that cognitive evaluations of technology are translated into actual adoption through behavioural mechanisms. In the context of agri-entrepreneurs in northern Uganda, interventions aimed at increasing mobile banking adoption should therefore go beyond improving technology functionality and institutional support to deliberately strengthen users' trust, cultivate positive attitudes, and encourage innovative behaviour. Such an integrated approach is more likely to promote sustained and meaningful adoption of mobile banking services within agricultural value chains.

## **CHAPTER SIX: Design and Validation of Evaluation Model for Mobile Banking Adoption**

### **6.1 Introduction**

This chapter presents the design and empirical validation of the integrated evaluation model explaining mobile banking adoption among agri-entrepreneurs in northern Uganda. Building on the empirical findings presented in Chapters Four and Five, the chapter synthesises the significant direct, indirect, and mediating relationships into a unified evaluation model. The specification stage translates the empirically supported relationships into an integrated framework, while the validation stage evaluates the model's explanatory adequacy using the empirical evidence generated from the study. The chapter concludes by presenting the final validated integrated evaluation model and its implications for understanding mobile banking adoption among agri-entrepreneurs.

### **6.2 Evaluation Model Design**

The design or structure of evaluation model was specified based on the empirical relationships established from the analysis of institutional, technological, behavioural, and socioeconomic determinants of mobile banking adoption. The model extends the Technology Acceptance Model by incorporating contextual factors relevant to agri-entrepreneurs, including institutional support mechanisms, behavioural mechanisms, and socioeconomic characteristics. The specification process involved synthesising the significant pathways identified from: direct effects of institutional and socioeconomic factors on mobile banking adoption; indirect effects through perceived ease of use (PEOU) and perceived usefulness (PU); and mediating effects of behavioural factors, namely attitude, trust, and innovativeness. The specified model positions mobile banking adoption as the outcome variable and identifies four interconnected explanatory dimensions: institutional factors (knowledge dissemination, awareness, coordination, training, user protection, sustainability); technological perceptions (perceived ease of use (PEOU), perceived usefulness (PU)); behavioural factors (attitude, trust, innovativeness); socioeconomic factors (age, gender, marital status, education level, income level, device category, device ownership, enterprise category).

### **6.2.2 Institutional Dimension of the Model**

The institutional component comprises knowledge dissemination, awareness, coordination, training, user protection, and sustainability. These empirical findings demonstrated that awareness, knowledge dissemination, user protection, sustainability, and coordination exerted significant direct effects on mobile banking adoption. Training did not directly influence adoption but significantly affected adoption through technological perceptions. Institutional support therefore contributes to adoption through two complementary mechanisms: direct influence on adoption; and indirect influence through perceived usefulness and perceived ease of use. These findings justify retaining all six institutional constructs within the integrated evaluation model.

### **6.2.3 Technological Dimension of the Model**

The technological dimension comprises perceived usefulness and perceived ease of use. The findings demonstrated that perceived ease of use significantly influenced mobile banking adoption through its total effect, indicating that usability remains an important determinant of adoption among agri-entrepreneurs. Perceived usefulness also emerged as an important technological construct by transmitting the effects of several institutional and socioeconomic factors to adoption. Accordingly, both technological constructs were retained as central explanatory mechanisms within the specified model.

### **6.2.4 Behavioural Dimension of the Model**

Behavioural factors specify the mechanisms through which institutional support and technological perceptions influence adoption behaviour. The empirical findings confirmed that trust, innovativeness, and attitude significantly mediated institutional and technological relationships with mobile banking adoption, although their strengths differed. Trust emerged as the strongest behavioural pathway, followed by innovativeness, while attitude demonstrated comparatively weaker mediation. These findings indicate that technological perceptions translate into actual adoption primarily through behavioural responses rather than through technological characteristics alone.

### 6.2.5 Socioeconomic Dimension of the Model

The socioeconomic dimension consists of age, gender, marital status, education level, income level, device category, device ownership, and enterprise category. Among these variables, age was the only socioeconomic factor demonstrating a statistically significant direct effect on mobile banking adoption. Several socioeconomic characteristics, however, exerted significant indirect effects through technological perceptions. Device ownership and device category exhibited the strongest indirect influences through perceived usefulness, while gender, marital status, and income primarily influenced adoption through perceived ease of use. Education level and enterprise category did not demonstrate statistically significant direct or indirect effects. These findings indicate that socioeconomic characteristics contribute to adoption mainly by shaping users' technological perceptions rather than directly determining adoption behaviour. The specified model (Figure 6.1) demonstrates that institutional factors influence mobile banking adoption directly and indirectly through technological perceptions and behavioural mechanisms. Technological perceptions influence adoption by shaping users' behavioural responses, while socioeconomic characteristics influence adoption mainly through their effects on technological perceptions.

The preceding analyses established the direct, indirect, and mediating effects of the institutional, technological, behavioural, and socioeconomic factors on mobile banking adoption among agri-entrepreneurs. Building on these empirical findings, the validated relationships were integrated into a single evaluation model that captures the combined influence of these dimensions on the intensity of mobile banking adoption. The model is specified in a reduced form as:

#### Equation 6. 1: Integrated Evaluation Model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_{12} (X_1.X_2) + \beta_{13} (X_1.X_3) + \beta_{23} (X_2.X_3) + \beta_{24} (X_2.X_4) + \text{error} \dots\dots\dots 6.1$$

Where Y represents the intensity of mobile banking adoption;  $X_1$  denotes institutional factors influencing adoption;  $X_2$  represents technological factors based on the Technology Acceptance Model (TAM) constructs;  $X_3$  comprises behavioural factors; and  $X_4$  represents socioeconomic factors. The intercept  $B_0$ , denotes the expected level of mobile banking adoption when all explanatory variables are held constant. The coefficients  $\beta_1$ ,  $\beta_2$ ,  $\beta_2$ , and  $\beta_4$  measure the direct effects of the respective dimensions on mobile banking adoption, while  $\beta_{12}$ ,  $\beta_{13}$ ,  $\beta_{23}$ , and  $\beta_{24}$

capture the interaction effects among the institutional, technological, behavioural, and socioeconomic factors. The error term, accounts for unexplained variation in mobile banking adoption. Based on the study's theoretical foundation and empirical findings, the coefficients are expected to be positive, indicating that improvements in the institutional environment, technological perceptions, behavioural attributes, and socioeconomic conditions are associated with higher levels of mobile banking adoption among agri-entrepreneurs. To enhance interpretation and provide a clearer representation of the validated relationships, Equation 6.1 is subsequently illustrated through a diagrammatic presentation of the Integrated Evaluation Model for Mobile Banking Adoption.

