# FACTORS AFFECTING CUSTOMERS' ADOPTION OF PREPAID WATER METER SERVICES IN TANZANIA RURAL AREAS: A CASE OF BAHI DISTRICT

**BUSELA KWIDIKA YUGA**

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PROJECT MANAGEMENT (MPM)**

**DEPARTMENT OF MARKETING, ENTREPRENEURSHIP AND MANAGEMENT**

**OF THE OPEN UNIVERSITY OF TANZANIA**

**2024**

## CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by The Open University of Tanzania a dissertation entitled, "**Factors Affecting Customers' Adoption of Prepaid Water Meter Services in Tanzania Rural Areas: A Case of Bahi District"** in partial fulfillment of the requirements for the award of Degree of Masters of Project Management (MPM).

……

Dr. Dionis Ndolage

(Supervisor)

……

Date

……

Dr. France Shayo

(Supervisor)

……

Date

## COPYRIGHT

## DECLARATION

I **Yuga Busela Kwidika,** declare that the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as original mine. It is hereby presented in partial fulfillment of the requirement for the Degree of Master of Project Management (MPM).

……..

Signature

April 19, 2024.

……..

Date

## DEDICATION

This dissertation is dedicated to the Almighty God, who is my creator and the source of my wisdom, knowledge, and insight.

Additionally, I dedicate my dissertation to my beloved wife Leah Maligana, my children Hugh and Huon, my father Yuga Kwidika, my mother Marietha Majige, my brother, and my sisters, and DSC workmates. Their love, support, and encouragement have been invaluable to me. Words cannot express my gratitude for them. I wish everyone the best of luck and God bless you.

## ACKNOWLEDGEMENT

I am grateful to have completed this work in good health, and I thank God for guiding me. Being accepted as a student by OUT has been a great opportunity for me, and I appreciate their acceptance. My supervisors, Dr. Dionis Ndolage and Dr. France Shayo have been incredibly supportive, providing guidance, supervision, and encouragement throughout the study. I am thankful for their lectures on research methodologies and thesis writing, as they have helped me understand the research process better.

I would also like to express my gratitude to the other academic staff members at OUT who advised, supported, and encouraged me in completing my coursework and research. Additionally, I am thankful to the Executive Director of Bahi District for permitting me to conduct research in Makanda, Mpalanga, and Chipanga wards. The Diocese of Central Tanganyika (DCT) through the Development Services Coordination (DSC) also deserves recognition for its collaboration throughout the research phase of the project areas. I would like to thank my family for their unwavering support and encouragement throughout my studies. This work is dedicated to them for their outstanding assistance and care in ensuring my academic success.

I would like to extend my appreciation to my fellow students and all those who contributed to the success of this work. Finally, I express my humble regards to all my friends who supported me in completing this work.

## ABSTRACT

This dissertation investigates the factors affecting the adoption of prepaid water meters in rural Tanzania, aiming to understand their impact on water management. Through a comprehensive study, the research explores the drivers behind customers' decisions to adopt prepaid water meters and their implications for customer behavior and intentions. Surveys were conducted to 120 water customers in the Bahi District Council, supplemented by Key Informants Interviews (KII). Data collection utilized Kobo collect software for both primary and secondary data. Statistical analysis, including logistic regression modeling, identified key adoption factors, including performance expectations, perceived risk, service quality and trust. While customers recognized the benefits of using prepaid water meters for budget control and managing water consumption, concerns about potential higher costs were predominant. Addressing perceived risks, particularly regarding costs, meter lifespan, and security through transparent information and assurance, is vital to foster adoption. Trust in service quality, promptness, and payment convenience emerged as crucial facilitators of adoption. These findings highlight the importance of addressing customer concerns, providing clear information, and fostering trust to promote the adoption of prepaid water meters in rural Tanzania. They have significant implications for shaping targeted policies and strategies to enhance water management in rural areas, ultimately leading to improved access to clean water and sustainable development.

**Keywords:** *Performance Expectancy, Service qualities, Perceived risks, and Effect of trust*

# TABLE OF CONTENTS

## LIST OF FIGURES

## LIST OF TABLES

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AMI | Advanced Metering Infrastructure |
| AMR | Automatic Meter Reading |
| CBM | Community-Based Management |
| CBWSO | Community-Based Waters Supply Organizations |
| DPs | Distribution Points |
| FGDs | Focus Group Discussions |
| HA | Alternative Hypothesis |
| HA | Alternative Hypothesis |
| HO | Null Hypothesis |
| KII | Key Informant Interview |
| MoW | Ministry of Water |
| NGOs | Non-Governmental Organizations |
| O & M | Operations and Maintenance |
| RUWASA | Rural Water Supply and Sanitation Agency |
| SPSS | Statistical Package for Social Sciences |
| SWDs | Smart Water Dispensers |
| URT | United Republic of Tanzania |
| WHO | World Health Organization |
| WM-T | Water Mission Tanzania |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Chapter Overview

This study seeks to explore the factors affecting customers' adoption of prepaid water meter services in Tanzania Rural Areas, A case of Bahi District Council. Key justification of the investigation is emphasized in this chapter, along with background information on the issue, a problem description, research objectives, research questions, the significance of the study, and its scope and organization.

## 1.2 Introduction to the Problem

Globally, the growing demand of water services is increasing day to day due to population change, economic, social, political and environmental factors that lead water use for domestic, irrigation, animal husbandry, recreation, fisheries and electricity power generation (Kabote & John, 2017). Following the scarcity of water supply services in the world, the water metering system were introduced around 1950's in order to make proper management of valuable resource which is water and to ensure sustainability, availability and accessibility of safe drinking water (Kumwenda, 2006).

Heymans, Eales & Franceys, (2014) introduced prepaid water meters as advanced devices that can process, store, and communicate data automatically. Customers pay for water upfront by purchasing and using a prepaid card, which grants access to water upon insertion. When the balance runs out, the system prompts the customer to recharge. Prepaid meters reduce reliance on manual meter reading and billing systems, lowering financial risks for utilities. Zyl, et al. (2018) highlighted the

potential of prepaid water meters to address various challenges and improve water management. They emphasized its role in increasing operational efficiency and transforming water utilities. Early versions of prepaid technologies were first used in urban water systems across Sub-Saharan African countries.

Casarin and Nicollier (2008) noted the initial development of this technology for the electricity sector in South Africa, later adapted for water utilities. Berg and Mugisha (2010) discussed the implementation of prepaid technology in Kampala as a strategy to serve low-income populations, despite initial challenges. Hope, et al., (2011) discussed the growing interest in technology as a solution for sustainable rural water supply, exploring mobile money infrastructure and NFC technology for prepaid systems. Guma (2019) emphasized the profit-driven nature of modern prepaid networks, raising concerns about equitable access to water in rural areas.

Experimental field trials conducted by Water Mission-Tanzania in collaboration with the World Bank aimed to assess the viability of solar-powered water supply systems and smart metering technology to improve financial accountability and promote sustainable water service delivery. Kristen, Isack and Elisekile (2017) observed mixed responses among customers to prepaid meters, with some transitioning from post-paid systems while others resisted the change. Despite arguments for prepaid meters to improve customer relations and revenue, critics raised concerns about technical reliability and costs, especially for economically disadvantaged customers.
Hans, Lukas, and Ali (2020) highlighted the ongoing debate surrounding prepaid water meters, emphasizing the need for further research into factors influencing customer adoption, particularly in rural areas like Bahi district.

### 1.3 Statement of the Research Problem

The adoption of prepaid water meters in rural Tanzania presents a critical challenge in the water sector. Despite being touted as a mechanism to enhance financial accountability and improve water service delivery, challenges persist regarding customer acceptance and adoption. While many water customers have embraced prepaid water metering systems, others remain reluctant, either rejecting post-paid meters in favor of prepaid ones or vice versa (Zyl, at al., 2018; Heymans, Eales, & Franceys, 2014).

Government efforts to strengthen the water sector through legislation such as the Water Supply and Sanitation Act No. 5 of 2019 and the National Water Policy of 2002 have aimed to improve revenue collection and manage rural water schemes (URT Water report, 2022). However, the effectiveness of these measures hinges on the widespread adoption of prepaid water meters, which offer improved financial control and management of water schemes (Hans, Lukas, & Ali, 2020). Despite existing literature on prepaid water metering systems in Tanzania, much of it focuses on technical aspects and supply-side challenges (Zyl, at al.,2018). Studies on consumer perceptions of switching from post-paid to prepaid electricity exist but do not fully address the unique challenges of prepaid water meter adoption in rural areas (Mahapatra & Golhar, 2018; Mushi, 2014; Quayson, 2012).

Similarly, while some research explores solar-powered prepaid water systems, gaps remain in understanding the factors influencing customer adoption in rural Tanzania (Kristen, Isack & Elisekile, 2017; Hans, Lukas & Ali, 2020). The limited availability of comprehensive research on prepaid water meter adoption in rural Tanzania has

delayed customers' ability to enjoy the benefits of this technology. Additionally, the applicability of frameworks such as the Unified Theory of Acceptance and Use of Technology (UTAUT) to address adoption factors remains largely unexplored. Therefore, this study seeks to investigate the factors affecting customers' adoption of prepaid water meter services in rural Tanzania, focusing on the Bahi District.

## 1.4 Research Objectives

### 1.4.1 General Objective

Generally, the study aimed to assess the key factors affecting customers' adoption of prepaid water meter services in rural Tanzania; A case of Bahi District Council.

### 1.4.2 Specific Objectives

i) To assess how performance expectancy affects the adoption of prepaid water meter services.

ii) To assess service quality impact on the adoption of prepaid water meter services.

iii) To assess the influence of customers' perceived risk on the adoption of prepaid water meter services.

iv) To assess the effect of trust in prepaid water meter adoption.

## 1.5 Research Questions

This study was guided by the following research questions.

i) Does performance expectancy have an impact on the adoption of prepaid water meter services?

ii) How do service qualities affect the adoption of prepaid water meter services?

iii) To what extent perceived risks by customers influence the adoption of prepaid water meter services?

iv) Does trust in the system can influence the adoption of prepaid water meter services?

## 1.6 Significance of the Study

This study offers valuable insights for enhancing the use of prepaid water meter services in Tanzania rural areas. It provides recommendations aimed at improving financial management and facilitating the successful adoption of prepaid water meters. Additionally, the study offers practical strategies for addressing obstacles that may hinder the adoption process. The findings contribute to the existing knowledge base and serve as a resource for future researchers and stakeholders interested in this area. It is relevant to mention that this study forms part of the researcher's pursuit of a Master's Degree in Project Management from the Open University of Tanzania (OUT).

## 1.7 Chapter Summary

The researcher structured this dissertation into five chapters. The first chapter provides background information on the problem at hand. The second chapter presents a literature review of scholars' perspectives. The third chapter outlines the research methodology employed. The fourth chapter presents the findings and subsequent discussion. Finally, the fifth chapter presents the conclusion and recommendations.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Chapter Overview

This chapter covers the definition of key study concepts, relevant theories guiding the study, and empirical literature on the problem, as well as identifying gaps in knowledge. It also includes the conceptual framework designed by the researcher to conduct the study.

## 2.2 Definition of Key Study Concepts

### 2.2.1 Performance Expectancy

This concept refers to individuals' perceptions of how using a particular technology or system will enhance their performance or productivity in completing tasks or achieving desired outcomes. It reflects the extent to which individuals believe that the technology will be beneficial and contribute positively to their work or activities (Venkatesh, Morris, Davis & Davis, 2003).

### 2.2.2 Service Quality

Service quality encompasses customers' perceptions of the overall excellence or superiority of the service provided by an organization. It includes various dimensions such as reliability (consistency and dependability of the service), responsiveness (willingness to help and provide prompt service), assurance (competence, courtesy, and credibility of service personnel), empathy (caring and individualized attention shown to customers), and tangibles (physical facilities, equipment, and appearance) (Parasuraman, Zeithaml & Berry, 1985).

### 2.2.3 Perceived Risks

Perceived risks refer to customers' subjective evaluations of the potential negative consequences or uncertainties associated with adopting and using a particular technology or service. These risks can include financial risks (costs and expenses associated with adoption), performance risks (concerns about the reliability and effectiveness of the technology), social risks (potential negative social consequences or embarrassment), and security risks (privacy and data security concerns) (Venkatesh, at al., 2003).

### 2.2.4 Effect of Trust

The effects of trust represent the influence of customers' confidence, credibility, and reliance on the technology or service provider. Trust is a critical factor that shapes customers' attitudes and intentions towards adopting and using a technology. It reflects customers' beliefs about the reliability, integrity, and benevolence of the technology or service provider, influencing their willingness to take risks and engage in transactions (Venkatesh, at al., 2003).

### 2.2.5 Prepaid Water Meter

These are advanced water meters that are capable of processing, storing, and communicating data without the interventions of human beings (Heymans, Eales, & Franceys, 2014). Prepaid meters are self-regulatory water meters implemented as an alternative to the post-paid water meter that requires a customer to pay for the units of water to be consumed (Zyl, at al., 2018).

## 2.3 Theoretical Review

In support of the study concerning the factors affecting customers' adoption of

prepaid water meter services in rural Tanzania, some theories complement it. These theories work in support of addressing the major issues that can be encountered in different perspectives and knowledge on the use of prepaid water meter services. The theory selected that related to this study was Unified Theory of Acceptance and Use of Technology (UTAUT).

### 2.3.1 Unified Theory of Acceptance and Use of Technology

It is a model suggested by (Venkatesh, at al.,2003) which is used to explore the factors affecting the intention to adopt technology. This model has been used widely in investigating information technology adoption. UTAUT model suggests that there is a set of factors that influence the intention of individual user acceptance. Those factors are classified into two kinds of variables, the first one is called external variable (Independent variables) which includes those factors that play a significant role in user acceptance, including Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). The other category represents the moderator variable or control variable which includes age, gender, experience, and Voluntariness of Use. Figure 2.1 shows the UTAUT model.

