THE IMPACT OF DIGITAL TRANSFORMATION ON THE OPERATION OF WATER UTILITIES IN TANZANIA: A CASE OF TANGA WATER SUPPLY AND SANITATION AUTHORITY

BEATUS GULABAGANIRA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION

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CERTIFICATION

The undersigned certifies that he has read and here by recommends for acceptance by The Open University of Tanzania a dissertation entitled, "**The Impact of Digital Transformation on the Operation of Water Utilities in Tanzania: A Case of Tanga Water Supply and Sanitation Authority",** in partial fulfillment of the requirements for the Degree of Master of Business Administration (MBA) of the Open University of Tanzania.

……..……

Dr. Salum Mohamed

(Supervisor)

……..……

Date

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DECLARATION

I, **Beatus Gulabaganira,** 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 originally mine. It is hereby presented in partial fulfillment of the requirements for the Degree of Master of Business Administration (MBA).

……..……

Signature

……..……

Date

DEDICATION

I would like to dedicate this work to Almighty GOD, for his love, blessing and strengths granted to my life.

ACKNOWLEDGEMENT

The completion of this study would not have been possible without the help and support from a number of people to whom I feel greatly indebted.

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ABSTRACT

This study aimed at assessing the impact of digital transformation on the operation of Water Utilities in Tanzania, a case of Tanga Water Supply and Sanitation Authority. The study focused on examining the capability of Water Utilities in pacing with digital transformation, examining the extent to which water utilities operations are affected by User acceptance on digital transformation and examining the status of digital technology application in the operations of Water Utilities. The data collection methods used for the study were survey and documentary review through the use of questionnaire with sample of 100 respondents. The Statistical Package for Social Sciences (SPSS) 23rd version coupled with descriptive statistics were used in analyzing the data. The study found out that, Water Utilities have various essential capabilities to pace with digital transformation. Also revealed that, Water Utilities Operations are likely to be affected by User acceptance on digital transformation since there are less involvement of Users in transforming digital solution and there is inadequate awareness on digital transformation initiatives planned to be undertaken in the organization. Finally, it was revealed that digital technology is widely applied in the operations of water utilities. Various core business process of Water Utilities have been digitized and the implementation of various tasks have been eased through use of ICT devices and systems. The implications of the findings revealed that, Policy makers should ensure formulated policies and other guidelines are favorable to promote innovations and creativity. Water Sector should prepare robust strategies and plans that will assist to keep pace and capitalize the benefits of digital transformation, including provision of adequate exposure to all staff and user involvement in planning, development and deployment of innovated digital solutions.

Key Words: Digital Transformation, Digital Technology, Water Utilities

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LIST OF ABBREVIATIONS AND ACRONYMS

DT	Digital Transformation
eGA	e-Government Agency
EWURA	The Energy and Water Utilities Regulatory Authority
GePG	Government Electronic Payment Gateway
GIS	Geographical Information System
ICT	Information Communication Technology
IDT	Innovation Diffusion Theory
MAJIIS	Maji Information System
OECD	Organization for Economic Co-operation and Development
SWAN	Smart Water Networks Forum
TAM	Technology Acceptance Model
Tanga WSSA	Tanga Water Supply and Sanitation Authority
TPB	Theory of Planned Behavior
UTAUT	Unified Theory of Acceptance and Use of Technology

CHAPTER ONE

INTRODUCTION

1.1 Background of the Problem

Digital technology has become an integral part of everyday life from work place to household level. The world has now been made smaller via digital technology allowing societies, businesses and people to connect one another instantly through technological innovation. The information is now easily shared globally through digitalized modes such as networked computers, telephones, television, radio and other networked Medias.

In the past, the digital technology was considered as a tool that can only be used for particular or specific activities, but nowadays they are backbone of the organization processes (Flyverbom et al., 2019). Many Organizations nowadays have shaped their processes by automating their activities in order to meet customer demands and reduce competitive pressure through digital technologies (Westermanet al., 2011). Digital technology has emerged in Africa as important growth impulses, igniting a new course of development in manufacturing and related services (Wohlmuth, 2019). The increase in mobile phone subscribers and internet access has promoted digital transformation in africa (Ndemo & Weiss, 2017).

The trend of increasing adoption of smart devices and online transactions for example is accelerating and becoming something that is more and more expected by customers and other stakeholders (International water association, 2019). Digital technologies have only now reached almost all individuals in Organization for Economic Co-

operation and Development (OECD) countries. In 2016, 83% of adults in the OECD area accessed the Internet and 95% of firms in OECD countries had a high-speed connection to the Internet (OECD, 2018). As of June 2017, there were almost 102 mobile broadband subscriptions per 100 people in the OECD, more than one per person (OECD, 2018h), and OECD mobile data use surged by 37% between 2015 and 2016 (OECD, 2017a).

The Government of Tanzania have made various reforms and initiatives to leverage the benefit of digital technology to ensure that the Public Sector is able to deliver quality, effective and efficient services to its citizens. The reforms and initiatives include the formulation of 2003 ICT policy and later amended in 2016 in order to promote the application of ICT in the country. The establishment of e-Government Agency in 2012 which was later changed to e-Government Authority (e-GA) in 2019 under the e-Government Act, No. 10 of 2019 for the purpose of coordinating, overseeing and promote e-Government initiatives as well as enforce e-Government related policies, laws, regulations, standards and guidelines in public institutions (e-Government Act, No. 10 of 2019). These reforms accelerated a notable digital development in Public sector including the sharing of ICT resources by Public Institutions, increased the use of e-services and strengthened the control of Government information and systems (eGA performance report 2012/2013-2016/2017).

In the specific context, the Water Utilities is public institution established under the Water Works Ordinance Capt. 281 in 1997 with responsibility for provision of clean and portable water supply and sanitation services among Tanzanian citizens as

mandated by Section 13(1) and Section 20 of the amended Water Supply and Sanitation Act of 2019. The ability of Water utilities to operate and maintain water and sanitation services in both technical and commercial is now depending much on type of technology used (National Water Development Strategy 2006-2015). The Water utilities has undergone a tremendous improvement from manual process oriented to automated process oriented to pace with global digital transformation and support Government initiatives in delivering quality, effective and efficient services to its citizens. The application of various systems such unified and Integrated Maji Information System (MAJIIS), Geographical Information System (GIS), Prepaid Metering System, Accounting, Inventory Management and human resource system is among the Water Utilities move towards digitizing its activities. The application of Government Electronic Payment Gateway (GePG) to comply with the requirement of Public Finance Act 2001 as amended in 2017 in collection of public monies has enabled a dramatic change and leveraged digital application within Water Utilities that led into change from traditional (manual) cash collection system to electronic cash collection. Even though there is a notable move of Water Utilities in the application of digital technology but there is almost a non-existence of specific studies on the impact of digital transformation on the operation of Water Utilities.

1.2 Statement of the Research Problem

The digital technology has provided opportunities for the government and its public institutions to restructure and reshape their business processes in order to improve performance and service delivery. The Government has now embrace digital technology as a key enabler for provision of service to its Citizen (Magayane et al., 2016).

There has been increasingly automation of business processes by water utilities in Tanzania attributed by global digital transformation. The application of electronic gadgets such as smart phones for customers' meter reading to instantly update customer database, electronic customer bills preparation and electronic customer bills dispatching are among business processes which have been automated as a result of digital transformation. Other automated business processes include the application of call centers for serving customers and handling customer complaints and the application of Unified and Integrated Maji Information System (MAJIIS), Geographical Information System (GIS), Prepaid Metering System in most of water utilities operations. Also the introduction of Government Electronic Payment Gateway (GePG) following the amendments of Public Finance Act 2001 in 2017 for collection of public monies has geared the water utilities towards the adaptation of digital technology.

Despite of notable efforts by Water Utilities to capitalize the advantage of digital technology, the fast and continuous changes as a result of global digital transformation creates hindrance to ensure adequate digitization of business processes. The capability and effectiveness in reacting with the changes of digital technology is a big challenge, since these changes impact the way organizations operates, brings new perceptions and changes the consumer behaviors.

This is in line with the study conducted by Huang, Jie and Huang (2018) stating that, the development of digital technology bring new thought, change existing consumption and business models, create comprehensive and fundamental changes to foundation, environmental, input and output. Also the study by Wohlmuth (2019)

revealed that, the key challenge relates to Africa is to keep pace with the rapidly changing dimensions of technological frontiers which make deep inroads into processing, design and marketing of products.

This study intends to unveil the impact of digital transformation on the operations of Water Utilities in Tanzania, a case of Tanga Water Supply and Sanitation Authority (Tanga WSSA). Currently there is no specific study conducted to show how digital transformation that results into continuous changes in digital technology have impacted the organizations as most of studies have generally identified the impact of digital technology.

1.3 Objectives of the Study

1.3.1 General Research Objective

The general objective of this study was to assess the impact of digital transformation on the operation of Water Utilities in Tanzania, a case of Tanga Water Supply and Sanitation Authority.

1.3.2 Specific Research Objectives

(i) To examine the capability of Water Utilities in pacing with digital transformation

(ii) To examine the extent to which water utilities operations are affected by User acceptance on digital transformation

(iii) To examine the status of digital technology application in the operations of Water Utilities.

1.4 Research Questions

1.4.1 General Research Question

What is the impact of digital transformation on the operations of Water Utilities in Tanzania?

1.4.2 Specific Research Questions

(i) Are Water Utilities capable to pace with digital transformation?

(ii) To what extent does water utilities operations affected by User acceptance on digital transformation?

(iii) What is the status of digital technology application in the operations of Water Utilities?

1.5 Significance of the Study

This study will be useful to various water sector stakeholders and other interested parties to have robust strategies and plans that will assist to keep pace and capitalize the benefits of digital transformation. It will also provide understanding on possible impacts the Organization is likely to face/encounter as a result of global digital transformation. Finally, the result of the study will provide the database that will be used/considered for future studies.

1.6 Scope of the Study

The study focused on the impact of digital transformation on the operation of Water Utilities a case of Tanga Urban Water Supply and Sanitation Authority. Specifically, the study examined the capability of water utilities in pacing with digital transformation, extent to which water utilities operations are affected by User

acceptance on digital transformation and the status of digital technology application in operation of water utilities. The study involved 100 employees of Tanga WSSA that was obtained randomly.

1.7 Organization of the Study

The study is organized into five chapters. Chapter one presents background of the problem, statement of the problem, objectives of the study, research questions and significance of the study and organization of the study. Chapter two describes literature review and chapter three presents methodology. Chapter four describes analysis, presentation and discussion of the findings and chapter five presents summary, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter describes conceptual definitions, theoretical review, empirical review, and research gap, conceptual framework and theoretical framework.

2.2 Conceptual Definitions

2.2.1 Digital Transformation

Digital transformation defined as transformation concerned with the changes digital technologies can bring about in a company's business model which result in changed products or organizational structures or in the automation of processes (Hess et al. (2016). It also defined as an evolutional question of survival or extinction depending on company's ability to adapt itself to new digital environment (Kreutzer, 2017). The definition used to examining the contribution of digital transformation toward improvement of processes and productivity, deliver better customer services and organization productivity.

2.2.2 Water Utility

Water Utility (Water Authority) is a Government Entity mandated by Water Supply and Sanitation Act of 2019 Section 13(1) and Section 20 to provide water supply and sanitation services among Tanzanian citizens. There is a total of 94 Regulated Water Utilities at Tanzania Mainland grouped under Regional Water Utilities, National Water Utilities and District and Township Utilities (Annual Water Utilities Performance Review Report 2019/2020 by EWURA).

2.3 Theoretical Literature Review

The study was guided by Technology Acceptance Model (Davis et al., 1989) and The Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al (2003).

2.3.1 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) proposed and developed the Unified Theory of Acceptance and Use of Technology (UTAUT), the framework was developed through a review and consolidation of the constructs contained in eight prominent theories previously employed by researchers in explaining ICT usage behavior: UTAUT incorporated Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Innovation Diffusion Theory (IDT), motivation model, social cognitive theory to develop a unified theory for technology acceptance (Negahban & Chung, 2014).

The model proposes four constructs namely (i) performance expectancy, (ii) effort expectancy, (iii) social influence, and (iv) facilitating conditions, grouping similar earlier constructs (Venkatesh et. al., 2003). UTAUT correlates environmental, social, and economic factors directly to the behavioral change of business. It suggests that businesses are likely to adopt, accept and use a certain piece of technology or technologies if these three factors are present. There has been a growing interest among researchers in using the UTAUT framework, finding application in diverse areas of research interests such as in exploring user acceptance of mobile technologies, to several technologies for both individual and organizational. The UTAUT model has been useful in explaining a large portion of variance in behavioral intention towards the use of technology. However, one interesting observation about

the model is that, based on cross-cultural examination of the model, empirical evidence shows that it responds to the growing needs of understanding factors that are critical to success of ICT deployment in a business environment (Venkatesh & Zhang, 2010). The theory however, was used in attesting individual behavior to adopt and accept digital technology changes to simplify the operation of water utilities.

2.3.2 Technology Acceptance Model (Davis et al., 1989)

The study on the other hand has adopted TAM theory that generate a number of variables used in exemplifying the study variables. The Technology Acceptance Model emphasize that emerging information technology cannot deliver improved organizational effectiveness if it is not accepted and used by potential users. Technology Acceptance Model (TAM) is one of the most successful measurements for computer usage effectively among practitioners and academics (Davis, 1989).

TAM is consistent with (Rogers, 1983) theory on diffusion of innovation where technology adoption is a function of a variety of factors including; relative advantage and ease of use. Two particular beliefs are addressed through TAM; perceived usefulness and perceived ease of use. Perceived usefulness is defined as being the degree to which a person believes that the use of a system will improve his performance. In addition Perceived Usefulness (PU) reflects the level to which an individual believes that using a new system would improve the task performance (Pituch and Lee, 2006, Saade, Nebebe & Tan, 2007 and Venkatesh & Davis, 2000). In the course of this study therefore, perceived usefulness of digital transformation exposed staffs and customers to new knowledge and react to digital transformation pertaining to water operation activities.

On the other hand, perceived ease of use refers to the degree to which a person believes that the use of a system will be effortless. TAM attempts not only for prediction but also for explanation to help researchers and practitioners identify why a particular system may be unacceptable and pursue appropriate steps. The TAM is also one of the most influential and commonly adopted theories for describing an individual's acceptance of information systems (Bagozzi, 2007). With careful observation, the variables that make up TAM are also similar to the personal ability expected of modern professionals in order to attain Information Literacy skill. The predictable variable includes capacity of water utilities, extent of acceptance use of digital transformation and status of digital transformation in the operations.

2.4 Empirical Literature Review

2.4.1 Empirical Literature Review World wide

Harvell (2018) did a study on The Internet of Things and the Water World. The study focused on how IOT provide utilities with information about water usage, location of leaks and save money and identify challenges. The study found out that SUEZ, a private water company providing services to over 7.5 million people in the United States and Canada, is an example of a utility that has found smart meters to be highly beneficial. SUEZ completed a smart water meter case study in Bayonne, New Jersey.