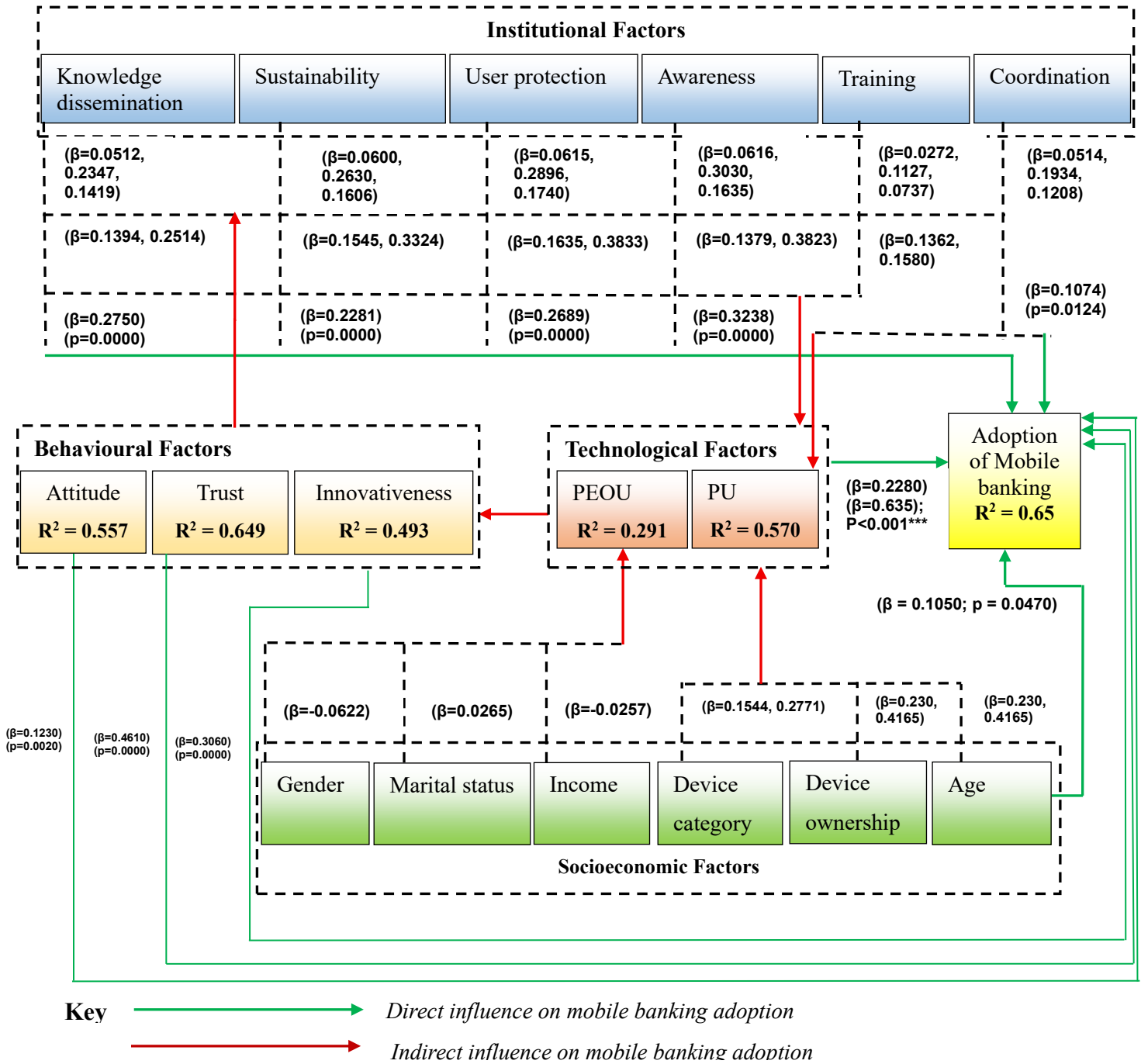


**Figure 6. 1: Evaluation Model for Mobile Banking Adoption among Agri-entrepreneurs in northern Uganda**

### **6.3 Empirical Validation of the Evaluation Model for Mobile Banking Adoption**

The empirical validation of the integrated evaluation model was conducted by assessing the extent to which the proposed relationships among institutional, technological, behavioural, and socioeconomic factors were supported by the study data. The validation process was based on the significant direct effects, indirect effects, and mediation pathways established through multiple regression analysis and Hayes' PROCESS Macro. The objective was to determine whether the specified model adequately explained variations in mobile banking adoption among agri-entrepreneurs in northern Uganda.

The validation results confirmed that institutional factors significantly contributed to mobile banking adoption through both direct and mediated pathways. Awareness demonstrated the strongest direct influence on adoption, indicating that knowledge of mobile banking services, their benefits, and their applicability to agricultural enterprise activities is a critical determinant of adoption decisions. Knowledge dissemination, user protection, sustainability, and coordination also demonstrated significant contributions, either directly or through technological perceptions. Training, although not directly associated with adoption, influenced adoption indirectly through perceived ease of use and perceived usefulness, confirming the role of institutional interventions in shaping users' technological perceptions.

The model was further validated through the significant contribution of technological perceptions, represented by perceived ease of use and perceived usefulness. Perceived ease of use demonstrated a significant total effect on mobile banking adoption ( $c = 0.4413$ ,  $p < 0.001$ ), indicating that users' perceptions regarding the simplicity and convenience of mobile banking services influence their willingness to adopt such technologies. Perceived usefulness also emerged as an important explanatory mechanism through which institutional and socioeconomic factors influenced adoption, demonstrating that agri-entrepreneurs are more likely to adopt mobile banking when they perceive its relevance to their enterprise activities.

The empirical evidence also confirmed the mediating role of behavioural factors in the adoption process. Attitude, trust, and innovativeness significantly transmitted the effects of institutional and technological factors to mobile banking adoption. Among these behavioural mechanisms, trust emerged as the strongest mediator, demonstrating that confidence in the reliability, security, and credibility of mobile banking services is central to transforming positive perceptions into

actual adoption behaviour. Innovativeness also provided a significant pathway, reflecting the role of users' willingness to engage with new financial technologies, while attitude contributed by strengthening positive orientations towards mobile banking.

The socioeconomic component of the model was partially validated. Age was the only socioeconomic factor that demonstrated a significant direct effect on mobile banking adoption ( $\beta = 0.1050$ ,  $p = 0.0470$ ). However, several socioeconomic characteristics influenced adoption indirectly through technological perceptions. Device ownership and device category demonstrated the strongest indirect effects, particularly through perceived usefulness, suggesting that access to appropriate mobile technologies enhances users' appreciation of the value of mobile banking for agricultural transactions. Conversely, education level and enterprise category did not demonstrate significant direct or indirect effects, indicating that these characteristics alone did not explain variations in adoption after accounting for technological perceptions.

Overall, the integrated evaluation model demonstrated substantial explanatory capacity, accounting for 65% ( $R^2 = 0.65$ ) of the variation in mobile banking adoption among agri-entrepreneurs. This level of explanatory power indicates that the combined institutional, technological, behavioural, and socioeconomic dimensions provide a comprehensive explanation of adoption behaviour. The empirical evidence therefore supports the validity of the specified integrated evaluation model and confirms that mobile banking adoption is a multidimensional process influenced by interconnected contextual, technological, behavioural, and individual-level factors.

The validated model provides an evidence-based framework for understanding mobile banking adoption within agricultural enterprise contexts and establishes the foundation for presenting the final integrated evaluation model in the subsequent section.

#### **6.4 Interpretation and Implications of the Evaluation Model**

The validated integrated evaluation model demonstrates that mobile banking adoption among agri-entrepreneurs in Northern Uganda is influenced by the interaction of institutional, technological, behavioural, and socioeconomic factors. The model extends technology-focused explanations of adoption by showing that adoption is not determined by technological availability alone but also by the institutional environment, users' perceptions, behavioural responses, and access-related conditions.

The findings indicate that institutional factors are important drivers of mobile banking adoption. Awareness emerged as the strongest direct predictor, highlighting the importance of informing agri-entrepreneurs about the availability, benefits, and practical applications of mobile banking services. Other institutional factors, including knowledge dissemination, user protection, sustainability, coordination, and training, contributed to adoption through direct and indirect pathways. This suggests that interventions should focus not only on expanding access but also on strengthening awareness, support mechanisms, and stakeholder collaboration.

The model further confirms that technological perceptions are key mechanisms influencing adoption behaviour. Perceived ease of use and perceived usefulness explain how agri-entrepreneurs evaluate and engage with mobile banking services. The findings imply that user-friendly platforms, reliable services, and practical business applications are essential for increasing adoption within agricultural enterprises.

A major contribution of the validated model is the identification of behavioural factors as important mediating mechanisms. Trust emerged as the strongest mediator, followed by innovativeness and attitude. This indicates that institutional support and positive technological perceptions enhance adoption primarily by building users' confidence, willingness to explore new technologies, and acceptance of mobile banking services.

The model also demonstrates that socioeconomic factors influence adoption mainly through technological perceptions rather than direct effects. Age was the only socioeconomic factor with a significant direct effect, while device ownership and device category had stronger indirect effects through perceived usefulness. This highlights the importance of access to appropriate digital devices and users' ability to perceive the value of mobile banking for enterprise activities.

Theoretically, the validated model extends the Technology Acceptance Model by incorporating institutional, behavioural, and socioeconomic dimensions relevant to agricultural enterprises. Practically, it provides guidance for financial institutions, policymakers, and agricultural stakeholders to promote adoption through awareness creation, digital financial literacy, consumer protection, service usability, and improved access to suitable mobile technologies.

Overall, the validated integrated evaluation model provides a comprehensive explanation of mobile banking adoption among agri-entrepreneurs by demonstrating that sustainable adoption

requires the alignment of institutional support, technological acceptance, behavioural readiness, and socioeconomic accessibility.

## **6.5 Conclusion**

This chapter specified and empirically validated the integrated evaluation model for mobile banking adoption among agri-entrepreneurs in Northern Uganda. The model was specified by integrating significant empirical relationships identified from institutional, technological, behavioural, and socioeconomic analyses. Validation results confirmed that the model provides substantial explanatory power and that adoption is influenced through both direct and mediated pathways. The validated model demonstrates that institutional support, technological perceptions, behavioural mechanisms, and selected socioeconomic characteristics jointly shape mobile banking adoption. The chapter provides the final contribution of the study by presenting an empirically supported framework for explaining mobile banking adoption within agricultural enterprise contexts.

## **CHAPTER SEVEN: General Synthesis and Discussion**

### **7.1 Chapter overview**

This chapter presents a comprehensive synthesis and discussion of the study findings in relation to the research objectives, theoretical foundations, and existing empirical literature on mobile banking adoption. The study specified and empirically validated an integrated evaluation model that explains mobile banking adoption among agri-entrepreneurs in northern Uganda by examining how institutional, technological, behavioural, and socioeconomic factors interact to influence the intensity of mobile banking usage.

The analysis and discussion follow the three specific objectives of the study. The first section examines the direct and indirect effects of socioeconomic and institutional factors on mobile banking adoption through technological perceptions, particularly perceived usefulness and perceived ease of use. The second section discusses the mediating role of behavioural factors in explaining how institutional and technological conditions influence adoption behaviour. The third section examines how empirical evidence contributed to the specification and validation of the integrated explanatory model.

Findings are interpreted within the broader technology adoption literature by comparing them with previous empirical evidence and examining their implications for the Technology Acceptance Model (TAM), diffusion of innovation theory, trust-based technology adoption, and digital financial inclusion perspectives. Beyond identifying determinants of adoption, the discussion emphasises the mechanisms through which contextual conditions influence technological perceptions, behavioural responses, and actual mobile banking usage among agricultural entrepreneurs.

### **7.2 Effects of Institutional, Socioeconomic, and Technological Factors on Mobile Banking Adoption**

Evidence generated from this study indicates that mobile banking adoption among agri-entrepreneurs in northern Uganda is shaped by institutional and socioeconomic conditions operating through technological perceptions. These results reinforce the argument that digital financial technology adoption is a multidimensional process in which users' acceptance decisions emerge from the interaction between technological evaluations, institutional support, and

individual circumstances. This provides empirical support for TAM (Davis, 1989), particularly the proposition that perceived usefulness and perceived ease of use are central mechanisms influencing technology acceptance. However, findings extend the application of TAM by demonstrating that these perceptions are not formed independently but are influenced by external contextual conditions. In this regard, institutional support mechanisms and socioeconomic characteristics provide important foundations through which users develop favourable or unfavourable perceptions of mobile banking. The extension is particularly relevant within agricultural contexts where adoption decisions are influenced by practical business realities, including transaction requirements, financial risks, accessibility challenges, and users' confidence in digital financial systems. Thus, the findings contribute to technology adoption literature by demonstrating that TAM-based explanations require consideration of the broader ecosystem within which technology utilisation occurs.

