Mandatory use of National Information Systems in Government: an extended UTAUT Perspective

Research Report

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DECLARATION

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ACKOWLEDGEMENTS

I hereby acknowledge my supervisor Jean-Marie Bancilhon under whose guidance this research was undertaken. I wish to express my sincere appreciation for his patience and support throughout the entire process.

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I wish to acknowledge the Department of Water and Sanitation and all the respondents who took their time to participate in the survey.

DEDICATION

This research is dedicated to my entire family who put up with me during the long hours of my absence. To my wife who constantly encouraged me to never give up. I also like to dedicate this to my daughter who I hope this work will be as an inspiration to her studies and to my son who showed an understanding for my unavailability to play and to visit other places like before.

Mandatory Use of National Information Systems in Government: an extended UTAUT perspective

ABSTRACT

Technology acceptance and use has been well researched in the past, particularly where usage was voluntary. This research study investigated factors that influence acceptance and use of technology in a mandatory setting. The study investigated previous studies in literature that have investigated acceptance and use in mandatory setting and suggested additional factors that contributed in the acceptance and use of technology in mandatory setting.

This research model adapted UTAUT and added Reward Expectancy and IT Compliance Behaviour constructs. While Venkatesh et al. (2000) indicated that punishment acted as a catalyst for Technology use, Punishment Expectancy is explicitly depicted as a construct in the adapted model for this study. The research was a quantitative study that surveyed users of the National Information Systems in a government department in South Africa. A sample size was a larger user group with 130 respondents from the three Information Systems and it was considered for the analysis.

Results indicated that Performance Expectancy, Effort Expectancy and Facilitating Conditions had effect on the usage of mandatory national information systems. The research model will serve as a guiding framework for empirical assessment of IT acceptance and usage in mandatory environments.

The practitioners will find that users of mandated systems expect organizational and technical support. Managers responsible for implementing policies will find that IT compliance behaviour is influenced by the policies. Management in organizations that have mandatory information systems will find that users' expectation of rewards have effect on IT compliance behaviour.

It is recommended that Facilitating Conditions be further investigated in future research as this construct indicated a weak effect on the usage of the mandatory system. Punishment Expectancy was also recommended for investigation in future research as it was not supported in this study which was inconsistent with previous study in mandatory settings.

Keywords: Mandatory Settings, Acceptance, Usage, Policies, Expectancy

Table of Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

1.1 Introduction

This chapter highlights the problem statement, the purpose of the study, the intended contribution of the study and its delimitation. The researcher highlights the context of the study and justification of studying technology acceptance and use in the context of mandatory settings.

1.2 Background

This study was conducted in the government Department of Water and Sanitation in South Africa. This department is responsible for monitoring, assessing and providing information on water resources (Chapter 3 of the National Water Act, Act 36 of 1998). The act stipulates that the Minister as the custodian of Water Resources in South Africa shall ensure that institutions that are managing water, water users and the public in general shall have access to information for their own purposes. Some of these stakeholders use water for their research and for planning.

The department uses information systems to store data and produce information for public usage and for research purposes. These information systems are mandated by the department for employees to use in order to generate information so that the department could achieve its objectives.

According to Schwarts and Chin (2007), management in organizations are faced with the continuing quest to ensure that users accept and use technology which is brought into an organization. There is an undocumented perception that not all of the users of some of the mandated national information systems at the Department of Water and Sanitation are using them or if used, they are not being used optimally. These mandated systems are national information systems that are used to capture and process data in order to generate information on national water resources.

There are multiple national information systems in the context of a South African government department. Three of these national information systems are used in the National Department of Water and Sanitation and they are, Water Management System (WMS), Water Authorization and Registration Management System (WARMS) and the Hydrological Information System

(HYDSTRA). This study focused on these three national information systems that are used by the Department of Water and Sanitation.

The Water Management System (WMS) is used to store data and to process information on the quality and quantity of water resources. The system is replicated in the 9 Regional offices of the Department of Water and Sanitation with the central processing taking place at the Head Office in Pretoria. The Water Authorization and Registration Management System (WARMS) is a National Information System that is used for the capturing and processing of data on water users and uses registrations. The other system, Hydrological Information System (HYDSTRA) is used to store and process data on surface water flow and groundwater.

Information contained in these information systems is used by the public, water boards and researchers. Registration is required in WARMS to capture data on the users of water and the purpose of using water. The water users are the stakeholders or clients that have been registered to use water from the water resources while the water uses are the purposes for which water is being used.

The choice of the three systems is motivated by the fact that they are in the same Department although they are serving different objectives. The investigation will assist in comparing the users' Behavioural Intention and their Compliance Behaviour as a proxy to the actual use of the National Information Systems.

The study adopts the Unified Theory of Acceptance and Use of Technology (UTAUT) as a theoretical focal lens. UTAUT is used to empirically determine the factors that influence employees' intention to accept and use the technology (Zuiderwijk, Janssen and Dwivedi, 2015). It has been argued that UTAUT is suitable for studies of technology acceptance and use as the model was able to explain about 70 percent of the variance in individual's intention to use technology and it also able to explain approximately half of the observed variance in using the technology (Venkatesh, Morris, Davis, Davis, 2003 and Venkatesh, Thong and Xu, 2012).

Although the study used three of the four main constructs as outlined by standard UTAUT model, the model was extended by adding other variables, Reward Expectancy and IT Compliance Behviour which are adopted from Liang, Xue and Wu (2012). Punishment Expectancy is also explicitly depicted in the model as an independent variable while Social Influence is excluded in the model as its influence is factored in punishment expectation in

mandatory settings thus the construct was not included in the adopted model (Xue, Liang and Wue, 2011). The inclusion of Reward Expectancy and IT Compliance Behaviour is to test the influence of the mechanisms employed by the organization towards the users' behaviour (Hwang, Al-Arabiat, Shin and Lee, 2016). Senior management in the organizations make decisions on the adoption of the systems on the premise that employees will use them. This suggests that there is a need to introduce other variables and modify existing models that will are capable of addressing the complexities of the organization (Williams, Nripendra, Rana and Dwivedi, 2015 and Hwang et al. 2016). This research aims to test validity of the claim that the two variables have an influence on the usage of the system.

According to Liang et al. (2012), many organizations have applied reward and punishment as a control measure of mandatory IT usage. It is thus important to determine the influence of the two variables on employee's compliance behaviour. The study also assesses the variable, IT compliance behaviour as a dependent variable for both Reward Expectancy and Punishment Expectancy as expressed by Liang et al. (2012). This study was conducted in mandatory setting and it was imperative to assess employees' compliance behaviour towards using the technology.

The addition of Reward Expectancy and IT Compliance Behaviour was further motivated by Williams et al. (2015) who did a literature review on UTAUT and one of their findings were that since its inception, some researchers have come up with new variables applicable to UTAUT.

When Gupta, Dasgupta, and Gupta (2008) explored how technology is adopted in the context of the government environment, they wanted to understand the extent to which this enhanced government-to-employee interactions. Although the study was not conducted in a mandatory setting, the authors examined which factors influence the acceptance of new technology by government employees in a developing country (Gupta et al. 2008). According to Prasanna and Huggins (2016), the end-users' use of the system does not mean that the system is fully accepted. It possibly that a user may only use the system partially and develop lack of interest in using the system (Mahmud, Ramayah and Kurtinia, 2016). This study will investigate how technology is accepted and used in mandatory environments and extends the variables that are used in the original UTAUT model.