After installing over 10,500 new smart meters (which covered 90% of the city's residents and businesses), SUEZ found over 1,000 leaks on customer properties in the first few months. These customers were unaware of the water leaks on their own properties, and two years after installing the new meters, the water consumption throughout the utility had decreased by 7%. Additionally, smart meters are

particularly useful for water utilities as they improve efficiency by virtually eliminating the need for onsite meter readings, thus reducing manpower, fuel and vehicle maintenance cost. Even though the study has described the contribution of smart meter in the operations but it doesn't show how the organization can be capable to capitalize its advantages.

Knoblauch and Stein (2020) did a survey on Digital water City-Leading urban water management to its digital future (DWC) in European countries. The main objective of the project was to boost the integrated management of water systems in five major European cities of Berlin, Milan, Copenhagen, Paris, and Sofia, by leveraging the potential of data and smart digital technologies. 18 advanced digital solutions to address current and future water-related challenges in European countries developed. The survey observed that digital technologies such as mobile devices, sensor network, real-time monitoring, machine learning and modeling tools improve management of water infrastructures significantly. They also improve the quality of services provided to citizens as well as awareness and cooperation between utilities, public authorities, and citizens in urban water management. Ultimately, DWC will provide an interoperable free flow of information among stakeholders and across the water value chain. The findings of study do not give highlights on human resource capability to support the effective operation of digital technology devices.

Kadhim, et al (2021) entitled the management of water distribution network using GIS application case study: AL-Karada area in Asia. A case study coupled with interview method used. The study intended to develop a model for geographic information

systems to manage the assets of the water supply networks in the Karrada region and to evaluate the network geometrically. The results of the engineering analysis of the network shows that the network does not contain engineering errors and depends on scientific and engineering foundations, and many tools have been used and a number of orders to manage the water distribution networks, inquire about their assets in full, and explain the importance of using these tools in order to inquire about the possibility of malfunctions in the network and help maintenance professionals in this and take immediate action to identify problems (for example, in the case of broken pipes, service areas).

In the system followed by rapid solutions to optimize network maintenance work, providing a framework for continuous improvement. The study recommended the authorities to establish a comprehensive central database for water networks with continuous updating of it, and to take advantage of new updates of water supply and use networks management programs to help maintenance professionals to monitor faults in the network. The study didn’t show infrastructure requirements to support smooth operations of network.

World Economic Forum, (2018) Harnessing the Fourth Industrial Revolution for Water. It focused on opportunities for advanced technology to address global water and sanitation challenge. It has been reported that Adoption of Smart Water Technologies Remains a Utility Management Challenge. The survey assessed the challenges facing water utility. Grounded-based methods coupled with questionnaire used. The article highlights survey results from the Smart Water Networks Forum (SWAN) in which some 81% of people agreed that, while the technology has been

developed to enable smarter water networks, there remains a challenge to convince water utilities. Another significant challenge is tied to the need for workforce training. In general, water-utility workforces are not trained in digital technology solutions and workforce transformation will be necessary to scale the adoption of digital technologies. Digital transformation may change the way water utilities are led, with new roles such as: Chief Digital Officer, Chief Customer Officer, or Digital Water Steward emerging (Francesco, 2015). Indeed, the respondents to a recent survey found that 40% of their Senior Managers had 'only a moderate understanding of the importance of digital skills', while 26% were believed to have 'little or no understanding' at all.

International Water Association report (2019) on Digital Water – Industry leaders chart the transformation journey in Europe revealed that unlike the Energy Sector, Water Utilities have not substantially changed their business model through ICT over the past century and the sector is generally characterized by a low maturity in the application of these technologies. Utilities are still lacking skilled staff to handle this unprecedented amount of data that comes with increased reliance on digital solutions (Goubersville, 2016). Many older Managers are open to innovation but often struggle to see the benefits of new digital solutions in the long term, partially because their own ICT skills are limited. In addition, data law specialists are not common in water utilities.

2.4.2 Empirical Literature Review in Africa

Study by Ivo Daniel, et al (2021), How is digital transformation impacting the water utility sector? - Insights from a worldwide online utility survey. Questionnaire survey

method was successful employed. The study aimed at analyzing common priorities in digital transformation, challenges entailed by digital transformation process. The results indicate that most of the participating utilities have already taken on digitalization and are moving forward by adopting new digital technologies, regardless of their geographic origin, company age, and size.

However, differences, as 50% of the cases in technology was either being implemented or planned in the near future and not considered. As the driving elements for their transition, utilities reported economic factors as most influential across all subsections with a ratio of 66%. Governmental influence and ecologic factors had a comparably smaller influence with a ratio 26% and 8%, respectively. However, the study didn't stipulate user responsiveness in digital transformation.

Otuke (2016) did a study on the Role of information Communication Technologies in Water Management in Nairobi. The purpose of the study was to establish the role ICTs can play in managing the water resources and services efficiently. The study adopted descriptive census design. The response rate for the target population was 83%, which is statistically significant to analyze the data. Data collected was analyzed using both descriptive and inferential statistics. The study established that Billing System, Meter Reading System, Financial Management system, Procurement system and the Dam Monitoring System were the main ICT applications used in water management. Further the study established that limited staff skills, limited resources (finance), lack of customized applications, lack of detailed top level management support and appreciation of the role of ICT by other departments were main challenges facing the implementation of ICT applications in the company. The study

identified; quality management, water supply chain monitoring, mapping of water supply stations using GIS and customer management to be the priority functions in water management where ICT applications are required most. However, the study didn't stipulate the extent of user acceptability of systems and ICT devices installed.

In Nairobi's Mathare slums, a public-private partnership between Nairobi Water and Sewerage Company, Safaricom (a telecommunication company), and Grundfos (a Danish water engineering firm) resulted in the installation of water vending machines (Schiller, 2016). It has been reported that clean water, users load points onto smart cards with credit bought on-site or via their mobile phones, then use the cards to access the water vending machines around the slum. With a simple swipe of their smart card, water is released from the main storage and into a waiting container. Through M-Pesa, payments are collected from customers more efficiently, while a cloud based system receives and publishes all transactional and operational data from each water dispenser, ensuring accountability and reducing service costs. The machines are revolutionizing water availability and distribution to the poor slum dwellers that have long been at the mercy of water cartels. The outcome seems to show that with the introduction of this payments platform, unit costs have declined substantially. However, the study didn't stipulate how infrastructures are capable to support application of installed ICT devices and systems.

Amankwa et al (2021) did a study on digitalizing the water sector: Implications for water service Management and Governance in Ghana. The study examines the process of water service digitalization and the resulting effects on service providers. Drawing on qualitative methods, ideas on digitalization, value, and power were used to

investigate the implementation and impact of digital technologies in Ghana's state water utility company. Internal cost-benefit analysis indicates that using digital payment channels saves the company about 10% of the administration cost of collecting and processing bills (DWI Consultant). To add billing was reported to be more accurate and faster than previously because of the use of messaging platforms like Telegram and WhatsApp as a means of engaging customer. We find digital water innovations to be recent and delivering relatively limited impacts as yet, with value mainly accruing at the utility's operational rather than strategic level. The digital technologies present avenues for power shifts and struggles internally and externally as well as some changes in water management structures and responsibilities. However, the study didn't stipulate the effectiveness of technology application support to ensure continuous service delivery.

Namaliya, (2017) carry out an investigation on strategies for Maximizing Revenue Collection in Public Water Utility Companies in Malawi. The purpose of the single-case study was to explore trustworthy business strategies senior managers of water utilities use to address inefficiencies in collecting water fee revenues. Semi structured, face-to-face interviews and a review of company documents methods were successfully used. Thematically analysis used in data analysis. The study findings revealed that CT embracing new ideas of doing things such as outsourcing billing and debt collection, and opening up of several convenient pay points.

The study further identifies customer relations management as an effective strategy for addressing inefficiencies in collecting water fee revenues. The use of electronic money transfers and mobile money payment platforms for example improve revenue

collection because customers can settle their bills at their suitability. The use of threats of punishment such as water supply disconnection, sending of notices and reminders, and sending out press releases on the need for customers to settle their water bills on time does not only maintain customer relations management, but the strategies also make customers feel obliged to settle their water bills on time. However, the study didn't indicate how introduction digital technology has impacted the overall operation.

Hanjahanja and Omuto (2018) did a study on Do prepaid water meters improve the quality of water service delivery? The case of Nakuru, Kenya. The study explored what a prepaid metering project in Nakuru, Kenya achieved, and whether or not prepayment can be considered to be an innovative way of providing water to the urban poor. In addition, the study investigated micro financing as tools for supporting efforts by water service providers serving the poor and whether they are an effective way of financing projects. Communal prepaid meters were installed in an existing conventional network and data on commonly used performance evaluation parameters collected through interviews, field visits, and existing literature.

The results portrayed prepaid metering with positive improvements to the conventional metering. It was found that there is an opportunity in microfinance for win-win partnerships among financial institutions, water service providers and low-income customers to help them in increasing access to water services. Communal prepaid meters are now bankable and viable options for serving urban poor communities. However, the study didn't stipulate the operating environment the organization should set to capitalize the benefit of installed prepaid water meter.

2.4.5 Empirical Literature Review in Tanzania

Digitalization touches every part of a water utility. Successful digitalization means that the utility has the tools, skills and business processes to harness new technology in order to ultimately improve their customer experience while maintaining (or increasing) returns to the shareholder.

On the other hand status of digital transformation and its application varies significantly across the global. It has been reported that more than 800 million people lack mobile access worldwide (63 percent of them in the bottom, 40 percent of the income distribution), and 4.3 billion lack internet access (49 percent in the bottom 40) (World Development Report, 2016). It exemplified that only15 percent can afford access to broadband internet. Mobile phones, reaching almost four-fifths of the world's people, provide the main form of internet access in developing countries. But even then, nearly 2 billion people do not own a mobile phone, and nearly 60 percent of the world's population has no access to the internet (Ibid). However, the study didn't stipulate the capability of user to use the mobile and internet.

Study by Maximiliano, (2017) on Managing Digitalization in Public Organizations: The role of managing organizational processes and actors found that the digital transformation had led to more data-driven organizational processes, which in turn led to a more coordinated work structure. Likewise GSM report (2019), on Digital transformation in Tanzania The role of mobile technology and impact on development goals, posits that mobile technology for example has emerged as the key driver of digital transformation in the country. The technology enables last-mile connectivity for people without access to fixed network infrastructure, while the convenience and

affordability of mobile devices, relative to other communications devices, enables personal connectivity to digital services. Mobile networks cover a wide area, making it a more cost effective option relative to fixed-line technologies for connecting underserved areas, while rising smartphone adoption is allowing more people to use advanced, feature-rich digital services. Richard, (2019) commented that Vodafone is pioneering ways that mobile telephony can benefit utility customers in Africa including Tanzania.

The Dar es Salaam Water and Sewerage Corporation (DAWASCO) started accepting mobile payments for utility bills in 2009, via Vodacom Tanzania. The service allows customers to pay their bills at the time of their choosing. However, the studies have not stipulated user's reactions on new introduced digital solutions. Krolikowski, (2014) did a study entitled Can mobile-enabled payment methods reduce petty corruption in urban water provision. Empirically the paper evaluates the ability of novel mobile-enabled payment methods to reduce information asymmetries and mitigate petty corruption in the urban water sector's billing and payment processes.

The case of Dar es Salaam is used to explore the role of mobile-enabled payment instruments through the use of a stratified random sample of 1097 water utility customers and 42 interviews with representatives from the water sector, the telecommunications industry, civil society, and banking institutions. Results show that mobile-enabled payment methods can reduce information asymmetries and the incidence of petty corruption to promote improved financial management by making payment data more transparent and limiting the availability of economic rents in the billing and payment process. These can be used to enhance water service delivery and

citizen participation in the production of urban water supplies. The use of mobile-enabled payment methods in the urban water sector represents an application of mobile communication technologies in a low income country with proven potential for scalability that simultaneously supports the achievement of development objectives. However, the study didn't show how mobile enabled payment is required to be facilitated.

Study by Nzilano (2017) entitled Factors Influencing Organization Efficiency of Water Supply and Sanitation Authorities in Tanzania. The study examines factors influencing organization efficiency of water supply utilities in Tanzania, using Mbeya Urban Water Supply Authority (Mbeya UWSA) as case in point. The unit of analysis of this study was all employees of the Mbeya UWSA. Data were collected through structured questionnaires, key informant interviews and documentary analysis. Descriptive analysis and one sample t-test were employed as data analysis methods. The findings show that the use of information and communication technology moderately contributes to organization efficiency while availability of working facilities, engagement in survey and innovation in water management contributes to a small extent to organization efficiency of the utility.

The study recommends Mbeya UWSA to take deliberate efforts to improve the attributes of human resource competences, financial resources and physical resources that have bearing effect on the organization efficiency of the utility in delivering services to customers. However, the study didn't stipulate the extent to which organization efficiency has been affected by user acceptance on introduced information and communication technology.

2.5 Research Gap

Digital transformation play a significant role in addressing operational challenges related to water management and services provision in Water Utility across the globally. The trend of increasing adoption of smart devices and online transactions for example is accelerating and becoming something that is more and more expected by customers and other stakeholders (International water association, 2019). The Government has now embracing digital technology as a key enabler for provision of service to its Citizen (Magayane et al., 2016).

Despite of notable efforts by Water Utilities to capitalize the advantage of digital technology, the fast and continuous changes as a result of global digital transformation creates hindrance to ensure adequate digitization of business processes. The capability and effectiveness in reacting with the changes of digital technology is a big challenge, since these changes impact the way organizations operates, brings new perceptions and changes the consumer behaviors. This is in line with the study conducted by Huang, Jie and Huang (2018) stating that, the development of digital technology bring new thought, change existing consumption and business models, create comprehensive and fundamental changes to foundation, environmental, input and output.

Also the study by Wohlmuth (2019) revealed that, the key challenge relates to Africa is to keep pace with the rapidly changing dimensions of technological frontiers which make deep inroads into processing, design and marketing of products. In Tanzania study by Richard (2019) focused on the acceptance of mobile payments for bills via Vodacom as it reduce costs though, lack of workforce training, network coverage and

installed infrastructures projected to affect the operation of water utility more effectively and efficiently.

The study will bridge the existing knowledge gap by assessing the impact of digital transformation in the operation of water utilities in Tanzania, specifically for Tanga Water Supply and Sanitation Authority focusing on capability of water utilities in pacing with digital transformation, the extent to which water utilities operations are affected by User acceptance on digital transformationand status of digital technology application in the operations of water utilities.

2.6 Conceptual Framework

Conceptual framework is a network, or a plane of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena (Yosef, 2009). The conceptual framework is the lays out the key factors, constructs, or variables, and presumes relationships among them Miles and Huberman (1994).