### **Institutional factors**

Significant relationships associated with knowledge dissemination, awareness creation, coordination, training, user protection, and sustainability mechanisms highlight the importance of institutional conditions in shaping mobile banking adoption among agri-entrepreneurs.

Knowledge dissemination influenced adoption through technological perceptions, supporting Rogers' (2003) diffusion of innovation theory, which identifies information availability as an important mechanism for reducing uncertainty associated with new technologies. This finding is consistent with evidence showing that access to information improves understanding, confidence, and acceptance of digital financial services (Aker & Mbiti, 2010; Oliveira et al., 2014). However, some scholars argue that information availability alone does not necessarily result in technology adoption. Donner & Escobari (2010), for example, highlight that mobile technology adoption among small enterprises is also influenced by affordability, relevance, infrastructure, and users' ability to integrate services into their economic activities. Similarly, Jack and Suri (2014) demonstrate that access to mobile financial services does not automatically translate into meaningful usage when trust and supporting conditions are limited.

The findings from this study extend these perspectives by demonstrating that knowledge dissemination influences adoption indirectly through perceived usefulness and perceived ease of use. This implies that information becomes effective when it enables users to understand the

practical value of mobile banking and increases confidence in their ability to use the technology. For agri-entrepreneurs, dissemination strategies should therefore focus not only on awareness of available services but also on demonstrating how mobile banking supports agricultural payments, savings, market transactions, and financial management.

Awareness creation also emerged as a significant institutional pathway influencing adoption through technological perceptions. This supports previous studies identifying awareness as an important antecedent of mobile banking acceptance (Shaikh & Karjaluoto, 2014; Thar et al., 2020). Nevertheless, contrasting evidence suggests that awareness may have limited influence where users perceive digital financial services as complex, insecure, or disconnected from their immediate needs.

Davis (1989) argues that awareness alone does not determine acceptance unless users perceive a technology as useful and easy to use. Similarly, Venkatesh et al. (2003) demonstrate that technology adoption depends on a combination of performance expectations, effort expectations, and facilitating conditions. The present study contributes to this debate by showing that awareness operates primarily by shaping technological perceptions rather than directly determining adoption. Therefore, effective awareness interventions should translate information into perceived value and practical relevance.

Training significantly influenced adoption through technological perceptions, supporting previous studies that identify digital skills development as an important mechanism for reducing technological barriers and increasing user confidence (Aker et al., 2016; Chitungo & Munongo, 2013).

However, evidence from other contexts suggests that training alone may not overcome broader structural constraints. Donner and Escobari (2010) argue that digital inclusion requires complementary conditions, including affordable access, reliable infrastructure, and services that respond to users' economic needs. Similarly, GSMA (2024) highlights that digital skills gaps often interact with device limitations and connectivity challenges to restrict meaningful use of digital financial services.

Findings from this study provide a more balanced interpretation by demonstrating that training contributes to adoption through improved perceptions of usability. Consequently, training should

be viewed as part of a wider digital inclusion strategy involving user support, reliable services, and accessible technologies.

User protection significantly influenced adoption through technological perceptions, confirming previous studies that identify security, privacy, and transaction reliability as important determinants of digital financial service adoption (Bongomin et al., 2018; Boateng et al., 2016; Zhou, 2012).

However, some technology adoption studies suggest that users may adopt digital services despite security concerns when perceived benefits and convenience are sufficiently high (Davis, 1989; Venkatesh et al., 2012). The findings from this study provide a contextual qualification to this position by demonstrating that user protection remains particularly important among agri-entrepreneurs whose mobile banking transactions are directly connected to business income, supplier payments, and agricultural value-chain activities.

Consequently, institutional mechanisms that strengthen consumer protection, transaction security, and complaint resolution are not merely supportive measures but important conditions for transforming positive perceptions into sustained mobile banking usage.

Sustainability mechanisms also influenced adoption through technological perceptions, supporting research that emphasises service continuity and reliability as important components of digital financial inclusion (Chen et al., 2016; Munyegera & Matsumoto, 2016). While much previous research has focused on initial technology acceptance, this study extends understanding by highlighting the importance of sustained service availability in encouraging routine integration of mobile banking into agricultural enterprise operations.

### **Socioeconomic factors**

Socioeconomic characteristics influenced mobile banking adoption through different pathways, indicating that individual circumstances shape users' ability and readiness to engage with digital financial services. These findings support the broader technology adoption literature, which recognises that demographic and socioeconomic characteristics influence technology acceptance by affecting users' exposure, capabilities, and access to enabling resources (Venkatesh et al., 2003; Venkatesh et al., 2012).

Age demonstrated both direct and indirect effects on mobile banking adoption. This finding is consistent with previous studies suggesting that younger users are generally more likely to adopt digital technologies due to greater familiarity, confidence, and exposure to technology (Morris & Venkatesh, 2000; Venkatesh et al., 2003). Similarly, studies on digital financial inclusion have reported age-related differences in the use of mobile financial services, with older users often experiencing greater difficulties associated with digital skills and technology confidence (Demirgüç-Kunt et al., 2022).

However, other evidence suggests that age may not necessarily represent a permanent barrier to technology adoption. Czaja et al. (2006) argue that differences in technology usage among age groups are often influenced by experience, training, usability perceptions, and access to support rather than age itself. Similarly, Venkatesh et al. (2012) suggest that facilitating conditions can reduce demographic differences in technology acceptance. The findings from this study provide a more nuanced interpretation by indicating that age influences adoption mainly through differences in technological readiness and confidence rather than functioning as an independent constraint. This implies that interventions targeting older agri-entrepreneurs should focus on improving digital confidence, practical skills, and user support rather than treating age as an inherent limitation.

Device ownership and device category significantly influenced mobile banking adoption through technological perceptions. This finding supports evidence that access to appropriate digital devices is a fundamental requirement for effective engagement with mobile financial services (Aker et al., 2016; GSMA, 2024). In agricultural settings, device capability affects users' ability to access mobile banking applications, navigate digital platforms, and perform diverse financial transactions beyond basic transfers.

Nevertheless, previous studies caution that access to devices alone does not guarantee meaningful digital financial inclusion. Donner and Escobari (2010) argue that mobile technology adoption depends on the interaction between device access, affordability, digital skills, and the relevance of available services. Similarly, Jack and Suri (2014) demonstrate that mobile financial services generate greater value when users have confidence in the systems and can integrate them into their economic activities.

The present study extends this argument by demonstrating that device access influences adoption primarily through technological perceptions. Therefore, possessing a mobile device becomes meaningful for adoption when users perceive mobile banking as useful, manageable, and relevant to their agricultural business operations.

Education level demonstrated limited influence on mobile banking adoption after accounting for technological perceptions and other contextual factors. This finding differs from studies that identify formal education as an important determinant of digital technology adoption because educated users are often expected to possess greater technological awareness and learning capacity (Venkatesh et al., 2003; Demirgüç-Kunt et al., 2022).

However, other studies suggest that practical exposure, digital literacy, and experience with technology may be more influential than formal educational attainment in determining technology use (Czaja et al., 2006). The limited effect of education observed in this study may therefore reflect the practical nature of mobile banking, where successful usage depends more on familiarity with digital platforms, access to devices, and confidence in performing transactions.

Enterprise category also showed limited influence on adoption. This finding contrasts with assumptions that entrepreneurs operating in different agricultural value-chain segments may demonstrate different levels of digital technology adoption due to differences in transaction requirements and business complexity. The result suggests that once technological perceptions and behavioural mechanisms are considered, differences between farmers, processors, input suppliers, and produce dealers become less influential in explaining adoption behaviour.

Overall, socioeconomic characteristics appear to function primarily as contextual conditions that influence users' readiness, access, and capacity to adopt mobile banking rather than operating as direct determinants in isolation. This finding extends TAM by demonstrating that individual characteristics shape adoption indirectly by influencing the conditions under which technological perceptions and behavioural responses develop.

### **7.3 Behavioural Factors as Mediators of Mobile Banking Adoption**

Results from the mediation analysis demonstrate that behavioural factors play an important role in transmitting the influence of institutional and technological factors to mobile banking adoption. These findings extend conventional TAM explanations by showing that adoption is not

simply a consequence of favourable perceptions of technology but involves psychological mechanisms through which users interpret, evaluate, and respond to technological opportunities. The mediating role of behavioural factors provides additional support for integrating behavioural dimensions into technology adoption models, particularly in contexts where uncertainty, trust concerns, and limited digital experience influence users' decisions. Among agri-entrepreneurs, mobile banking adoption involves not only evaluating technological usefulness but also developing confidence and willingness to incorporate digital financial services into routine enterprise activities.