Aims and Objectives

This research aims to provide practitioners and researchers with a model that will help them to better understand the acceptance and use of technologies by employees in mandatory environments.

The overall objectives of this study are to determine which factors influence employees' behaviour towards using mandatory information systems. The adopted model comprises five key constructs from literature. The objective is to determine which of the constructs have effect on the dependent variables and the level of significance.

The study determines the extent to which IT compliance behaviour influences actual usage of mandated information systems. The outcomes of this research could assist practitioners to focus on how to implement IT policies and how to provide organizational and technical support to the IT users.

1.2.1 Research Gap

Many studies have been conducted in different context in mandatory settings. Some focused on technologies and others focused on personality of users and resistance by users to use the systems. These studies are discussed in section 2.2 of this report. The researcher noted from existing literature that the users' broad expectations have not been explored and understood even if the systems are mandatory to use.

According to Hwang, Al-Arabiat, Shin and Lee (2016), overall literature does not pay enough attention to the issue of systems that are mandated to use by organizations. There is also little assessments done on e-government systems from a perspective of government employees as primary users (Stefanovic, Marjanovic, Delic, Culibrk and Llic (2016).

Rehouma and Hofmann (2018) performed a literature review on Government employees' adoption of Information Technology and found that the majority focused on business (G2B) or the citizen (G2C) and only a few deal with employee's perspectives (G2E). The researcher explored other variables that could help to explain the expectations of users from the technologies and organizations perspective.

1.2.2 Research Problem

Despite technology adoption having been studied widely, few of the known studies have explored and assessed the antecedents and consequences of adoption of technology in a mandatory setting, (Al-Arabiat and Mohammed, 2014 and Chan,Thong, Venkatesh, Brown, Jen-Hwa Hu and Tam, 2010). Even though information systems are expected to be used as mandated, some employees' might not use these systems particularly if there are no IT policies that regulates their compliance. Al-Arabiat and Mohammed (2014) indicate that there has not been much work done in the mandatory settings through the identification of the relevant core constructs. Mahmud, Ramayah and Kurnia (2017) indicates that user resistance behaviour is likely to occur when the system is mandatory. According to Badenhorst, (2007), the problem statement needs to identify the existing knowledge gap in a particular study from previously researched material. Thus, this study highlights other factors which were unknown before in order to enhance the knowledge about acceptance and use of technologies in mandatory environments.

1.3 Purpose of the study

The study intends to assess the factors that influence the government workers' behavioural intention to use IT, their IT compliance behaviour and the actual use of information systems in a National Government mandatory setting. As opposed to the mandatory studies by Walsh, Gettler-Summa and Kalika, (2016); Klaus, Wingreen and Blanton, (2010) and the non-mandatory study by Gupta et al. (2008), whose study was restricted to the use of Internet by all government organizational employees, which is government-to-employee setting, the context of this study was the National Information Systems which are mandatory to use by employees in specific functional units in the Department of Water and Sanitation.

This study intends to assess the extensions of the key constructs as indicated by the original UTAUT model and also assess the effects of the additional and the dependent constructs, Reward Expectancy and Punishment Expectancy towards IT compliance behaviour as adopted in the model for the acceptance and use of the National Information Systems. The question was also raised by Chan et al. (2010) when they indicated that there has not been much work done in the mandatory settings through the identification of the relevant core constructs.

1.4 Intended contribution of the study

The research intends to advance the understanding of acceptance and use of information systems in mandatory settings by proposing an extension of the UTAUT model. This model was tested in the context of government department in South Africa. The findings will potentially help managers on how to deal with employees' expectations when using the mandated technologies. The tested model could also be used as a framework for other researchers to test the proposed model in different organizations where use of technologies is mandatory.

The extension of the original UTAUT model was motivated by Williams et al. (2015) who indicated in their literature review on UTAUT that despite the model developing quickly, there are still clear opportunities of investigating and introducing other variables and new relationships between its constituent components.

1.5 Delimitations of the study

The research was conducted in a National Department of Water and Sanitation in South Africa. The focus was on employees who are accountable to the National Office in terms of their responsibilities. Officials, who are not tasked with the responsibilities of using the National Information Systems and were not expected to use the systems due to their job functions, were excluded.

The population sample is the employees at operational level as well as middle management officials who use the systems for viewing, monitoring trends and understand the management and requirements for data capturing and processing.

1.6 Outline of the Report

Chapter 2 reviews the existing literature on the related studies of technology acceptance and use. The chapter provides the theoretical underpinning for this study as well as related prior research on mandated systems. Other constructs are introduced and added to the underpinning UTAUT model. The research model for the purpose of this study is then developed.

Chapter 3 is the research methodology. The chapter highlights the type of research that is to be conducted. It outlines the research design and methodology as well as the data collection methods and analyses. The consideration of Ethics to maintain control is also highlighted.

Chapter 4 is the results analysis part whereby results from the survey are analyzed. The reliability and validity of the administered questionnaire will be tested. Tests from the derived hypotheses will also be analyzed.

Chapter 5 is the interpretation of the results. It discusses was found in chapter 4. This is the chapter whereby conclusions are generated from the findings. The limitations of the research and the recommendations for future research are highlighted.

CHAPTER 2: LITERATURE REVIEW AND MODEL DEVELOPMENT

2.1 Introduction

A theoretical background that was used for the purpose of this study is provided in this chapter. The chapter investigated theories that have been used to study acceptance and use of technologies in mandatory settings and also investigates literature where UTAUT was employed in different environments for acceptance and use of technologies. The chapter highlights the shortfalls of these theories and justifies the adoption of UTAUT as the suitable model for this investigation. The model was then developed from literature concepts and tested in a mandatory environment for its suitability.

Theoretical underpinning for this research is the standard Unified Theory of Acceptance and Use of Technology (UTAUT) with the extension of variables such as Reward Expectancy, IT Compliance Behaviour and an explicit introduction of Punishment Expectancy. In this study, the original UTAUT model is adapted to include these two independent variables and the IT Compliance Behaviour as a dependent variable and test these variables against the mandatory use.

The use of technology in mandatory environments is generally considered compulsory. However, the users can be discretional in using the technology due to the number of factors that include developing lack of interest towards the system (Mahmud et al. 2017) and the users' perceptions on how the system was implemented (Prasanna and Huggins, 2016). The system implementation in this context refers to the role of management support and guidance.

Given that the study is conducted in mandatory environment, the researcher did not consider including perceived voluntariness of using the system as a variable. Generally, in mandatory environments when the system is implemented, the users are expected to use it whether they like it or not. The biggest challenge lies with management to get the user's buy-in and support by creating an environment that deals with the user's concerns towards the adoption and use of the system (Hwang et al. 2016).

According to Hwang et al. (2016), senior management in organizations make many adoption decisions built upon the premise that employees will use the technology. Thus, management must consider adopting the guidelines that will address the user's concerns and provide

sufficient support during the implementation and post deployment of the system (Ojiako, Chipulu, Maguire,Akinyemi and Johnson, 2012).