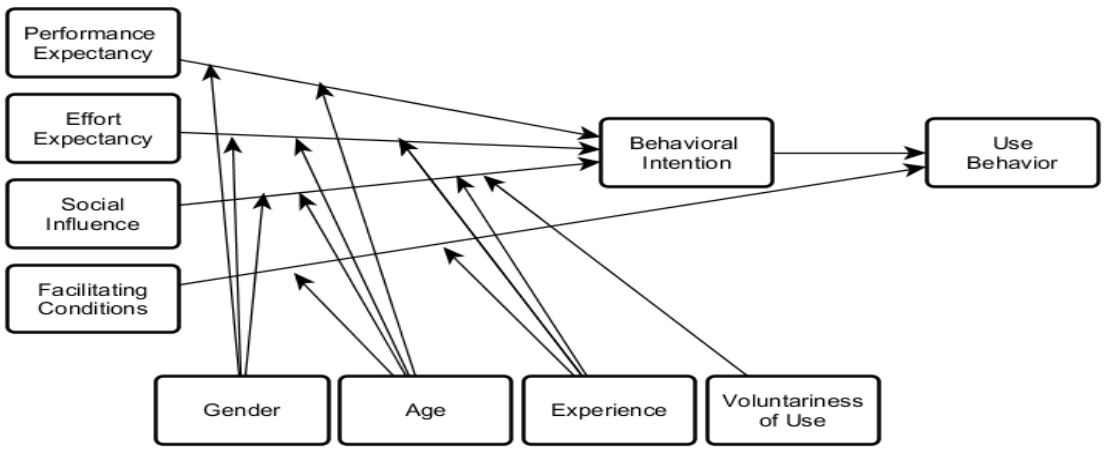


**Figure 2.1: Unified Theory of Acceptance and Use of Technology**
**Source**: Venkatesh, at al., 2003).

**Performance Expectancy**: This concept refers to individuals' perceptions of how using a particular technology or system will enhance their performance or productivity in completing tasks or achieving desired outcomes. It reflects the extent to which individuals believe that the technology will be beneficial and contribute positively to their work or activities (Venkatesh, Morris, Davis, & Davis, 2003). In the context of prepaid water meters, customers' perceptions of the benefits of these meters in managing water consumption and budget align with performance expectancy.

**Effort Expectancy:** Effort expectancy reflects the degree of ease associated with using a technology. It refers to users' perceptions of how easy or difficult it is to use the technology (Venkatesh, at al., 2003). Effort Expectancy can be associated with the perceived risks construct in the UTAUT framework. Perceived risks, such as concerns about usability or potential negative consequences of technology usage, can influence users' perceptions of effort expectancy. In the context of prepaid water meters, effort expectancy could relate to customers' perceptions of the ease of using the metering system, including factors such as installation, reloading credits, and monitoring water usage.

**Social Influence (SI):** The degree to which users perceive that important others believe they should use the technology (Venkatesh, at al., 2003). Trust can be related to the social influence construct in the UTAUT framework. Trust in the system or service provider can influence users' perceptions of social influence and their intention to adopt the technology.

**Facilitating Conditions (FC):** The extent to which users believe that organizational and technical infrastructure exists to support the use of the technology (Venkatesh, at al., 2003). Facilitating conditions, it can be conceptualized as part of the broader construct Service Quality. Service Quality encompasses customers' perceptions of the overall excellence or superiority of the service provided by an organization. It includes various dimensions such as reliability, responsiveness, assurance, empathy, and tangibles (Parasuraman, Zeithaml & Berry, 1985). Service quality can contribute to users' perceptions of the overall facilitation of technology usage.

#### 2.3.1.1 Relationships Between Constructs

The relationship between constructs within the UTAUT framework is pivotal for understanding users' behavioral intentions and actual usage behavior towards adopting prepaid water meter services in rural Tanzania. Performance Expectancy, Effort Expectancy, Facilitating Condition, and Social Influence interact dynamically to affect customers' decisions regarding the adoption of prepaid water meters. For instance, Social Influence may influence customers' views of the Performance Expectancy of prepaid water meters in the system's reliability and the Facilitating Conditions. Additionally, Effort Expectancy such as concerns about meter reliability or data security may affect customers' trust in the system and their willingness to adopt the technology.

#### 2.3.1.2 Empirical Support

Empirical studies have demonstrated the effectiveness of the UTAUT framework in explaining technology adoption behavior across various contexts. While specific studies focusing on prepaid water meter adoption in rural Tanzania may be limited,

research conducted in other domains has provided valuable insights. For example, studies in the healthcare, education, and banking sectors have shown that the UTAUT model effectively predicts users' intentions and behavior towards adopting new technologies. This empirical support underscores the applicability of the UTAUT framework in understanding customers' adoption of prepaid water meter services in rural areas.

#### 2.3.1.3 Applicability to the Study

The UTAUT framework is highly applicable to the study of factors influencing customers' adoption of prepaid water meter services in rural Tanzania. By leveraging this theoretical framework, researchers can systematically examine the influence of performance expectancy, effect of trust, perceived risks, and service quality on customers' intentions to adopt prepaid water meters. This approach allows for a comprehensive analysis of the factors shaping customers' adoption behavior and provides valuable insights for policymakers, water utility providers, and other stakeholders involved in rural water management.

#### 2.3.1.4 Limitations and Criticisms

While the UTAUT framework offers a robust theoretical foundation for understanding technology adoption behavior, it is not without limitations. Critics have pointed out that the model may not fully capture the complexity of user behavior and that additional factors may affect technology adoption in specific contexts. Additionally, the applicability of the UTAUT framework to rural areas in developing countries such as Tanzania may require further validation due to differences in socio-economic factors, infrastructure, and cultural norms.

#### 2.3.1.5 Implications for Research and Practice

The findings from research applying the UTAUT framework in the context of prepaid water meter adoption have significant implications for both research and practice. From a research perspective, studies exploring the factors affecting customers' adoption behavior can contribute to a deeper understanding of technology adoption processes in rural settings. These insights can inform the development of targeted interventions and policies aimed at promoting the adoption of prepaid water meter services. For practitioners and policymakers, understanding the key drivers and barriers to adoption can help in designing effective strategies to facilitate the uptake of prepaid water meters, ultimately improving access to clean water and enhancing sustainable water management practices in rural areas.

By addressing these key areas in the theoretical literature review, researchers can provide a comprehensive understanding of the theoretical framework guiding their study and its relevance to the specific context of prepaid water meter adoption in rural Tanzania.

## 2.4 Empirical Review

### 2.4.1 General Studies

The emergence of prepaid water meters in the early 2000s marked a significant shift in water utilities' approach to providing predictive and proactive water services (Crainic, 2012). Often referred to as Advanced Metering Infrastructure (AMI), these systems serve as a crucial link between water suppliers and consumers, facilitating accurate meter readings and billing processes. By utilizing analytical software, AMI systems provide valuable insights into water consumption patterns, leading to more

efficient resource management. Moreover, AMI encompasses Automatic Meter Readings (AMR), streamlining data collection and reducing the need for manual meter reading visits (Gambe, 2015; Thulsidas, 2019).

### 2.4.2 Studies in African Countries

In a study examining consumer perception and acceptability of prepaid metering in the Accra West Region, Quayson (2012) aimed to determine the level of consumer acceptability towards prepaid meters and identify strategies to promote their selection. The findings revealed that consumers consider several factors when accepting or selecting prepaid meters, including user-friendliness, durability, and access to prepaid meter vending points. Strengths of the study include its focus on consumer perception and the identification of key factors influencing meter selection. However, a limitation is the lack of exploration into potential barriers to prepaid meter adoption.

Mburu and Sathyamoorthi (2014) conducted a case study on consumer perception following the switch from post-paid to prepaid electricity metering by Botswana Power Corporation. The study revealed that consumers embraced prepaid meters due to associated benefits. Positive reasons for selecting prepaid meters included improved payment models. However, challenges such as network issues and service quality were identified. The study recommended timely communication of changes to address negative consumer perceptions.

In another study, Mahapatra and Golhar (2018) examined consumer perception and satisfaction following the switch from post-paid to prepaid electricity metering. The

study found that prepaid meters enhanced real-time service and reduced customer complaints regarding billing issues. Consumer perception of prepaid meters was positive, indicating satisfaction with the service. Strengths of the study include its focus on consumer satisfaction, but a limitation is the lack of exploration into potential challenges associated with prepaid meter adoption.

### 2.4.3 Empirical Studies in Tanzania

Salim (2016) conducted a study on the factors affecting consumers' willingness to pay for water services in the west district, Zanzibar. The study revealed that the availability of water services in the area was low, and consumers faced challenges such as sabotage of water infrastructure, reluctance to pay water bills, lack of modern equipment, and rapid population growth. Additionally, the study found that women and girls, in particular, spent significant time and effort fetching water from distant sources. Strategies adopted by consumers to pay water bills included the establishment of rules and regulations to negotiate payment. The study recommended government support for consumers willing to pay their water bills.

Darra (2019) investigated the willingness to pay for improved conservation of water catchment in Hai District, Tanzania. The study revealed a decline in water flows in streams and rivers, indicating rampant environmental degradation in catchment areas and buffer zones. Despite this, the study found high levels of awareness among respondents regarding rules and regulations governing water catchment conservation. Consequently, the study concluded that efforts to improve water catchment conservation should focus on enforcing existing regulations and increasing public awareness.

Khadija (2020) investigated the factors affecting the adoption of electronic procurement among public procuring entities in Tanzania, focusing on TANESCO. The study highlighted the significant role of technological factors in the adoption of E-procurement, particularly in TANESCO. The applicability and usability of technology were identified as crucial determinants of preference for E-procurement. Moreover, E-procurement was perceived to facilitate organizational transformation and improve workplace practices.

## 2.5 Research Gap

The existing literature on the shift from post-paid to prepaid water meters primarily focuses on technical aspects beneficial to suppliers, such as revenue collection and cost recovery (Kumwenda, 2006). However, these studies often overlook the interests and concerns of water users, particularly in rural areas of Tanzania. Additionally, while some research has explored factors influencing consumers' willingness to pay for water services (Salim, 2016), and the adoption of electronic procurement among public entities in Tanzania (Khadija, 2020), there remains a gap in understanding the specific factors influencing customers' adoption of prepaid water meter services in rural Tanzania.

Therefore, there was a need for further investigation into the Factors Affecting Customers' Adoption of Prepaid Water Meter Services in Tanzania Rural Areas, utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) model. This study was aimed to fill this gap and provide valuable insights into the adoption behavior of rural customers regarding prepaid water meters in Tanzania.

## 2.6 Conceptual Framework

Figure 2.3 provides the conceptual framework. The goal of this study was not to replicate the UTAUT study as in (Venkatesh, at al.,2003). Instead, this research aimed to ascertain what factors considerably affect customers to adopt prepaid water meter services. Therefore, additional constructs selected from water services literature were taken into the research structure, which was addressed as follows. Based on revising different scholarly literature reviews the following proposed model was adopted. The below Figure shows the proposed model which examines the relationship between the dependent, moderated and independent variables.

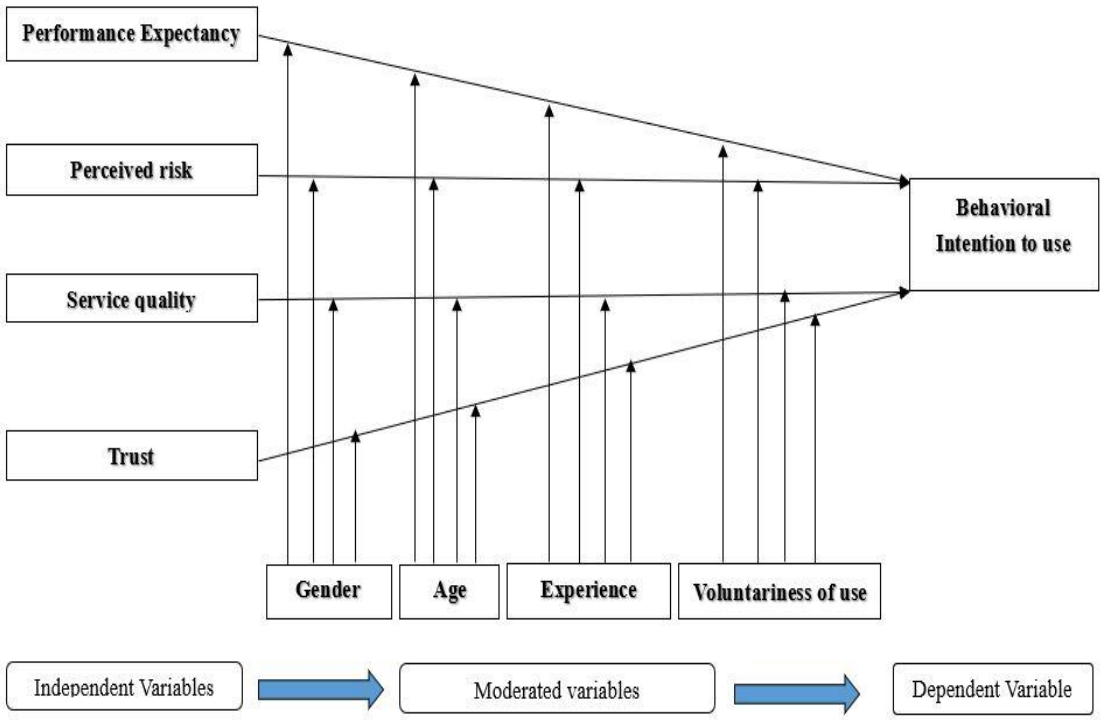


**Figure 2.2: Conceptual Framework**
**Source:** Modified from Venkatesh, at al., (2003).

**Independent Variables:**

(a) Performance Expectancy (PE): Customers' perceptions of the extent to which using prepaid water meters will help them achieve gains in managing their water

consumption and budget control.

(b) Perceived Risks: Customers' perceptions of potential negative consequences associated with adopting prepaid water meters, such as financial risks or concerns about privacy and data security.

(c) Service Quality: Customers' evaluations of the overall quality and reliability of the prepaid water meter services, including factors such as responsiveness, accuracy of water meter readings, and ease of use.

(d) Effect of Trust: The impact of Customers' trust in the reliability, security, and credibility of the prepaid water meter system and its providers on their adoption behavior.

**Moderated Variables;**

(a) Gender: Differences in gender may moderate the relationship between the independent variables and behavior intention to use prepaid water meters. For example, gender may influence how individuals perceive the benefits and risks of adopting the technology.

(b) Age: Variations in age may moderate the impact of the independent variables on behavior intention to use prepaid water meters. Different age groups may have distinct perceptions and preferences regarding technology adoption.

(c) Experience: Users' prior experience with similar technologies may moderate their willingness to adopt prepaid water meters. Those with more experience may be more comfortable with technology adoption, while novices may exhibit greater apprehension.

(d) Voluntariness to Use: The degree to which users perceive the adoption of

prepaid water meters as voluntary may moderate their behavior intention to use. Users who perceive adoption as voluntary may exhibit higher levels of intention to use.

**Dependent Variable:**

Behavior Intention to Use: Customers' intention to adopt prepaid water meter services' in Tanzania rural areas, influenced by the independent variables and moderated by demographic and situational factors. Higher levels of behavior intention to use indicate a greater likelihood of actual adoption behavior. Through examining the relationships between these variables within the conceptual framework of UTAUT and considering the moderating effects of demographic and situational factors, this study aims to provide the understanding of the factors affecting customers' adoption of prepaid water meter services' in Tanzania rural areas.