The Figure 2.1 describes the linkage between digital transformation and operation of water utility. Independent variables were organization capability, user acceptance of digital transformation, and digital technology application. These factors are projected to affect organizational performance and productivity. While dependent variable were operational efficiency and improved service delivery. These variables were used in assessing impact of digital transformation in the operation of water utility as the expectation of this study was that if these factors are well observed the operation of water utility is likely to be efficient with improved service delivery.

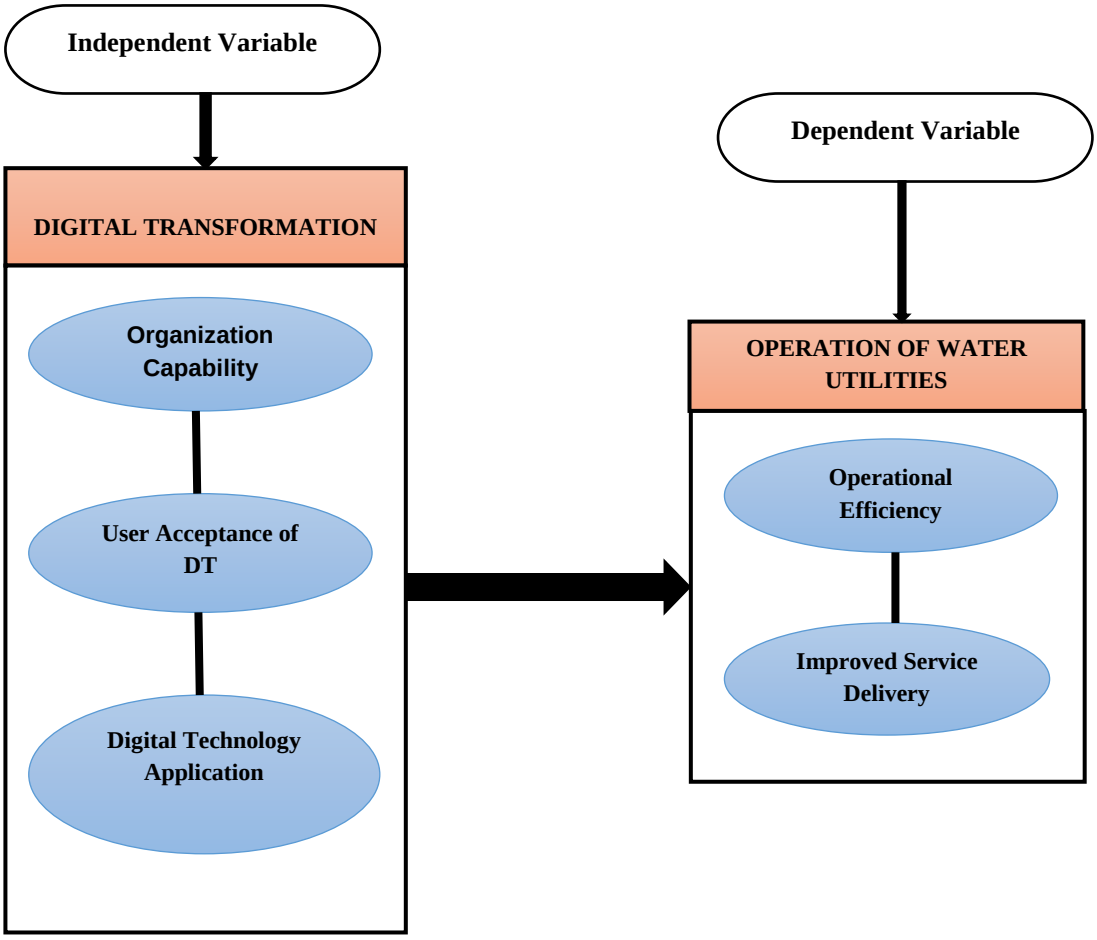

Figure 2.1: Conceptual Framework

Source: Author

2.7 Theoretical Framework

The theoretical framework of this study evaluated organization capability in pacing with digital transformation. Also examined the extent to which water utilities operations are affected by User acceptance on digital transformation and the status of digital technology application in the operations of Water Utilities coupled with the perceived usefulness and perceived ease to use model of technological acceptance propounded by Devis et al, 1989. On the other hand, UTAUT model used in examining the extent of acceptance use of technology affecting water utility operations. The study anticipated that financial status/ capability, user ability to use

the technology in service delivery, affordability of mobile devices, access to the services and internet connectivity have great influence in actual use of digital transformation in water utility operations. To copy with rapid technological innovation the institution initiative and government is so important. This particular study applied both UTAUT and technological acceptance model in the direction of explaining the impact of digital transformation on the operations of water utilities as effective use of the said technology depend on individual intention toward the use technology.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Methodology is the general research strategy that outlines the way in which research is to be undertaken and, among other things, identifies the methods to be used in it. It may be understood as a science of studying how research is done scientifically **(**Kothari, 2004). This part describes research design, population of the study, area of the study, sampling technique and sample size, data collection methods, data analysis as well as validity and reliability of data.

3.2 Research paradigm

Research paradigm is an approach or model of conducting research. The study used deductive research approach. Deductive reasoning moves from the general to the particular. “It takes a general premise and deduces particular conclusions”. (Harvey, 1995) Deductive methodology considered to be important and realistic because of the nature of data needed along with the Impact of Digital Transformation on the Operation of Water Utilities in Tanzania as well as objectives of study. The approach was also used in establishing the relationship between microfinance agency and digital transformation and the operation of water utilities. On the other hand the choice of the approach influenced by the sample used in data collection as well as data analysis approach.

3.3 Research Design

A research design is a plan showing the approach and strategy of investigation aimed at obtaining relevant data, which fulfill the research objectives and the research

questions (Cohen and Marnion, 2000). The research design sets the procedure on the required data, the methods to be applied to collect and analyze data, and how all these answer the research question (Grey, 2014). The study adopted survey research design. The survey research design describes systematically a situation, phenomenon, or area of interest factually and accurately (Omari, 2011). It is a useful design to use when researchers seek to collect data quickly and economically, study attitudes and opinions, and survey geographically dispersed individuals (Creswell, 2012). The design was used in collecting quantitative data from large sample of population by using questionnaires in evaluating the impact of digital transformation in the operation of water utility.

Quantitative is a research approach aimed at testing theories, determining facts, demonstrating relationships between variables, and predicting outcomes (Van der Merwe, 1996). The approach used to ensure objectivity, generalizability and reliability (Weinreich, 2009). The techniques that was used in this approach include random selection of research participants from the study population in an unbiased manner.

3.4 Area of the Study

The study on the impact of digital transformation on water utilities operation was conducted in Tanga Water Authority. The selection of the area influenced by researcher familiarity and wide use of technology in water supply.

3.5 Population of the Study

Population refers to the complete set of individuals (subjects or events) having common characteristics in which the researcher is interested (Fraenkel and Warren,

2002). For the present study, the population from which the researcher draw conclusions comprised all employees of Tanga WSSA from five departments of Managing Director Office, Technical, Customer Service, Finance and Human Resource and Administration. The choice of the departments or group based on the fact that they are expected to be more knowledgeable about the impact of digital transformation on the operation of Water Utility and have lots of information to share about the status of digital technology application in the operations of Water Utilities. On the other hand, the study also involved the Managing Director and Head of Departments based on job position, experience and knowledge pertaining to impact of digital transformation on the operation of Water Utility.

Table 3.1: Tanga Water Supply and Sanitation Authority Population

Respondents by Departments	**No of Employee**
Managing Director Office	16
Human Resource	32
Technical	75
Finance	20
Customer Service	63
Total	**206**

Source: Author

3.6 Sampling Design and Sample Size

3.6.1 Sampling Design

Sampling design defined as the procedure used to select sample units for measurement. It can be individuals from a defined population or sites within a study area. In this study probability through stratified random sampling and non-probability design through purposive sampling was used to select area of study and respondents.

Stratified random sampling design involves dividing the population into homogenous subgroups and then taking sample in each subgroup (Kothari, 2004). The sample selected in such way that certain subgroups in the population are represented in the sample in appropriate to their number in the population. The respondents were stratified on the basis of their job position and experience. The technique is chosen because the nature of the study is homogeneous (that is only Tanga WSSA employee). The respondents (employee) from the study area were stratified and randomly selected by the use of employee inventories from Tanga WSSA.

3.6.2 Sample Size

Sample is a finite part of a statistical population whose properties are studied to gain information about the whole. Patton (2010) and Creswell (2009) view sample as a small population selected for observation and analysis. For possible access and manageability, the total sample of 100 respondents out of 206were involved. The selection of these respondents influenced by representation basis and disproportionate of total population of each department.

Table 3.2: Composition of Sample

Respondents by Departments	Employees	Actual sample	%	Sampling Design	Data Collection Tools
Managing Director	16	(16/206)*100= 8	8%		
Human Resource	32	(32/206)*100= 16	16%	Random	Questionnaires
Technical	75	(75/206)*100= 36	36%	design	
Finance	20	(20/206)*100= 10	10%		
Customer Service	63	(63/206)*100= 30	30%		
Total	**206**	**100**	**100%**		

Source: The Author

3.7 Data Collection Method

In this study, survey and documentary review method were used in data collection. Survey is a research method used for collecting data from a predefined group of respondents to gain information and understandings several topics of interest. The method is restricted to a representative sample of the potential group that the researcher is interested in, for reasons of practicality and cost-effectiveness (Methers et al, 2007). In this study the method used to tape information related to impact of digital transformation on water utilities operation through the use of questionnaire.

3.7.1 Secondary Data

Secondary data are information that has been gathered previously for some purpose other than the current research project (Kumekpor, 2002). Secondary data were obtained from the articles in journal (published document from the internet) and books. Through documentary review the capability of Water Utilities in pacing with digital transformation, the extent to which water utilities operations are affected by User acceptance on digital transformation and the status of digital technology application in the operations of water utilities were noted and used in building discussion on the entire document.

3.7.2 Primary Data

Primary data are original data collected for a specific research goal (Hox and Boeije, 2005). In this study primary data were collected through the use of questionnaire. The questionnaires were administered to employees including the Head of Departments and Managing Director from the study area.

3.8 Data Collection Tools

3.8.1 Questionnaire

Questionnaire is an observational technique, which comprises series of items presented to a respondent in a written form, in which the individual is expected to respond in writing (Ajayi, 2017). They are widely used to obtain information about current conditions and practices and to make inquiries concerning attitudes and opinions quickly in the precise form (Kombo and Tromp, 2006). Closed-ended questions were self-administered to 100 employees and enabled the researcher to capture both qualitative and quantitative information pertinent for the study. The tool was prepared into English language.

3.9 Validity and Reliability of Research Instrument

3.9.1 Validity

Validity is the subjective judgment that the instrument measures what it intends to measure in terms of relevance (Babbie, 2010). Validity of this study was secured through the use of questionnaire survey method in data collection. When developing the instruments uncertainties was eliminated by using appropriate words and concepts in order to enhance clarity and general suitability of the instrument.

3.9.2 Reliability

Reliability refers to the degree to which an assessment tool produces stable, consistent results (Phelan &Wren, 2006). The testing and pretesting of instrument was conducted prior to the main study so as to avoid doubts of the contents in the data collection measuring instruments. To add, reliability was attained through the use of purposive

and stratified random sampling and the use of survey questionnaire method. The instrument was prepared in English.

Cronbach's alpha used to estimate the reliability of instrument used in data collection and testing the consistency of the data. It happens that the questionnaire instrument test statistically and brought about positive correlation coefficient with a statistical value of .7o. The statistical testing provides the researcher with opportunities to administer questionnaire instrument in data collection more efficiently.

3.10 Data Analysis

Data analysis involves some manipulations of data collected through the use of statistical tools in order to compute a number or a percentage (Orodho, 2008). In this study data was analyzed in accordance to the research questions. Data that was captured through the use of questionnaires was edited and assigned serial numbers for the purpose of easy identification during the coding process and rechecking of information on the questionnaires during data entering exercises. Then computer software Statistical Package for Social Sciences (SPSS) 23rdversion was used in analyzing quantitative data.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter provides a general presentation, analysis and discussion of research findings; and provides an interpretation of the findings from respondents on impact of digital transformation on the operation of water utilities a case of Tanga water supply and sanitation Authority. The chapter consists of four sections. The first section describes the characteristics of the respondents; next section describe the capability of Water Utilities in pacing with digital transformation. Third section describe the extent to which water utilities operations are affected by user acceptance on digital transformation, the fourth section examines the status of digital technology application in the operations of water utilities and the last section presents the discussion of findings.

Table 4.1 presents information about gender of the respondents, age of respondents, education level of respondents and working experience. The findings shows that 74% of the respondents were male while (26%) of respondents were female. The number of male were higher that female because at Tanga WSSA female are about 23% of all employees and the data collection considered this proportionate.

The study findings also shows that, 46% of respondents were between 31-35 years followed by 21% of respondents ranging from 36-40 years, 18% of respondents ranging from 20-30 years and 15% of respondents are above 41 years. The age of respondents has been used to measure the capability of respondents to pace with digital transformation.

4.2 Characteristics of the Respondents

Table 4.1: Gender of the Respondents, Age of Respondents, Education Level of Respondents and Working Experience

Category	Variables		Frequency	Percent
Gender	Male		74	74.0%
	Female		26	26.0%
			100	**100.0%**
Age	20-30 years		18	18.0%
	31-35 years		46	46.0%
	36-40 years		21	21.0%
	41 years and above		15	15.0%
			100	**100.0%**
Education Level	Certificate		29	29.0%
	Diploma		34	34.0%
	Degree		29	29.0%
	Masters		6	6.0%
	Others	Certified Public Accountant	2	2.0%
		Certified Procurement and Supplies Professional		
			100	**100.0%**
Working experiences	Less than 5 years		25	25.0%
	6-10 years		52	52.0%
	11-18 years		16	16.0%
	18 years and above		7	7.0%
			100	**100.0%**

Source: Field Data (2021)

Further study findings shows that, 34% of respondents have a diploma, 29% of respondents have degree, also 29% of respondents have certificate, 6% of respondents have masters and 2% of respondents have other level of education Certified Public Accountant and Certified Procurement and Supplies Professional. By taking into consideration, the level of education of respondents, which is certificate and above implies that their responses are reliable due to the fact that they are more knowledgeable as far as a formal education is concerned.

Finally, the respondents were asked to identify their working experience in Tanga WSSA. This was very important for this study in order to identify for how long they

have been using the ICT solution installed in the organization operations. The findings shows that, 52% of respondents have working experience of 6 to 10 years, 25% of respondents have less than 5 years, 16% of respondents have 11 to 18 years and 7% of respondents have more than 18 years.

4.3 The Capability of Water Utilities in Pacing with Digital Transformation

The first question aimed at examining the capability of water utilities in pacing with digital transformation. The Respondents were asked to respond to eleven (11) statements presented in a likert scale by indicating the level agreement or disagreement. The responses resulted into the following findings:

4.3.1 The Organization Adequately offers Training/Exposure to Employee on the Use of Innovated Technology

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the organization adequately offers training/exposure to employee on the use of innovated technology and the feedback was as shown in Table 4.2.