IT use is a central construct in information systems (IS) research and it has received increased scrutiny over the past few years (Walsh, Gettler-Summa and Kalika, 2016). The study investigated specific phenomenon of usage, expectable use. The authors sought to explain the inclination by the users to adopt the technology. The study adopted a theoretical lens that used mixed method of quantitative and qualitative to assess the influence of the users' profiles and the characteristics of the users relative to their cognition. Walsh et al. (2016) found that user's IT culture significantly influenced the user's expectable use.

The concept of mandatory use of the technology in this study reflects on the management decision to deploy the systems. According to Hwang et al. (2016), users might base their perceptions of mandatory use on complex set of beliefs. This might lead to discretional use of the system by the users. There is a possibility that the users may simply not use the technology even if it is mandated (Mahmud et al. 2017).

According to Laumer, Maier, Eckhardt and Wetzel (2016), research and practice generally recognize negative employee reactions when mandated systems are implemented.

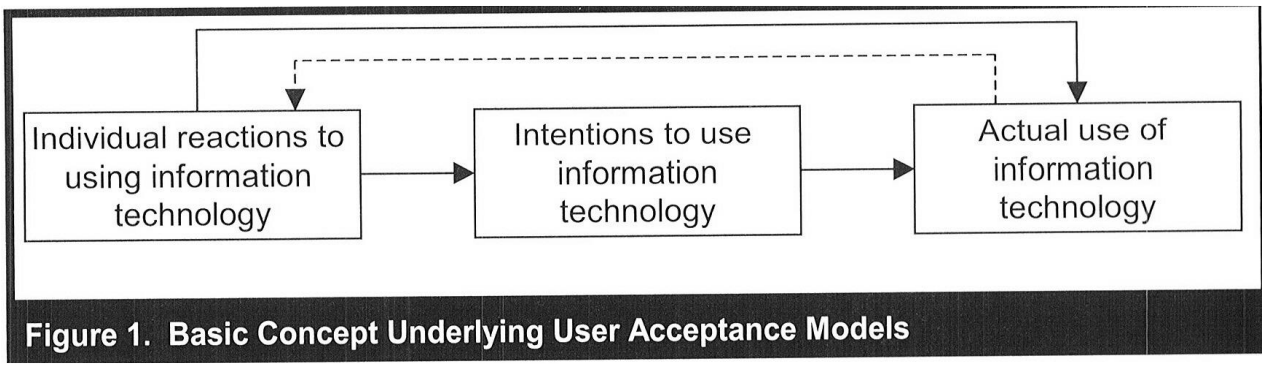


Figure 1. Basic Concept Underlying User Acceptance Models

Adapted from Venkatesh et al. (2003)

According to Coeurderoy, Guilmot and Vas (2014), there are a series of decisions made by individuals based on a number of different factors that lead to the adoption of technology. There are other factors that needs to be explored according to Coeurderoy, et al. (2014) and this study seeks to highlight the expectations by users that ultimately lead to the actual usage of the information systems, particularly where the technology is mandatory to use.

In comparing Voluntary and Mandatory contexts, the vast majority of research on IT acceptance and use has examined IT use in voluntary usage context (Venkatesh et al, 2003; Bhattacherjee, Davis, Connolly and Hikmet, 2017). Venkatesh, Morris, Davis, and Davis, (2003) cautioned that the results should not be generalized to mandatory settings. In circumstances where such directives exist, the use of IT is less voluntary and more mandatory (Bhattacherjee et al., 2017).

The literature review pointed to fewer studies done for IT adoption in mandatory environments when compared to voluntary environments and this is highlighted by Chan et al. (2010). The authors indicated that there has not been much work devoted to understanding how technology gets adopted in the context of mandatory use through the identification of the relevant core constructs.

2.2 Theories in Literature for IT use in mandatory settings

Technology acceptance and use have been previously researched through voluntary settings and mandatory settings. Voluntary settings are environments where users are not compelled to use the IT and mandatory settings are environments where IT users have no choice but to use the technology. This research investigates acceptance and use of technologies in mandatory settings and highlights few theories that have been previously used in literature.

In the context of mandatory use of technology, other studies employed different theories to explain different factors affecting acceptance and use of technologies. Klaus, Wingreen and Blanton, (2010) investigated the types of user resistance through Concourse Theory and Q-methodology. The authors were keen on finding the underlying causes of resistance when the system is mandatory. The researchers' focus was the concourse itself and not the organization or the users of technology.

The authors employed the Concourse Theory to reveal the naturally existing structure in this domain of their research interest. They identified the types of users and the nature of user resistance by investigating how resistance manifests itself through the behaviour of users. The findings were that resistant groups do exist in IT mandatory use environment and management needs to be aware and develop strategies to deal with the expectations of users in a mandatory environment.

Although the study highlights the expectations of users where IT is mandated, this theory falls short of relating the user resistance with the technology itself. Despite the authors indicating that mandatory technologies can affect employees' jobs, organizational and technical support for employees was not addressed in the research. Thus, when compared to UTAUT, the theory is not well rounded to investigate other factors that influence technology acceptance and use in mandatory settings.

In another study done on technology acceptance in a mandatory setting involving workplace users, Huang and Hsu (2009), assessed the learning intentions of the new technology by the users. Their sample comprised of 112 workers, workload pressure together with what they termed the exogenous variables such as computer knowledge, subjective norms and training were investigated to assess the determinants of the users' learning intentions (Huang and Hsu, 2009). The researchers found that technology support and the subjective norm can effectively improve the attitude of users in learning to use a new technology.

Huang and Hsu used the Technology Acceptance Model (TAM) for their study. TAM is one of the eight competing models which Venkatesh et al. (2003) identified to formulate UTAUT which is considered a well-rounded model to be used for acceptance and use of technologies (Zuiderwijk, Janssen, and Dwivedi, 2015).

Bhattacherjee, Davis, Connolly and Hikmet (2017) conducted a research on user responses to mandatory IT Use from the Coping theory perspective. They investigated the causal factors and processes that drive specific IT user responses and the subsequent changes of those responses over time. The Coping theory was used to explain changes in user's emotions and behaviours as they used the technology.

The authors argue that the use of IT in organizations can be viewed on a continuum from voluntary to mandatory. The authors contend that in mandatory settings, where users have no choice or have less choice to use IT, it is inaccurate to examine IT use behaviour as a choice. This is because even the users who hold negative perceptions of the IT use are compelled to use it regardless of their preferences.

The study was qualitatively performed and their findings were that there was a pattern of more reluctant responses to compliance following the implementation of a mandatory system. The Coping theory falls short of explaining users' relationship with management for organizational

and technical support. The coping theory seemed to focus on assessing the feelings of the users regarding IT usage which is probably why the researchers found different responses. In an environment where technology is mandated, users might still be discretional and briefly use the system and discard it later. This study looks at the influence of the mechanisms that management employ in the organization like rewards, punishment and IT compliance in a mandatory environment where the users might still resist using the technology despite it being mandatory (Mahmud et al. 2017).