## 2.7 Theoretical Framework

In this framework, the independent variables are factors affecting customers' adoption of the prepaid water meter system, whereas the dependent variables are the Behavior Intention (BI) to Adopt/Accept prepaid water Meter services.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Chapter Overview

In this chapter, the researcher discussed the research philosophy, research design, sampling methods, study area, data collection methods, and data analysis techniques utilized in the research.

## 3.2 Research Philosophy

The research philosophy refers to the beliefs, assumptions, and principles guiding the approach to a study (Smith, 2019). In this study, a pragmatic research paradigm was employed, allowing for the utilization of both quantitative and qualitative methods depending on the research questions and context (Johnson & Onwuegbuzie, 2004). This pragmatic approach often leads to a mixed-method approach, combining different data types and analysis methods (Creswell & Plano Clark, 2018). The researcher adopted a problem-solving mindset, aiming to find practical ways to achieve various research objectives (Tashakkori & Teddlie, 2003).

For objectives (i) to (iv), a mixed-method approach was required to comprehensively assess the factors influencing the adoption of prepaid water meter services. This approach allowed for a deeper exploration of the complex relationships between variables such as performance expectancy, service quality, perceived risk and trust, thereby providing a more holistic understanding of customer behavior (Creswell, 2017). By combining quantitative data analysis with qualitative insights, the researcher can gain valuable insights into the nuances of customer perceptions and behaviors related to prepaid water meter adoption (Teddlie & Tashakkori, 2009).

Triangulation, a data collection and analysis technique combining both qualitative and quantitative data, will be employed to enhance the validity and reliability of the findings (Denzin & Lincoln, 2018).

### 3.3 Research Design

In this study, a cross-sectional research design was employed to gather data from respondents at a single point in time (Kothari, 2004). This design was chosen for its cost-effectiveness and time efficiency, given the researcher's limited resources. The study focuses on assessing the factors affecting customers' adoption of prepaid water meter services in rural Tanzania. Data were collected from water users in three selected villages (Makanda, Chidilo, and Chiguluka), as well as from CBWSO leaders and RUWASA-Bahi staff. Data collection occurred between August 4, 2023, and September 4, 2023, following a systematic plan to ensure validity in addressing the research questions (Parahoo, 2014).

### 3.4 Area of Research

The study was conducted in three villages namely Makanda, Chidilo, and Chiguluka within Bahi district, Dodoma. This area was chosen due to the lack of existing research on water supply challenges in Bahi district, particularly regarding prepaid water meter services. Despite the adoption of prepaid meters in these villages, little is known about the factors affecting customer acceptance. Thus, the study aimed to investigate the factors affecting customer adoption of prepaid water meter services in rural Tanzania, focusing on Bahi district council.

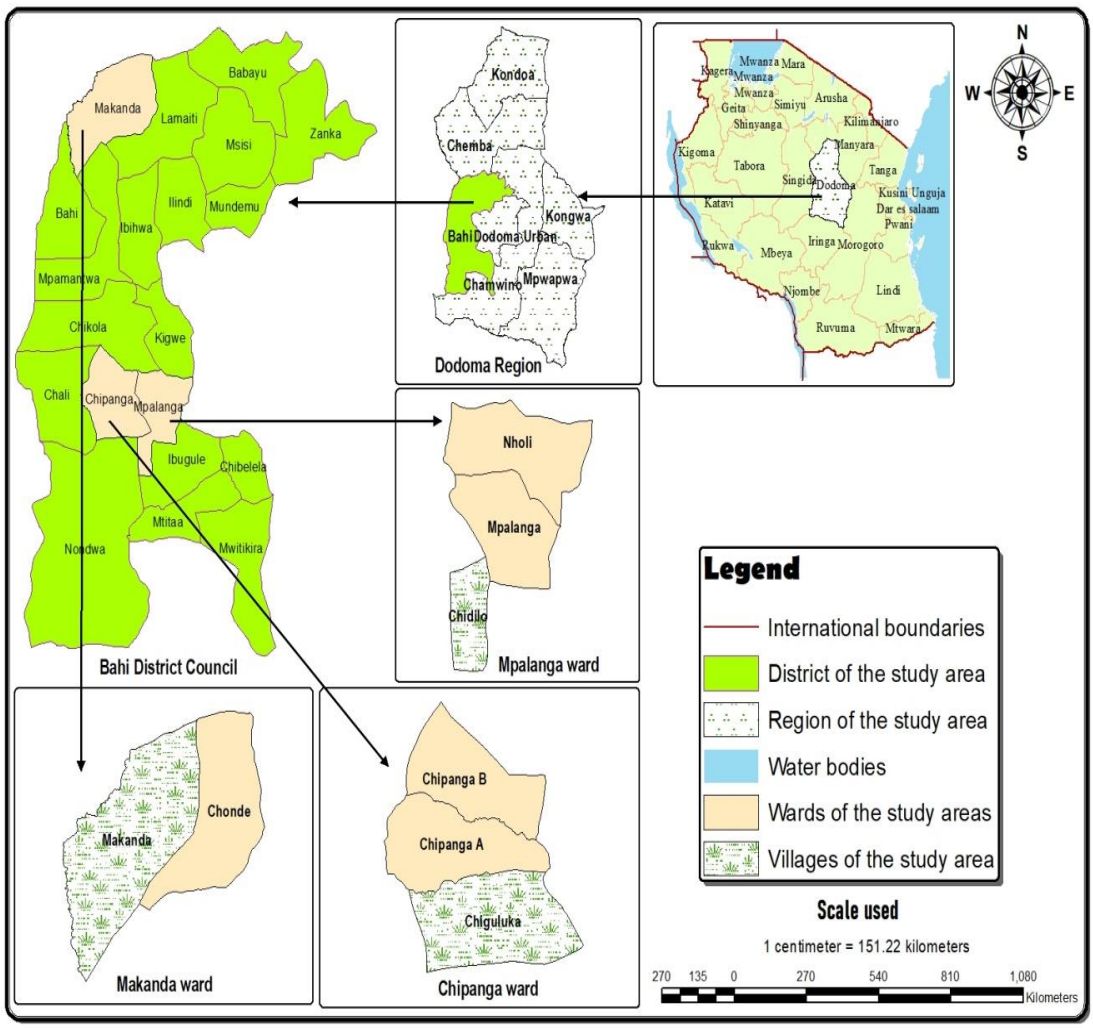


**Figure 3. 1: Map of Dodoma Region that shows the location of the Study area**
**Source:** Own generated by using ArcGIS (*Geographical Information System*) by the researcher

## 3.5 Sampling Methods

### 3.5.1 Sampling

Sampling involves examining a specific subset of a population (Krishnaswami, 2003), and sample design refers to the methodology used for selection (Kothari, 2004). According to the e-water report (2023), only 2038 households in three study areas had shifted from post-paid to pre-paid water meters, out of a total of 3224 households exposed to pre-paid water meter services. Each household is considered

a customer as one prepaid water meter card is provided per household. To capture insights, interviews were conducted with households that had switched and those exposed to pre-paid meters. A random sample of 120 customers/households was interviewed, including 97 pre-paid and 23 post-paid users, as well as non-users. Key informant interviews were also conducted with CBWSO, Village Government, and RUWASA-Bahi staff, selected through purposive sampling due to the population size.

### 3.5.2 Sampling Frame

Three villages namely Chidilo, Chiguluka, and Makanda were selected for the study, encompassing all water customers (prepaid and postpaid). The population distribution in the study area is outlined in Table 3.1, with the number of households serving as a representation of the water customer base. The total number of households across the three villages was 3,226, while the overall population encompassed 16,536 individuals.

**Table 3.1: Distribution of Population in the Study Areas**

| Ward | Village | Total number of Household | Total number of people | Total number of households/customers use prepaid water meters |
|---|---|---|---|---|
| Makanda | Makanda | 1,702 | 8,175 | 958 |
| Mpalanga | Chidilo | 732 | 3,841 | 567 |
| Chipanga | Chiguluka | 792 | 4,520 | 513 |
| | **Total** | **3,226** | **16,536** | **2,038** |

**Source:** Ward and Village Government Offices, 2023, and (e-water report, 2023).

### 3.5.3 Sampling Unit

The sampling unit comprised water customers in the selected study areas, chosen via random proportional sampling, with the household head or representative as the

main unit.

### 3.5.4 Sample Size

A sample size is a number that is chosen to represent the entire population as a sample. The selected sample should have the same characteristics as the entire group and should directly represent it (Kumar, 2013). The study targeted 100 respondents but interviewed 120 water customers representing households to account for variations in household numbers across village and ensure statistical reliability. In addition, 13 Key Informants interviewed were CBWSO leaders and the RUWASA team from Bahi District. Sekaran (2003) advises that too large a sample size could become a problem and recommends sample sizes between 30 and 500. Hence, Yamane's (1967) formula was applied in determining the appropriate portion of respondents to represent the study population.

Where

*n* is the sample size,

*N* is the total target population, in this case, the 3,226 population size was obtained from three selected villages, and

*e* is the error rate in this case 10% or 0.1.

The sample size for this study was calculated as shown below.

$$n = \frac{N}{1 + N(e)^2}$$

N = the Total Population

e = the margin of error (10% has been used to obtain the best sample given the population size)

n = the sample size

$n$ = 3,226 /1+ 3,226 (0.01)

n = 99.99

Therefore, the sample size was **100** respondents, but the researcher stretched to **120** respondents/households interviewed.

The choice to interview 120 households for this research was strategically founded on the principles of stratified sampling and proportional representation. Given the diverse rural areas such as Makanda, Chidilo, and Chiguluka, a stratified approach was essential to account for variations in household numbers and to accurately capture the intricacies of adoption factors across these regions.

**Table 3.2: Proportional Sample of Respondents by Villages in the Study Area**

| Village/Study Area | Frequency | Percent |
|---|---|---|
| Makanda | 48 | 40.0 |
| Chiguluka | 40 | 33.3 |
| Chidilo | 32 | 26.7 |
| **Total** | **120** | **100** |

**Source:** Researcher (2023).

In addition, Roscoes (1975) suggests that a sample size ranging from 30 to 500 is suitable for representing an entire population. In line with this, a random sample of 3,226 households was selected, comprising 97 prepaid water meter adopters and 23 Non-prepaid water meter adopters.

### 3.5.5 Sampling Procedures

Random sampling was used to capture adopters and non-adopters of prepaid water meters, with proportional sampling from three villages in each study area. This approach ensured representation from geographically dispersed areas, with 120 customers participating in the study.

### 3.6 Data Types and Sources

The study used both qualitative and quantitative data from primary and secondary sources of data. Primary data were interviews, key informant interviews, and field observation. Also, the secondary was a documentary review.

### 3.7 Data Collection Methods

For gathering primary data, the researcher employed structured questionnaires that were composed of both open and closed-ended questions. This was done through the use of Kobo Toolbox, which is a mobile data collection tool, as well as field observation and key informant interviews. In addition, secondary data was obtained from relevant documents such as the District water infrastructure assessment report, e-water report, and data collection tools used by stakeholders. To ensure accuracy and usefulness, we conducted pre-testing and made necessary changes to the Kobo survey form. Our data collection process took place over two weeks in August 2023.

#### 3.7.1 Interview

Interviews served multiple objectives in this study. Structured questionnaires administered via digital devices such as mobile phones and tablets as data collection tools, specifically Kobo Toolbox facilitated the assessment of performance expectancy, service quality impact, and trust in prepaid water meter adoption (McNamara, 1999). Additionally, semi-structured interviews allowed for exploring customers' perceived risk associated with prepaid water meter services.

#### 3.7.2 Key Informant Interview

Key informant interviews were essential for gaining practical insights and expert opinions, aligning with objectives (ii) and (iv). By engaging with CBWSO leaders,

government representatives, and RUWASA-Bahi staff, the study gathered qualitative data on service quality, trust, and potential risks involved in adopting prepaid water meters.

### 3.7.3 Field Observation

Field observations were particularly useful for addressing objective (iii) regarding customers' perceived risk. By observing behaviors and interactions in natural settings, researchers gained firsthand insights into how customers navigate concerns about prepaid water meter adoption. This method also complemented questionnaire data by providing validation through consistent observations and informal discussions.

### 3.7.4 Documentary Review

The documentary review method supported various objectives by providing contextual information and background data. By analyzing reports on water infrastructure, district water assessments, and data collection tools, the study enriched its understanding of performance expectancy, service quality, perceived risk, and trust factors influencing prepaid water meter adoption (Chinelo, 2016).

**Table 3.3: Data Collection Methods and Tools**

| Data source | Data collection methods | Data collection tools |
|---|---|---|
| Primary Data | Interview | Questionnaire via Kobo as a mobile data collection tool |
| | Key informants' interviews (KII's) | Checklist |
| | Field observation | Checklist |
| Secondary data | Documentary review | Checklist |

**Source:** Researcher (2023).

### 3.8 Data Processing, and Analysis

#### 3.8.1 Data processing

To transform the data collected from the KoBo form/questionnaire, the researcher utilized IBM-SPSS Statistics version 25 and Microsoft Excel. It was crucial to ensure data quality by performing data cleaning, which involved editing or removing incomplete and incorrect data. This made the data usable and suitable for statistical analysis.

#### 3.8.2 Data Analysis

The data for this study was collected using a questionnaire survey and analyzed using KoBo Toolbox and IBM-SPSS Statistics version 25. Before analyzing the data, reliability, and normality were tested using Cronbach's alpha, skewness, and kurtosis tests to ensure that they met the requirements. Descriptive statistics were used to analyze the percentage, mean, median, and frequency distribution of all variables that were then subjected to a correlation test to demonstrate the relationship between independent factors and dependent variables.

To address any gaps in the analysis, Key Informants' Interviews (KII's) were conducted and the data from these interviews, along with open-ended questions, were analyzed using qualitative analysis. This involved analyzing the meaning and contextual relationship of the text data and/or concepts to make qualitative interpretations and conclusions (Stemler, 2015). To determine the impact of the independent variables on the dependent variable, logistic regression analysis was utilized. This analysis was also employed to rank the factors. A model incorporating the variables of Performance Expectancy (PE), Service Quality (SQ), Perceived

Risks (PR), and Effect of Trust (ET) guided this study. These variables interact to affect customers' adoption of prepaid water meter services in Tanzania rural areas. The model can be represented as follows:

$PA = \beta 0 + \beta 1PE + \beta 2SQ + \beta 3PR + \beta 4ET + \varepsilon$

Where:

i) PA represents the Prepaid Water Meter Adoption.

ii) PE denotes Performance Expectancy, reflecting the perceived benefits and advantages customers associate with using prepaid water meter services.

iii) SQ stands for Service Quality, indicating the level of satisfaction and reliability customers experience with the prepaid water meter services.

iv) PR represents Perceived Risks, capturing customers' perceptions of potential drawbacks, uncertainties, or negative consequences associated with adopting prepaid water meter services.

v) ET denotes Effect of Trust, reflecting the level of confidence and reliance customers have in the prepaid water meter system and service provider.

vi) $\beta 0$ represents the intercept, $\beta 1$ to $\beta 4$ are the coefficients for each variable, and $\varepsilon$ is the error term.