### **Attitude**

Attitude significantly mediated relationships between several institutional factors and mobile banking adoption, as well as the relationship between perceived ease of use and adoption. This finding supports the original TAM proposition that users' evaluations of technology influence their acceptance behaviour (Davis, 1989). It also aligns with subsequent technology adoption studies demonstrating that positive attitudes facilitate the translation of favourable perceptions into usage behaviour (Venkatesh et al., 2003). However, the absence of a significant mediation effect between perceived usefulness and adoption through attitude provides an important qualification to previous assumptions. Earlier studies often suggest that users who perceive clear benefits from a technology are likely to develop favourable attitudes and subsequently adopt the technology (Davis, 1989; Venkatesh et al., 2012). The findings from this study suggest that perceived usefulness alone may not be sufficient to generate adoption among agri-entrepreneurs. Although users may recognise that mobile banking can improve financial transactions, they may require additional assurance regarding security, reliability, and ease of use before these perceptions translate into positive attitudes and actual usage. This highlights the importance of considering behavioural confidence and contextual conditions when applying TAM in rural agricultural settings.

### **Trust**

Trust emerged as the strongest behavioural mediator in the validated evaluation model. This finding confirms growing evidence that trust represents a critical mechanism influencing digital financial service adoption (Zhou, 2012; Bongomin et al., 2018; Ha et al., 2023; Jafri et al., 2024). The strong mediating role of trust indicates that institutional and technological factors influence

adoption partly by reducing uncertainty and perceived risks associated with digital financial transactions. This finding is particularly significant among agri-entrepreneurs because mobile banking is closely connected to business operations, including receiving payments, purchasing inputs, transferring funds, and managing agricultural income. Nevertheless, some technology adoption studies argue that trust may become less important where users perceive high convenience, usefulness, and ease of use (Davis, 1989; Venkatesh et al., 2012). From this perspective, users may accept technologies when expected benefits outweigh perceived risks.

The findings from this study provide a contextual extension to this argument by demonstrating that trust remains central even when technological perceptions are favourable. In agricultural enterprise environments characterised by financial uncertainty and dependence on reliable transactions, trust acts as a critical mechanism that enables users to move from recognising technological benefits to actively integrating mobile banking into business practices. This contributes to digital financial inclusion literature by positioning trust not merely as an additional adoption determinant but as a behavioural pathway through which institutional support and technological perceptions influence actual usage.

### **Innovativeness**

Innovativeness significantly mediated relationships between institutional factors, technological perceptions, and mobile banking adoption. This finding supports Rogers' (2003) diffusion of innovation theory, which identifies individual willingness to experiment with new technologies as an important factor influencing adoption decisions.

Previous studies similarly demonstrate that individuals with greater personal innovativeness are more likely to explore and adopt emerging technologies because they are more open to uncertainty and technological change (Agarwal & Prasad, 1998). However, some scholars argue that innovation adoption in developing-country contexts cannot be explained solely by individual characteristics because structural conditions often determine whether users have opportunities to experiment with new technologies (Donner & Escobari, 2010).

The findings from this study contribute to this debate by demonstrating that innovativeness operates within an enabling institutional environment. Awareness creation, training, and exposure to digital financial services can strengthen users' willingness to experiment with mobile banking.

Therefore, innovativeness should not only be viewed as an inherent individual trait but also as a behavioural orientation that can be encouraged through supportive institutional mechanisms.

Collectively, these findings demonstrate that behavioural factors provide important explanatory pathways linking institutional and technological conditions to mobile banking adoption. By incorporating attitude, trust, and innovativeness as mediating mechanisms, the study extends TAM-based explanations and provides a more context-sensitive understanding of adoption behaviour among agri-entrepreneurs.

#### **7.4 Evaluation Model and Contribution to Knowledge**

The principal contribution of this study is the specification and empirical validation of an integrated evaluation model explaining mobile banking adoption among agri-entrepreneurs in northern Uganda. Unlike previous studies that have predominantly examined individual determinants of digital financial technology adoption, this study integrates institutional, technological, behavioural, and socioeconomic dimensions to explain the pathways through which mobile banking adoption occurs. The integrated evaluation model provides a comprehensive explanation of adoption behaviour by demonstrating that mobile banking adoption is not determined exclusively by technological perceptions but results from interactions among institutional support mechanisms, users' evaluations of technology, behavioural responses, and individual characteristics. This represents a shift from examining isolated predictors of adoption towards understanding the underlying mechanisms through which contextual factors influence actual mobile banking usage intensity.

Empirical validation of the model was established through assessment of measurement reliability and validity, examination of hypothesised relationships, analysis of direct and indirect effects, and evaluation of the model's explanatory capacity. The results demonstrated significant relationships among institutional factors, technological perceptions, behavioural factors, and mobile banking adoption, providing empirical support for the proposed model structure. The validated model demonstrated substantial explanatory capacity, accounting for 65% of the variation in mobile banking adoption among agri-entrepreneurs ( $R^2 = 0.65$ ). This indicates that the integrated combination of institutional conditions, technological perceptions, behavioural mechanisms, and socioeconomic characteristics provides a strong explanation of differences in mobile banking usage intensity within the study context. However, the remaining 35% of

unexplained variation suggests that adoption behaviour may also be influenced by other factors not included in the current model. Therefore, the  $R^2$  value is interpreted as evidence of explanatory strength rather than predictive accuracy, consistent with the study's objective of developing and empirically validating an explanatory model.

At the theoretical level, the model contributes to technology adoption scholarship by extending the Technology Acceptance Model (TAM) (Davis, 1989). While the original TAM identifies perceived usefulness and perceived ease of use as central determinants of technology acceptance, findings from this study demonstrate that these perceptions are influenced by broader institutional conditions. Specifically, knowledge dissemination, awareness creation, training, user protection, coordination, and sustainability mechanisms shape how agri-entrepreneurs perceive the usefulness and usability of mobile banking services.

This extension does not suggest that these institutional factors constitute original TAM constructs. Rather, they represent contextual antecedents that explain how TAM mechanisms operate within rural agricultural environments. The contribution of the model therefore lies in demonstrating that technological perceptions are socially and institutionally embedded and cannot be fully understood without considering the conditions surrounding technology use.

A further contribution of the model is the incorporation of behavioural mechanisms as explanatory pathways linking contextual factors and technological perceptions to adoption outcomes. Previous technology adoption studies have frequently focused on identifying direct associations between technological characteristics and adoption behaviour. In contrast, this study demonstrates that behavioural factors, particularly trust, attitude, and innovativeness, explain how institutional and technological conditions translate into actual mobile banking usage.

The strong mediating role of trust provides an important contribution to digital financial technology adoption literature. Although perceived usefulness and perceived ease of use remain important foundations of adoption, the findings demonstrate that favourable perceptions alone may not be sufficient where financial transactions involve uncertainty and perceived risk. Trust therefore functions as a critical behavioural mechanism through which users develop confidence to integrate mobile banking into agricultural enterprise operations.

Methodologically, the study contributes an explanatory modelling approach that examines both direct and indirect relationships among multiple dimensions of mobile banking adoption. By applying mediation analysis with bootstrap estimation, the study provides evidence on the mechanisms through which institutional and technological factors influence adoption through behavioural pathways. This advances understanding beyond identifying significant predictors by explaining how and why adoption occurs.

Contextually, the study contributes empirical evidence from agri-entrepreneurs in Northern Uganda, a population that has received limited attention in mobile banking adoption research. Previous studies have largely focused on general consumers, households, or urban populations. By focusing on agricultural entrepreneurs, this study demonstrates how adoption is shaped by enterprise-related financial requirements, including receiving payments, purchasing agricultural inputs, transferring funds, saving, and managing agricultural transactions.

The practical contribution of the validated model lies in providing a framework for policymakers, financial institutions, mobile network operators, and agricultural stakeholders to design more effective digital financial inclusion interventions. The model demonstrates that increasing mobile banking adoption requires more than expanding service availability. Sustainable adoption requires coordinated efforts to improve awareness, digital capability, service reliability, user protection, technological accessibility, and trust among users.

Overall, the doctoral contribution of this study extends beyond identifying factors associated with mobile banking adoption. Through empirical validation and its ability to explain 65% of the variation in adoption behaviour ( $R^2 = 0.65$ ), the integrated evaluation model provides a theoretically informed and contextually grounded explanation of how institutional conditions, technological perceptions, behavioural mechanisms, and socioeconomic characteristics interact to influence mobile banking usage intensity among agri-entrepreneurs. The model therefore represents an advancement in understanding digital financial technology adoption within rural agricultural contexts.

### **7.5 Theoretical Implications of the Study**

The findings of this study have important implications for existing theories of technology adoption, particularly TAM, diffusion of innovation theory, and trust-based technology adoption perspectives.

First, the study contributes to TAM by demonstrating that perceived usefulness and perceived ease of use are not formed independently of the surrounding environment. While TAM explains how users evaluate technological characteristics, the findings show that these evaluations are influenced by institutional support mechanisms. This suggests that technology acceptance models applied in developing-country agricultural contexts should incorporate external enabling conditions that shape users' perceptions before adoption decisions occur.

Second, the study extends behavioural perspectives of technology adoption by demonstrating the importance of trust, attitude, and innovativeness as mediating mechanisms. Traditional technology acceptance explanations often emphasise cognitive evaluations of technology, whereas this study shows that psychological confidence and willingness to engage with technology are essential in translating perceptions into actual usage behaviour. The mediating role of trust particularly highlights the importance of reducing uncertainty in digital financial environments.

Third, the findings contribute to diffusion of innovation theory (Rogers, 2003) by showing that adoption is influenced not only by individual innovativeness but also by institutional mechanisms that facilitate exposure, knowledge acquisition, and confidence building. Although innovativeness influenced adoption behaviour, the findings indicate that supportive environments can strengthen users' willingness to experiment with digital financial technologies.