Table 4.2: Responses on Whether Training/Exposure are provided to User of Technology

Variables	Frequency	%
Strongly Agree	22	22%
Agree	55	55%
Neutral	17	17%
Disagree	6	6%
Total	**100**	**100%**

Source: Field Data (2021)

From the responses as presented in Table 4.2, the study has found that the Water Utilities are offering adequate training/exposure to employee on the use of innovated technology. As per the responses from the statement, 55 (55%) respondents agreed with the statement, 22 (22%) respondents strongly agreed with the statement, 17(17%) respondents were neutral while 6 (6%) respondents disagreed with the statement. Cumulatively, 77 (77%) respondents have supported the statement by strongly agree and agree. This implies that, employees have exposure on how to use/apply the innovated technologies.

4.3.2 The Organization Set Sufficient Funds to Pace with Technology Developments

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the organization set sufficient funds to pace with technology developments and the feedback was as shown in the Table 4.3.

Table 4.3 Responses on Whether Funds are Sufficiently set by Organization to Pace with Technology Developments

Variables	Frequency	%
Strongly Agree	5	5%
Agree	38	38%
Neutral	54	54%
Disagree	3	3%
Total	**100**	**100%**

Source: Field Data (2021)

The responses as shown in Table 4.3 indicates that 54 (54%) of respondents were neutral on the statement which implies that there are not sure on whether Water

Utilities set sufficient funds to pace with technology developments. This could be attributed by staff being unaware with priorities and budgets set by organization in various plans. Apart from that, 38 (38%) respondents have agreed with the statement, 5 (5%) have strongly agreed and 3 (3%) have disagreed with the statement. By taking into consideration of 43 (43%) responses, which have cumulatively supported the statement, the study shows that it is probable that the funds are set to pace with technology developments.

4.3.3 The Organization Successfully Implement Earmarked/Planned Investment in Technology Development

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the organization successfully implement planned investment in technology development and the feedback was as shown in the Table 4.4.

Table 4.4: Responses on Whether Planned Investment in Technology is Implemented

Variables	Frequency	%
Strongly Agree	23	23%
Agree	49	49%
Neutral	23	23%
Disagree	5	5%
Total	**100**	**100%**

Source: Field Data (2021)

Based on the responses as presented in Table 4.4 the study found that the Water Utilities successfully implements earmarked/planned investments in technology development. As per the responses from the statement, 49 (49%) respondents agreed

with the statement, 23 (23%) respondents strongly agreed with the statement, 23(23%) respondents were neutral while 5 (5%) respondents disagreed with the statement. Cumulatively, 72 (72%) respondents have supported the statement by strongly agree and agree. This implies that, the progress and planned milestones to improve organization's operations through digital transformation is likely to be achieved.

4.3.4 The Government Supports the Initiatives for Technological Developments and Innovations

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the government supports the initiatives for technological developments and innovations and the feedback was as shown in the Table 4.5.

Table 4.5: Responses on whether Government Provides Support for Technology Development

Variables	Frequency	%
Strongly Agree	25	25%
Agree	53	53%
Neutral	14	14%
Disagree	8	8%
Total	**100**	**100%**

Source: Field Data (2021)

The study revealed that the government provides support to Water Utilities for technological developments and innovations initiatives. The responses in Table 4.5 indicates that, 53 (53%) respondents have agreed with the statement, 25 (25%) respondents have strongly agreed with the statement, 14(14%) respondents were

neutral while 8 (8%) respondents have disagreed with the statement. Cumulatively, 78 (78%) respondents have supported the statement by strongly agree and agree. This implies that, Water utilities plans to pace with technological developments and innovations are likely to be easily achieved through facilitated and favourable operational environments.

4.3.5 Staff are Capable to Pace with Digital Development and Innovations

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if Staff are capable to pace with digital development and innovations and the feedback was as shown in the Table 4.6.

Table 4.6: Responses on Whether Staff are Capable to Pace with Digital Development

Variables	Frequency	%
Strongly Agree	11	11%
Agree	30	30%
Neutral	12	12%
Disagree	47	47%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study indicated in Table 4.6, shows that Staff are not capable to pace with digital development and innovations. As per analysis of responses, 47 (47%) respondents have disagreed with the statement, 30 (30%) have agreed with the statement, 12 (12%) were neutral and 11 (11%) have strongly agreed with the statement. This implies that, the application and use of innovated technologies is much depending on how effective the Water Utilities offers training/exposure to its staff.

4.3.6 Technical/Professional Skills are Adequate to Support Organization's Digital Developments/Innovations

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if Technical/professional skills are adequate to support organization's digital developments/innovations and the feedback was as shown in the Table 4.7.

Table 4.7: Responses on Whether Government Provides Support for Technology Development

Variables	Frequency	%
Strongly Agree	27	27%
Agree	48	48%
Neutral	10	10%
Disagree	15	15%
Total	**100**	**100%**

Source: Field Data (2021)

The study responses as presented in Table 4.7, indicates that the Water Utilities have adequate technical/professional skills to support organization's digital developments/innovations. As per analysis of responses on the statement, 48 (48%) respondents have agreed with the statement, 27 (27%) respondents have strongly agreed with the statement, 10 (10%) respondents were neutral while 15 (15%) respondents have disagreed with the statement. Cumulatively, 75 (75%) respondents have supported the statement by strongly agree and agree. This implies that, the organization is capable to resolve operational challenges or difficulties associated with application of digital technology.

4.3.7 Installed Infrastructures and Facilities are Adequate to Support Digital Transformation

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the installed infrastructures and facilities are adequate to support digital transformation and the feedback was as shown in the Table 4.8.

Table 4.8: Responses on whether ICT Infrastructures are Adequate

Variables	Frequency	%
Strongly Agree	8	8%
Agree	29	29%
Neutral	57	57%
Disagree	6	6%
Total	**100**	**100%**

Source: Field Data (2021)

The responses as shown in Table 4.8 indicates that 57 (57%) of respondents were neutral on the statement which implies that there are not sure on whether installed infrastructures and facilities are adequate to support digital transformation in the Water Utilities. This could be attributed by less knowledge of the most of respondents on issues related to ICT infrastructures and facilities. Apart from that, 29 (29%) respondents have agreed with the statement, 8 (8%) have strongly agreed and 6 (6%) have disagreed with the statement.

4.3.8 The Organization has Policies and Guidelines to Guide the Application Of Digital Technology

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the organization has policies

and guidelines to guide the application of digital technology and the feedback was as shown in the Table 4.9.

Table 4.9: Responses on whether Organization has ICT Guidelines, Policies and Rules

Variables	Frequency	%
Strongly Agree	33	33%
Agree	46	46%
Neutral	7	7%
Disagree	9	9%
Strongly Disagree	5	5%
Total	**100**	**100%**

Source: Field Data (2021)

The study responses as presented in Table 4.9, indicates that the Water Utilities have various policies, guidelines and rules to guide the application of digital technology. As per analysis of responses on the statement, 46 (46%) respondents have agreed with the statement, 33 (33%) respondents have strongly agreed with the statement, 9 (9%) respondents have disagreed with the statement, 7 (7%) respondents were neutral while 5 (5%) respondents have strongly disagreed with the statement. Cumulatively, 79 (79%) respondents have supported the statement by strongly agree and agree. This implies that, digital transformation initiatives in Water Utilities are adequately controlled and managed.

4.3.9 The Organization has Plans (Short, Medium and Long Term) for Digital Technology Investment

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if the organization has plans

(short, medium and long term) for digital technology Investment and the feedback was as shown in the Table 4.10.

Table 4.10: Responses on Whether there are Plans for Technology Investment

Variables	Frequency	%
Strongly Agree	22	22%
Agree	42	42%
Neutral	26	26%
Disagree	2	2%
Strongly Disagree	8	8%
Total	**100**	**100%**

Source: Field Data (2021)

The study responses as presented in Table 4.10, indicates that the Water Utilities have plans (short, medium and long term) for digital technology investment. As per analysis of responses on the statement, 42 (42%) respondents have agreed with the statement, 22 (22%) respondents have strongly agreed with the statement, 26 (26%) respondents were neutral 8 (8%) respondents have strongly disagreed with the statement while 2 (2%) respondents have disagreed with the statement. Cumulatively, 64 (64%) respondents have supported the statement by strongly agree and agree. This implies that, organization has a proper direction/milestone to improve business process and service delivery through innovated digital solution.

4.3.10 Senior Management are Committed to Support Digital Transformation

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if Senior Management are committed to support digital transformation and the feedback was as shown in the Table 4.11.

Table 4.11 Responses on whether Senior Management are Supporting Digital Transformation

Variables	Frequency	%
Strongly Agree	17	17%
Agree	58	58%
Neutral	21	21%
Disagree	4	4%
Total	**100**	**100%**

Source: Field Data (2021)

The study revealed that the Senior Management are committed to support digital transformation. The responses in Table 4.11 indicates that, 58 (58%) respondents have agreed with the statement, 17 (17%) respondents have strongly agreed with the statement, 21(21%) respondents were neutral while 4 (4%) respondents have disagreed with the statement.

Cumulatively, 78 (78%) respondents have supported the statement by strongly agree and agree. This implies that, digital transformation plans and initiatives are likely to be adequately facilitated and implemented.

4.3.11 The Exposure of Senior Management on Digital Development and Innovations

In assessing the capability of water utilities in pacing with digital transformation the researcher analysed the feedback from respondents on if Senior Management have adequate exposure on digital development and innovations required for the organization and the feedback was as shown in the Table 4.12.

Table 4.12 Responses on whether Senior Management have Exposure on Digital Transformation

Variables	Frequency	%
Strongly Agree	11	11%
Agree	24	24%
Neutral	14	14%
Disagree	41	41%
Strongly Disagree	10	10%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study indicated in Table 4.12, shows that Senior Management does not have adequate exposure on digital development and innovations required for the organization. This could be attributed by inadequate capability to pace with fast development of digital technology. As per analysis of responses, 41 (41%) respondents have disagreed with the statement, 24 (24%) have agreed with the statement, 14 (14%) were neutral, 11 (11%) have strongly agreed with the statement and 10 (10%) respondents have strongly disagreed with the statement. Cumulatively, 51 (51%) respondents are against the statement by strongly disagree and disagree that Senior Management have adequate exposure on digital development and innovations required for the organization.

4.4 Extent to Which Water Utilities Operations are Affected by User Acceptance on Digital Transformation

4.4.1 Involvement of Users in Transforming Digital Solution used in Operations

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from

respondents on if Users are involved in transforming digital solution used in operations and the feedback was as shown in the Table 4.13.

Table 4.13: Responses on whether Users are involved in Transforming Digital Solution

Variables	Frequency	%
Strongly Agree	5	5%
Agree	24	24%
Neutral	29	29%
Disagree	41	41%
Strongly Disagree	1	1%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that Users are not always involved in transforming digital solutions used in operations. As per analysis depicted in Table 4.13 shows that, 41 (41%) respondents have disagreed with the statement, 29 (29%) were neutral, 24 (24%) have agreed with the statement, 5 (5%) have strongly agreed with the statement and 1 (1%) respondent have strongly disagreed with the statement. Cumulatively, 42 (42%) respondents are against the statement by strongly disagree and disagree that the organization always involve Users in transforming digital solution used in operations. This implies that, there is a possibility of users to pose great challenges in accepting and owning the innovated digital solutions.

4.4.2 Awareness of Users on Planned Digital Transformation Initiatives Undertaken

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from

respondents on if Users are aware on planned digital transformation initiatives undertaken in the organization and the feedback was as shown in the Table 4.14.

Table 4.14: Responses on whether Users are aware on Planned DT Initiatives

Variables	Frequency	%
Strongly Agree	4	4%
Agree	22	22%
Neutral	17	17%
Disagree	56	56%
Strongly Disagree	1	1%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that Users of technology are not adequately aware with digital transformation initiatives planned to be undertaken in the organization. As per analysis depicted in the Table 4.14 shows that 56 (56%) respondents have disagreed with the statement, 22 (22%) have agreed with the statement, 17 (17%) were neutral, 4 (4%) have strongly agreed with the statement and 1 (1%) respondent have strongly disagreed with the statement. Cumulatively, 57 (57%) respondents are against the statement by strongly disagree and disagree that Users of technology are adequately aware with digital transformation initiatives planned to be undertaken in the organization. This implies that there is knowledge gap among staff on organization direction towards digital transformation hence poses challenges on acceptability transformation.

4.4.3 The Digital Transformation is always Perceived by Users as Essential to ease Organizational Operations

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from

respondents on if the digital transformation is always perceived by users as essential to ease organizational operations and the feedback was as shown in the Table 4.15.

Table 4.15: Responses on whether Digital Transformation Perceived as Essential to Ease Organizational Operations

Variables	Frequency	%
Strongly Agree	23	23%
Agree	54	54%
Neutral	21	21%
Disagree	2	2%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that digital transformation is always perceived by Users as essential to ease organizational operations. As per analysis portrayed in Table 4.15 shows that 54 (54%) respondents have agreed with the statement, 23 (23%) respondents have strongly agreed with the statement, 21(21%) respondents were neutral while 2 (2%) respondents have disagreed with the statement. Cumulatively, 77 (77%) respondents have supported the statement by strongly agree and agree. This perception implies that, the level acceptance of digital transformation is likely to be high if the transformation result into easing organizational operational.

4.4.4 Users believes Digital Transformation Improves Organizational Efficiency and Performance

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on if the Users believes digital transformation improves organizational efficiency and performance and the feedback was as shown in the Table 4.16.

Table 4.16: Responses on whether Users believes DT Improves Efficiency and Performance

Variables	Frequency	%
Strongly Agree	27	27%
Agree	46	46%
Neutral	19	19%
Disagree	8	8%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that Users believes digital transformation improves organizational efficiency and performance. As per analysis portrayed in Table 4.16 shows that 46 (46%) respondents have agreed with the statement, 27 (27%) respondents have strongly agreed with the statement, 19(19%) respondents were neutral while 8 (8%) respondents have disagreed with the statement.

Cumulatively, 73 (73%) respondents have supported the statement by strongly agree and agree. This implies that, the level acceptance of digital transformation is likely to be high if the transformation result into improvement of organizational efficiencies and performances.

4.4.5 Users are always Ready to Accept Operational Changes Associated with Digital Transformation

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on if Users are always ready to accept operational changes associated with digital transformation and the feedback was as shown in the Table 4.17.

Table 4.17: Responses on whether Users are always Ready to Accept Operational Changes Associated With DT

Variables	Frequency	%
Strongly Agree	5	5%
Agree	22	22%
Neutral	24	24%
Disagree	43	43%
Strongly Disagree	6	6%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that Users are not always ready to accept operational changes associated with digital transformation. As per analysis depicted in Table 4.17 shows that 43 (43%) respondents have disagreed with the statement, 24 (24%) were neutral, 22 (22%) have agreed with the statement, 5(5%) have strongly agreed with the statement and 6 (6%) respondents have strongly disagreed with the statement. Cumulatively, 49 (49%) respondents are against the statement by strongly disagree and disagree that Users are always ready to accept operational changes associated with digital transformation. This implies that, the digital transformation initiatives is likely to be impacted by inherent culture and behaviour of resistance to changes.