Liang, Xue and Wu (2012), conducted a study of IT acceptance and use in a mandatory setting and they indicate that there has not been an explicit study on reward expectation and punishment expectation that investigates the intention of employees to use the mandated systems in literature. The study was conducted using the organizational justice theoretical lens and the authors contend that the use of IT in mandatory settings needs to be compliant. Liang et al. (2012) define IT compliance behaviour as the extent to which employees adhere to the organization's IT policies to appropriately use the technology when doing their work. This suggests that employees' intention to adhere to the IT policies in mandatory environments precedes and determines the appropriateness of the actual use of the technology.

The organizational justice theory applied in this study focuses on policies to be implemented and reward and punishment for compliance and non-compliance respectively. There is no accommodation for users experience with the technology and does not provide the strength to assess the acceptance and use from the users' perspective. Punishment and reward expectancy were deemed necessary to be incorporated in the UTAUT model as they measure IT compliance which is an important variable for this study which is conducted in mandatory setting.

2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT model and the constructs used to formulate the model are discussed in this section. The section also highlights different environments where UTAUT has been tested and the significance that the constructs had on their dependents

UTAUT is used to describe the acceptance and use of technology and it was developed from assessing the Theory of Reasoned Action; Technology Acceptance Model; Motivational Model; Theory of Planned Behaviour; Innovation Diffusion Theory; Model of PC Utilization;

Combined TAM and TPB and the Social Cognitive Theory from previously researched work. These theories and models were synthesized in order to find the commonalities among them and establish a new model that encompasses all of them (Venkatesh et al., 2003).

The seemingly fragmented models were thus integrated into a unified model by empirically comparing the existing models. This unification exercise involved investigations done from four organizations, tested data from these organizations and eventually cross-validated the UTAUT model. This investigation was conducted in both voluntary and mandatory settings and the model was subsequently validated for both voluntary and mandatory environments.

The authors examined the implementation of technology in voluntary and mandatory environments and found that the newly established model was able to explain a about 70 percent of observed variance in individuals' intention to use technology. UTAUT is a model which is often used to examine information technology acceptance and use and is considered a well-established model that has been considerably tested in many different contexts (Zuiderwijk et al., 2015). According to Venkatesh et al. (2012), UTAUT is able to identify important factors that could predict whether targeted individuals could use or not use the mandated technology in their working environment.

Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions are the four key constructs of UTAUT. These constructs seek to explain the kind of behaviour that potential user's exhibit in intending to adopt a new technology and subsequently use it (Venkatesh et al., 2003). In this study which was conducted in mandatory setting, three of the four key constructs of UTAUT were employed. This excludes Social Influence which the authors indicated that the effect of its influence becomes non-significant over time in mandatory settings as its role gets eroded as users get used to the technology. According to Xue, Liang and Wue (2011), Social Influence is factored in punishment expectation in mandatory settings thus the construct was not included in the adapted model.

According to UTAUT's model as presented by Venkatesh et al. (2003), of the four key constructs, social influence directly influenced the intentional behaviour of the users. The four constructs were found to have significant effect on their dependents. UTAUT model was also found to posit that behavioural intention directly determinants of use behaviour.

2.3.1 Evolution of UTAUT

In a systematic literature review study of UTAUT by Williams et al. (2015), the researcher's analysis indicated that although UTAUT was developing quickly, it was in relatively early stages of development.

The evolution of UTAUT has been witnessed through other studies that augmented the model by other researchers. This was witnessed by the development of UTAUT2 that integrated other constructs and relationships into the original model (Venkatesh et al., 2012). The study by Williams et al. (2015) indicated that there are ample opportunities available for researchers to introduce variables by exploring alternative relationships between other components constituted by UTAUT in various contexts and different environments in order to further shape and develop the field.

In exploring work published by Venkatesh et al. (2003), it was found that exploratory techniques were examined through which many technologies and systems were used. Williams et al. (2015) reflected that examining different systems and technologies in many different contexts created confusion among researchers and they ended up being selective in their choice of characteristics as most of the models seemed to be competing with each other. According to the authors, by bringing together the different views and developing UTAUT assisted in harmonizing the literature that dealt with the acceptance and use of technology.

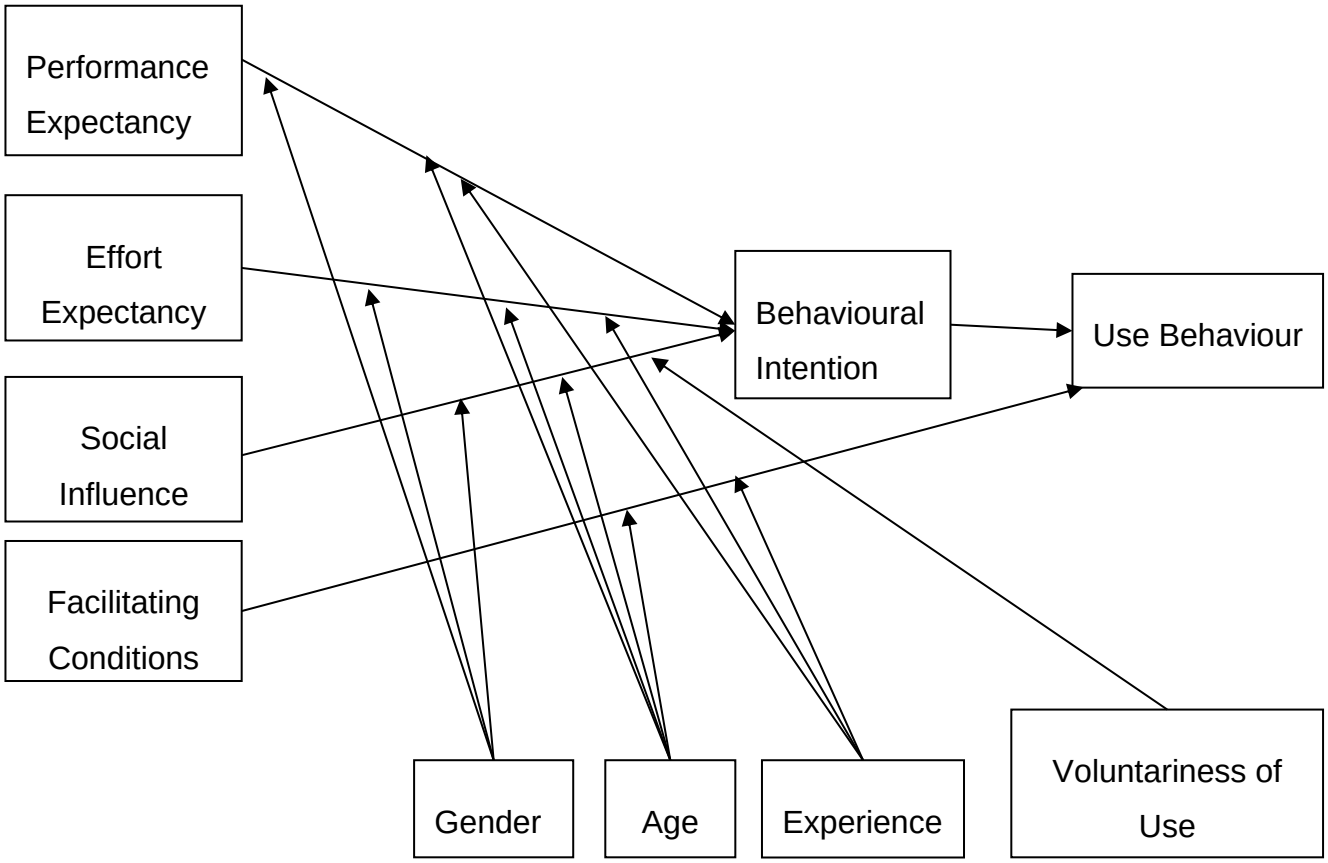
2.3.2 UTAUT in Mandatory Settings

When technology is mandated in an organization, it implies that users have no control over their decision to use it or not. In becomes a challenge when organizations that implement mandatory technologies do not have regulatory processes that govern the behavioural compliance of users. It is imperative for organizations to have explicit organizational directives or mandates for employees to use IT for specific organizational tasks (Bhattacherjee et al. 2017).