Finally, the study contributes to digital financial inclusion perspectives by distinguishing between access to mobile banking services and meaningful utilisation. The availability of mobile networks, mobile accounts, and financial platforms does not automatically result in adoption. Actual usage depends on whether users perceive value, possess confidence, trust service providers, and operate within supportive institutional environments.

Therefore, the theoretical implication of this study is that mobile banking adoption should be understood as a socially and institutionally embedded process rather than solely as an individual technology acceptance decision. The validated integrated evaluation model provides a broader theoretical explanation of adoption by linking technological perceptions with institutional conditions, behavioural mechanisms, and socioeconomic realities.

## **CHAPTER EIGHT: Conclusion and Recommendations**

### **8.1 Chapter Overview**

This chapter synthesizes the major findings of the study by drawing together the key themes emerging across the preceding chapters. It presents the overall conclusions in relation to the study objectives, highlights the study's contribution to knowledge, provides recommendations arising from the empirical findings, discusses the limitations of the study, and identifies areas for further research aimed at strengthening understanding of mobile banking adoption among agri-entrepreneurs.

### **8.2 Conclusion**

This study specified and empirically validated an integrated evaluation model explaining mobile banking adoption among agri-entrepreneurs in northern Uganda by examining the influence of institutional, technological, behavioural, and socioeconomic factors. The findings demonstrate that mobile banking adoption is a multidimensional process shaped by interactions among institutional support mechanisms, users' technological perceptions, behavioural responses, and socioeconomic characteristics.

The first objective established that institutional factors influence mobile banking adoption both directly and indirectly through perceived usefulness and perceived ease of use. Knowledge dissemination, awareness creation, training, coordination, user protection, and sustainability mechanisms were found to strengthen technological perceptions, thereby enhancing the intensity of mobile banking usage. Although socioeconomic characteristics influenced adoption differently, their effects were largely indirect, indicating that individual characteristics shape adoption primarily by influencing users' capacity and readiness to engage with mobile banking technologies.

The second objective demonstrated that behavioural factors play a significant mediating role in explaining how institutional and technological factors influence mobile banking adoption. Trust emerged as the strongest behavioural mediator, highlighting the importance of confidence in the security, reliability, and credibility of mobile banking services. Attitude and innovativeness also provided important behavioural pathways through which favourable institutional conditions and technological perceptions translated into actual usage behaviour.

The third objective was achieved through the specification and empirical validation of an integrated evaluation model that explains mobile banking adoption among agri-entrepreneurs. The validated model demonstrated substantial explanatory capacity, accounting for 65% of the variation in mobile banking adoption ( $R^2 = 0.65$ ). This indicates that institutional support, technological perceptions, behavioural mechanisms, and socioeconomic characteristics jointly provide a strong explanation of differences in mobile banking usage intensity among agri-entrepreneurs in northern Uganda. The remaining unexplained variation suggests that additional contextual factors may also influence adoption and warrant further investigation.

Overall, the study concludes that mobile banking adoption among agri-entrepreneurs is best understood as an integrated process in which institutional support, technological perceptions, behavioural mechanisms, and socioeconomic conditions operate collectively rather than independently. The empirically validated integrated evaluation model therefore provides a comprehensive explanation of how these dimensions interact to influence the intensity of mobile banking usage. This contribution advances understanding of digital financial adoption in rural agricultural contexts and provides an evidence-based framework for designing interventions that promote sustainable digital financial inclusion.

### **8.3 Contribution to Knowledge**

The principal contribution of this study is the specification and empirical validation of an integrated evaluation model explaining mobile banking adoption among agri-entrepreneurs in northern Uganda. Unlike previous studies that have predominantly examined isolated determinants of digital financial technology adoption, this study integrates institutional, technological, behavioural, and socioeconomic dimensions within a single explanatory framework to explain the mechanisms through which mobile banking adoption occurs.

Theoretically, the study extends the Technology Acceptance Model (TAM) by demonstrating that perceived usefulness and perceived ease of use are shaped by institutional conditions rather than emerging solely from technological characteristics. Institutional mechanisms, including knowledge dissemination, awareness creation, training, coordination, user protection, and sustainability serve as contextual antecedents that influence users' technological perceptions and subsequent adoption behaviour. The study further demonstrates that trust, attitude, and

innovativeness function as behavioural mechanisms through which institutional and technological factors influence actual mobile banking usage.

Methodologically, the study contributes an explanatory modelling approach that examines both direct and indirect relationships among multiple dimensions of mobile banking adoption. Through mediation analysis using bootstrap estimation, the study explains not only whether institutional and technological factors influence adoption but also how these influences occur through behavioural pathways. Unlike studies that rely primarily on direct-effect models, the validated integrated evaluation model explains the mechanisms linking contextual conditions to mobile banking usage. Its substantial explanatory capacity ( $R^2 = 0.65$ ) provides empirical evidence that the integrated framework offers a robust explanation of adoption behaviour within the study context.

Contextually, the study contributes empirical evidence from agri-entrepreneurs in Northern Uganda, a setting that has received limited attention in mobile banking adoption research. By focusing on commercial farmers, agro-processors, produce dealers, and agricultural input suppliers, the study demonstrates how enterprise-related financial activities shape mobile banking adoption in agricultural value chains.

Practically, the validated integrated evaluation model provides an evidence-based framework that can guide policymakers, financial institutions, mobile network operators, and agricultural development agencies in designing interventions that promote sustainable mobile banking adoption. The findings demonstrate that improving adoption requires coordinated efforts that strengthen institutional support, enhance technological accessibility and usability, build trust, and address users' behavioural readiness.

Overall, the doctoral contribution of this study extends beyond identifying predictors of mobile banking adoption. The validated integrated evaluation model explains the pathways through which institutional conditions, technological perceptions, behavioural mechanisms, and socioeconomic characteristics interact to influence mobile banking usage intensity, thereby advancing theoretical understanding and practical application of digital financial technology adoption in rural agricultural contexts.

## **8.4 Recommendations**

The recommendations arising from this study are directed towards key stakeholders involved in promoting digital financial inclusion among agri-entrepreneurs.

Government ministries, regulatory agencies, and development partners should strengthen institutional support through coordinated awareness campaigns, digital financial literacy programmes, and agricultural extension services that demonstrate the practical value of mobile banking for agricultural enterprises.

Financial institutions and mobile network operators should prioritise user protection by strengthening transaction security, improving transparency in service delivery, enhancing fraud prevention mechanisms, and providing responsive customer support. Since trust emerged as the strongest behavioural mediator, interventions that improve confidence in mobile banking services are likely to increase sustained usage.

Stakeholders should also invest in practical digital skills training tailored to agri-entrepreneurs. Training programmes should emphasise enterprise-related applications of mobile banking, including payments, savings, fund transfers, and financial record management, while accommodating differences in users' technological capabilities and device accessibility.

Policymakers and development agencies should improve access to affordable digital infrastructure and appropriate mobile devices, particularly in rural communities where technological accessibility remains an important enabling condition for mobile banking adoption.

Finally, the validated integrated evaluation model should be adopted as a guiding framework for planning, implementing, and evaluating mobile banking interventions. By recognising the interaction among institutional, technological, behavioural, and socioeconomic factors, stakeholders can design more comprehensive strategies that promote sustainable digital financial inclusion within agricultural value chains.

## **8.5 Limitations of the Study**

Several limitations were considered when interpreting the findings of this study.

First, the cross-sectional research design enabled examination of relationships among the study variables at a single point in time but does not permit assessment of changes in adoption

behaviour over time or support strong inferences regarding temporal ordering and causal relationships.

Second, the study relied on self-reported data collected through structured questionnaires. Although appropriate procedures were undertaken to ensure reliability and validity, responses may have been influenced by recall limitations or social desirability bias. Objective transaction records could provide complementary evidence of actual mobile banking usage.

Third, the study was conducted among agri-entrepreneurs in four districts of northern Uganda. While this context was appropriate for addressing the study objectives, the findings may not be directly generalisable to other regions, urban populations, or non-agricultural enterprises.

Fourth, although the integrated evaluation model incorporated institutional, technological, behavioural, and socioeconomic dimensions, other contextual factors, including financial literacy, regulatory conditions, service affordability, cultural influences, and social networks, were not explicitly examined.

Finally, the validated model explained 65% of the variation in mobile banking adoption ( $R^2 = 0.65$ ), indicating substantial explanatory capacity. Nevertheless, the remaining 35% suggests that additional determinants may also contribute to adoption behaviour and should be investigated in subsequent studies.

## **8.6 Areas for Further Research**

Building on the limitations, several avenues for further investigation are recommended.

Longitudinal studies would provide greater insight into how mobile banking adoption evolves over time and how institutional interventions influence sustained usage behaviour. Such studies would complement the cross-sectional evidence presented in this research by examining changes in users' technological perceptions, behavioural responses, and adoption patterns.

Additional validation of the integrated evaluation model using Structural Equation Modelling (SEM) would strengthen evidence regarding its measurement and structural properties by incorporating global model fit indices alongside the explanatory relationships examined in this study.

Replicating the study across other regions of Uganda, different agricultural value chains, and other categories of digital financial service users would enhance understanding of the model's applicability and generalisability under varying institutional and socioeconomic conditions.

Further studies should also incorporate additional explanatory variables, including financial literacy, digital skills, regulatory support, service affordability, social influence, and network effects, to improve understanding of the unexplained variation in mobile banking adoption beyond the current explanatory capacity of the model ( $R^2 = 0.65$ ).