4.4.6 Grounds Causing System Users to Reject Operational Changes Attributed by Digital Transformation

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on grounds that can contribute for most of system users to reject or fail to accept operational changes attributed by digital transformation and the feedback was as shown in the Table 4.18.

Table 4.18: Responses on the Cause for System Users to Reject or Fail to Accept Operational Changes Attributed by DT

Particulars		Responses	
		Number	**Percent**
Lack of ownership on introduced digital technology developments		66	19.7%
Lack of exposure on digital transformation aspects		79	23.6%
Resistance or negative attitudes towards changes		68	20.3%
Digital transformation fail to yield intended results		52	15.5%
Digital transformation affects employment position or status		67	20.0%
Others	Cultural believe	1	0.9%
	User creativity	1	
	Minimal support to users on troubleshooting	1	
Total		**335**	**100.0%**

Source: Field Data (2021)

The findings of the study as depicted in the Table 4.18 on grounds that contributes for system users to reject or fail to accept operational changes attributed by digital transformation shows that 79 (23.6%) respondents have responded to lack of exposure on digital transformation aspects as a contributing ground. Other responses show that 68 (20.3%) respondents, 67 (20%) respondents, 66 (19.7%) respondents, 52 (15.5%) respondents have said the contributing ground is resistance or negative attitudes towards changes, digital transformation affects employment position or status, lack of ownership on introduced digital technology developments and digital transformation fail to yield intended results respectively. The 3 (0.9%) respondent have responded to other contributing ground which are cultural believe, user creativity and minimal support to users on troubleshooting. This implies that, for effective user acceptability of operational changes associated with digital transformation, organization should have a strategy that accommodates also the interest and solutions of users.

4.4.7 Challenges that may affect Users in Applying the Digital Technology Developments

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on challenges that may affect Users in applying the digital technology developments and the feedback was as shown in the Table 4.19.

Table 4.19: Responses on Challenges in using Digital Technology Developments

Particulars		Responses	
		Number	**Percent**
Limited staff skills		71	29.7%
Lack of resources		33	13.8%
Lack of customized applications		33	13.8%
Internet connectivity problem		75	31.4%
Lack of access to the devices		21	8.8%
Others	Business as usual	1	2.5%
	Devices compatibility in work areas	1	
	Data security	1	
	Resistance to change	1	
	Poor or failure to achieve intended result	1	
	Poor support to Users on technical challenges and shortcomings of deployed technology	1	
Total		**239**	**100%**

Source: Field Data (2021)

The findings of the study as depicted in table 4.19 on challenges that may affect Users in applying the digital technology developments shows that 75 (31.4%) respondents have responded to internet connectivity problem challenge. Other responses on subject matter show that, 71 (29.7%) respondents have responded to limited staff skills, 33 (13.8%) respondents have responded to lack of resources, 33 (13.8%) respondents have responded to lack of customized applications and 21 (8.8%) respondents have

responded lack of access to the devices. The 6 (2.5%) respondent have responded to other challenges which are business as usual, devices compatibility in work areas, data security, resistance to change, poor or failure to achieve intended result and poor support to users on technical challenges and shortcomings of deployed technology. This implies that, the level of application of digital technology developments will be high if operating environments are favourable.

4.4.8 Digital Transformation has Significantly Improved Customer's Water Meter Reading and Billing Processes

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on if digital transformation has significantly improved customer's water meter reading and billing processes and the feedback was as shown in the Table 4.20.

Table 4.20: Responses on whether DT has Improved Water Meter Reading and Billing Process

Variables	Frequency	%
Strongly Agree	41	41%
Agree	47	47%
Neutral	12	12%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that there is significant improvement of customer's water meter reading and billing attributed by digital transformation. As per analysis portrayed in Table 4.20 shows that, 47 (47%) respondents have agreed with the statement, 41 (41%) respondents have strongly agreed with the statement and 12(12%) respondents were neutral. Cumulatively, 88 (88%) respondents have supported the statement (by

strongly agree and agree). This implies that, there is an improved service delivery through digitized meter reading and billing processes.

4.4.9 Digital Transformation Provides Real Time and Effective Customer Handling

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on if digital transformation provides real time and effective customer handling and the feedback was as shown in the Table 4.21.

Table 4.21: Responses on whether DT Provides Real Time and Effective Customer Handling

Variables	Frequency	%
Strongly Agree	21	21%
Agree	58	58%
Neutral	17	17%
Disagree	4	4%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that digital transformation provides real time and effective customers handling. As per analysis portrayed in Table 4.21 shows that 58 (58%) respondents have agreed with the statement, 21 (21%) respondents have strongly agreed with the statement, 17(17%) respondents were neutral while 4 (4%) respondents have disagreed with the statement. Cumulatively, 79 (79%) respondents have supported the statement by strongly agree and agree. This implies that, serving customers are easily facilitated by digital transformation through effective interaction and real time feedback.

4.4.10 Digital Transformation has Significantly Improved Revenue Collection

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from respondents on if digital transformation has significantly improved revenue collection and the feedback was as shown in the Table 4.22.

Table 4.22: Responses on whether DT has Improved Revenue Collection

Variables	Frequency	%
Strongly Agree	19	19%
Agree	66	66%
Neutral	12	12%
Disagree	3	3%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that digital transformation has significantly improved revenue collection through introduction of electronic payment system and prepaid water meters. As per analysis portrayed in Table 4.22 shows that 66 (66%) respondents have agreed with the statement, 19 (19%) respondents have strongly agreed with the statement, 12 (12%) respondents were neutral while 3 (3%) respondents have disagreed with the statement. Cumulatively, 85 (85%) respondents have supported the statement by strongly agree and agree. This implies that, service delivery has been improved through a reliable and favourable means for customer's bills settlement hence improved revenue collection.

4.4.11 Digital Transformation Improves Decision Making

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from

respondents on if digital transformation improves decision making and the feedback was as shown in table 4.23.

Table 4.23: Response on whether DT Improves Decision Making

Variables	Frequency	%
Strongly Agree	23	23%
Agree	52	52%
Neutral	19	19%
Disagree	6	6%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that digital transformation improves decision making through real time and summarized organization performance dashboard. As per analysis portrayed in Table 4.23 shows that 52 (52%) respondents have agreed with the statement, 23 (23%) respondents have strongly agreed with the statement, 19 (19%) respondents were neutral while 6 (6%) respondents have disagreed with the statement. Cumulatively, 75 (75%) respondents have supported the statement by strongly agree and agree. This implies that, through digital transformation the organization can get an instant notification and feedback in automated mode and fasten decision making.

4.4.12 Digital Transformation Ease Organization's Operations by Automating and Integrating Business Processes

In assessing the extent to which Water Utilities operations are affected by User acceptance on digital transformation, the researcher analysed the feedback from

respondents on if digital transformation ease organization's operations by automating and integrating business processes and the feedback was as shown in table 4.24.

Table 4.24: Responses on whether DT Ease Organization's Operations

Variables	Frequency	%
Strongly Agree	31	31%
Agree	46	46%
Neutral	21	21%
Disagree	2	2%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that digital transformation ease organization's operations by automating and integrating business processes. As per analysis portrayed in Table 4.24 shows that 46 (46%) respondents have agreed with the statement, 31 (31%) respondents have strongly agreed with the statement, 21 (21%) respondents were neutral while 2 (2%) respondents have disagreed with the statement. Cumulatively, 77 (77%) respondents have supported the statement by strongly agree and agree. This implies that, through digital transformation information are easily shared and transferred between business processes.

4.5 The Status of Digital Technology Application in Operation of Water Utilities

4.5.1 Level of Digital Transformation of the Organizational Business Processes

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on the level of digital

transformation of the organizational business processes and the feedback was as shown in the Table 4.25.

Table 4.25: Responses on Level of DT of Business Processes

Particulars	Responses	
	Number	**Percent**
All organization's business processes are digitized/automated	4	4.0%
Majority of organization's business processes are digitized/automated	39	39.0%
Few of organization's business processes are digitized/automated	56	56.0%
All organization's business processes are not digitized/automated	1	1.0%
Total	**100**	**100.0%**

Source: Field Data (2021)

Findings from the study on the level of digital transformation of the organization business process as depicted in Table 4.25 shows that, 56 (56%) respondents have said that few of organization's business processes are digitized/automated, 39 (39%) respondents have said majority of organization's business processes are digitized/automated, 4 (4%) respondents have said that all organization's business processes are digitized/automated and 1 (1%) respondent have said that all organization's business processes are not digitized/automated. This implies that, Water utilities still have a journey to capitalize the benefit of digital transformation and ensure automation of all its business processes.

4.5.2 Business Processes which have been Digitized/Automated

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on the business processes which have been digitized/automated and the feedback was as shown in the Table 4.26.

Table 4.26: Responses on digitized/automated process

Automated Business Process		Responses in Relation to Department				
		Human Resource	Technical	Customer Service	Managing Director	Finance
Water abstraction processes			1			
Water treatment processes			4			
Customer identification and location processes			25	3	2	
Customer application and connection processes			28	5	3	
Asset management processes		6	11	2	3	5
Water meter reading and management processes				12	3	
Customer billing processes				20	4	
Revenue collection processes				20	3	4
Customer handling processes			1	12	2	
Payment processes				2	5	6
Financial management processes					2	9
Stock management processes					2	7
Staff performance monitoring process		1				
Human resources management process		12			1	
Procurement processes			6		4	1
Others	Cost estimate for new customer process		1			
	ICT process				1	
	Record management process	2				
	Payroll process	2				
Total Responses		**23**	**77**	**76**	**35**	**32**

Source: Field Data (2021)

The responses of the study as depicted in Table 4.26 shows that, there are 19 business process that have been digitized/automated. Among those automated business process, 5 support the operations/activities of Human Resources Department, 8 support the operations/activities of Technical Department, 8 support the operations/activities of Customer Service Department, 13 support the operations/activities of Managing Director Department and 6 support the operations/activities of Finance Department.

The responses also shows that, those automated business processes support various core business processes such as customer identification and location processes, customer application and connection processes, asset management processes, water meter reading and management processes, customer billing processes. Others are revenue collection processes, customer handling processes, payment processes, financial management processes, stock management processes, human resources management process, procurement processes, water treatment processes, water abstraction processes, record management process and payroll process. With such status implies that, service delivery of water utilities have notably eased and made convenient to its customers.

4.5.3 ICT Devices used in the Operations of Water Utilities

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on the ICT devices used in the operations of water utilities and the feedback was as shown in the Table 4.27. The responses of the study as depicted in Table 4.27 shows that, there are 19 ICT devices used in various organization's operations. Among those ICT devices, 4 support the operations/activities of Human Resources Department, 18 support the

operations/activities of Technical Department, 8 support the operations/activities of Customer Service Department, 11 support the operations/activities of Managing

Table 4.27: Responses on Automated ICT Devices

Automated ICT Devices		Responses in Relation to Department				
		Human Resource	**Technical**	**Customer Service**	**Managing Director**	**Finance**
Electrical Energy and power management devices			19		1	
Water quality management devices			1		1	
Water treatment chemical analyzer			6		2	
Water pressure management devices/sensors			1			
Water infrastructure monitoring devices			1			
Water level indicator/sensors			2			
Digital pump			7			
Water flow detector/sensors			1			
Power rodder			18		1	
Jetting machines			18		1	
Smart meter			2	3		
Prepaid meter			4	24	3	
Meter testing kit			4	14	1	
Biometric time management devices		10	25	22	4	7
CCTV cameras		10	29	21	5	7
Computer and related devices		12	37	18	8	9
Barcode reader devices for assets and stocks		2	2	1	2	2
Others	GPS		6			
	Smart phone for meter reading			9		
Total		**34**	**183**	**112**	**29**	**25**

Source: Field Data (2021)

Director Department and 4 support the operations/activities of Finance Department. These devices are used in various core business process such as meter reading, water treatment processes, water distribution processes, billing processes and sanitation

processes. This implies that, Water Utilities tasks are likely to be performed in an effective and efficient manner that can lead into serving of costs, time and work force and finally improves service delivery.

4.5.4 Systems Mostly used in the Operations of Water Utilities

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on the systems mostly used in the operations of water utilities and the feedback was as shown in the Table 4.28.

Table 4.28: Responses on Systems Mostly Used

Particulars	Responses	
	Numbers	**Percent**
Billing systems	88	11.3%
Smart meter reading system	5	0.6%
Bills payment systems	82	10.5%
Bills dispatch systems	66	8.4%
Geographical Information Systems (GIS)	75	9.6%
Accounting system	63	8.1%
Inventory/Stock control system	58	7.4%
Human resource system	59	7.5%
Payroll system	63	8.1%
Project designing and management systems	9	1.2%
Procurement systems	52	6.6%
Asset Management system	43	5.5%
Record management system	57	7.3%
Customer handling system	62	7.9%
Total	**782**	**100.0%**

Source: Field Data (2021)

The responses of the study as depicted in Table 4.28 shows that, there are about 14 systems that are used in various organization's operations. The systems that are likely to be known by majority of the respondents are the billing system which have been responded by 88(11.3%) respondents followed closely by bills payment system

responded by 82(10.5%) respondents, geographical information system (GIS) responded by 75(9.6%) respondents. The bills dispatch system responded by 66(8.4%) respondents, accounting system and payroll system each responded by 63(8.1%) respondents, customer handling system responded by 62(7.9%) respondents, human resource system responded by 59(7.5%) respondents, inventory/stock control system responded by 58(7.4%), record management system responded by 57(7.3%), procurement system responded by 52(6.6%) and asset management system responded by 43(5.5%) respondents. The other systems which have lowest responses are project designing and management systems responded by 9(1.2%) respondents and smart meter reading system responded by 5(0.6%) respondents. This could be probably not know to majority of respondents or the respondents were not aware with what there are responding.

4.5.5 The Frequencies of Using the Installed Systems in Undertaking Responsibilities

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on the frequencies of using the installed systems in undertaking responsibilities and the feedback was as shown in the Table 4.29.

Table 4.29**: Responses of frequency of using the systems**

Particulars	Responses	
	Number	**Percent**
Always	22	22.0%
Most used	44	44.0%
Occasionally used	25	25.0%
Rarely used	9	9.0%
Total	**100**	**100.0%**

Source: Field Data (2021)

The responses of the study as depicted in Table 4.29 shows that 44 (44%) respondents have responded that the installed systems are mostly used in undertaking the responsibilities. The other responses shows that 25 (25%) respondents, 22 (22%) respondents and 9(9%) respondents have responded that occasionally used, always used and rarely used respectively. This implies that, the installed systems are not redundant and are effectively used to support the organization's operations hence ease service deliveries.