In testing the validity of UTAUT in a mandatory setting, through the use of e-learning environments, Decman (2015) found that while using gender and students' previous education, *performance expectancy (PE)* positively influenced behavioural intention (BI). The relationship was found to be the strongest between PE and BI while the other constructs were found to be significant despite being relatively slightly weak.

When Chan et al. (2010) investigated the application of UTAUT in a mandatory setting where e-government technology was used by the citizens; the researchers applied the core constructs of UTAUT to assess their impact on the citizen's satisfaction. The key constructs of UTAUT were found to have effect on the dependents. The adapted UTAUT model used in this study was tested in a government environment to determine government employee's behavioural intention, IT compliance behaviour and actual use of the technology.

Figure 2: Original UTAUT Model (Adapted from Venkatesh et al. 2003)



2.4 Extended UTAUT Model

The original UTAUT model is extended by using other independent constructs, Reward Expectancy, Punishment Expectancy and IT Compliance Behaviour which are adopted from Liang, Xue, and Wu, (2012).

According to Mitchel et al. (2012), some workers or technology users in an organization can be motivated to use the technology just to avoid being punished if it is scoped into their performance agreements while others might use it if there is a reward attached to it. On the other hand Casey and Wilson-Evered (2012), cautions change managers against discounting perceptions of staff about technological functionality as that could potentially reduce the likelihood of technology uptake.

Brown et al. (2002), argue that in mandatory settings the workers who intent to use the technology may do so due to their belief about the associated rewards and punishment than their belief on the technology itself. The model thus introduced punishment expectancy to test its effect on the government employees' IT compliance intention to use the technology.

2.5 Reward Expectancy and Punishment Expectancy

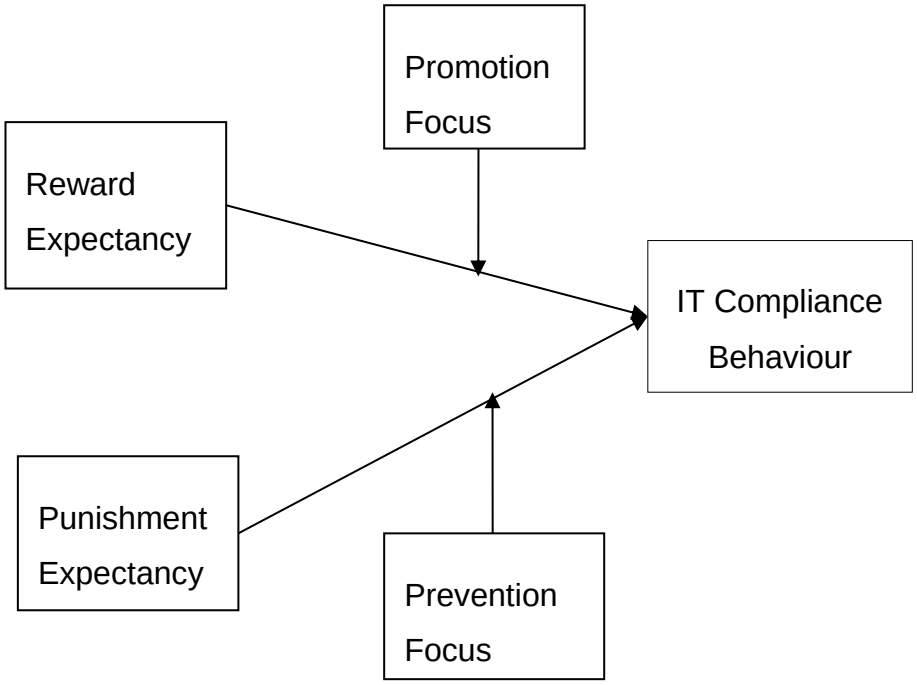
Reward Expectancy is defined as an employee's expectation to be rewarded for their IT compliance behaviour while Punishment Expectancy is defined as the expectation that non-compliant IT use will be punished (Liang et al., 2012). The authors argue that expectation for rewards and punishment can modify an individual's behaviour. In their study, Xue et al. (2011) contend that when punishment is carried out, it leads individuals to cognitively expect it and device means to avoid it.

Liang et al. (2012) found that reward expectancy significantly affects employees' compliance behaviour if they are focused on being promoted. On the other hand, the authors found that punishment expectancy strongly influenced individuals' compliance behaviour and also influence the way they perceive the ease of using the technology.

In the adapted model for this study, IT compliance behaviour serves as a proxy to using the IT and Reward Expectancy and Punishment Expectancy are added to complement UTAUT which according to Williams et al. (2015) the model is regarded to be open to assess the addition of other variables.

Punishment Expectancy replaces Social Influence as according to Venkatesh and Davis (2000) and Xue, Liang and Wue (2011); Social Influence is factored in punishment expectation in mandatory settings. The Reward Expectancy variable is added as there is a belief that the users tend to positively change their behaviour when they imagine the incentives for compliance behaviour (Liang, Xue, and Wu, 2012).

Figure 3: Punishment Expectancy and Reward Expectancy



Adapted from Liang et al. (2012)

In the figure above, reward expectancy influences IT Compliance behaviour through the moderation of focus on promotion. When employees have strong focus on getting a promotion, they tend to comply and change their IT Compliance behaviour. On the other hand, punishment expectancy is moderated by the focus on preventing it and thus individuals tend to enhance their behaviour towards IT compliance (Liang et al., 2012).

2.6 RESEARCH MODEL AND HYPOTHESES

Due to the considerations of the specific working environment and mandatory use of the National Information Systems in a government organization, the conceptual model as indicated in Figure 4, is based on the standard UTAUT which is extended to include the variables from Figure 3.

The Dependent Variable(s):

a) **Use Behaviour (Mandatory Usage)**

According to Venkatesh et al. (2003), the Use Behaviour or actual use of the technology is predicted by the user's intention to use the technology. The user' indication of intending to use

IT is so critical that even in mandated environments, usage is still fundamentally volitional, i.e. users can still decide not to use a mandated technology (Hartwick & Baki, 1994). System use behaviour is indicated in Technology Acceptance Model (TAM) as being determined by how it is perceived to be useful and how it could be easily operated (Lee and Park, 2008).

Walsh et al. (2016) argue that IT usage has a direct link to IT disposition that reflects the frame of mind with which the user approaches any new IT artefact. Brown, Massey, Montoya-Weiss and Burkman, (2002) identify Usage as a dependent variable in a mandatory environment. Brown et al. (2002) argue that usage in mandatory environments is highly correlated with job function and not with any positive or negative affect toward the system. However, Hsieh, Rai, Petter, and Zhang (2012) posit that in a mandatory use of a system, perceptions of employees about the system is aligned with their behaviour to use the system when they are satisfied with the usage of the system.