This model provides a framework for analyzing the factors affecting customers' decisions to adopt prepaid water meter services, facilitating a deeper understanding of adoption behaviors in rural Tanzania.

# CHAPTER FOUR

# FINDINGS, RESULTS AND DISCUSSION

## 4.1 Introduction

This chapter presents the results of the study and interprets the findings through a discussion based on the results. Pie charts, graphs, and tables are used to present the results obtained from the respondents. The main aim of this chapter is to show the findings of the study.

## 4.2 Demographic Variables

The respondents' demographic variables discussed include sex, age, marital status, education level, income level, source of income, and experience using postpaid and prepaid water meters.

### 4.2.1 Sex of Respondents

The respondents of this study comprised 58 female and 62 males. Figure 4.1 presents the sex of the respondents.

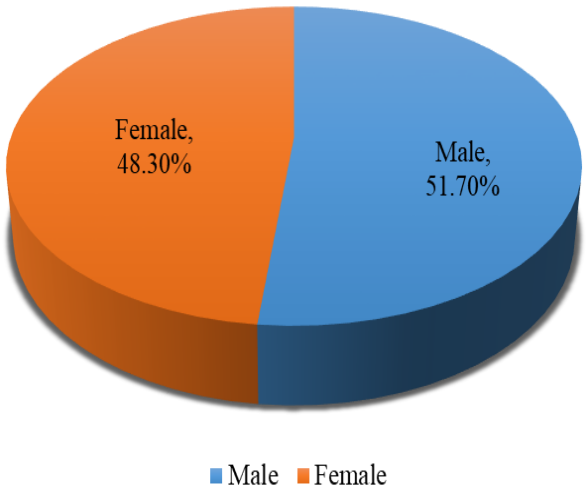


**Figure 4.1: Sex of Respondents**
**Source:** Survey data, (2023).

According to Figure 4.1, 51.7% of the respondents were male, while 48.3% of the respondents were female. The frequency for males was 62, and for females, it was 58. This indicates that there were more male participants in the study than female participants. It also suggests that males dominate most households, which is consistent with Quay son's (2012) findings.

### 4.2.2 Age of the Respondents

The age range of participants in this study was as follows: 18-30 (30 respondents), 31-40 (29 respondents), 41-50 (29 respondents), 51-60 (24 respondents), and 61 and above (8 respondents). Table 4.1 displays this information.

**Table 4.1: Age of Respondents**

| S/n | Age | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | 18-30 | 30 | 25 |
| 2 | 31-40 | 29 | 24 |
| 3 | 41-50 | 29 | 24 |
| 4 | 51-60 | 24 | 20 |
| 5 | 61 and above | 8 | 7 |
| | **Total** | **120** | **100** |

**Source:** Survey, (2023).

Based on Table 4.1, the age range of the participants in this study varied from 18 to 30 years, which accounted for 25% of the sample. Those aged between 31 and 40 years constituted 24% of the sample, while those aged between 41 and 50 years comprised 24% as well. Those between 51 and 60 years of age accounted for 20% of the sample, and those aged 61 years and above made up 7% of the sample. Therefore, the majority of water users surveyed were between 18 and 50 years old.

### 4.2.3 Marital Status

The study examined the marital status of respondents about their usage of prepaid water meters. Among the users of prepaid water meters, 70.1% were married

monogamous individuals, while 65.2% of non-users were also married monogamous. This represents a total of 69.2% of the respondents. Additionally, 7.2% of prepaid water meter users and 8.7% of non-users were married polygamous individuals, accounting for a total of 7.5%. Furthermore, 4.1% of prepaid water meter users and 4.3% of non-users were single, resulting in a total of 4.2%. Moreover, 8.2% of prepaid water meter users and 4.3% of non-users were separated, making up a total of 7.5%. Lastly, 10.3% of prepaid water meter users and 17.4% of non-users were widowed, contributing to a total of 11.7%. The figure below presents the marital status of the respondents.

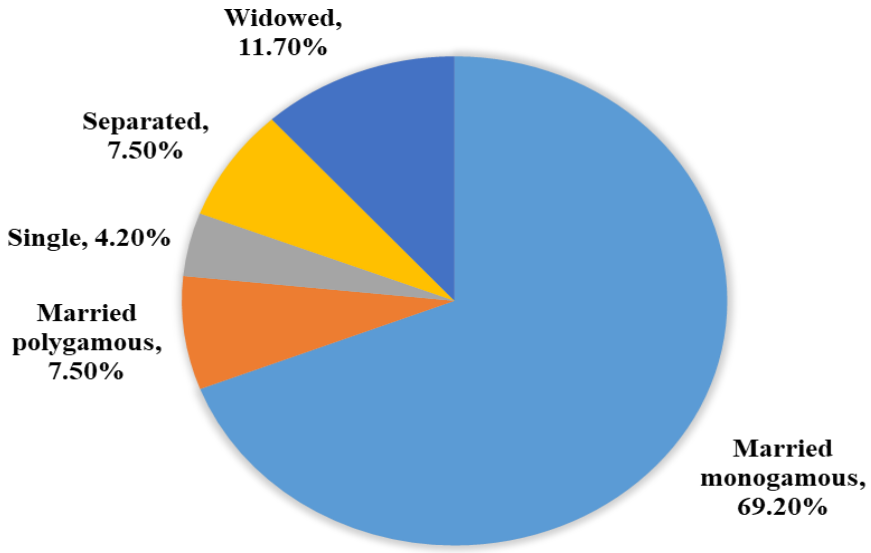


**Figure 4.2: Marital Status of the Respondents**
**Source**: Field data, (2023).

The findings are visually represented in Figure 4.2, which illustrates the marital status distribution among the 120 respondents. It can be observed that the majority of respondents, 69.2%, were married monogamous individuals. Additionally, 7.5% were married polygamous, 4.2% were single, 7.5% were separated, and 11.7% were widowed.

### 4.2.4 Adopter and Non-Adopter of Prepaid Water Meter Services at the Household Level

From the data, it can be observed that out of the total 120 households surveyed, 95 were headed by males and 25 were headed by females. This indicates that a majority of the households surveyed were male-headed. When it comes to the adoption of prepaid water meters, 77 households headed by males were users of prepaid water meters, accounting for 79.4% of the male-headed households surveyed. On the other hand, 18 households headed by males were non-users of prepaid water meters, representing 20.6% of the male-headed households surveyed.

Among the female-headed households, 20 were users of prepaid water meters, accounting for 78.3% of the female-headed households surveyed. Additionally, 5 female-headed households were non-users of prepaid water meters, representing 21.7% of the female-headed households surveyed.

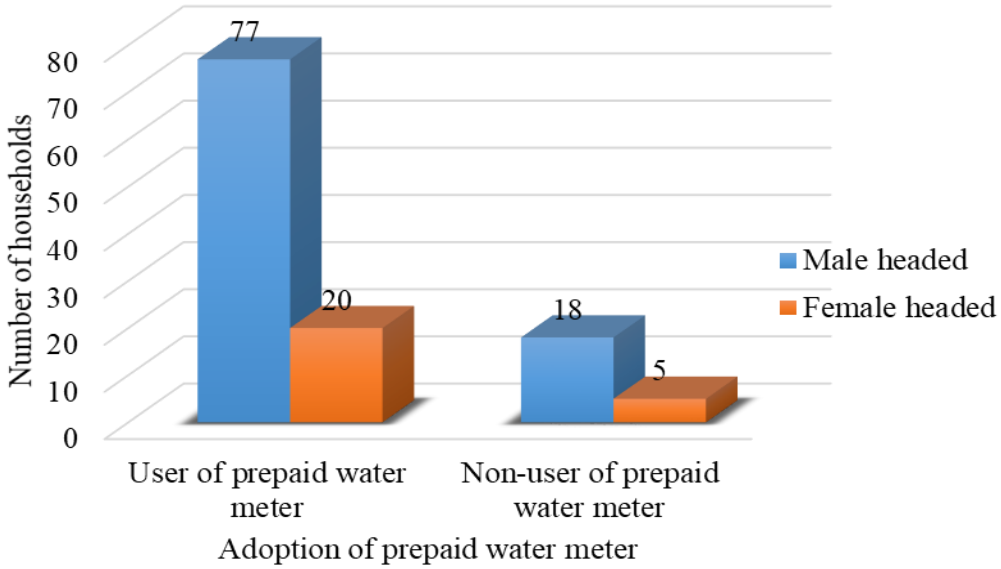


**Figure 4.3: Adopters and Non-Adaptors of Prepaid Water Meters at Household**
**Source**: Field data, (2023).

Overall, the data suggests that there is a relatively high adoption rate of prepaid water meters among both male-headed and female-headed households in the rural areas of Tanzania. However, it is worth noting that there is a slightly higher adoption rate among male-headed households compared to female-headed households.

### 4.2.4 Education Level of the Respondents

The surveyed data shows that 2 respondents possess a college/tertiary education, 25 possess secondary education, and 71 possess primary education, while the remaining 22 have not gone to school. Figure 4.4 presents the education level of the respondents.

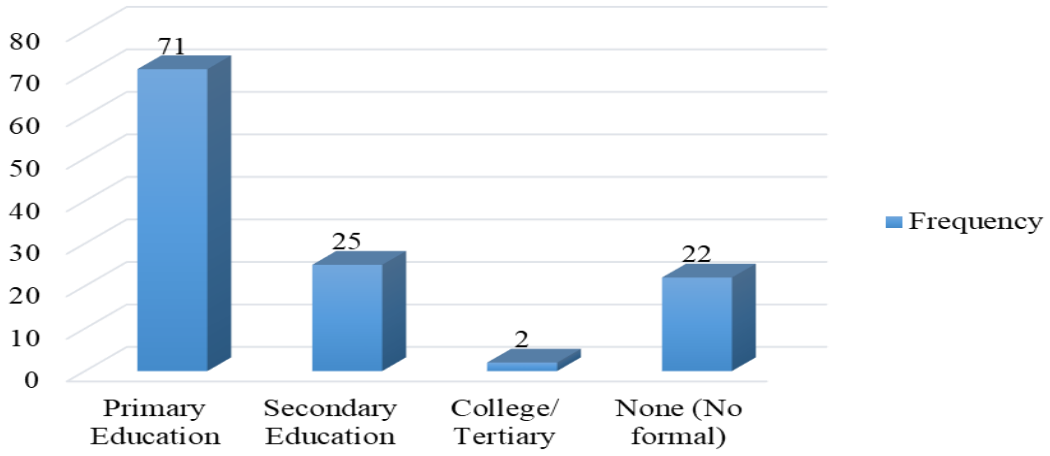


**Figure 4. 4: Education Level of the Respondents**
**Source**: Field data, (2023).

Based on the data presented in Figure 4.4, it can be observed that the majority of respondents have a basic level of education. Specifically, 59.2% of the respondents possess primary education, 20.8% possess secondary education, and 1.7% possesses college/tertiary education. Furthermore, a significant percentage of 18.3% have no formal education. These results indicate that most of the customers are educated to some extent and have a general understanding of prepaid water meter adoption.

### 4.2.5 Income Level of the Respondents

Based on Figure 4.5, the monthly income ranges for respondents who use prepaid water meters and those who do not are as follows: less than TZS 170,000 (94 respondents), TZS 170,000 - 300,000 (22 respondents), TZS 300,000 - 500,000 (1 respondent), and TZS 500,000 - 1,000,000 (3 respondents).

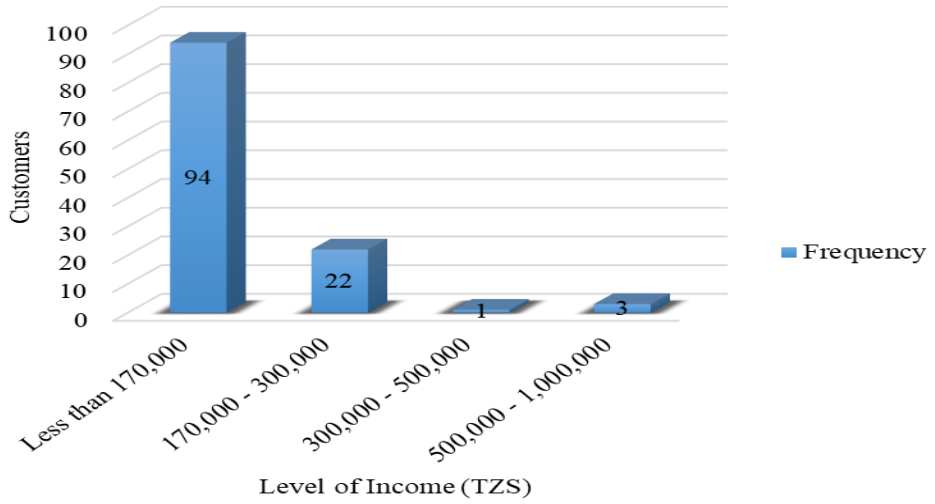


**Figure 4. 5: Monthly Level of Income of the Respondents**
**Source**: Field data, (2023).

According to Figure 4.5, only 2.5% of respondents have a monthly income of 500,000-1,000,000, 0.8% have an income of TZS 300,000-500,000, 18.3% have an income of TZS 170,000-300,000, and 78.3% have an income of less than TZS 170,000. On average, respondents earn less than TZS 100,000, indicating that the income level of customers in the study area is low and they can only afford basic water services. Only a small percentage of customers (2.5%) have a high income.

### 4.2.6 Source of Income of the Respondents

In this study, the respondents derived their income from various sources. The majority of the respondents, about 80, earned their income from farming, while 36

gained their income from self-employment such as small businesses. Only 3 of them were employed, and 1 earned their income from livestock keeping. To have a clearer view of the income sources of the respondents in the study area, refer to Figure 4.6.