4.5.6 The Organization Structure Recognizes the ICT Function

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on if the organization structure recognizes the ICT function and the feedback was as shown in the Table 4.30.

Table 4.30: Responses on Recognition of ICT Function in the Structure

Variables	Frequency	%
Strongly Agree	37	37%
Agree	61	61%
Neutral	2	2%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that the structure of the organization recognizes the ICT function. As per analysis portrayed in Table 4.30 shows that 61 (61%) respondents have agreed with the statement, 37 (37%) respondents have strongly agreed with the statement while2 (2%) respondents were neutral. Cumulatively, 98 (98%) respondents have supported the statement by strongly agree

and agree. This implies that, the organization has set a framework for institutionalization of ICT activities and initiatives for better operations of digital technology.

4.5.7 The Organization has ICT Professionals to Support Organization Initiatives to Digital Technology Development

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on if the organization has ICT professionals to support organization initiatives to digital technology development and the feedback was as shown in the able 4.31.

Table 4.31: Responses on the Existence of ICT Professional Support

Variables	Frequency	%
Strongly Agree	32	32%
Agree	63	63%
Neutral	4	4%
Disagree	1	1%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that the organization has ICT professionals to support organization initiatives to digital development. As per analysis portrayed in Table 4.31 shows that 63 (63%) respondents have agreed with the statement, 32 (32%) respondents have strongly agreed with the statement, 4 (4%) respondents were neutral while 1 (1%) respondent have disagreed with the statement. Cumulatively, 95 (95%) respondents have supported the statement by strongly agree and agree. This implies

that, digital transformation initiatives are highly supported which give a smooth application and operation of digital technology.

4.5.8 ICT Functions Provides Real Time Support to Users of the System

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on if the ICT functions provides real time support to users of the system and the feedback was as shown in the Table 4.32.

Table 4.32: Responses on whether ICT Function Provides Real Time Support

Variables	Frequency	%
Strongly Agree	9	9%
Agree	21	21%
Neutral	17	17%
Disagree	43	43%
Strongly Disagree	10	10%
Total	**100**	**100%**

Source: Field Data (2021)

The study found that ICT function does not provide real time support to user of the system. As per analysis depicted in Table 4.32 shows that 43 (43%) respondents have disagreed with the statement,21 (21%) have agreed with the statement, 17 (17%) were neutral, 9 (9%) have strongly agreed with the statement and 10 (10%) respondents have strongly disagreed with the statement. Cumulatively, 53 (53%) respondents are against the statement by strongly disagree and disagree that the ICT function does not provide real time support to user of the system. This implies that, the organization activities and operations are likely to be impacted by digital technology failure due to untimely technical support.

4.5.9 Staff are Periodically Given Training on Application of New Developed ICT Solution

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on if the Staff are periodically given training on application of new developed ICT solution and the feedback was as shown in the Table 4.33.

Table 4.33: Responses on whether Staff are Periodically given Training of New ICT Solution

Variables	Frequency	%
Strongly Agree	23	23%
Agree	53	53%
Neutral	16	16%
Disagree	8	8%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that staff are periodically given training on application of new developed ICT solution. As per analysis portrayed in Table 4.33 shows that 53 (53%) respondents have agreed with the statement, 23 (23%) respondents have strongly agreed with the statement, 16 (16%) respondents were neutral while 8 (8%) respondents have disagreed with the statement. Cumulatively, 76 (76%) respondents have supported the statement by strongly agree and agree. This implies that, digital transformation initiatives and earmarked milestones are likely to achieve through knowledgeable manpower resources.

4.5.10 The ICT Infrastructures are Adequate to Support Smooth Operations of the Organization

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on if the ICT infrastructures are adequate to support smooth operations of the organization and the feedback was as shown in the Table 4.34.

Table 4.34: Responses on whether ICT Infrastructures are Adequate to Support Operations

Variables	Frequency	%
Strongly Agree	4	4%
Agree	32	32%
Neutral	51	51%
Disagree	13	13%
Total	**100**	**100%**

Source: Field Data (2021)

The responses as shown in Table 4.34 indicates that 51 (51%) of respondents were neutral on the statement which implies that there are not sure on whether the ICT infrastructures are adequate to support smooth operations of the organization. This could be attributed by less knowledge of the most of respondents on issues related to ICT infrastructures and facilities. Apart from that, 32 (32%) respondents have agreed with the statement, 13 (13%) have disagreed with the statement and4 (4%) have strongly agreed with the statement.

4.5.11 The Organization has Adequate and Real Time Backup Facilities for ICT Processed Information

In assessing the status of digital technology application in operation of Water Utilities, the researcher analysed the feedback from respondents on if the organization has

adequate and real time backup facilities for ICT processed information and the feedback was as shown in the Table 4.35.

Table 4.35: Responses on whether there is Adequate and Real Time ICT Backup Facilities

Variables	Frequency	%
Strongly Agree	7	7%
Agree	51	51%
Neutral	33	33%
Disagree	8	8%
Strongly Disagree	1	1%
Total	**100**	**100%**

Source: Field Data (2021)

The responses of the study have revealed that the organization has adequate and real time backup facilities for ICT processed information. As per analysis portrayed in Table 4.35 shows that 51 (51%) respondents have agreed with the statement, 33 (33%) respondents were neutral, 8 (8%) respondents have disagreed with the statement, 7 (7%) respondents have strongly agreed with the statement, while 1 (1%) respondent have strongly disagreed with the statement. Cumulatively, 58 (58%) respondents have supported the statement by strongly agree and agree. This implies that, the organization is well prepared to prevent ICT data/information loss in the event of disasters and ensure continuous operations of ICT systems.

4.6 Discussions of the Findings

The discussion of the findings of this study is grounded on the application of the concepts emanated from the reviewed empirical literature in chapter two. The

discussion also reflects the research objectives and research questions concerning with examining the capability of Water Utilities in pacing with digital transformation, the extent to which water utilities operations are affected by User acceptance on digital transformation and the status of digital technology application in the operations of Water Utilities.

With respect to Water Utilities capability in pacing with digital transformation the findings shows that majority of respondents supported the statement that the organization offers adequate training/exposure to employees on the use of innovated technology. Linking with operational changes attributed by digital transformation, training/exposure is essential since it promote the capability on the use of innovated technology. Similarly the study by Nadkarni and Prügl (2021) revealed that everyone within the organization must be prepared with an adaptive skill set and digital knowhow.

Further responses in respect to Water Utilities capability in pacing with digital transformation, the findings shows that 54% of respondents were neutral on the statement that the organization set sufficient funds to pace with technology developments. This implies that, there is a possibility that respondents were either not sure on the level investments required for technology developments or are less involved in planning process, which pose knowledge gap on priorities or budgets set by organization in various plans. However, by considering the cumulative supporting responses of about 43% of respondents, and the emerging need for digitizing the organizational operations it is probable that the funds are set to pace with technology developments.

Similarly, the study by Bharadwaj et al. (2013) revealed that IT strategy must be integrated into business strategy to leverage digital transformation. In addition, study by Yeow et al. 2018 revealed that for successful digital transformation, changes must occur at various levels within the organization, including the exchange of resources and capabilities.

The other finding from the assessment of Water Utilities capability in pacing with digital transformation also shows that majority of respondents supported the statement that the Water Utilities successfully implements earmarked/planned investments in technology development. This gives the confidence that the progress and planned milestones to improve organization's operations through digital transformation is likely to be achieved. Given the prevailing fast development of technology, the improvements in organization operations will only be possible by gradually investing in technology. Nadkarni and Prügl, (2021) revealed that digital transformation needs both technology and people.

The findings also shows that the majority of respondents agreed that the Government supports the initiatives for technology developments and innovations. The support of Government is essential since it provides both resources support and facilitate operational environment by issuing frameworks for effective digital transformation. This is evidenced by establishment e-Government Agency in 2012 which was later changed to e-Government Authority (e-GA) in 2019 under the e-Government Act, No. 10 of 2019 for the purpose of coordinating, overseeing and promote e-Government initiatives as well as enforce e-Government related policies, laws, regulations, standards and guidelines in public institutions (e-Government Act, No. 10 of 2019).

Further findings on the capability of Water Utilities in pacing with digital transformation revealed that majority of respondents are against the statement that Staff are capable to pace with digital development and innovations. This is probable attributed by most of staff being more acquainted with analogy and manual operations that pose challenges to pace with rapid change of digital technology. This is in line with the study by Kohli and Johnson (2011) and Nadkarni and Prügl (2021) that digitization may lead to a growing skills gap between pre-digitization employees who might not keep pace with digital high-speed train.

In addition, findings on the capability of Water Utilities in pacing with digital transformation revealed that majority of respondents supported the statement that there are adequate technical/professional skills to support organization's digital developments/innovations. This is essential since it ensures smooth application of digital technology in organization's operations. According to Setiowati et al. (2015), ICT support offers new ways for organizations to store, process, disseminate and exchange data.

The study findings on the capability of Water Utilities in pacing with digital transformation also shows that majority of respondents were neutral on the statement that installed infrastructures and facilities support innovation of digital transformation in the Water Utilities. This is possibly attributed by less knowledge of the most of respondents on issues related to ICT infrastructures and facilities. However, by considering the cumulative supporting responses of 34% of respondents and the current business environment in which the existence and performance of organization is highly dependent of digital technology, it is probable that the installed infrastructure

and facilities support innovation of digital transformation. ICT infrastructures is essential since it provide the platforms for effective operation of digital technology. Similarly the study by Nwankpa, & Roumani, (2016) revealed that ICT infrastructure enables firm to build a robust communication and integration system within and across organization.

The majority of respondents also supported the statement that, the Organization has various policies, guidelines and rules to guide the application of digital technology. This provides the confidence that digital transformation initiatives in Water Utilities are adequately controlled and managed. The ICT policy provides a set of principles intended to govern the acquisition, implementation, adoption, management and use of ICTs in organizations (E-Government Guidelines 2017).

The capability of Water Utilities in pacing with digital transformation as responded by majority of respondents also shows that, the organization has plans (short, medium and long term) for digital technology investment. These plans are essential since gives roadmap/direction on how to improve business processes through digital transformation. The study by Mithas et al., (2011) also revealed that Firms with the ability to plan and integrate their IT resources are more capable to capture information and improve business processes.

Furthermore, the study on the capability of Water Utilities in pacing with digital transformation shows that, Senior Management are committed to support digital transformation. The commitment of senior Management is vital for effective implementation of digital transformation initiatives. Similarly the study by Lee &

Chou (2017) revealed that, effective digital landscape requires commitment of top management and clear vision.

Finally, the assessment findings on the capability of Water Utilities in pacing with digital transformation revealed that majority of respondents are against the statement that, Senior Management have adequate exposure on digital development and innovations required for the organization. This could be attributed by inadequate capability to pace with fast development of digital technology. With current business environment in which the survival and performance of organization is highly dependent of digital technology, poses pressure to Senior Management to rebuild their capability and be acquainted with fast changing digital era. Similarly the study by Nadkarni and Prügl, (2021) revealed that, Senior Management requires a new digital mindset in order to captain their organization's digital transformation journey. Also, Li et al. (2017) argued that Organizations can promote digital transformation through building the dynamic managerial capabilities of their top management.

Next, the study managed to explore the extent to which water utilities operations are affected by user acceptance on digital transformation. It has been observed that, majority of respondents are against to the statement that the organization always involve Users in transforming digital solution used in operations. This pose great challenge on user acceptability and ownership of innovated digital solutions. User involvement in various stages of digital transformation promote user ownership, lead into better use of innovated digital solutions hence user acceptability. Similarly the study by Kushniruk, & Nøhr, (2016) revealed that, user involvement and input is critical success factor in the adoption of information systems.

Furthermore, the study on the extent to which water utilities operations are affected by User acceptance on digital transformation revealed that, majority of respondents are against to the statement that Users of technology are adequately aware with digital transformation initiatives planned to be undertaken in the organization. This could be attributed by less involvement of user in planning process, which pose knowledge gap on organization direction towards digital transformation. User awareness on planned digital transformation initiatives is essential since it provide common understanding of organization direction and ease digital transformation acceptability. Similarly the study by Jöhnk, et al (2020) revealed that, communication and a shared culture enables better collaboration within the organization.

In addition, findings of the study on the extent to which water utilities operations are affected by User acceptance on digital transformation revealed that, majority of respondents supported the statements that, digital transformation is always perceived by users as essential to ease organizational operations. User perception has great effects on the level of acceptance towards digital transformation. According to Technology Acceptance Model (TAM) by Davis et al., (1989), emphasized that emerging information technology cannot deliver improved organizational effectiveness if it is not accepted and used by potential users. Two particular beliefs addressed through TAM are perceived usefulness and perceived ease of use. Perceived usefulness is defined as being the degree to which a person believes that the use of a system will improve his performance. The Perceived Usefulness reflects the level to which an individual believes that using a new system would improve the task performance (Pituch and Lee, 2006, Saade, Nebebe & Tan, 2007 and Venkatesh & Davis, 2000).

Further study findings on the extent to which water utilities operations are affected by User acceptance on digital transformation shows that, majority of respondents supported the statement that, users believes digital transformation improves organizational efficiency and performance. In specific context in relation to improved operational efficiency and performance of water utilities, majority of respondents supported the statements that, digital transformation has significantly improved customer's water meter reading and billing processes; digital transformation provides real time and effective customer handling.

Also the respondents supported the statements that, digital transformation has significantly improved revenue collection through introduction of electronic payment system and pre-paid meters, digital transformation improves decision making through real time and summarized organization performance dashboard and digital transformation ease organization's operations by automating and integrating business processes. The study by Mukhtarov, et al (2018) provides more emphasize that; ICT tools have the potential to help in efficiency and effectiveness of urban water service provision.

The assessment on the extent to which water utilities operations are affected by User acceptance on digital transformation revealed that, majority of respondents are against to the statement that users are always ready to accept operational changes associated with digital transformation. Further findings from respondents revealed that, grounds that can contribute for users to reject operational changes attributed by digital transformation are lack of exposure, resistance or negative attitudes towards changes, digital transformation affects employment position or status, lack of ownership on

introduced digital technology developments, digital transformation fail to yield intended results, cultural believe, user creativity and minimal support to users on troubleshooting. The study by Ali, Zhou, Miller, & Ieromonachou (2016) revealed that, grounds that can contribute to user resistance to technology are change of status quo, uncertainty, lack of involvement in the change, redistribution of resources, lack of top management support, reliability issues, lack of interaction between system developers and user, lack of training for the new system, changes in job contents, variation in interest level, fast and complex change environment.

Finally, study findings also have revealed 11 challenges that affects Users in applying the digital technology developments which include, internet connectivity problem, limited staff skills, lack of resources, lack of customized applications, lack of access to the devices, business as usual, devices compatibility in work areas, data security, resistance to change, poor or failure to achieve intended result and poor support to users on technical challenges and shortcomings of deployed technology. The study by Rana, et al (2013) also revealed that, challenges for adaptation of technology developments are technological barriers, lack of security, lack of privacy, lack of trust, lack of resources, digital divide, poor management and infrastructure, lack of awareness, legal barriers, lack of IT infrastructure, lack of IT skills, and resilience.