Finally, mixed-methods and qualitative studies could provide deeper insights into how trust is developed, how institutional support influences user confidence, and how agri-entrepreneurs experience mobile banking within their day-to-day business operations. Such evidence would complement the quantitative findings by explaining the contextual processes underlying technology adoption.

Collectively, these research directions provide opportunities to refine, validate, and extend the integrated evaluation model developed in this study. They also offer a basis for strengthening theoretical understanding and informing policies and interventions that promote sustainable mobile banking adoption among agri-entrepreneurs and other digitally excluded populations.

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## Appendices

### Appendix A: Sample Size Determination

**Table 3. 7: Morgan Table for Sample Size Determination**

-----  
*Table for Determining Sample Size from a Given Population*

| <i>N</i> | <i>S</i> | <i>N</i> | <i>S</i> | <i>N</i> | <i>S</i> |
|----------|----------|----------|----------|----------|----------|
| 10       | 10       | 220      | 140      | 1200     | 291      |
| 15       | 14       | 230      | 144      | 1300     | 297      |
| 20       | 19       | 240      | 148      | 1400     | 302      |
| 25       | 24       | 250      | 152      | 1500     | 306      |
| 30       | 28       | 260      | 155      | 1600     | 310      |
| 35       | 32       | 270      | 159      | 1700     | 313      |
| 40       | 36       | 280      | 162      | 1800     | 317      |
| 45       | 40       | 290      | 165      | 1900     | 320      |
| 50       | 44       | 300      | 169      | 2000     | 322      |
| 55       | 48       | 320      | 175      | 2200     | 327      |
| 60       | 52       | 340      | 181      | 2400     | 331      |
| 65       | 56       | 360      | 186      | 2600     | 335      |
| 70       | 59       | 380      | 191      | 2800     | 338      |
| 75       | 63       | 400      | 196      | 3000     | 341      |
| 80       | 66       | 420      | 201      | 3500     | 346      |
| 85       | 70       | 440      | 205      | 4000     | 351      |
| 90       | 73       | 460      | 210      | 4500     | 354      |
| 95       | 76       | 480      | 214      | 5000     | 357      |
| 100      | 80       | 500      | 217      | 6000     | 361      |
| 110      | 86       | 550      | 226      | 7000     | 364      |
| 120      | 92       | 600      | 234      | 8000     | 367      |
| 130      | 97       | 650      | 242      | 9000     | 368      |
| 140      | 103      | 700      | 248      | 10000    | 370      |
| 150      | 108      | 750      | 254      | 15000    | 375      |
| 160      | 113      | 800      | 260      | 20000    | 377      |
| 170      | 118      | 850      | 265      | 30000    | 379      |
| 180      | 123      | 900      | 269      | 40000    | 380      |
| 190      | 127      | 950      | 274      | 50000    | 381      |
| 200      | 132      | 1000     | 278      | 75000    | 382      |
| 210      | 136      | 1100     | 285      | 1000000  | 384      |

Note.—*N* is population size.  
*S* is sample size.

## Appendix B: Questionnaire

**Gulu University**  
**Faculty of Agriculture and Environment**  
**Department of Rural Development and Agribusiness**  
*Using Mobile Banking in Agribusiness*

### *Preamble*

My name is **Abandu Jackson**. I am conducting a study on “the **adoption of mobile banking service**”. This study seeks to achieve the purpose by analyzing responses from you by answering the following questions. All the responses shall remain anonymous and confidential and they will be used for academic purposes only. Please tick in the appropriate boxes and write in the spaces provided.

Thanks for giving me your valuable time.

**Questionnaire ID:** .....**Village/Ward:** .....

**Parish:** ..... **Sub County:** .....

**District/Municipality:** .....**Region:** .....

**A: DEMOGRAPHIC INFORMATION (Please, tick or write in the box).**

1. Gender

☐ Male ☐ Female

2.  years

3. Education level ☐ Primary ☐ Secondary ☐ Institution ☐ None

4. Marital status ☐ Single ☐ Married ☐ Divorced ☐ Widowed

5. Category of enterprise:

☐ Commercial farmer ☐ Processor ☐ Produce dealer ☐ Innovator ☐ Input dealer

6. Monthly income level in Uganda Shillings (UGX)

7. Do you have a mobile device? ☐ Yes ☐ No

8. If yes in 7., what category of mobile device do you have? (You may tick more than one)

☐ Ordinary phone ☐ Feature phone ☐ Smartphone ☐ Tablet ☐ Laptop

9. Are you aware of mobile banking? ☐ Yes ☐ No

10. Which mobile banking service (s) are you aware of?

☐ Mobile money ☐ Agent banking ☐ Centemobile ☐ Flexipay ☐ Internet banking ☐ Mobile wallet ☐ other and specify.....

11. Do you use mobile banking service for buying and selling Agricultural products?

☐ Yes ☐ No

12. If yes in 11., select the mobile banking services that you use for buying and selling Agriculture products.

☐ Mobile money ☐ Agent banking ☐ Centemobile ☐ Flexipay ☐ Internet banking ☐ Mobile wallet ☐ other and specify.....

13. How frequent do you use mobile banking service in a week or a month? ☐ Once a week  
☐ More than two times a week ☐ Once a month ☐ More than two times a month

14. If no in 11, what are the likely reasons for not using mobile banking service to buy and sell  
Agricultural products?

☐ High charges ☐ Lack of training ☐ Lack of trust ☐ Lack of benefits ☐ Lack  
of interest ☐ Lack of network ☐ Unavailability of agents in my area ☐ Long distance to  
the agent ☐ other and specify.....

Indicate your level of Agreement with the following statements by ticking Strongly Disagree or Agree or Undecided or Disagree or Strongly Disagree.

| Statement                                                                               | Strongly disagree<br>(1) | Disagree<br>(2) | Undecided<br>(3) | Agree<br>(4) | Strongly agree<br>(5) |
|-----------------------------------------------------------------------------------------|--------------------------|-----------------|------------------|--------------|-----------------------|
| <b>B: INSTITUTINAL FACTORS</b>                                                          |                          |                 |                  |              |                       |
| <b>Knowledge dissemination</b>                                                          |                          |                 |                  |              |                       |
| 1. I know the regulations of mobile banking.                                            |                          |                 |                  |              |                       |
| 2. I am aware of mobile banking procedures.                                             |                          |                 |                  |              |                       |
| 3. Knowing mobile banking rules motivates me to use it.                                 |                          |                 |                  |              |                       |
| 4. I am aware of the dos and don'ts in mobile banking.                                  |                          |                 |                  |              |                       |
| 5. I use mobile banking because it has been legally authorized.                         |                          |                 |                  |              |                       |
| 6. I think mobile banking guidelines are clear for me to use.                           |                          |                 |                  |              |                       |
| <b>Coordination</b>                                                                     |                          |                 |                  |              |                       |
| 1. I think that assistance is vital for effective mobile banking.                       |                          |                 |                  |              |                       |
| 2. I do not require any external help to perform mobile banking <sup>R</sup> .          |                          |                 |                  |              |                       |
| 3. Access to information about mobile banking would be vital to guiding me in using it. |                          |                 |                  |              |                       |
| 4. Getting knowledge about different mobile banking services is vital for me.           |                          |                 |                  |              |                       |
| <b>Training</b>                                                                         |                          |                 |                  |              |                       |
| 1. I need specialized skills for effective mobile banking.                              |                          |                 |                  |              |                       |
| 2. I need help in using a mobile banking service.                                       |                          |                 |                  |              |                       |
| 3. Getting more knowledge to perform mobile banking is necessary for me.                |                          |                 |                  |              |                       |

| Statement                                                                          | Strongly disagree<br>(1) | disagree<br>(2) | Undecided<br>(3) | Agree<br>(4) | Strongly agree<br>(5) |
|------------------------------------------------------------------------------------|--------------------------|-----------------|------------------|--------------|-----------------------|
| 4. I have knowledge to use Internet.                                               |                          |                 |                  |              |                       |
| 5. I can comfortably use mobile devices such as smartphones, tablets, and laptops. |                          |                 |                  |              |                       |
| <b>User protection</b>                                                             |                          |                 |                  |              |                       |
| 1. Knowing mobile banking rights is vital for me.                                  |                          |                 |                  |              |                       |
| 2. I am aware of mobile banking safety measures.                                   |                          |                 |                  |              |                       |
| 3. Having knowledge to guard against financial losses is vital for me.             |                          |                 |                  |              |                       |
| 4. I am aware of potential financial losses in mobile banking.                     |                          |                 |                  |              |                       |
| 5. I believe that mobile banking has clear consumer protection guidelines.         |                          |                 |                  |              |                       |
| <b>Awareness</b>                                                                   |                          |                 |                  |              |                       |
| 1. I am aware of mobile banking.                                                   |                          |                 |                  |              |                       |
| 2. I am not mindful of mobile banking <sup>R</sup> .                               |                          |                 |                  |              |                       |
| 3. I know the benefits of mobile banking.                                          |                          |                 |                  |              |                       |
| 4. Alertness about mobile banking enables me to use it.                            |                          |                 |                  |              |                       |
| 5. It is vital to be aware of mobile banking services to use it.                   |                          |                 |                  |              |                       |
| <b>Sustainability</b>                                                              |                          |                 |                  |              |                       |
| 1. Since mobile banking is available, I keep using it.                             |                          |                 |                  |              |                       |
| 2. I use a mobile banking service because it is cheap.                             |                          |                 |                  |              |                       |