According to Brown et al. (2002) while employees may be using mandatory technology, their job satisfaction might be negatively affected. However, the authors stress that when systems are mandated, employees are obliged to use them in order to do the job. It is thus critically important to have a high connection of a job function with a technological non-option so that employees do not devise means of using other alternative technologies.

Klaus, Wingreen and Blanton, (2010), related a mandatory usage of a system on account of the level of how integrated the system is. According to Klaus et al. (2010), the system that is mandatory to use is not only forcing the users to use it but it often alters the user's job to comply with its processes.

An individual's decision to use the system is influenced by the perceptions of what the inputs will deliver (Ojiako et al., 2012). The authors argue that even in a mandated environment, perception of individuals is important to consider as their reception is directly associated with the favourable returns from the system.

b) **Behavioural Intention**

Behavioural Intention is influenced by the three core UTAUT's variables, that excludes the Facilitating Conditions' construct (Decman, 2015). Technology Acceptance Model (TAM) posits that the intentional behaviour to use technology determines computer usage whereby

employees' intention to use a system is determined by their attitude towards using it and their perception about the usefulness of the system (Keong, Ramayah, Kurnia and Chiun, 2012).

Hartwick and Barki (1994) found that subjective norm had significant effect on individual's behaviour when they are required to use the mandatory systems. Venkatesh et al. (2003) found an association between subjective norm and social influence and that social influence directly influenced behavioural intention.

Behavioural Intention is typically focused on user's initial decision on whether to use or ignore the technology that is mandated. In the context of a mandatory environment, IT usage is a non-option, hence once an organization mandates use, there is likelihood that user's attitudes could take on heightened importance and thus warrants considerations from management (Brown et al., 2002). Considering that even in mandated environments, users might be discretional in their decision on whether to use the system or not, it is hypothesised that the behavioural intention to use the National Information Systems relates positively to its mandatory use.

c) **IT Compliance Behaviour**

Liang et al. (2012) refers to IT compliance as specifying how IT should be used. The authors indicated that for any given compliance structure, the absence of policies that stipulate how IT should be used, could lead to non-compliance. This could in turn manifest as non-use, misuse and using it inappropriately. This suggests that adherence to IT compliance could lead to the desired use of the information systems.

Independent Variables

Three of the four UTAUT's key constructs are employed in this study:

Performance Expectancy – It is the extent to which an employee believes that their work performance will improve as a result of using the technology. Performance Expectancy is included as a variable as it indicates strong prediction of intention which was significant to all the concepts that were measured in both voluntary and mandatory settings (Venkatesh et al., 2003).

Users will adopt and use the technology if they believe that it will assist them to perform their duties (Decman, 2015). Casey and Wilson-Evered (2012); Gupta, Das Gupta and Gupta (2008)

found Performance Expectancy to have significant influence on individual's intention which led to the actual use of the system.

According to Brown et al. (2010), when there is no option to use or not to use, performance expectancy serves to encourage positive attitude towards the system and thus enhance efficiency. However, Zuderwijk, Janssen and Dwidedi (2015) supports the idea that people tend to stick to their traditional ways of working if they do not believe that the system will help them improve their performance and in the case of the National Information Systems, workers are likely to use their preferred systems if they believe that the National Information Systems will not help them perform their job better. Thus, the employees will adapt their behaviour towards using the system if they consider it beneficial towards their job fulfilment.

Hypothesis (H1): Performance Expectancy will have a positive influence towards the workers' behavioural intention to use the mandatory National Information Systems.

Effort Expectancy is the degree of ease that is associated with the use of technology (Venkatesh et al., 2003).

Li, Liu and Liu (2016) argue that the design of the system or the technology itself such as the inappropriate design or poor user friendliness may be factors of resistance to using the system by users. According to Coeurderoy et al. (2014), Effort expectancy is captured by previous studies as "perceived ease of use" from TAM), "complexity" from the model of PC utilization and "ease of use" from the innovation diffusion theory.

This study predicts that the government employees, who perceive the National Information Systems to be easy to use, will use them. Perception of ease of using technology refers to the extent to which an individual believes that there will not be much effort required to use a particular system (Davis, 1989). This means that the system will be less complex to operate it.

Rogers, (1983) defines complexity as the degree to which people perceive an innovation is to be very difficult to understand and operate. Thus, this study intends to investigate how complex or easy do employees find the mandated technology to use. Premkumar, Ramamurthy and Nilakanta (1994) posit that once the technology is perceived to be complex, the ability to use it effectively can be expected to influence the level of satisfaction with the use of that system. It is contended in this study that if employees perceive the National Information Systems to be complex to use, they will not be satisfied with it and may not use or adopt it.

If the effort of using the system outweighs that of the performance benefits to be derived from using the system, the users will be tempted not to use it (Davis, 1989). Both TAM and UTAUT suggest that the perception on the difficulty to use a technology and how useful it is perceived to be, are the most important determinants of IT use behaviour as any new system is supposed to assist employees to perform their duties without exerting too much of effort (Laumer et al. 2016). It is thus claimed that Employees will use a system that they believe that it will provide benefits to them and will require less effort to use it.

Hypothesis (H2) – Effort Expectancy will have a positive influence on the workers' behavioural intention to use the National Information Systems.

Reward Expectancy

Reward Expectancy is an employee's expectation to be rewarded for their IT compliance behaviour (Liang, Xue and Wu, 2012). In the context of this study, rewards refers to financial or promotion at work. The authors contend that rewards have an influence on both the individuals that are being rewarded and those that are observing those that are being rewarded. This implies that employees who witness their colleagues being rewarded also tend to believe that they will also be rewarded at some point.

As also indicated by Liang et al. (2012), rewards refer to the positive consequences that the supervisors apply to the subordinates, thus this act as a key driver of behavioural change. The expectancy from the workers will thus be that a given reward will follow a given behaviour (Liang et al., 2012).

Brown et al. (2002) suggested that in mandatory environments, an individual's intention to perform certain behaviour may be associated more with the beliefs about the associated reward and punishment. This could suggest that individuals' compliance behaviour could improve and thus use the system if they believe that they stand a better chance to be rewarded.

Hypothesis (H3) – Reward Expectancy positively affects the worker's IT compliance behaviour towards using the National Information Systems.

Punishment Expectancy

Liang, Xue and Wu (2012) define Punishment Expectancy as the individual's expectation that they will be punished for their IT non-compliance. In this study, Punishment Expectancy is

adopted to account for Social Influence which is said to be factored as punishment expectation in mandatory settings (Venkatesh and Davis, 2000 and Xue, Liang and Wue 2011).

According to Liang et al. (2012), punishment expectancy modifies employee behaviour through two different ways, namely, it has potential to deter future misconduct and secondly, punishment has potential to not only influence individual workers but also other members of the organization.

In the mandatory use context, an intention to perform behaviour may be associated with individuals' beliefs regarding the punishments rather than their beliefs about the technology itself (Brown et al., 2002).