Lastly, the study managed to explore the study on the status of digital technology application in the operations of Water Utilities. The study findings as responded by majority of respondents revealed that, organization have few business processes that have been digitized/automated. But by taking into consideration the responses it shows that, majority of those few digitized business processes support various core

business processes such as customer identification and location processes, customer application and connection processes, asset management processes, water meter reading and management processes, customer billing processes. Others are revenue collection processes, customer handling processes, payment processes, financial management processes, stock management processes, human resources management process, procurement processes, water treatment processes, water abstraction processes, record management process and payroll process. With such status implies that, service delivery of water utilities have notably eased and made convenient to its customers. The study by Giri, & Shakya, (2018) revealed that, ICT is a potential tool of efficient public service delivery.

Furthermore, the study findings on the status of digital technology application in the operations of Water Utilities revealed that, Water Utilities have taken a huge step to ease its tasks by applying various ICT devices in its operations. The responses show that, there are about 19 ICT devices used in various organizations' operations. With the aid of these ICT devices, Water Utilities tasks are likely to be performed in an effective and efficient manner that can lead into serving of costs, time and work force and finally improves service delivery. The study by Mukhtarov, et al (2018) argued that ICT tools have the potential to help in efficiency and effectiveness of urban water service provision.

In addition, the study findings on the status of digital technology application in the operations of Water Utilities shows that, Water Utilities operations are supported by 14 ICT system and these installed systems are mostly used in the organization's operations. With such responses indicates that, the installed systems are not redundant

and are effectively used to support the organization's operations hence ease service deliveries. The study by Giri, & Shakya, (2018) revealed that, ICT is a potential tool of efficient public service delivery.

The study findings on the status of digital technology application in the operations of Water Utilities also shows that, majority of respondents have indicated that organization has a structure that recognize the ICT function. The ICT structure is essential since it gives the framework for institutionalization of ICT activities and initiatives for better operations of digital technology. Mubarak et al. (2019) revealed that, organization structure should be supportive of accepting and implementing new technology.

Further findings on the assessment of the status of digital technology application in the operations of Water Utilities shows that, majority of respondents has supported the statement that organization has ICT professionals to support organization initiatives to digital technology development. Further responses has revealed that, even though there is ICT professional to provide support but the supports provided are not adequate and not provided in real time. The ICT support is vital to ensure smooth application and operation of digital technology. The study is in line with Setiowati et al. (2015), argued that, ICT support offers new ways for organizations to store, process, disseminate and exchange data.

In terms of capacity building on application of digital technology, majority of respondents has supported the statement that, Staff are periodically given training on application of new developed ICT solution. Training/exposure is essential since it

promote the capability on the use of innovated technology and it gives the confidence that digital transformation initiatives and earmarked milestones are likely to achieve through knowledgeable manpower resources. Similarly the study by Nadkarni and Prügl (2021) revealed that everyone within the organization must be prepared with an adaptive skill set and digital knowhow.

The study findings on the status of digital technology application in the operations of Water Utilities also shows that majority of respondents were neutral on the statement the ICT infrastructures are adequate to support smooth operations of the organization. This is possibly attributed by less knowledge of the most of respondents on issues related to ICT infrastructures and facilities.

However, by considering the cumulative supporting responses of 36% of respondents and the current business environment in which the existence and performance of organization is highly dependent of digital technology, it is probable that the installed ICT infrastructures are adequate to support smooth operations of the organization. An ICT infrastructure is essential since it provide the platforms for effective operation of digital technology. Similarly the study by Nwankpa & Roumani, Y. (2016) revealed that ICT infrastructure enables firm to build a robust communication and integration system within and across organization.

Finally, the study findings on the status of digital technology application in the operations of Water Utilities shows that, majority of respondents have supported the statement that, the organization has adequate and real time backup facilities for ICT processed information. This indicates that the organization is well prepared to prevent

ICT data/information loss in the event of disasters and ensure continuous operations of ICT systems. The study by Xia et al. (2014) also revealed that data backup is essential for providing protection against data loss from both natural and man-made incidents.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter describes the summary of the research findings, conclusion and recommendation of the study.

5.2 Summary of the Main Findings

The study examines the impact of digital transformation on the operation of water utilities in Tanzania, A case of Tanga Water Supply and Sanitation Authority (Tanga WSSA). It has been revealed that digital transformations affects water utilities operations and simplify the process of service provision. To achieve this, the study was guided by three specific objectives: to examine the capacity of water utility in pacing with digital transformation; to examine the extent to which water utilities operations are affected by User acceptance on digital transformation and to examine the status of digital technology application in the operations of Water Utilities. The theoretical framework that underpinned the study was Technology Acceptance Model (TAM) proposed by Davis et al., 1989 and The Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al (2003). TAM addresses two particular beliefs, which are perceived usefulness and perceived easy to use while UTAUT have four constructs namely: performance expectancy, effort expectancy, social influence and facilitating conditions. The following are the summary of the main findings:

5.2.1 The Capability of Water Utilities in Pacing with Digital Transformation

The responses of the study has revealed several capabilities of Water utilities in pacing with digital transformation.

(i) In terms of human capital capability, majority of respondents acknowledged that employees are given adequate training/exposure on the use of innovated technology and there are adequate technical/professional skills to support organization's digital developments/innovations.

(ii) In terms of financial resources and investment capability, majority of respondents acknowledged that, the funds are sufficiently set to pace with technology developments, the earmarked/planned investments in technology development are successfully implemented and there are plans (short, medium and long term) for digital technology investment.

(iii) In terms of support and operating framework, majority of respondents acknowledged that, Government supports the initiatives for technology developments and innovations, Senior Management are committed to support digital transformation and there are various policies, guidelines and rules to guide the application of digital technology,

(iv) The findings further indicated that installed infrastructures and facilities support innovation of digital transformation in the Water Utilities.

The responses of the study have also revealed two weaknesses, which affects the capabilities of Water Utilities in pacing with digital transformations. The findings revealed that,

(i) Staff are not capable to pace with digital development and innovations. This is probable attributed by most of staff being more acquainted with analogy and manual operations that pose challenges to pace with rapid change of digital technology.

(ii) Senior Management have no adequate exposure on digital development and innovations required for the organization. This could be attributed by inadequate capability to pace with fast development of digital technology.

5.2.2 The Extent to which Water Utilities Operations are affected by User Acceptance on Digital Transformation

(i) Majority of respondents have acknowledged that, digital transformation has eased organizational operations and improved the organizational efficiency and performance specifically in customer's water meter reading and billing processes, real time and effective customer handling, revenue collection through introduction of electronic payment system and pre-paid meters, real time and summarized organization performance dashboard and automating and integrating business processes.

(ii) Furthermore, the study finding has revealed that the improved operations through digital transformation is likely to be impacted by user acceptance since there are less involvement of Users in transforming digital solution used in operations which poses great challenge on the ownership of innovated digital solutions. In addition, there is inadequate awareness on digital transformation initiatives planned to be undertaken in the organization that poses knowledge gap on organization direction towards digital transformation.

(iii) The study responses also revealed that users are not always ready to accept operational changes associated with digital transformation. The grounds for resistance as revealed by respondents includes, lack of exposure, resistance or negative attitudes towards changes, digital transformation affects employment position or status, lack of ownership on introduced digital technology developments, digital transformation fail to yield intended results, cultural believe, user creativity and minimal support to users on troubleshooting. The challenges that affects Users in applying the digital technology developments include, internet connectivity problem, limited staff skills, lack of resources, lack of customized applications and lack of access to the devices. Other challenges include business as usual, devices compatibility in work areas, data security, resistance to change, poor or failure to achieve intended result and poor support to users on technical challenges and shortcomings of deployed technology.

5.2.3 The Status of Digital Technology Application in the Operations of Water Utilities

(i) The study findings has revealed that, organization have few business processes that have been digitized/automated and these digitized business processes supports various core business process which implies that, service delivery of water utilities have notably eased and made convenient to its customers.

(ii) In addition, the findings revealed that Water Utilities have taken a huge step to ease its tasks by applying 19 ICT devices in its various organization's operations. With the aid of these ICT devices, Water Utilities tasks are likely to

be performed in an effective and efficient manner that can lead into serving of costs, time and work force and finally improves service delivery.

(iii) Furthermore, the study findings has revealed that Water Utilities operations are supported by 14 ICT system and these systems are mostly used in the organization's operations. With such responses indicates that, the installed systems are not redundant and are effectively used to support the organization's operations hence ease service deliveries.

(iv) The findings also revealed that, organization has a structure that recognize the ICT function and there are ICT professionals to support organization initiatives to digital technology development. Further findings have revealed that, the support provided is not adequate and not provided in real time.

(v) In terms of capacity building on application of digital technology, the findings revealed that, Staff are periodically given training on application of new developed ICT solution.

(vi) The study findings also revealed that the ICT infrastructures are adequate to support smooth operations of the organization.

(vii) Finally, the study findings shows that the organization is well prepared to prevent ICT data/information loss in the event of disasters and ensure continuous operations of ICT systems by installing real time backup facilities for ICT processed information.

5.3 Implications of the Findings

Based on the research findings the following are the implications of the findings.

5.3.1 Implication of the Findings to Policy Makers

Policy makers play vital role to create and facilitate favorable environment for digital transformation initiatives. Policy makers should ensure formulated policies and other guidelines are favorable for the operations of Water Utilities and other Public Institution so as to promote innovations and creativity for effective digital transformation.

5.3.2 Implication of the Findings to Water Sector

Water Sector should prepare robust strategies and plans that will assist to keep pace and capitalize the benefits of digital transformation. The digital transformation culture should be enhanced by providing adequate exposure to all staff on digital technology issue and enhance user involvement in planning, development and deployment of innovated digital solutions.

5.3.3 Implication of Findings to Academics

The study will be used as database for future reference in relation to area of study. It will also be useful to academicians in identifying areas for further studies.

5.4 Conclusion

Digital transformation has made a great impact in the operation of Water Utilities. The effectiveness of service delivery is now much dependent on the organization capability to leverage the opportunities and benefits of digital transformation. Water Utilities have been forced to reshape their business strategies to enhance its capability to pace with digital transformation for effective service delivery. This includes, provision of exposure/training to employees on innovated technology, setting funds

for digital development, successfully achieving its plans, ensuring availability of professional skills to support organization's digital developments/innovations, availability of ICT infrastructures, presence of policies, guidelines and rules to guide the application of digital technology, Senior Management commitment and Government support.

Water Utilities Operations are likely to be affected by User acceptance on digital transformation since there are less involvement of Users in transforming digital solution used in operations which poses great challenge on the ownership of innovated digital solutions. In addition, there is inadequate awareness on digital transformation initiatives planned to be undertaken in the organization that poses knowledge gap on organization direction towards digital transformation.

Finally, digital technology is widely applied in the operations of water utilities. Various core business process of Water Utilities have been digitized and the implementation of various tasks have been eased through use of ICT devices. This can be justified by the presence of various systems installed and mostly used in the organization's operations hence ease service deliveries.

5.4.1 Recommendations of the Study

The following recommendations are made in order to ensure there are effective digital transformation in the operations of Water Utilities.

(i) Water Utilities should make training need assessment to its employees specifically on digital technology to identify skill gaps and required exposure and prepare training program to cover the identified skills gaps.

(ii) Digital transformation initiatives should be given priority in the overall strategy and budget of Water Utilities for effective operation and service delivery.

(iii) Policy Makers should formulate policies and guidelines that favorable to promote innovations and creativity for effective digital transformation.

(iv) Water Utilities should ensure adequate and real time ICT professionals/technical support for effective application of digital technology.

(v) Water Utilities should ensure adequate involvement of Users in implementing digital transformation initiatives to promote user acceptance on innovated technology.

5.5 Limitations of the Study

Some respondents were found to have limited knowledge on digital transformation issues, which affected collection of data activity. To facilitate the collection of data, the researcher took the initiative to provide clarifications and raise awareness to some issues that were not well known to respondents.

5.6 Suggested area for Further Study

Since the study on the impact of digital transformation on the operation of Water Utilities in Tanzania has covered only Tanga Water Utility, the findings cannot be used to reflect the situation to all Water Utilities in Tanzania. More study on the impact of digital transformation in the operation should be done by involving various Water Utilities and expanding horizon on issues to be assessed such as cyber issues, digital currency and cloud computing.

REFERENCES

Ajayi, O. V. (2017). Course Title: Advance Statistical Methods in Education Course Code: EDU 901 Course of Study: PhD Science Education. Central University in Patna, India.

Ali, M., Zhou, L., Miller, L., & Ieromonachou, P. (2016). User resistance in IT: A literature review. *International Journal of Information Management, 36(1),* 35-43.

Albu, O. B., & Flyverbom, M. (2019). Organizational transparency: Conceptualizations, conditions, and consequences. *Business & Society*, 58(2), 268-297.

Amankwaa, G., Heeks, R., & Browne, A. L. (2021). Digitalizing the Water Sector: Implications for Water Service Management and Governance in Ghana. *arXiv preprint arXiv:2108.09746*.

Babbie. E. (2010). *The Practice of Social Research*. 12th ed. Belmont, CA: Wadsworth.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: toward a next generation of insights. *MIS quarterly*, 471-482.

Clohessy, T., Acton, T., Morgan, L. (2017). The Impact of Cloud-Based Digital Transformation on ICT Service Providers' Strategies. *International Journal of Cloud Applications and Computing,* 7(4), 33-46.

Cohen, L., Manion, L. M., & Morrison, K. (2000). *Research Methods in Education.* London: Routledge falmers

Creswell, J. W. (2009). *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks, CA: Sage Publications Inc.

Creswell, J. W. (2012). *Education Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research.* Lincoln: University of Nebraska.

Fraenkel, F. J., & Warren, NE. (2002). *How to Design and Evaluate Research in Education* 4th Ed. New York. McGraw-Hill.

Francesco, B., Gabhoué. B., & Schneider, J. M. (2015). Recall No. 22 Higher satisfaction at lower costs: Digitizing, customer care, retrieved on 8th Aug, 2021 from: https://www.mckinsey.com/

Freyberg, T. (2017). Adoption of Smart Water Technologies Remains a Utility ManagementChallenge.Waterworld.Com:https://www.waterworld.com/articles/wwi/2017/05/adoption-ofsmart-water-technologies-remains-a-utility-management-challenge.html,on 4th Aug, 2021.

Giri, S., & Shakya, S. (2018). ICT and service delivery mechanisms in civil service of Nepal. *International Journal of Computer Science and Mobile Computing, 7(4),* 47-52.

Goubersville, P. (2016). Key Challenges For Smart Water, Procedia Engineering 154 (2016), 11 – 18. doi: https://doi. org/10.1016/j.proeng.412.