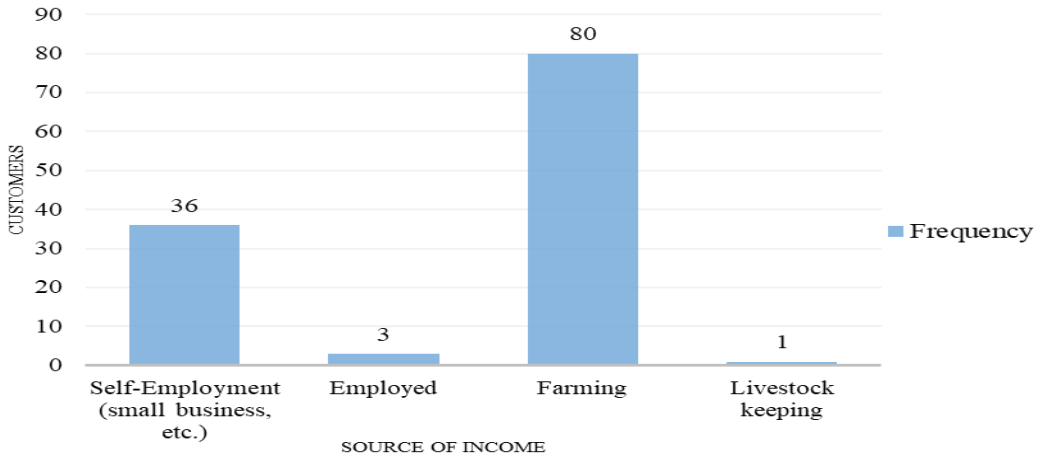


**Figure 4.6: The Source of Income of the Respondents**
**Source:** Field data, (2023)

From Figure 4.6 above, it can be inferred that 66.7% of the respondents rely on farming as their primary source of income, while 30.0% depend on self-employment (small business, etc.). Only 2.5% of the respondents depend on salary as their source of income, and 0.8% depend on livestock keeping. These results indicate that the majority of water customers in the study area are farmers, followed by self-employed individuals. A small percentage of respondents rely on livestock keeping, while even fewer are employed.

**Table 4.2: Source of Income of the Respondents**

| S/n | Source of Income | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | farming | 80 | 66.7 |
| 2 | Self-employment | 36 | 30.0 |
| 3 | Salary | 3 | 2.5 |
| 4 | Livestock keeping | 1 | 0.8 |
| | **Total** | **120** | **100** |

**Source:** Survey, (2023).

### 4.1.7 Access to Clean and Safe Water Supply in the Community

In terms of access to clean and safe water supply in the community, 99% of users of prepaid water meters and 91.3% of non-users reported having access to clean and safe water. This suggests that access to clean and safe water supply is not a significant factor influencing the adoption of prepaid water meter services.

**Table 4.3: Access to Clean and Safe Water Supply in the Community**

| Access to clean and safe water supply in the community | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| NO | f | 1 | 2 | 3 |
| | % | 1.0% | 8.7% | 2.5% |
| YES | f | 96 | 21 | 117 |
| | % | 99.0% | 91.3% | 97.5% |
| **Total** | **f** | **97** | **23** | **120** |
| | **%** | **100.0%** | **100.0%** | **100.0%** |

**Source:** Field data, (2023).

### 4.1.8 Access to Clean and Safe Water at Household

Similarly, when it comes to access to clean and safe water at the household level, 88.7% of users of prepaid water meters and 82.6% of non-users reported having access to clean and safe water. Again, this indicates that access to clean and safe water at the household level is not a major factor affecting the adoption of prepaid water meter services.

**Table 4.4: Access to Clean And Safe Water at Household**

| Access to clean and safe water at household | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| N/A | f | 1 | 2 | 3 |
| | % | 1.0% | 8.7% | 2.5% |
| NO | f | 10 | 2 | 12 |
| | % | 10.3% | 8.7% | 10.0% |
| YES | f | 86 | 19 | 105 |
| | % | 88.7% | 82.6% | 87.5% |
| **Total** | **f** | **97** | **23** | **120** |
| | **%** | **100.0%** | **100.0%** | **100.0%** |

**Source:** Field data, (2023).

Looking at the percentages, it is evident that a higher proportion of users (88.7%) had heard about prepaid water meter services compared to non-users (82.6%). This suggests that hearing about prepaid water meter services may have a positive influence on the adoption of these services.

### 4.1.9 Hearing about Prepaid Water Meter

Regarding hearing about prepaid water meter services, 89.6% of users of prepaid water meters and 90.5% of non-users reported hearing about these services. This suggests that awareness of prepaid water meter services is relatively high among both users and non-users.

**Table 4.5: Hearing about Prepaid Water Meter**

| Hearing about prepaid water meter | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| NO | f | 0 | 4 | 4 |
| | % | 0.0% | 17.4% | 3.3% |
| YES | f | 97 | 19 | 116 |
| | % | 100.0% | 82.6% | 96.7% |
| **Total** | **f** | **97** | **23** | **120** |
| | **%** | **100.0%** | **100.0%** | **100.0%** |

**Source:** Field data, (2023).

Overall, the data indicates that factors such as access to clean and safe water supply in the community and at the household level do not significantly influence the adoption of prepaid water meter services in rural areas of Tanzania. However, awareness of prepaid water meter services appears to be relatively high among both users and non-users.

### 4.1.10 Source of Information on a Prepaid Water Meter

Among the respondents, the most common sources of information about prepaid

water meter services were village meeting assemblies, CBWSO leaders, RUWASA staff, E-water staff, and training. Village meeting assemblies were the most frequently mentioned source, with 61.2% of respondents indicating that they received information about prepaid water meters through these meetings. This was followed by CBWSO leaders (59.5%), RUWASA staff (49.1%), E-water staff (31.0%), and training (29.3%).

Looking at the percentages, it is evident that a majority of users of prepaid water meters obtained information about these services from village meeting assemblies, CBWSO leaders, RUWASA staff, and E-water staff. This suggests that these sources of information play a significant role in influencing the adoption of prepaid water meter services. Among non-users of prepaid water meters, the most commonly mentioned sources of information were village meeting assemblies, CBWSO leaders, and RUWASA staff. However, the percentages for non-users were lower compared to users, indicating that these sources may have less influence on non-users decision to adopt prepaid water meter services.

**Table 4.6: Source of Information about the Prepaid Water Meters**

| Source of information on a prepaid water meter | Responses | Percent |
|---|---|---|
| Village meeting assembly | 71 | 61.2 |
| CBWSO leaders | 69 | 59.5 |
| RUWASA staff | 57 | 49.1 |
| NGOs | 36 | 31.0 |
| Neighbor | 34 | 29.3 |
| E-water staff | 31 | 26.7 |
| Service provider/ Private operator | 17 | 14.7 |
| Water customers | 16 | 13.8 |
| Training | 6 | 5.2 |
| Neighbors village | 4 | 3.4 |

**Source:** Field data, (2023).

Overall, the data suggests that village meeting assemblies, CBWSO leaders, RUWASA staff, E-water staff, and training are important sources of information about prepaid water meter services in rural areas of Tanzania. These sources play a role in influencing the adoption of these services, particularly among users of prepaid water meters. Efforts to provide information and education through these channels can be effective in promoting the adoption of prepaid water meter services in rural communities.

### 4.1.11 Trainer of Prepaid Water Meter

The most common trainers of prepaid water meter services were CBWSO leaders, RUWASA staff, and NGOs. These trainers were mentioned by 77.9%, 73.3%, and 46.5% of respondents, respectively. This suggests that these trainers play a significant role in providing education and training on prepaid water meter services.

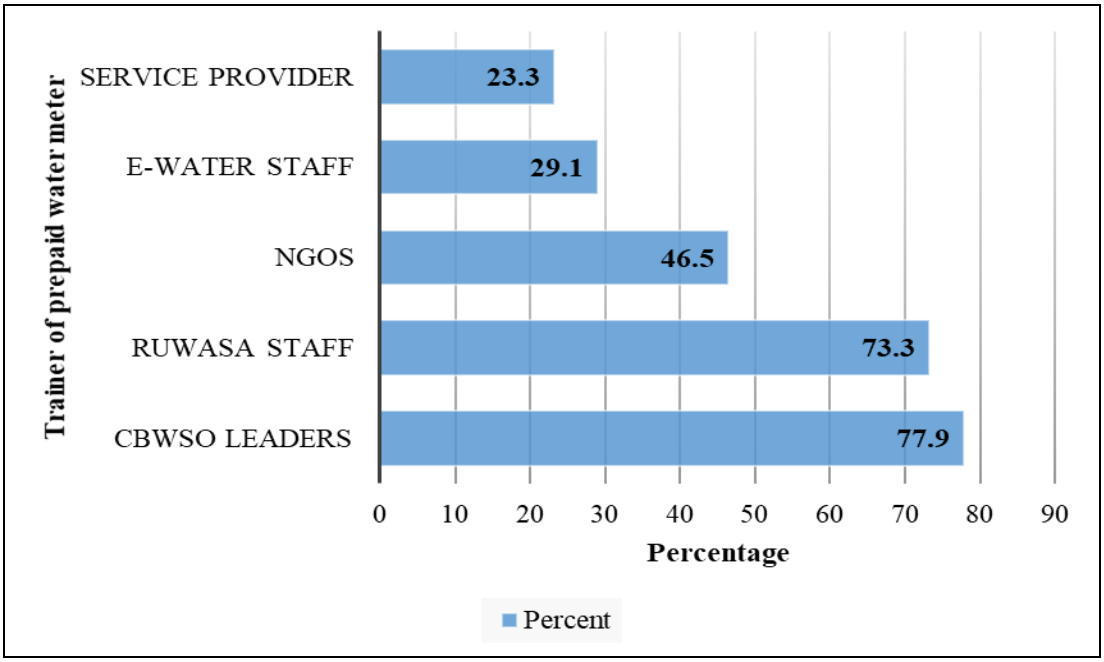


**Figure 4.7: Trainers of Prepaid Water Meter**

**Source:** Field data, (2023).

### 4.1.12 Duration of Using Prepaid and Postpaid Water Meters

Duration of Using Prepaid and Postpaid Water Meters: Among users of prepaid water meters, 46.4% reported using them for less than one year, while 51.5% reported using them for one to two years. This indicates that users have been using prepaid water meters for a relatively short period. However, for postpaid water meters, 80% of users reported using them for less than one year.

**Table 4.7: Duration Using prepaid water meter**

| Duration Using a prepaid water meter | Frequency | Percent |
|---|---|---|
| Less than one year | 45 | 46.4 |
| One to two years | 50 | 51.5 |
| Above two years | 2 | 2.1 |
| **Total** | **97** | **100.0** |

**Source:** Field data, (2023).

**Table 4.8: Duration using postpaid water meter**

| Duration using a postpaid water meter | Frequency | Percent |
|---|---|---|
| Less than one year | 8 | 80.0 |
| One to two years | 2 | 20.0 |
| **Total** | **10** | **100.0** |

**Source:** Field data, (2023).

Overall, the data suggests that factors such as the source of information, mobilization and training efforts, and the type of water meter used play significant roles in the adoption of prepaid water meter services in rural areas of Tanzania. Efforts to educate and inform the community about the benefits and usage of prepaid water meters, as well as improving access to safe water sources, can further promote the adoption of these services.

### 4.1.13 Experience in Using a Prepaid and Post-Paid Water Meter

Based on the responses received, it was found that 97 respondents had experience using prepaid water meters for over a year, while 10 respondents had experience

using post-paid water meters for more than a year. Additionally, 13 respondents reported having no experience using either prepaid or postpaid water meters.

The results are presented in Figure 4.8.

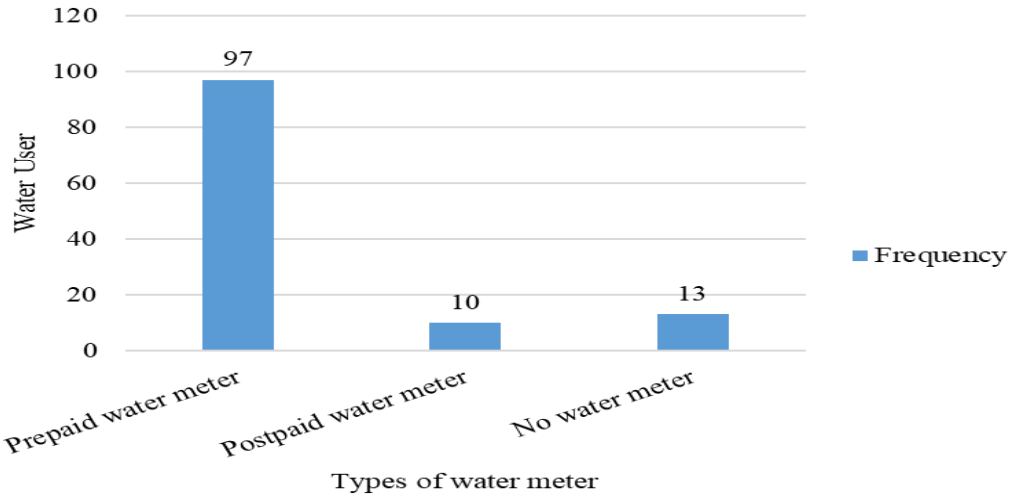


**Figure 4.8: Experience of using Water Meters**
**Source:** Field data, (2023).

According to Figure 4.8, 80.8% of the respondents reported having experience using prepaid water meters for more than one year. In contrast, only 8.3% of respondents reported having experience using post-paid water meters for more than one year, while 10.8% reported having no experience with either type of meter. The majority of respondents had experience using prepaid water meters for more than a year, which was of particular interest to the researcher who aimed to examine the factors influencing customers' adoption of prepaid water meter services.

### 4.1.14 Methods used to Pay the Bill

The most common methods used to pay the water bill were e-payment and manual cash payment. Among users of prepaid water meters, 76.3% reported using e-payment, while 23.7% reported using manual cash payment. Among non-users,

28.3% reported using e-payment, while 65.8% reported using manual cash payment. This indicates a preference for e-payment among users of prepaid water meters.

**Table 4.9: Methods used to Pay Bill**

| The method used to pay the bill | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| e-payment | f | 74 | 5 | 79 |
| | % | 76.3% | 21.7% | 65.8% |
| Manual (Cash) | f | 23 | 11 | 34 |
| | % | 23.7% | 47.8% | 28.3% |
| Not paying | f | 0 | 7 | 7 |
| | % | 0.0% | 30.4% | 5.8% |
| **Total** | **f** | **97** | **23** | **120** |
| | **%** | **100.0%** | **100.0%** | **100.0%** |

**Source:** Field data, (2023).

### 4.1.15 Ability to Control Water Consumption at Household Level

Among the respondents, 7.2% of users of prepaid water meters reported not being able to control water consumption at the household level, while 8.7% of non-users reported the same. This indicates that there may be challenges in managing water consumption, regardless of whether prepaid water meters are being used or not.