| Statement                                                                            | Strongly disagree<br>(1) | disagree<br>(2) | Undecided<br>(3) | Agree<br>(4) | Strongly agree<br>(5) |
|--------------------------------------------------------------------------------------|--------------------------|-----------------|------------------|--------------|-----------------------|
| 3. Access to mobile banking services makes me use it.                                |                          |                 |                  |              |                       |
| 4. The availability of power for charging enables me to do mobile banking regularly. |                          |                 |                  |              |                       |
| <b>C: BEHAVIORAL FACTORS</b>                                                         |                          |                 |                  |              |                       |
| <b>Innovativeness</b>                                                                |                          |                 |                  |              |                       |
| 1. I like to keep up with technological advances.                                    |                          |                 |                  |              |                       |
| 2. I use technology because others are using it.                                     |                          |                 |                  |              |                       |
| 3. I am a person who accepts new ideas.                                              |                          |                 |                  |              |                       |
| 4. I am willing to adopt new technologies.                                           |                          |                 |                  |              |                       |
| 5. I like to be considered a leader of new ideas.                                    |                          |                 |                  |              |                       |
| 6. My colleagues often come to me for advice about new ideas.                        |                          |                 |                  |              |                       |
| 7. When I hear about new technology, I try to look for ways to experiment with it.   |                          |                 |                  |              |                       |
| 8. I am often interested in exploring new technologies.                              |                          |                 |                  |              |                       |
| 9. I like trying out new technologies.                                               |                          |                 |                  |              |                       |
| <b>Trust</b>                                                                         |                          |                 |                  |              |                       |
| 1. I believe mobile banking is reliable.                                             |                          |                 |                  |              |                       |
| 2. Mobile banking is secure for me to use.                                           |                          |                 |                  |              |                       |
| 3. I have confidence in using mobile banking services.                               |                          |                 |                  |              |                       |
| 4. I depend on mobile banking to do my financial tasks.                              |                          |                 |                  |              |                       |
| 5. I use mobile banking service because is trustworthy.                              |                          |                 |                  |              |                       |

| Statement                                                                   | Strongly disagree<br>(1) | Disagree<br>(2) | Undecided<br>(3) | Agree<br>(4) | Strongly agree (5) |
|-----------------------------------------------------------------------------|--------------------------|-----------------|------------------|--------------|--------------------|
| <b>Attitude</b>                                                             |                          |                 |                  |              |                    |
| 1. I find mobile banking an easier way to solve my banking needs.           |                          |                 |                  |              |                    |
| 2. Mobile banking gives me greater control over my finances.                |                          |                 |                  |              |                    |
| 3. I accept utilizing mobile banking because it is not expensive.           |                          |                 |                  |              |                    |
| 4. Mobile banking allows me to manage my finances anytime and anywhere.     |                          |                 |                  |              |                    |
| 5. Mobile banking services are fast to use.                                 |                          |                 |                  |              |                    |
| <b>D: TECHNOLOGICAL FACTORS</b>                                             |                          |                 |                  |              |                    |
| <b>Perceived Usefulness</b>                                                 |                          |                 |                  |              |                    |
| 1. I find mobile banking convenient to use.                                 |                          |                 |                  |              |                    |
| 2. Mobile banking improves my performance in making financial transactions. |                          |                 |                  |              |                    |
| 3. It is easier to manage my financial tasks with mobile banking.           |                          |                 |                  |              |                    |
| 4. Overall, I find mobile banking useful for my financial tasks.            |                          |                 |                  |              |                    |
| 5. I think mobile banking saves my time in performing banking transactions. |                          |                 |                  |              |                    |
| 6. Mobile banking makes accessing banking services affordable.              |                          |                 |                  |              |                    |
| <b>Perceived Ease of Use</b>                                                |                          |                 |                  |              |                    |
| 1. I think using mobile banking is easy for me.                             |                          |                 |                  |              |                    |
| 2. Mobile banking does not require a lot of mental effort.                  |                          |                 |                  |              |                    |
| 3. I find it easy to use mobile banking.                                    |                          |                 |                  |              |                    |
| 4. I find mobile banking easy to navigate.                                  |                          |                 |                  |              |                    |

|                                                                                  |                                  |                         |                          |                      |                           |
|----------------------------------------------------------------------------------|----------------------------------|-------------------------|--------------------------|----------------------|---------------------------|
| 5. I think mobile banking is simple to use.                                      |                                  |                         |                          |                      |                           |
| <b>Statement</b>                                                                 | <b>Strongly disagree<br/>(1)</b> | <b>Disagree<br/>(2)</b> | <b>Undecided<br/>(3)</b> | <b>Agree<br/>(4)</b> | <b>Strongly agree (5)</b> |
| <b>E: Mobile Banking Adoption</b>                                                |                                  |                         |                          |                      |                           |
| 1. I Frequently make agricultural and household payments through mobile banking. |                                  |                         |                          |                      |                           |
| 2. I am highly interested in using mobile banking to support my agribusiness.    |                                  |                         |                          |                      |                           |
| 3. I manage most of my finances with mobile banking.                             |                                  |                         |                          |                      |                           |
| 4. I strongly recommend the use of mobile banking to other agri-entrepreneurs.   |                                  |                         |                          |                      |                           |

**Thanks for your valuable time**

## Appendix C: Reliability Statistics

**Table 3. 8: Reliability Coefficients of Constructs**

| Construct                    | No. of Items | Cronbach's Alpha |
|------------------------------|--------------|------------------|
| <b>Technological Factors</b> |              |                  |
| Perceived Usefulness (PU)    | 4            | 0.808            |
| Perceived Ease of Use (PEOU) | 3            | 0.793            |
| Mobile Banking Adoption      | 4            | 0.903            |
| <b>Institutional Factors</b> |              |                  |
| Knowledge dissemination      | 3            | 0.761            |
| Coordination                 | 3            | 0.721            |
| Awareness                    | 3            | 0.770            |
| Sustainability               | 3            | 0.616            |
| Training                     | 3            | 0.637            |
| User protection              | 3            | 0.704            |
| <b>Behavioural Factors</b>   |              |                  |
| Attitude                     | 3            | 0.716            |
| Trust                        | 4            | 0.851            |
| Innovativeness               | 6            | 0.804            |

## Appendix D: Assessment of Normality

**Table 3. 9: Skewness and Kurtosis Assessment**

| Likert Scale<br>Constructs | N   | Min  | Max   | Descriptive Statistics |             |            |               |            |               |
|----------------------------|-----|------|-------|------------------------|-------------|------------|---------------|------------|---------------|
|                            |     |      |       | Mean                   | Std.<br>Dev | Skewness   |               | Kurtosis   |               |
|                            |     |      |       |                        |             | Statistics | Std.<br>Error | Statistics | Std.<br>Error |
| PEOU                       | 477 | 1.00 | 5.00  | 1.9712                 | .89221      | 1.191      | .112          | 1.139      | .223          |
| PU                         | 477 | 1.00 | 7.33  | 1.7881                 | .78800      | 1.894      | .112          | 6.348      | .223          |
| Knowledge                  | 477 | 1.00 | 5.50  | 2.0811                 | .82796      | .981       | .112          | 1.271      | .223          |
| Coordination               | 477 | 1.00 | 5.33  | 1.4305                 | .62892      | 2.134      | .112          | 6.515      | .223          |
| Awareness                  | 477 | 1.00 | 4.25  | 1.4675                 | .65103      | 1.561      | .112          | 2.134      | .223          |
| Sustainability             | 477 | 1.00 | 8.33  | 1.5653                 | .72551      | 2.559      | .112          | 15.630     | .223          |
| User protection            | 477 | 1.00 | 5.00  | 1.7933                 | .67870      | 1.156      | .112          | 1.832      | .223          |
| Training                   | 477 | 1.00 | 9.00  | 1.6443                 | .85529      | 2.378      | .112          | 11.948     | .223          |
| Adoption                   | 477 | 1.00 | 5.00  | 1.5933                 | .76264      | 1.828      | .112          | 3.653      | .223          |
| Trust                      | 477 | 1.00 | 5.00  | 1.8024                 | .78532      | 1.150      | .112          | 1.291      | .223          |
| Attitude                   | 477 | 1.00 | 14.40 | 1.9182                 | .96202      | 5.211      | .112          | 59.441     | .223          |
| Innovativeness             | 477 | 1.00 | 5.00  | 1.6943                 | .78477      | 1.422      | .112          | 2.123      | .223          |
| Valid N<br>(listwise)      | 477 |      |       |                        |             |            |               |            |               |

## Appendix E: Ethics Approval Letter-Gulu University Research Ethics Committee

**GULU**  
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**RESEARCH ETHICS COMMITTEE**

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November 6, 2019

### APPROVAL NOTICE

Mr. Abandu Jackson  
Gulu University

Re: Application No. GUREC-100-19

**Type of review:**

☒ Initial review

☐ Amendment

☐ Continuing review

☐ Termination of study

☐ SAEs

☐ Other, Specify: \_\_\_\_\_

Title of Proposal: **"EVALUATION MODEL FOR MOBILE BANKING UPTAKE AMONG AGRI-ENTREPRENEURS: STRUCTURAL INTERVENTION AND CONSUMER RESPONSE ANALYSIS"**

I am pleased to inform you that at the 55<sup>th</sup> convened meeting on 22<sup>nd</sup> August 2019, the Gulu University Research Ethics Committee (GUREC) voted to approve the above referenced application.

Approval of the research is for the period of **22<sup>nd</sup> August 2019 to 21<sup>st</sup> August 2020**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the GUREC for re-review and approval prior to the activation of the changes. The GUREC application number assigned to the research should be cited in any correspondence.