Hanjahanja, R., & Omuto, C. (2018). Do prepaid water meters improve the quality of water service delivery? The case of Nakuru, Kenya. *Smart Water*, (*3*), 4

Harvell, E. (2018). The Internet of Things and the Water World, at http://efc.web.unc.edu/the-internet-of-things-and-the-water-world on 10th, Aug, 202

Hellebrand. T., Vincenzo,R., Ray. P. (2021). Upgrading water management: how to turn digital investment into real sustainability gains. https://www.digitaleurope.org/resources.

Hess, T., Matt, C., Benlian, A., & Wiesböck, F. (2016). Options for formulating a digital transformation strategy. *MIS Quarterly Executive, 15(2),* 51-66.

International water association, (2019). Digital Water Industry leaders chart the transformation journey. Retrieved from https://iwa-network.org/wp-content Digital_Water_Report.pdf on 8th, Aug, 2021.

Jöhnk, J., Ollig, P., Oesterle, S., & Riedel, L. N. (2020). The Complexity of Digital Transformation-Conceptualizing Multiple Concurrent Initiatives. In Wirtschaftsinformatik (Zentrale Tracks) (pp. 1051-1066).

Kadhim1, N. R., Abdulrazzaq., K. A., & Athraa H. M. (2021). The management of water distribution network using GIS application case study: AL-Karada area in Asia. *Journal of Physics*

Knoblauch, S., Felicetti, L., & Stein, U. (2020). Digital Water City-Leading urban water management to its digital future (DWC). Retrieved from https://www.ecologic.eu/16524 on 2nd, Sept, 2021.

Kohli, R., & Johnson, S. (2011). Digital Transformation in Latecomer Industries: CIO and CEO Leadership Lessons from Encana Oil & Gas (USA) Inc. *MIS Quarterly Executive,* 10(4), 24-35.

Kombo, D. K., & Tromp, D. A. L. (2006). *Proposal and Thesis Writing: An Introduction***.** Nairobi: Paulines Publications Africa.

Kreutzer, R.T. (2017). Treiber und hinterguende der digitalen transformation, in. Schalmo, D. et al. (Ed.), Digitale Transformation von Geschaeftmodellen, Springer.

Krolikowski, A. (2014). Can mobile-enabled payment methods reduce petty corruption in urban water provision? *Water Alternatives*, *7*(1), 71-84.

Kumekpor, T. K. B. (2002). *Research methods and Techniques for Social Research*: Accra: Sonlife Press and Services.

Kushniruk, A., & Nøhr, C. (2016). Participatory design, user involvement and health IT evaluation. *Stud Health Technol Inform, 222,* 139-151.

Lee, M. X., Lee, Y. C., & Chou, C. J. (2017). Essential implications of the digital transformation in industry 4.0.

Magayane, A. A., Mokua, J. K., &Lanrong, Y. (2016). Evaluation of the current status of E-government implementation in Tanzania: Government websites perspectives. *ACSIJ Advances in Computer Science, 5(2),* 47-55.

Mether, S., Fox,N., and Hunn, A. (2007). A Surveys and Questionnaires. The NIHR RDS for the East Midlends. Yorkshire and the Humber.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded source book (2nd ed*.). Newbury Park, CA: Sage.

Mithas, S., Ramasubbu, N., & Sambamurthy, V. (2011). How information management capability influences firm performance. *MIS quarterly*, 237-256.

Mukhtarov, F., Dieperink, C., & Driessen, P. (2018). The influence of information and communication technologies on public participation in urban water governance: A review of place-based research. *Environmental Science & Policy*, 89, 430-438.

Nadkarni, S., & Prügl, R. (2021). Digital transformation: a review, synthesis and opportunities for future research. *Management Review Quarterly*, *71(2),* 233-341.

Namaliya, N. G. (2017). Strategies for Maximizing Revenue Collection in Public Water Utility Companies (Doctoral dissertation, Walden University).

Nwankpa, J. K., & Roumani, Y. (2016). IT capability and digital transformation: A firm performance perspective.

Nzilano, K. L. (2017). Factors Influencing Organization Efficiency of Water Supply and Sanitation Authorities in Tanzania: The Analysis of Mbeya Urban Water Supply Authority. Aquademia: *Water, Environment and Technology*, 1(2), 04

OECD, (2017a). *Digital Economy Outlook 2017.* Paris: OECD Publishing.

OECD, (2018h). OECD Broadband Statistics Update, February 2018, http://www.oecd.org/sti/broadband/broadband-statistics/.

Omari, I. M. (2011). *Concepts and Methods in Educational Research*: Dar es Salaam: Oxford University Press (T).

Orodho, J. A. (2008). *Techniques of writing Research Proposals and Reports in Education and Social Sciences, second Edition*. Nairobi: Kanezja Publishers.

Otuke, J. O. (2016). Role of information Communication Technologies in Water Management (Doctoral dissertation, University of Nairobi).

Phelan, C., & Wren, J. (2006). Exploring reliability in academic assessment. Retrieved from http://www.uni.ed/chifasoa/ Reliability and validity.

Rana, N. P., Dwivedi, Y. K., & Williams, M. D. (2013). Analysing challenges, barriers and CSF of egov adoption. Transforming Government: People, Process and Policy.

Richard. B. (2019). Digital Water Understanding the commercial opportunities for UK plc. Retrieved from https://www.theukwaterpartnership.org/wp-content/uploads /2019/12/UK-Water-Partnership-Digital-Water.pdf on 8th Aug, 2021.

Schiller, B. (2016). “How The Technology Behind Bitcoin is Going to Change the Lives of the Bottom Billion.” co.exist.

The International Water Association (2019). Digital Water – Industry leaders chart the transformation journey. Retrieved from https://iwa-network.org/publications /digital-water/

Venkatesh, F., & Zhang, X. (2010). Unified theory of acceptance and use of technology: US vs. China. *Journal of Global Information Technology Management*, 13 (1), 5–27.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a unified view. *MIS Quarterly*, 27 (3).

Water Europe (2017). Water Europe Water Vision 2030, Brussels: Water Europe. Retrievedfrom https://watereurope.eu/wpcontent/Water-Europe-Vision_English. pdf on 10th, Aug, 2021.

Westerman, G., Calméjane, C., Bonnet, D., Ferraris, P., & McAfee, A. (2011). Digital Transformation: A roadmap for billion-dollar organizations. MIT Center for digital business and capgemini consulting, 1, 1-68.

World Development Report, (2016). Digital dividends. Retrieved from https://documents1.worldbank.org/curated/en/896971468194972881/pdf.

Xia, R., Yin, X., Lopez, J. A., Machida, F., & Trivedi, K. S. (2014). Performance and availability modeling of IT systems with data backup and restore. *IEEE Transactions on Dependable and Secure Computing, 11(4)*, 375-389.

Yeow, A., Soh, C., & Hansen, R. (2018). Aligning with new digital strategy: A dynamic capabilities approach. *The Journal of Strategic Information Systems*, 27(1), 43-58.

Yosef, J. (2009). Building a Conceptual Framework: Philosophy, Definitions, and Procedure. *International Journal of Qualitative Methods*, 1.

APPENDICES

Questionnaire for the Study

Part A: Demographic Information

Read each question carefully and adhere to the instruction given

1. Department ……..
2. Indicate your gender

   Male ☐ Female ☐
3. Marital status

   Single ☐ married ☐ divorce ☐
4. Please indicate your age

   20-30 years ( )

   31-35 ( )

   36-40 ( )

   41 and above ( )

5. Education background, tick what is relevant

   Certificate ( )

   Diploma ( )

   Degree ( )

   Masters ( )

   Others ( ) specify…….

6. For how long have you been working at Tanga WSSA

   Less than 5 years ( )

   6-10 years ( )

   11-18 years ( )

   18 and above years ( )

Part B: The capability of water utilities in pacing with digital transformation

7. The following statement related with capability of water utilities in pacing with digital transformation. Indicate the level of agreement or disagreement in a likert scale ranging from agreement to disagreement-whereas SA-Strongly agree, AG-Agree, NE-Neutral, DIS-Disagree and SD-Strongly disagree. Tick what is appropriate

S/No	Statement	1 SA	2 AG	3 NEU	4 DIS	5 SD
1	The organization adequately offers training/exposure to employee on the use of innovated technology.					
2	The organization set sufficient funds to pace with technology developments.					
3	The organization successfully implements earmarked/planned investment in technology development.					
4	The government supports the initiatives for technological developments and innovations.					
5	Staff are capable to pace with digital development and innovations					
6	There are adequate technical/professional skills to support organization's digital developments/innovations.					
7	Installed infrastructure and facilities support innovation of digital transformation in water utilities					
8	The Organization has various policies, guidelines and rules that guide the application of digital technology.					
9	The organization has plans (short, medium and long term) for digital technology Investment					

10	Senior Management are committed to support digital transformation.					
11	Senior Management have adequate exposure on digital development and innovations required for the organization.					

Part C: Extent to which water utilities operations are affected by User acceptance on digital transformation

8. The following statement describes the user involvement and acceptance on digital transformation. Indicate the level of agreement or disagreement in a likert scale ranging from agreement to disagreement whereas SA-Strongly agree, AG-Agree, NE-Neutral, DIS-Disagree and SD-Strongly disagree. Tick what is appropriate

No	Statement	1 SA	2 AG	3 NEU	4 DIS	5 SD
1	The organization always involve Users in transforming digital solution used in operations					
2	Users of technology are adequately aware with digital transformation initiatives planned to be undertaken in the organization					
3	The digital transformation are always perceived by users as essential to ease organizational operations					
4	Users believes digital transformation improves organizational efficiency and performance.					
5	Users are always ready to accept operational changes associated with digital transformation.					

9. What grounds do you think can contribute most for system Users to reject or fail to accept operational changes attributed by digital transformation? Tick what is/are appropriate

   a) Lack of ownership on introduced digital technology developments ( )

   b) Lack of exposure on digital transformation aspects ( )

   c) Resistance or negative attitudes towards changes ( )

   d) Digital transformation fail to yield intended results ( )

   e) Digital transformation affects employment position or status ( )

   f) Others (specify if any) ( )

   ……..…..

   ……

   ……..…….

   ……..…….

10. What challenges do you think may affect Users in applying the digital technology developments? Tick what is/are appropriate

   a) Limited staff skills ( )

   b) Lack of resources ( )

   c) Lack of customized applications ( )

   d) Internet connectivity problem ( )

   e) Lack of access to the devices ( )

   f) Others (specify if any) ( )

   ……..…..

   ……

   ……..…….

   ……..…….

11. The following statement describes the ways in which digital transformation affect water utilities operation. Indicate the level of agreement or disagreement in a likert scale ranging from agreement to disagreement whereas SA-Strongly

agree, AG-Agree, NE-Neutral, DIS-Disagree and SD-Strongly disagree. Tick what is appropriate

No	Statement	1 SA	2 AG	3 NEU	4 DIS	5 SD
1	Digital transformation has significantly improved customer's water meter reading and billing processes.					
2	Digital transformation provides real time and effective customer handling.					
3	Digital transformation has significantly improved revenue collection through introduction of electronic payment system and pre-paid meters.					
4	Digital transformation improves decision making through real time and summarized organization performance dashboard.					
5	Digital transformation ease organization's operations by automating and integrating business processes.					

Part D: The status of digital technology application in operation of water utilities

12. Which Department is mainly associated with your daily responsibilities? Tick what is/are appropriate
    a) Managing Director Office Department ( )
    b) Human Resource Department ( )
    c) Technical Department ( )
    d) Customer Service Department ( )
    e) Finance Department ( )
13. What is your view on the level of digital transformation of the organizational business processes?
    a) All organization's business processes are digitized/automated
    ( )

b) Majority of organization's business processes are digitized/automated ( )

c) Few of organization's business processes are digitized/automated ( )

d) All organization's business processes are not digitized/automated ( )

14. From the Department associated with your daily responsibilities responded in question 12 above, indicate the processes, which have been digitized/automated. Tick what is/are appropriate

a) Water abstraction processes ( )
b) Water treatment processes ( )
c) Water distribution processes ( )
d) Sewage disposal system ( )
e) Customer identification and location processes ( )
f) Customer application and connection processes ( )
g) Asset management processes ( )
h) Water meter reading and management processes ( )
i) Customer billing processes ( )
j) Revenue collection processes ( )
k) Customer handling processes ( )
l) Payment processes ( )
m) Financial management processes ( )
n) Stock management processes ( )
o) Staff performance monitoring process ( )
p) Human resources management process ( )
q) Procurement processes ( )
r) Others (specify if any) ( )

……..…..

……

……

15. From the Department associated with your daily responsibilities responded in question 12 above, indicate the ICT devices used in the operations of water utilities. Tick what is/are appropriate

a) Electrical Energy and power management devices ( )
b) Water quality management devices ( )
c) Water treatment chemical analyser ( )
d) Water pressure management devices/sensors ( )
e) Water infrastructure monitoring devices ( )
f) Water leak detector devices/sensors ( )
g) Water level indicator/sensors ( )
h) Digital pump ( )
i) Water flow detector/sensors ( )
j) Sewer gas detector ( )
k) Power rodder ( )
l) Jetting machines ( )
m) Automatic meter ( )
n) Smart meter ( )
o) Prepaid meter ( )
p) Meter testing kit ( )
q) Biometric time management devices ( )
r) CCTV cameras ( )
s) Computer and related devices ( )
t) Barcode reader devices for assets and stocks ( )
u) Others (specify if any) ( )

……..

……

……

16. The following are the systems mostly used in the operations of water utilities (Tick what is/are applicable)

a) Billing systems ( )
b) Smart meter reading system ( )

c) Bills payment systems ( )
d) Bills dispatch systems ( )
e) Geographical Information Systems (GIS) ( )
f) Accounting system ( )
g) Inventory/Stock control system ( )
h) Human resource system ( )
i) Payroll system ( )
j) Project designing and management systems ( )
k) Supervisory Control and Data Acquisition (SCADA) system ( )
l) Procurement systems ( )
m) Audit systems ( )
n) Analytical tools ( )
o) Asset Management system ( )
p) Record management system ( )
q) Customer handling system ( )
r) Others (specify if any) ( )

……..…..

……

……

17. How often are you using installed systems in undertaking your responsibilities?
    a) Always ( )
    b) Most used ( )
    c) Occasionally used ( )
    d) Rarely used ( )
    e) Never used ( )

18. The following statement describes the status of ICT governance and investment level. Indicate the level of agreement or disagreement in a likert scale ranging from agreement to disagreement whereas SA-Strongly agree, AG-Agree, NE-Neutral, DIS-Disagree and SD-Strongly disagree. Tick what is appropriate.

No	Statement	1 SA	2 AG	3 NEU	4 DIS	5 SD
1	The organization structure recognizes the ICT function.					
2	The organization has ICT professionals to support organization initiatives to digital technology development.					
3	ICT functions provides real time support to users of the system					
4	Staff are periodically given training on application of new developed ICT solution					
5	The ICT infrastructures are adequate to support smooth operation of the organization					
6	The organization has adequate and real time backup facilities for ICT processed information					

Thank you for your cooperation