**Table 4.10: Ability to Control Water Consumption At Household Level**

| Ability to control water consumption at the household level | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| NO | f | 7 | 2 | 9 |
| | % | 7.2% | 8.7% | 7.5% |
| YES | f | 90 | 21 | 111 |
| | % | 92.8% | 91.3% | 92.5% |
| **Total** | **f** | **97** | **23** | **120** |
| | **%** | **100.0%** | **100.0%** | **100.0%** |

**Source:** Field data, (2023).

### 4.1.16 Ability to Pay Water Bill

Among the respondents, 10.8% of users of prepaid water meters reported not being able to pay the water bill, while 89.2% reported being able to pay. Among non-users, 5.8% reported not being able to pay, while 65.8% reported being able to pay. This suggests that the ability to pay the water bill may be a significant factor influencing the adoption of prepaid water meter services.

**Table 4.11: Ability to Pay Water Bill**

| Ability to pay such bill | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| NO | f | 6 | 7 | 13 |
| | % | 6.2% | 30.4% | 10.8% |
| YES | f | 91 | 16 | 107 |
| | % | 93.8% | 69.6% | 89.2% |
| Total | f | 97 | 23 | 120 |
| | % | 100.0% | 100.0% | 100.0% |

**Source:** Field data, (2023).

### 4.2 Reliability Test

The reliability of data or instruments is crucial in ensuring that the intended outcomes are achieved. It refers to the extent to which data collection and analysis techniques produce consistent findings. To test the reliability of items used to define Performance Expectancy, Perceived risks, Service Quality, Trust, and Behavioral Intention to adopt prepaid water meter services, a Cronbach's Alpha analysis was performed using the Statistical Package for Social Sciences. The results indicate that Cronbach's Alpha coefficients across all four objectives were above 0.7 and close to 1.0, suggesting that there is a good measure of internal consistency. Generally, a correlation coefficient of 0.7 or higher indicates adequate reliability (Cronbach, 1951; Hair at al., 2010).

### 4.3 Performance Expectancy Affects the Adoption of Prepaid Water Meter Services

The first objective of this study was to discern the influence of Performance Expectancy on the adoption of prepaid water meter services. The researcher aimed to understand how individuals' perception of performance affects their decision to embrace this service. To accomplish this, the study conducted a comprehensive analysis that encompassed both descriptive and inferential statistics. These statistical methodologies were deployed to quantify and explore the relationships between variables, and the results were precisely interpreted and discussed. This process not only contributed to a deeper understanding of the subject but also provided a solid foundation for the dissertation's subsequent findings and insights.

**Table 4.12: Performance Expectancy Affects The Adoption of Prepaid Water Meter Services**

| **Performance expectancy** | **Yes responses** | **Percent** |
|---|---|---|
| Control budget | 88 | 90.7% |
| Control consumption | 91 | 93.8% |
| Makes a higher cost of water | 44 | 45.4% |
| Purchase at an affordable amount | 89 | 91.8% |
| No hassle with disconnection and reconnection with fee | 62 | 63.9% |
| Availability of spare parts | 60 | 61.9% |

**Multiple responses*

| **Performance expectancy** | | **Yes** | **No** | **I don't know** | **Total** |
|---|---|---|---|---|---|
| Control budget | f | 88 | 3 | 6 | 97 |
| | % | 90.7% | 3.1% | 6.2% | 100.0% |
| Control consumption | f | 91 | 2 | 4 | 97 |
| | % | 93.8% | 2.1% | 4.1% | 100.0% |
| Makes a higher cost of water | f | 44 | 39 | 14 | 97 |
| | % | 45.4% | 40.2% | 14.4% | 100.0% |
| Purchase at an affordable amount | f | 89 | 6 | 2 | 97 |
| | % | 91.8% | 6.2% | 2.1% | 100.0% |
| No hassle with disconnection and reconnection with fee | f | 62 | 24 | 11 | 97 |
| | % | 63.9% | 24.7% | 11.3% | 100.0% |
| Availability of spare parts | f | 60 | 4 | 33 | 97 |
| | % | 61.9% | 4.1% | 34.0% | 100.0% |

**Source:** Field data, (2023).

According to a survey conducted among the respondents, it was found that the majority of them (90.7%) agreed that prepaid water meters help them control their budget effectively. This indicates that the prepaid water meter system provides a clear understanding of water consumption and allows users to manage their finances accordingly. Similarly, 93.8% of the respondents believed that prepaid water meters allow them to control their water consumption. This suggests that the metering system promotes water conservation among users, as they can monitor their usage and take necessary steps to reduce wastage.

However, there were concerns raised by 45.4% of the respondents regarding the potential for higher costs of water with prepaid water meters. This suggests that there may be a perception among some users that the pricing structure associated with prepaid meters could result in increased expenses. Such concerns may be because prepaid meters often charge higher rates for water compared to conventional billing systems. Despite these concerns, the majority of respondents (91.8%) found it affordable to purchase water through prepaid water meters.

This indicates that, overall, the cost of water through prepaid meters is manageable and acceptable to the users in the rural areas of Tanzania. Additionally, a significant number of respondents (63.9%) appreciated the convenience of not having to deal with disconnection and reconnection fees. This suggests that prepaid water meters eliminate the need for manual disconnection and reconnection processes, saving time and effort for the users. Overall, the factors affecting the adoption of prepaid water meters in Tanzania's rural areas are closely related to the performance expectations

associated with these meters. The ability to control budget and water consumption, affordability, and convenience are significant drivers for users to adopt prepaid meter services.

These findings highlight the importance of addressing user concerns regarding the potential higher costs of water with prepaid meters. By implementing transparent pricing structures and ensuring reasonable rates, the perceived cost-related barriers can be alleviated, leading to wider acceptance and adoption of prepaid water meters in rural areas of Tanzania. Furthermore, it is crucial to emphasize the benefits of prepaid meters, such as effective budget control, water conservation, and the elimination of disconnection and reconnection fees. This can help create a positive perception among potential users and encourage them to embrace this technology for their water needs. In conclusion, the adoption of prepaid water meters in Tanzania's rural areas is influenced by factors such as performance expectations. By addressing concerns related to pricing and highlighting the benefits of these meters, the acceptance and adoption of prepaid meter services can be enhanced, leading to improved water management and financial control among rural communities.

### 4.4 Service Quality Impact on the Adoption of Prepaid Water Meter Services

The second aim of the research delved into examining the correlation between service quality and the uptake of prepaid water meter services. The researcher sought to uncover how the quality of service provision affected the adoption of this specific water metering technology.

**Table 4.13: Service Quality Impact on the Adoption of Prepaid Water Meter Services**

| Service Quality | Yes responses | Percent |
|---|---|---|
| Assuring service soon after payment with prepaid water | 75 | 77.3% |
| No network dependence | 56 | 57.7% |
| Easy to buy tokens and pay for water service with a prepaid water meter | 79 | 81.4% |
| Payment of water service to the nearby vendor with a prepaid water meter | 60 | 61.9% |
| No frequent movements to a service provider with the use of a prepaid water meter | 67 | 69.1% |
| Encouragement of the use of mobile payments | 75 | 77.3% |

**Multiple responses*

The availability of spare parts for prepaid water meters was perceived positively by 61.9% of the respondents. This suggests that customers in rural areas of Tanzania are aware of the importance of having access to spare parts to ensure the smooth functioning of their prepaid water meters. This is a crucial factor that can affect their adoption of the service, as the ability to easily repair and maintain the meters plays a significant role in their overall satisfaction. The high level of satisfaction expressed by the respondents is noteworthy.

Overall, 97% of the respondents expressed satisfaction with the ease of using prepaid water meters for control over their budget, consumption, affordability, and avoiding disconnection and reconnection issues. This indicates that customers in Tanzania's rural areas are finding prepaid water meters to be a convenient and effective solution for managing their water usage. The majority of respondents (90.7%) agreed that prepaid water meters help them control their budget effectively. This is a significant finding as controlling expenses is often a priority for households, especially in rural areas where access to financial resources may be limited.

The ability to determine and regulate how much money is allocated towards water expenditure can give customers a sense of control and empowerment. Furthermore,

93.8% of the respondents believed that prepaid water meters allow them to control their water consumption. This reflects the importance placed on conservation and efficient water use. With prepaid water meters, customers can monitor their usage in real-time and make adjustments accordingly. This not only helps in managing their water budget but also promotes responsible and sustainable water use practices.

On the other hand, 45.4% of the respondents expressed concerns that prepaid water meters may lead to higher costs of water. This indicates that there is some level of apprehension regarding the potential impact on water expenses. Service providers must address these concerns by clearly communicating the pricing structure and ensuring that the cost of water remains reasonable and affordable for all customers. However, it is promising to note that despite these concerns, 91.8% of the respondents found it affordable to purchase water through prepaid water meters. This suggests that, overall; customers perceive the service to be financially accessible, which is essential for the widespread adoption and continued use of prepaid water meter services in rural areas.

Additionally, 63.9% of the respondents appreciated the convenience of not having to deal with disconnection and reconnection fees. In many rural areas, manual methods of water connection and disconnection can be time-consuming and burdensome. Prepaid water meters offer a convenient alternative, eliminating the need for manual intervention and the associated fees. This convenience factor plays a significant role in customers' decision-making process when considering the adoption of prepaid water meters. In conclusion, the performance expectations of prepaid water meter services, such as budget control and water consumption management, are positively

perceived by customers in Tanzania's rural areas.

The availability of spare parts for maintenance is also considered an important factor. The high satisfaction rate indicates that customers find prepaid water meters to be a convenient and effective solution. However, concerns about higher costs of water should be addressed, although the affordability of purchasing water through prepaid meters is generally acknowledged. The convenience of avoiding disconnection and reconnection fees is also appreciated by customers. Overall, these factors contribute to the adoption of prepaid water meter services in Tanzania's rural areas.

### 4.5 Influence of Customers' Perceived Risk on the Adoption of Prepaid Water Meter Services

This represented the third research objective, situated within the domain of inquiry, wherein the researcher sought to comprehend the influence of customers' perceived risk on the adoption of prepaid water meter services. The objective of this study was to investigate the intricate relationship between the perception of risk by customers and their willingness to adopt prepaid water meter services, shedding light on the critical factors influencing consumer decisions in this specific context.

**Table 4.14: Influence of Customers' Perceived Risk on the Adoption of Prepaid Water Meter Services**

| Perceived risk | Yes responses | Percent |
|---|---|---|
| Not easy to be stolen and used by someone else | 42 | 43.3% |
| The lifespan of prepaid water meter | 55 | 56.7% |
| The difference in water units when paying the same amount for water to different vendors | 38 | 39.2% |
| Disadvantages of the system for the poor | 41 | 42.3% |
| Guarantee of repairing the prepaid water meter when damaged | 57 | 58.8% |
| Probability of water privileges with prepaid water meters | 45 | 46.4% |

**Source:** Field data, (2023).

**Table 4.15: Perception of Water User Customers in Terms of Risk**

| Perceived risk | | The user of the prepaid water meter | Non-user of prepaid water meter | Total |
|---|---|---|---|---|
| Not easy to be stolen and used by someone else | f | 42 | 7 | 49 |
| | % | 53.2% | 70.0% | |
| The lifespan of prepaid water meter | f | 55 | 3 | 58 |
| | % | 69.6% | 30.0% | |
| The difference in water units when paying the same amount for water to different vendors | f | 38 | 4 | 42 |
| | % | 48.1% | 40.0% | |
| Disadvantages of the system for the poor | f | 41 | 7 | 48 |
| | % | 51.9% | 70.0% | |
| Guarantee of repairing the prepaid water meter when damaged | f | 57 | 4 | 61 |
| | % | 72.2% | 40.0% | |
| Probability of water privileges with prepaid water meters | f | 45 | 3 | 48 |
| | % | 57.0% | 30.0% | |

**Source:** Field data, (2023).

The adoption of prepaid water meter services in rural areas in Tanzania is influenced by various factors. One important factor is the performance expectations that customers have regarding prepaid water meters.

The majority of respondents, about 90.7%, agreed that these meters help them control their budget effectively. This suggests that customers appreciate the ability to monitor and manage their water expenditure, allowing them to allocate their financial resources more efficiently. Furthermore, 93.8% of the respondents believed that prepaid water meters enable them to have better control over their water consumption. This perception highlights the importance of water conservation and the role that prepaid meters play in encouraging responsible usage among consumers. By providing real-time information on water usage and costs, prepaid meters empower customers to make informed decisions about their water consumption and take steps toward reducing wastage.

Despite the positive perceptions mentioned above, 45.4% of the respondents expressed concerns that prepaid water meters may lead to higher costs of water. This apprehension indicates a lack of understanding about the billing and pricing structures associated with prepaid meters. It is crucial to address this concern by providing clear and transparent information about the pricing mechanisms to assure customers that prepaid meters do not necessarily result in increased water expenses. However, despite these concerns, an overwhelming majority (91.8%) of the respondents found it affordable to purchase water through prepaid water meters.

This highlights the affordability of prepaid water meter services and their suitability for customers in rural areas who may have limited financial resources. This finding suggests that prepaid meters can provide a cost-effective solution for accessing clean and safe water, particularly for low-income households. Moreover, convenience is another factor influencing customers' adoption of prepaid water meters. About 63.9% of the respondents appreciated the convenience of not having to deal with disconnection and reconnection fees. This convenience factor is particularly significant in rural areas where households may face difficulties in accessing timely and reliable water supply due to logistical challenges.

The elimination of disconnection and reconnection fees simplifies the process for customers and reduces the burden of administrative procedures associated with managing their water supply. In terms of perceived risks, 43.3% of respondents were confident that prepaid water meters are not easily stolen or misused by others. This perception reflects customers' trust in the security features of prepaid meters, which is crucial for their adoption. It is essential to assure customers that their water meters

are protected against theft and tampering, as this can address any potential apprehensions regarding security and privacy. Additionally, the lifespan of prepaid water meters was a concern for 56.7% of respondents.

This finding suggests that customers value the durability and longevity of prepaid meters. By addressing concerns related to the lifespan of these meters and ensuring their reliability, service providers can enhance customer confidence and encourage the adoption of prepaid water meter services. However, it is worth noting that 39.2% of respondents did not see any significant risks associated with prepaid water meters. This finding indicates a lack of awareness or understanding of potential risks and challenges associated with these types of metering systems. It is important to educate customers about the potential risks and drawbacks of prepaid meters, such as the need for regular maintenance and potential technical issues, to ensure informed decision-making and mitigate any negative perceptions.