According to Xue, Liang and Wu (2011), in mandatory settings, punishment is widely utilized as a forceful measure to ensure that employees comply with the policies that govern the use of IT. The authors also suggest that punishment is critical in mandatory use of IT in that it influences individuals' IT use behaviour. They based this suggestion on what they believe Venkatesh and Davis (2000) posited when they indicated that the effect of subjective norm on user's behavioural intention was largely due to the authorities' capability to punish non-compliance.

According to the researchers, the study reveals that punishment influences the behaviour of employees through punishment expectancy which the authors referred to it as the expectation that non-compliance of IT use behaviour will be punished. It is also suggested that employee's expectation to be punished assist them in associating the potential punitive measures with their non-compliant IT behaviour. That means that employees could relate their non IT compliance behaviour with the punishments that are associated with non-compliance of IT use.

Hypothesis (H4) – Punishment Expectancy positively affects the workers' IT compliance behaviour towards using the National Information Systems.

Facilitating conditions - the extent to which an individual believes that there is existing infrastructure in the organization and the availability of support for them when they need it when operating the system (Venkatesh et al., 2003).

The original UTAUT model depicts facilitating conditions as a direct determinant of Use. Figure 2 indicates Facilitating Conditions directly influencing Use Behaviour. This is enabled

by an organizational investment in training and help desk support. According to Decman, (2015) facilitating conditions focuses on what employees expect from the organization and its technical support when information systems are mandated to be used. If the use of the system is mandatory, employees would expect the organization to provide them with training, reliable infrastructure and the technical support whenever they need it. Although the author focused on e-learning environment, Chae and Poole (2005) posits a similar view on infrastructure related aspect when they say that it is largely the reliability of existing infrastructure and the availability of technical support that influence how these mandated systems are viewed and applied.

As in UTAUT's original model, the adopted model indicates facilitating conditions directly influencing Usage. As Howard, Restrepo and Chang (2017) argue that workers will use a system if they perceive that less effort will be required to use it, it is contended that the better the working tools, like software, hardware as well as training become available, the easier it will become for the users to work with the National Information System. According to Chae and Poole (2005), IT infrastructure has potential to provide a frame for the requirements of mandatory systems from a technical point of view. They also argue that this also indicates a roadmap for the implementation of mandatory information systems.

Furthermore, the authors indicate that organization's IT infrastructure itself can constrain users from using the technology if the employees perceive it to be not user friendly. When such perceptions exist, an organization might enforce the standards for conformance on the mandated system. Given that the National Information Systems are mandatory systems, it is assumed that the Department of Water and Sanitation has policies and standards to which these systems should conform for their operation.

Hypothesis (H5) – Facilitating Conditions have a positive influence on the mandatory usage of the National Information Systems.

Behavioural Intention

According to Venkatesh et al. (2003), there is empirical evidence that supports the relationship between behavioural intention/intention to use across a variety of settings including where use is mandatory in organizations. Actual use which is referred to as the mandatory use in the

context of this study captures the activities that emanate from the behavioural intention to use the National System (Saaed and Abdinnour, 2010).

Keong et al. (2012) indicated that examining behavioural intention to use technology in mandatory use environments is as important as it is in voluntary use because even in a mandatory environment the end-users who's intention to use technology is relatively low, may ultimately reduce their frequency of using the system.

Hypothesis (H6) – The behavioural intention to use the technology is positively related to the mandatory use of the National Information Systems.

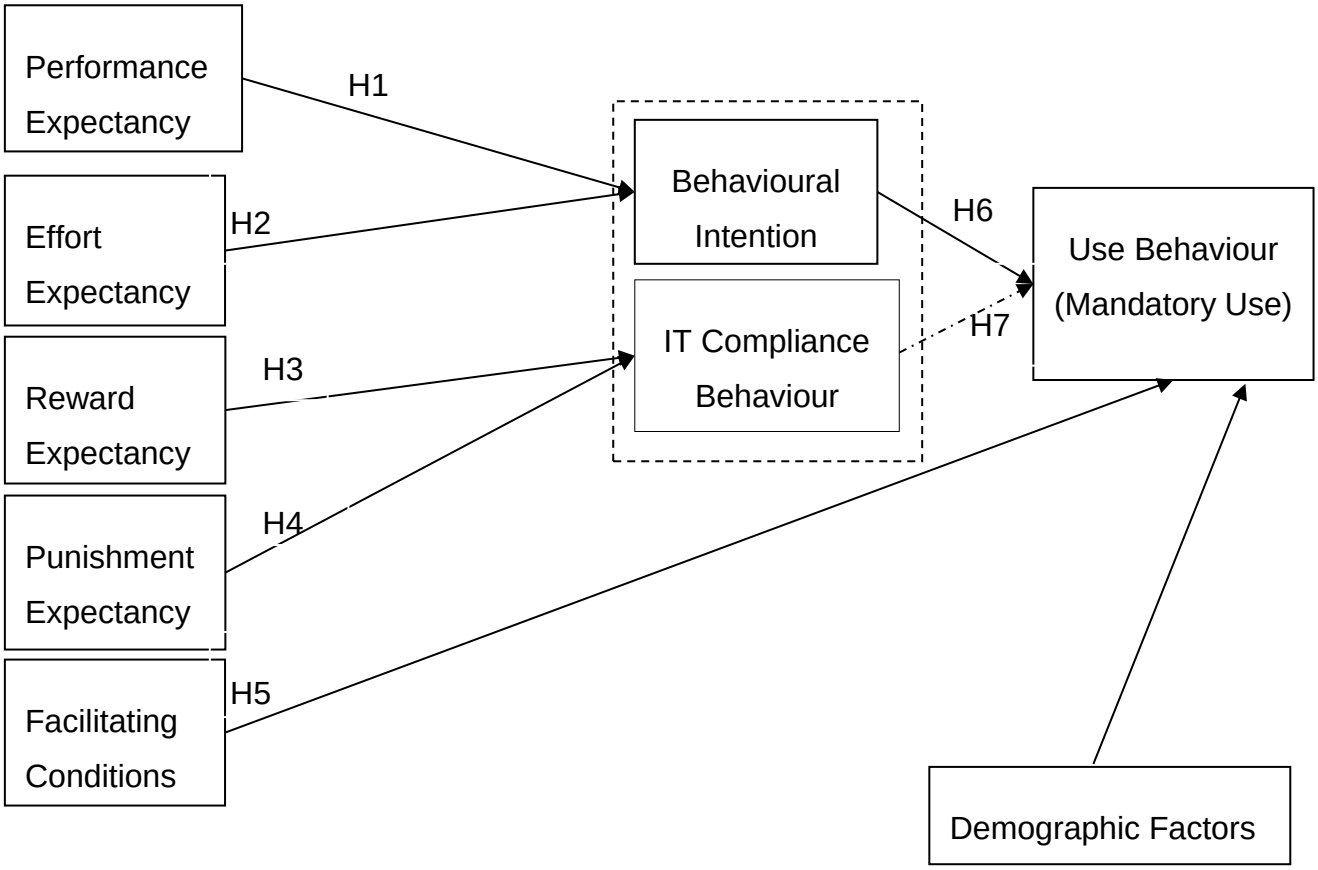
IT Compliance Behaviour

Liang et al. (2012) define IT Compliance as the extent to which employees follow IT policies in an organization in order to use the IT in an appropriate manner while performing their duties. According to Xue et al. (2011) IT compliance includes the use of IT and clear directives for using the IT. The authors content that noncompliance is manifested as non-use or misuse in mandatory setting.