3. Any unanticipated problems involving risks to participants must be promptly reported to the **GUREC**. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for the **GUREC** review.
4. Only approved and stamped consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The **GUREC** may conduct audits of all study records, and consent documentation may be part of such audits.
5. Regulations require review of an approved study not less than once per 12-month period. Therefore, a continuing review application must be submitted to the **GUREC** eight (8) weeks prior to the above expiration **date of 21<sup>st</sup> August 2020** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely manner may result in suspension or termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.
6. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following documents have been approved in this application by the **GUREC**:

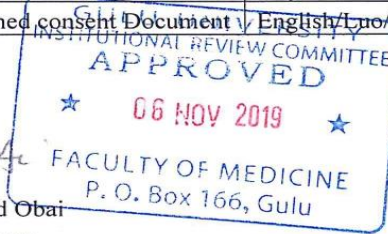
|   | Document                  | Language            | Version     | Version Date                  |
|---|---------------------------|---------------------|-------------|-------------------------------|
| 1 | Protocol                  | English             | Version 2.0 | 6 <sup>th</sup> November 2019 |
| 2 | Data Collection Tools     | English/Luo/Lugbara | Version 2.0 | 6 <sup>th</sup> November 2019 |
| 3 | Informed consent Document | English/Luo/Lugbara | Version 2.0 | 6 <sup>th</sup> November 2019 |

Signed,

Dr. Gerald Obai

**Chairperson**

**Gulu University Research Ethics Committee**



## Appendix F: Ethics Approval Letter-Uganda National Council for Science and Technology



### Uganda National Council for Science and Technology

*(Established by Act of Parliament of the Republic of Uganda)*

Our Ref: SS 5134

13<sup>th</sup> December 2019

Mr. Jackson Abandu  
Principal Investigator  
Gulu University  
Gulu

Dear Mr. Abandu,

**Re: Research Approval: Evaluation Model for Mobile Banking Uptake among Agri – Entrepreneurs: Structural Intervention and Consumer Response analysis**

I am pleased to inform you that on **03/12/2019**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **03/12/2019** to **03/12/2022**.

Your research registration number with the UNCST is **SS 5134**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.
2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.
4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.

---

#### LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda  
P. O. Box 6884  
KAMPALA, UGANDA

#### COMMUNICATION

TEL: (256) 414 705500  
FAX: (256) 414-234579  
EMAIL: [info@uncst.go.ug](mailto:info@uncst.go.ug)  
WEBSITE: <http://www.uncst.go.ug>

5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

Please note that this approval includes all study related tools submitted as part of the application as shown below:

| No. | Document Title         | Language                 | Version Number | Version Date |
|-----|------------------------|--------------------------|----------------|--------------|
| 1.  | Research proposal      | English                  | N/A            | N/A          |
| 2.  | Questionnaire          | English, Luo and Lugbara | N/A            | N/A          |
| 3.  | Interview guide        | English, Luo and Lugbara | N/A            | N/A          |
| 4.  | Informed consent forms | English, Luo and Lugbara | N/A            | N/A          |



BETH MUTUMBA

For: Executive Secretary

**UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY**

Copied: Chair, Mbarara University of Science and Technology, Research Ethics Committee

## Appendix G: Consent Form

**Title of the study: EVALUATION MODEL FOR MOBILE BANKING ADOPTION AMONG  
AGRI-ENTREPRENEURS IN NORTHERN UGANDA: EXPLORING INSTITUTIONAL,  
TECHNOLOGICAL, BEHAVIOURAL, AND SOCIOECONOMIC FACTORS**

**Investigator:** ABANDU JACKSON

**Institution:** GULU UNIVERSITY

**Introduction**

Jackson Abandu is a PhD student enrolled at Gulu University, and conducting a research study titled “Evaluation Model for Mobile Banking Adoption among Agri-Entrepreneurs in Northern Uganda: Exploring Institutional, Technological, Behavioural, and Socioeconomic Factors”. The study has been approved by Gulu University Research Ethics Committee (GUREC). This informed consent explains the study to you. After the study has been presented, any questions you may have are answered, and you have decided to participate in the survey, you will be asked to sign a consent, which you will be given a copy to keep.

**A brief description of the sponsors of the research project:**

*The ADB-HEST project, affiliated with Gulu University, sponsors my research.*

**Purpose:**

*The study seeks to develop an evaluation model for mobile banking adoption among Agri-entrepreneurs in Northern Uganda. The findings of this study will add to the body of knowledge and practice. The model to be developed will guide the adoption of mobile banking among Agri-entrepreneurs and empower them to understand their value in the social and economic growth of the country. It will also inform the Government, service providers, policymakers, and designers of the mobile banking gaps so that plans can be laid to enrich their capacity to get rid of them. In other words, the study is intended to offer empirical evidence to overhaul the work practices of service providers such as banks and Telecom firms to enhance the adoption of mobile banking among agri-entrepreneurs and the public as a whole.*

**Procedures:**

The procedure for participation will involve you responding to questions as will be asked of you.

**Who will participate in the study?**

You have been chosen to participate in this study because you are an agricultural entrepreneur. Responding to your questions will last for approximately 45 minutes, and 480 participants will participate by answers to the questionnaire.

**Risks/discomforts:**

*There is no foreseeable risk of harm or discomfort that will arise from your participation in this study. The only risk or discomfort will be the inconvenience of time spent during the interview.*

**Benefits:**

*There is no immediate benefit. However, you will get feedback on the findings and progress of the study, and any new information that affects you as a participant will be made available to you.*

**Confidentiality:**

*Your identity will not be revealed to anyone as we shall only use codes to identify participants. Information obtained will only be accessible by the research team. A password will protect soft copies of the data, and hard copy files will be kept under lock and key. The principal investigator will only access confidential information.*

**Alternatives:**

*You do not have to participate in this study if you are not interested. You will not lose any benefit in case of no participation.*

**Cost:**

*There will not be any additional cost incurred due to participating in this study.*

**Questions:**

If you have any questions about the study as a research participant, you can contact the principal investigator, ABANDU JACKSON, on telephone number 0772857559 or via email at [j.abandu@gu.ac.ug](mailto:j.abandu@gu.ac.ug).

**Statement of voluntariness:**

Participation in the research study is voluntary, and you may join of your own free will. You have a right to withdraw from the study at any time without penalty.

If you have any issues about your rights in the study, please get in touch with the Chairperson, Gulu University Research Ethics Committee, Dr. Gerald Obai Tel: No., 0772305621; email: [lekobai@yahoo.com](mailto:lekobai@yahoo.com)/[lekobai@gmail.com](mailto:lekobai@gmail.com); or the Uganda National Council for Science and Technology, on plot 6 Kimera Road, Ntinda, Kampala on Tel 0414705500.

**Statement of consent**

..... has described to me what is going to be done, the risks, the benefits involved, and my rights as a participant in this study. I understand that my decision to participate in this study will not affect me in any way. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that I do not waive my legal rights by signing this form. Still, I merely indicate that I have been informed about the research study in which I voluntarily agree to participate. A copy of this form will be provided to me.

Name .....Signature/thumbprint of participant..... Date .....

Name..... Signature of interviewer..... Date.....

Name .....Signature of witness ..... Date .....

**GULU**  
P.O. Box 166  
Gulu, Uganda



**UNIVERSITY**

Tel: +256-471-32924

Fax: +256 471343095

Emails: [ul@gu.ac.ug](mailto:ul@gu.ac.ug)

URL: [www.gu.ac.ug](http://www.gu.ac.ug)

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**PLAGIARISM CHECK**

**Declaration for Originality Form**

This form must be completed and signed for all scholarly work produced.

Name: **JACKSON ABANDU (MR.)**

Personal File No.(staff) Reg. (student). **REG. No. 18/U/3252/PHD**

Faculty/Institute: **AGRICULTURE AND ENVIRONMENT, GULU UNIVERSITY**

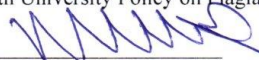
Department: **RURAL DEVELOPMENT AND AGRIBUSINESS,**

Title and bibliographic description of the work

**EVALUATION MODEL FOR MOBILE BANKING ADOPTION AMONG AGRI-  
ENTREPRENEURS IN NORTHERN UGANDA: EXPLORING INSTITUTIONAL,  
TECHNOLOGICAL, BEHAVIOURAL, AND SOCIOECONOMIC FACTORS**

**Declaration.**

1. I understand what plagiarism is and I am aware of the University policy on this regard,
2. I declare that this ... Thesis ... (Dissertation, Proposal, essay, assignment, paper, report etc.) is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my work has been used, this has been properly acknowledged and referenced in accordance with Gulu University requirements,
3. I have not sought or used the services of any professional agency to produce this work,
4. I have not allowed, and shall not allow anyone to copy my work with the intention of passing it off as his/her own,
5. I understand that any false claim of this work shall result in disciplinary action in accordance with University Policy on Plagiarism.

Signature 

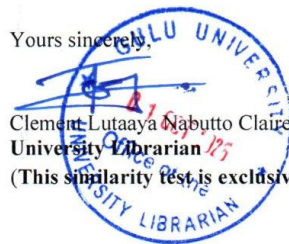
Date **02/10/2025**

**Originality Report**

The article/thesis/document titled above have been subjected to plagiarism check and the level was found to be.....**18%** (percent) this is classified as:

- ☒ Minor  
☐ Moderate  
☐ Serious

Yours sincerely,

  
Clement Lutaaya Nabutoo Claire (PhD)

University Librarian

(This similarity test is exclusive of published articles by the student from the Thesis)