In conclusion, the adoption of prepaid water meter services in rural areas in Tanzania is influenced by factors such as performance expectations, affordability, convenience, and perceived risks. By addressing customers' concerns and providing accurate and transparent information, service providers can promote the adoption of prepaid water meter services and contribute to improved water management in rural areas.

### 4.6 Effect of Trust in Prepaid Water Meter Adoption

This constituted the fourth research objective within the designated domain of investigation. The researcher's primary aim was to discern the impact of trust in the

context of prepaid water meter adoption. This objective sought to unravel the intricate dynamics of how trust plays a pivotal role in influencing the adoption of prepaid water meter services. The study aimed to provide a comprehensive understanding of the significance of trust as a contributing factor in the decision-making process surrounding this particular service.

**Table 4.16: Effect of Trust in Prepaid Water Meter Adoption**

| Trust | Yes responses | Percent |
|---|---|---|
| No disruption of bills with prepaid water meter | 82 | 84.5% |
| Quick response to encountering problems when using a prepaid water meter | 80 | 82.5% |
| Payment of water service in advance | 89 | 91.8% |

**Multiple responses*
**Source:** Field data, (2023).

**Table 4.17: Perception Of Water User Customers On Trust In The Use Of Prepaid Water Meter**

| Trust | | Yes | No | I don't know | Total |
|---|---|---|---|---|---|
| No disruption of bills with prepaid water meter | f | 82 | 13 | 2 | 97 |
| | % | 84.5% | 13.4% | 2.1% | 100.0% |
| Quick response to encountering problems when using a prepaid water meter | f | 80 | 14 | 3 | 97 |
| | % | 82.5% | 14.4% | 3.1% | 100.0% |
| Quick response to encountering problems when using a prepaid water meter | f | 89 | 3 | 5 | 97 |
| | % | 91.8% | 3.1% | 5.2% | 100.0% |

**Source:** Field data, (2023).

Trust is a crucial factor that affects customers' adoption of prepaid water meter services in rural areas of Tanzania. The level of trust that customers have in the service and its providers plays a significant role in their willingness to use prepaid water meters. In terms of trust, the majority of respondents (68.3%) expressed positive views on the service quality provided by prepaid water meters. They felt assured that they would receive prompt service after making a payment with a

prepaid water meter. This indicates that customers have confidence in the reliability of the system and trust that their payments will be processed efficiently. Furthermore, 67.5% of respondents found it easy to purchase tokens and pay for water services using prepaid water meters. This ease of use fosters trust and convenience, as customers can easily access and make payments for water services without any hassle.

Payment to nearby vendors with prepaid water meters was perceived favorably by 55.8% of the respondents. This suggests that customers feel comfortable making payments to trusted local vendors, which further enhances their trust in the system. Moreover, 60% of respondents appreciated the convenience and encouragement of using mobile payments with prepaid water meters. This indicates that customers value the flexibility and convenience provided by mobile payment options. Mobile payments eliminate the need for physical tokens and allow customers to make payments using their mobile devices, adding an extra layer of trust and convenience. Notably, respondents also valued the independence from network providers that prepaid water meters offer. This suggests that customers appreciate the autonomy and control they have over their water consumption, without being reliant on external service providers. This sense of independence builds trust and further encourages customers to adopt prepaid water meter services.

Overall, the factor of trust significantly influences the adoption of prepaid water meter services in rural areas of Tanzania. Customers' positive views on service quality ease of use, payment options, and independence from network providers contribute to the trust they have in these services. Building trust is crucial for

encouraging more customers to adopt prepaid water meter services and improving access to reliable and affordable water services in rural areas.

# CHAPTER FIVE

# CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

This chapter explains the conclusion, recommendations of the study, areas for future researchers, and policy implications.

## 5.2 Conclusion

In conclusion, the adoption of prepaid water meter services in rural areas of Tanzania is affected by a complex interplay of factors, encompassing income distribution, performance expectations, service quality, perceived risks, and trust. These diverse elements collectively shape the decisions made by customers when it comes to embracing this innovative approach to water management. Income distribution is a prominent factor affecting adoption, with the majority of respondents demonstrating limited financial means. This scenario presents a significant challenge to the affordability of prepaid water meter services, especially for those with lower incomes. In response to this challenge, stakeholders must implement measures such as subsidies and financial assistance programs to make these services accessible to individuals across all income levels.

Educational campaigns are also vital to increase awareness about the advantages of prepaid water meter services, such as managing water consumption and ensuring equitable distribution. Performance expectations constitute another critical dimension, with users expressing high levels of satisfaction regarding the ability of prepaid water meters to help control budgets and water consumption. Despite concerns about potential higher costs, the majority of respondents found the service

affordable. This indicates that, on the whole, the cost of water through prepaid meters is acceptable to users in rural Tanzania. The convenience factor, particularly the elimination of disconnection and reconnection fees, significantly influences customer decision-making in favor of adopting prepaid water meters.

Service quality, including the availability of spare parts and ease of use, is positively perceived by users. The high satisfaction rate suggests that customers find prepaid water meters to be a convenient and effective solution for managing their water usage. The ability to control expenses and promote water conservation is a priority for many households, especially in areas where financial resources are limited. Perceived risks, such as concerns about higher costs and the lifespan of prepaid water meters, should be addressed to maintain customer confidence in the technology. Education on potential drawbacks and risks, coupled with transparent communication on pricing structures, is essential for informed decision-making.

Trust plays a pivotal role in the adoption of prepaid water meter services. Customers express confidence in the reliability of the system, the ease of making payments, and the convenience of interacting with trusted local vendors. Mobile payment options and independence from external service providers add an extra layer of trust and convenience. Building trust is vital to encourage more customers to adopt prepaid water meter services, which can significantly enhance access to reliable and affordable water services in rural Tanzania. In summary, the adoption of prepaid water meter services in rural Tanzania is not solely determined by one factor but is influenced by a multifaceted web of income levels, performance expectations, service quality, perceived risks and trust.

A comprehensive approach that addresses these factors is necessary to promote the adoption of prepaid water meters, which can lead to more effective water management and increased access to clean and safe water for rural communities in Tanzania. Stakeholders must work together to create affordable solutions, instill confidence in the technology, and facilitate user-friendly and efficient services to ensure the success of prepaid water meter adoption in rural areas.

### 5.3 Recommendations

In the effort and commitment of the Water Authorities to achieve the minimal human water requirements, it is also critical to consider institutional financial sustainability and customer preferences. Customers' adoption of prepaid water meter services in Tanzanian rural areas should consider the following factors:-

i) Conduct regular promotional campaigns to educate customers about the benefits of prepaid water meters, emphasizing their performance reliability to enhance adoption rates based on performance expectancy.

ii) Prioritize Government intervention to address technical barriers related to installation, maintenance, and reliability, thus improving service quality and fostering trust among potential adopters.

iii) Implement robust security measures to deter water theft at prepaid meter distribution points, mitigating perceived risks and increasing confidence in the system's integrity.

iv) Develop policies that ensure the affordability of prepaid water meter services, considering the financial constraints of consumers, thereby influencing trust and adoption levels.

### 5.4 Areas for Future Researchers

The study had limitations, prompting the need for further research. Its focus on three villages in the Bahi district permits cautious interpretation. Additional research is needed to explore factors influencing prepaid water meter adoption in Tanzanian rural areas.

i) Future research should investigate deeper into performance expectancy factors, such as reliability and ease of use, to enhance understanding of their influence on prepaid water meter adoption rates.

ii) Conducting replications in various geographical locations is crucial to validate findings on service quality's impact, ensuring applicability across diverse contexts and populations.

iii) Investigating the perceptions and attitudes of higher-income families towards prepaid water meters will provide insights into trust dynamics within this demographic, addressing the trust aspect of adoption.

iv) Expanding the research framework to include additional variables related to perceived risk, such as data security and privacy concerns, would offer a more comprehensive analysis of their impact on adoption rates.

## REFERENCES

Bagozzi, R. (2007). The Legacy of Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems, 8*(4), 244-254.

Benasat, I. & Barki, H. (2007). Que Vadis TAM. *Journal of the Association of Information Systems, 8*(4), P. 211-218.

Berg, H. & Mugisha, S. (2010). Prepaid water meter implementation in Kampala: A strategy to serve the urban poor? *Water Alternatives, 3* (2), 304-319.

Boakye-Ansah, A. S., Schwartz, K. & Zwarteveen, M. (2019). Unraveling pro-poor water services: what does it mean and why is it so popular? *Journal of Water, Sanitation and Hygiene for Development, 9*(2), 187–197.

Boyle, T., Giurco, D., Mukheibir, P., Liu, A., Moy, C., White, S. & Stewart, R. (2013). Intelligent metering for urban water: a review. *Water, 5*(3), 1052–1081.

Casarin, C., & Nicollier, T. (2008). Development of prepaid technology for the electricity sector in South Africa. *Journal of Energy in Southern Africa,* 19(1), 7-12.

Crainic, M. S. (2012). A Short History of Residential Water Meters Part I: Mechanical Water Meters with Moving Parts. Installation for Buildings and Ambiental Comfort Conference XXI Edition, October, (pp. 27–35.).

Creswell, J. W. & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage Publications.

Creswell, J. W. & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research.* London: Sage Publications.

Darra, B. (2019). Willingness to pay for improved conservation of water catchment in Hai District, Tanzania. Retrieved on 12th June, 2023 from; https://www.researchgate.net/publication/333039211_An_Assessment_of_Willingness_to_Pay_for_Improved_Water_Services_in_Tanzania_A_Case_Study_of_Igunga_Town.

Denzin, N. K. & Lincoln, Y. S. (2018). *The Sage handbook of qualitative research*. London: Sage Publications.

e-water, (2022). Retrieved from e water services: https://www.ewater.services/

Fouka, G., & Mantzorou, M. (2011). What are the major ethical issues in conducting research? is there a conflict between research ethics and the nature of nursing? *Health Science Journal, 5*(1), 3–14.

Gambe, J. (2015). Advanced Metering Infrastructure: A Review. *Journal of Water Resources Planning and Management, 141*(12), 04015034.

Guma, P. K. (2019). *Smart urbanism? ICTs for water and electricity supply in Nairobi. Urban Studies.* Nairobi: Urban Studies.

Hans, K., Lukas, K. & Ali, M. (2020). Why prepaid technologies are not a panacea for inclusive and sustainable rural water services in Tanzania? *Journal of the World Water Council, 22*(5), 925–942.

Heymans, J., Eales, K. & Franceys, R. (2014). Advancements in prepaid water meter technology. *Water Resources Research,* 50(4), 265-278.

Hope, R., Foster, T., Krolikowski, A. & Cohen, A. (2011). Exploring mobile money infrastructure for prepaid water systems. *Journal of Water, Sanitation, and Hygiene for Development,* 1(2), 93-105.

Johnson, R. B. & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.

Kabote, S. J., & John, P. (2017). Water Governance in Tanzania : Performance of Governance Structures and Institutions. Retrieved 15th Septembe, 2023 from; https://doi.org/10.12691/wjssh-3-1-3.

Khadija, F. (2020). Factors affecting the adoption of electronic procurement among public procuring entities in Tanzania: A case of TANESCO.

Kothari, C. R. (2004). Research Methodology: Methods and Techniques (Second Rev). New York: New Age International Publisher.

Krishnaswami, O. (2003). *Methodology of Research in Social Sciences*. Mumbai: Himalaya Publishing House.

Kristen, J., Isack, M., & Elisekile, M. (2017). Solar-powered prepaid water systems in Tanzania. *Journal of Sustainable Development*, *14*(2), 341-355.

Kumar, M., Talib, S. A., & Ramayah, T. (2013). *Business Research Methods. Selangor, Malaysia: Oxford University Press.*

Kumwenda, M. K. (2006). Prepaid Water Metering: Social Experiences and Lessons Learned from Klipheuwel Pilot Project, South Africa. M. Phil dissertation, University of the Western Cape.

Mahapatra, S. & Golhar, D. (2018). Consumer perception of switching from post-paid to prepaid electricity: A case study. *Energy Policy*, *23*(4), 567-578.

Mburu, P. & Sathyamoorthi, C. (2014). Switching from Post-paid to Prepaid Models: Customer perception and the Organisational Role in managing the change: A case study of Botswana Power Cooperation. *Journal of Management Research, 6*(3), 171- 185.

Mushi, E. (2014). Understanding consumer behavior in prepaid electricity: A qualitative study. *Journal of Consumer Behavior, 31*(2), 145-159.

Parahoo, K. (2014). Nursing Research: Principles, Process, and Issues (3rd ed.). Palgrave Macmillan.

Parasuraman, A., Zeithaml, V. A. & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing, 49*(4), 41-50.

Quayson, A. (2012). The impact of prepaid electricity on consumer behavior: Insights from a field study. *Energy Economics, 18*(3), 231-245.

Salim, S. H. (2016). *The factors affecting consumer's willingness to pay for water services: A Case of West District, Zanzibar. Dodoma: The University of Dodoma.* Retrieved on 10th September, 2023 from; http://hdl.handle.net/20.500.12661/593.

Sekaran, U. (2003). *Research Methods,* Greenwich, Conn: JAI Press.

Smith, J. (2019). Research Methods in Education. Routledge.

Tashakkori, A. & Teddlie, C. (2003). *Handbook of mixed methods in social and behavioral research.* London: Sage Publications.

Teddlie, C. & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences.* London: Sage Publications.

Thulsidas, K. (2019). Automatic Meter Reading Systems: A Comprehensive Review. *Water Resources Management,* 33(8), 2807-2825.

URT, (2002). (United Republic of Tanzania, National Water Policy of 2002) Retrieved on 13th October, 2023 from http://www.tzonline.org/pdf/water

policy20021.pdf.

URT, (2019, February 22nd). (United Republic of Tanzania, Water Supply and Sanitation Act. No.5 of 2019) Retrieved February 22, 2019, from https://www.maji.go.tz/

URT, (2022). UN World Water Development Report 2022. Retrieved from https://www.unwater.org/publications/un-world-water-development-report-2022.

Venkatesh, V., Morris, G, M., Davis, B, G. & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Water Mission-Tanzania & World Bank, (2017). Field trials of solar-powered water supply systems and smart metering technology. *Report on Sustainable Water Service Delivery, 25* (3), 57-72.

Yamane, T. (1967). Statistics. *An introductory Analysis*, 2nd Edition, New York: Harper and Row.

Zyl, V., J, Ngabirano, L, Malunga, M. & Mwangi, M. (2018). Experiences with advanced water metering in South Africa the state of the Art in advanced metering technology and application, WRC Report No. 2370/1/17

# APPENDICES

## Appendix 1: Questionnaire for Water User Customers

**OPEN UNIVERSITY OF TANZANIA**

**FACULTY OF BUSINESS MANAGEMENT**

**Survey Questionnaire**

This questionnaire intends to assess the "Factors Affecting Customers' Adoption of Prepaid Water Meter Services in Tanzania Rural Areas, A Case of Bahi District Council". Hence, taking into account its educational purpose, you are kindly requested to respond to the questionnaire objectively and honestly, since the student researcher believes that the outcome of this study will highly depend on your cooperation. Participation is purely voluntary. My name is **Busela Kwidika Yuga**; if you have any comments or questions, you can contact me using my number +255712751976.

I would like to thank you for your cooperation and for allowing me to take a few minutes of your valuable time.

**Seeking consent from respondents**: Are you willing to continue with the interview? If not, please end the interview.

A. Yes (Continue)

B. No (Thank you very much – End of interview)

**NOTE: -**

Your confidentiality is maintained sincerely

**Section A: Demographic Characteristics**

i) Village name:

| Village name | Makanda | Chidilo | Chiguluka |
|---|---|---|---|
| Put a tick to indicate your choice | | | |

ii) Name of Respondent ……

**Please put a "√" to indicate your choice.**

iii) Sex

| Sex | Male | Female |
|---|---|---|
| Put a tick to indicate your choice | | |

iv) Age: How many old are you? (Years). ……..

v) Household size: How many members are in your household? ……

vi) Marital status:

| Marital type | Put a tick |
|---|---|
| Married monogamous | |
| Married polygamous | |
| Single | |
| Separated | |
| Widowed | |

vii) Is the head of the household male or female?

| Household head | Put a tick |
|---|---|
| Male headed | |
| Female-headed | |

viii) Level of education. What is your highest level of education?

| Level of education | Please indicate the appropriate class or form |
|---|---|
| None (No formal) | |
| Primary School Education | |
| Secondary School Education | |
| College/ Tertiary | |

ix) Economic status. (Please indicate the main source of income)

| Source of income | Put a tick (Multiple responses) |
|---|---|
| Self-Employment (small business, petty trade, etc.) | |
| Casual work | |
| Employed permanent | |
| Farming | |
| Livestock keeping | |
| Retired | |
| Private Sector Employee | |
| Unemployment | |
| None | |

x) Please state your income per month (TSH). Estimate an average income per month (TSH)

| Average income per month | Put a tick |
|---|---|
| Less than 170,000 | |
| 170,001-300,000 | |
| 300,001-500,000 | |
| 500,001-1,000,000 | |
| Above 1,000,000 | |

xi) Please state your income per Annum (TSH): …….

**Section B: Factors affect Customers' decision to adopt prepaid water meter services**

1. Do you have access to clean and safe water in your community?

| Yes | No |
|---|---|
| | |

2. If yes, do you have access to clean and safe water services in your family?

| Yes | No |
|---|---|
| | |

3. Have you heard about the prepaid water meter services?

| Yes | No |
|---|---|
| | |

4. If yes, what was the source of information about prepaid water meter technology?

| Select all that apply | A. Village meeting assembly<br>B. CBWSO leaders<br>C. RUWASA staff<br>D. E-water staff<br>E. Trainings<br>F. Water customers<br>G. Neighbor<br>H. Service provider/ Private operator<br>I. NGOs<br>Other (Specify); …… |
|---|---|

5. If other, please specify, what was the source of information about the prepaid water meter technology.

6. Have you mobilized, and trained on prepaid water meter services?

| Yes | No |
|---|---|
| | |

7. If yes, who conducted the training about the prepaid water meter services?

   (i) CBWSO leaders

   (ii) RUWASA Staff

   (iii) E-Water staff

   (iv) Service Provider

   (v) NGOs

   (vi) Other (Please specify)

8. If others specify, who conducted the training about the prepaid water meter?

   ……..

9. **Other Question**

| No. | Question | **ANSWER CATEGORY** ***(Circle the code that applies)*** |
|---|---|---|
| 1 | What type of water meter is used by the customer | A. Prepaid<br>B. Postpaid<br>**C.** No water meter |
| 2 | If no public and/or private connection. Where do you fetch water? | A. Neighbors<br>B. Protected well<br>C. Unprotected well |
| 4 | What status of a customer on the adoption (practices) of prepaid water meter services? | A. Prepaid water meter adopter<br>B. Non-prepaid water meter adopter |
| 5 | If you're not a user of the prepaid water meter, please explain why. | Reasons …… |
| 6 | How long have you used the prepaid water meter? | A. Less than one year<br>B. One to two years<br>C. Above two years |
| 7 | How long have you used the post-payment water meter? | A. Less than one year<br>B. One to two years<br>C. Above two years |
| 8 | How long do you spend fetching water per day? | Estimate minutes ……. |
| 9 | How many liters of water do you collect per day? | Convert several buckets with filled water into liters and fill it here …… |
| 10 | How many liters are consumed by the household members per day? | Convert several buckets used into liters and fill it here …… |
| 11 | Are you able to control water consumption in your household? | A. Yes<br>B. No |
| 12 | Please estimate the cost of paying for one bucket (20 Liter) of water | ……. |
| 13 | Are you able to pay such a bill? | A. Yes<br>B. No |
| 14 | Which method are you using to pay your water bill? | A. e-payment<br>B. Manual (Cash)<br>C. Not paying |
| 15 | Do you think that payment method is suitable for you to use? | A. Yes<br>B. No<br>C. I don't understand |
| 16 | Who keeps the money after paying the bill? | A. e-water<br>B. Village government leaders<br>C. CBWSO leaders<br>D. Other: ……. |
| 17 | Are you sure the bill you pay is kept safe? | A. Yes<br>B. No |
| 18 | Is it possible for you to fetch water at any time? | A. Yes<br>B. No |
| 19 | If yes, please explain why. | Reasons: …….. |
| 20 | If No, please explain why. | Reasons: …….. |
| 21 | Who is responsible for regularly | A. Myself |

| | | |
|---|---|---|
| | monitoring, maintaining, and repairing the water system infrastructure in your community? | B. Village government leaders Service Provider<br>C. CBWSO leader RUWASA<br>D. Community members NGOs<br>E. Other: Please mention …….. |
| 22 | Is the maintenance and repair of water system infrastructure conducted regularly? | A. Yes<br>B. No |
| 23 | If yes, please explain how | Explain: …… |
| 24 | With your experience, what are the best water meter practices between prepaid and postpaid water? | A. Prepaid<br>B. Postpaid<br>C. Non water meter |
| 25 | If it's prepaid a water meter, please explain why | Reason: ……. |
| 26 | If non-prepaid water meter, please explain why. | Reason: ……. |
| 27 | If non-prepaid water meter, please explain why. | Reason: ……. |
| 28 | Where are you going to pay a bill and get a token once the money is finished in your card? | A. Water service provider Using the e-water app<br>B. Mobile agent (M-Pesa, Halo pesa, Tigo Pesa, Airtel Money, etc)<br>C. Other (Please specify) |
| 29 | If other, Please specify where are you going to pay the bill once the money is finished in your card | …… |
| 30 | Will you continue to use prepaid water meters in the future? | A. Yes<br>B. No |
| 31 | If yes, why will you continue to use prepaid water meters in the future? | Give the reasons: ……. |
| 32 | If others specify, why will you continue to use prepaid water meters in the future? | Specify: ……. |
| 33 | If not, why will not continue to use prepaid water meters in the future? | Specify: ……. |
| 34 | Did you register with the smart card to pay bills for water services | A. Yes<br>B. No |
| 35 | If yes, when did you start paying the water bill through the e-water (Mention year) | ……. |
| 36 | If not, why you have not registered to use a smart card for fetching water? (Give the reasons) | …… |
| 37 | Where are you going to pay a bill and get a token once the money is finished on your card? | A. Water service provider<br>B. Using the e-water app |
| 38 | Will you continue to use prepaid | A. Yes |

| | | |
|---|---|---|
| | water meters in the future? | B. No |
| 39 | If yes, why? (Give the reasons) | A. Safe and convenient<br>B. Easily track your spending<br>C. Easily control your water consumption<br>D. Control household income<br>Other: (Specify)…… |
| 40 | If not, why? (Give the reasons) | A. Prepaid cards come with a fee<br>B. Limited use of water<br>C. Fetching water in the private connection<br>D. I don't see any benefit in using a prepaid water meter<br>Other: (Specify)…… |

**47. Please make sure that you select the right answer. Ask respondents in your language and make sure he/she understand your question.**

### A. Performance Expectancy

| No. | Item | Possible Answers (Choose one | | |
|---|---|---|---|---|
| | | YES | No | I don't know |
| PE01 | Customers can control the budget | | | |
| PE02 | Customers can control their consumption | | | |
| PE03 | It makes higher the cost of water | | | |
| PE04 | Can purchase water at an affordable amount | | | |
| PE05 | No hassle with disconnection and reconnection fees | | | |
| PE06 | The spares of prepaid water meters are always available | | | |

### B. Perceived risks

| No. | Item | Possible Answers (Choose one | | |
|---|---|---|---|---|
| | | YES | NO | I don't know |
| PR01. | It is not easy to be stolen and used by someone else | | | |
| PR02. | The lifespan of a prepaid water meter is long before the replacement | | | |
| PR03. | There is a difference in water units when paying the same amount for water to different vendors | | | |
| PR04. | The system has more disadvantages for the poor | | | |
| PR05. | There is a guarantee of repairing the prepaid water meter when damaged | | | |
| PR06. | There is a probability of water privileges with prepaid water meters | | | |

## C. Trust

| No. | Items | Possible Answers (Choose one) | | |
|---|---|---|---|---|
| | | YES | NO | I don't know |
| T01. | No more disputed bills with prepaid water meter | | | |
| T02. | There is a quick response to encountering problems when using a prepaid water meter | | | |
| T03. | I can pay for water service in advance | | | |

## D. Service Quality

| No. | Items | Possible Answers (Choose one) | | |
|---|---|---|---|---|
| | | YES | NO | I don't know |
| SQ01 | To assess service quality impact on the adoption of prepaid water meter services | | | |
| SQ02 | Customers are assured service soon after payments with prepaid water | | | |
| SQ03 | No network dependence on water with a prepaid water meter | | | |
| SQ04 | It is easy to buy tokens and pay for water service with prepaid water meter | | | |
| SQ05 | I can pay for water service to the nearby vendor with a prepaid water meter | | | |
| SQ06 | No frequent movements to a service provider with the use of a prepaid water meter | | | |
| SQ07 | Prepaid water meters encourage mobile payments | | | |

Do you have any comments on water supply services?

| YES | NO |
|---|---|
| | |

(i) If yes, explain: …….

(ii) What are your suggestions to ensure the improvement of the customers' adoption of prepaid water metering systems?

Thank you very much – End of the interview

## Appendix 2: Interview Guide for CBWSO leaders and RUWASA team

1. Name and location of the CBWSO
2. When did you first hear of prepaid water meters?
3. Brief history of the experiences you have had with CBWSO when it comes to settling your water bill
4. Where do you purchase your tokens from or how tin you usually top-up?
5. How many times do you top up in a month?
6. Is your community aware of how to manage water?
7. What is your experience with the prepaid water meter, what do you like about it and what don't you like?
8. What is the best experience, in your view about the prepaid water meter?
9. What is the worth of experience, in your view about the prepaid water meter?

## Appendix 3: Research Clearance Letter

**THE UNITED REPUBLIC OF TANZANIA**

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

**THE OPEN UNIVERSITY OF TANZANIA**

**Ref. No OUT/ PG202086987** **3rd August, 2023**

Program Manager,

Diocese of Central Tanganyika Development Services Coordination (DCT-DSC),

P.O.Box 15,

**DODOMA.**

Dear Manager

**RE: RESEARCH CLEARANCE FOR MR. BUSELA KWIDIKA YUGA, REG NO: PG202086987**

2. The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

3. To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. Busela Kwidika Yuga**

**Reg. No: PG202086987)** pursuing **Master of Project Management (MPM).** We here by grant this clearance to conduct a research titled **":** **Factors Affecting Customers' Adoption of Prepaid Water Meter Services in Tanzania Rural Areas: A Case of Bahi District".** He will collect his data at your office from 4th August to 4th September 2023.

4. In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

**THE OPEN UNIVERSITY OF TANZANIA**

Prof. Magreth S.Bushesha

**For: VICE CHANCELLOR**

## Appendix 4: Approval Letter for Data Collection

**JAMHURI YA MUUNGANO WA TANZANIA**

**OFISI YA RAIS**
**TAWALA ZA MIKOA NA SERIKALI ZA MITAA**

**HALMASHAURI YA WILAYA YA BAHI**

***Unapojibu tafadhali taja:***

**KUMB.NA.** HW/V.30/2vol V/238 07/ Augosti, 2023

MKUU WA CHUO,
CHUO CHA OUT (THE OPEN UNIVERSITY OF TANZANIA),
S. L. P,23409,
**DAR ES SALAAM.**

**YAH: KIBALI CHA KUFANYA UTAFITI.**

Tafadhali husika na kichwa cha habari hapo juu.

2. Rejea barua yako yenye kumbu Na.OUT/PG202086987 ya tarehe 03/08/2023 iliyomuombea Mwanafunzi kufanya utafiti katika Halmashauri ya Wilaya ya Bahi.

3. Napenda kukutaarifu kuwa Mwanafunzi Busela Kwidika Yuga amekubaliwa kufanya utafiti kama alivyoomba.

4. Aidha katika utafiti huo Mkurungenzi Mtendaji wa Halmashauri ya Wilaya ya Bahi hatahusika na gharama yoyote. Hivyo katika muda wote wa utafiti anatakiwa kufuata sheria, kanuni na taratibu za utumishi wa Umma katika kipindi chote cha kufanya utafiti huo.

Nashukuru kwa ushirikiano.

Bosco Macha.
**Kny: MKURUGENZI MTENDAJI (W)**
**BAHI**

STRICT EXECUTIVE DIRECTOR
BAHI DISTRICT COUNCIL
P. O. Box 2993
DODOMA

**Nakala:** Mtendaji wa kijiji cha Chidilo, Makanda na Chiguluka.
S. l. P. 2993
**Bahi – (mpokee na kumpa ushirikiano)**

" Busela Kwidika Yuga
Ripoti Ofisi ya Mtendaji wa kijiji cha Chidilo, Makanda na Chiguluka.

*Ofisi ya Mkurugenzi Mtendaji, Barabara ya Mkakatika, S.L.P 2993, Dodoma, Simu: +255 26 2961400, Nukushi: +255 26 2961401, Barua Pepe: info@bahidc.go.tz, ded@bahidc.go.tz, Tovuti: www.bahidc.go.tz, **41301 BAHI***