As indicated by Liang et al. (2012) individuals reinforce their behavioural model based on what they learn from their colleagues in their surroundings and hence use what they imagine to be the benefits to help change their own behaviour. If an individual expects to be rewarded, they will adhere to the IT policies in their subsequent use of the technology. IT Compliance Behaviour is hypothesised as a proxy to the actual usage of the National Information Systems.

Hypotheses (7) – The need for IT compliance affects mandatory use of the National Information Systems

Figure 4: Research Model



Adapted from Venkatesh et al. (2003)

Demographic Factors

Gender:

Gender was is one of the demographic factors that are included in the research model and was used as a control in the multiple regression.

Experience:

Experience is part of the demographic factor in the adapted research model. Decman (2015) did not find it significant in their study for e-learning in a mandatory setting.

Age:

Age has been considered to be a relevant moderator due to the fact that Venkatesh et al. (2003) indicated that studies that consider gender without referencing age can be misleading. However, Age is included as part of demographic control as indicated in the adapted model.

2.7 Chapter Summary

This chapter highlighted different studies that used UTAUT as the theoretical lens. The chapter also highlighted different types of usage that were investigated by using UTAUT in different context. The existing literature was explored to justify UTAUT as a suitable model for this study.

This chapter established an extended UTAUT as underpinning to this study. The variables from the extended UTAUT model were then used to derive the seven hypotheses that were used to examine the factors that could have influence on employees' behaviour to accept and use technologies in mandatory environments. Literature was reviewed to assess the suitable control variables for the adopted research model. The next chapter will explain the methods adopted in this study that will be used to test the hypotheses.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the type of research that was conducted. It outlines the research design, the methodology, data collection methods and data analyses. The Ethics issues are also highlighted as a means to protect the respondents from harm.

3.2 Research Paradigm and Approach

There are two research paradigms, positivist paradigm and interpretive paradigm. Positivist paradigm is focused on testing the theory and interpretive paradigm is focused on building the theory (Bhattercherjee, 2012). Researchers using positivist approach, work on collected empirical data to test the hypotheses. An interpretive researcher seeks to make sense from an observed unit of analysis and constructs a theory from the analysis.

This study was informed by positivist research paradigm as it intended to test the hypotheses. It is also quantitative as observed data was presented in a numerical form (Rosnow and Rosenthal, 1999). It examined the extended UTAUT variables and determined the factors influencing the employees' technological use and assessed the impact of their decisions.

An interpretive research was not suitable for this study as it is holistic and contextual and does not deduce from theory. This study sought to quantitatively analyse the statistics of the users regarding their use of the technology. The relationships between the variables were to be investigated using statistical tools and positivist paradigm was deemed suitable for this study as it employs objective techniques such as standardized measures (Bhattacherjee, 2012).

Terre Blanche and Durrheim (1999) indicate that a researcher who adopts a positivist approach should be objective and detach themselves from influencing the outcomes. Similarly, Bhattacherjee (1999) describes positivist research as a research paradigm that encourages the independence of the researcher and thus avoids influencing the research. The study can be abstracted from the context under study and be decomposed using objective techniques such as standardised measures. The researcher in this study remained detached from the data collection process after sending the questionnaires to the respondents.

3.3 Research Design and Methodology

The design of this study is explanatory and adopts a quantitative methodology. The study is conducted by using survey as individuals are the unit of analysis. According to Bhattacherjee, (2012) this is a suitable methodology to use for such studies. In this case unobservable data relating to the people's attitudes and behaviours will be measured, which makes a survey research suitable for this study by remotely collecting data.

Table 3.1

Research Objectives	Limitations	
	Strengths	Weaknesses
The overall objective was to determine which factors influence government employees' behaviour towards using mandated information systems.	- The survey method was used to send the standardized questionnaire to the respondents. The pilot test on the questionnaire was conducted and this provided the researcher with an opportunity to refine the questionnaire. - The measuring of the survey items were adopted from previous studies and some of these items were adapted for this study (Table 3.2).	- The study was conducted only on the users of the selected National Information Systems in the Department of Water and Sanitation in South Africa. - The investigation was limited only to the employees who use the systems to perform their duties at work.

To test the adapted theoretical model and test the hypotheses, the researcher identified the Department of Water and Sanitation as an institutional setting where the National Information Systems are implemented.

Research using surveys involve using standardized questionnaires to collect data about people including their behaviour in a systematic manner.

This study has its focus on assessing the factors that could have influence on the acceptance and use of Information Systems like the Water Management System (WMS), Water Authorisation and Registration Management System (WARMS) and the Hydrological Information System (HYDSTRA) that are used by workers employed by functional units in the National Department of Water and Sanitation in South Africa. This Department is mandated to protect the water resources of the country and uses National Information Systems to monitor the water resources by capturing and storing data on the systems.

The Department provides services to the people by ensuring that the citizens are informed about the potential hazards of water in the surrounding areas. Hypotheses were be tested using data collected from survey questionnaire.

3.4 Data Collection Methods

In order to develop instrument, the researcher adopted the approach used by Venkatesh et al. (2003), Liang et al. (2012) and Decman (2015) to attain validation and refinement. To develop scales, literature was surveyed to assess the validated scale and relevant items that could be suitable for this study. Scales or indices as they are often used interchangeably, places the received responses on a continuum for the determination of the direction, the intensity level and the strength of a variable construct (Rossouw, 2003).

As Bhattacherjee (2012) indicated that a research instrument should be created using the refinement of all construct items and in this study a group of employees were considered as the targeted respondents to test the extended UTAUT model. The conceptual definitions of constructs and the items in Table 3-2 below were adapted from the referenced literature.

Table 3.2 Instrument Construct for the research:

Construct	Conceptual Definition	Items	Type of Variable
Performance Expectancy (PE)	It is the degree to which an employee believes that his or her job performance will be enhanced by using the technology. Venkatesh et al. (2003)	1. I find the system to be useful in my job. 2. Using the system will help me accomplish my tasks quickly. 3. Using the system will help me increase my productivity 4. If I use the system, I will be increasing my chances of getting a salary increase or promotion. Reference: Venkatesh et al. (2003)	Independent
Effort Expectancy (EE)	It is an extent of ease with which an employee will find their association with the use of technology. Venkatesh et al. (2003)	1. My interaction with the system would be clear and understandable. 2. It would be easy for me to become skilful at using the system 3. I find the system easy to use. 4. Learning to use the system is easy for me. Reference: Venkatesh et al. (2003) and Decman (2015)	Independent
Reward Expectancy (RE)	Reward Expectancy is an employee's expectation to be rewarded for their IT compliance behaviour	1. I expect to be rewarded when I use the system. 2. I will use the system if my supervisor acknowledges in the quality of my work.	Independent

	Liang et al. (2012)	3. If I do well in my job, I believe that my supervisor will reward me. 4. My supervisor would do all that he or she could to help me progress if I use the system. Liang et al. (2012) and Podsakoff et al. (1984)	
Punishment Expectancy (PuE)	Punishment Expectancy is defined as the expectation that non-compliant IT use will be punished. Liang et al. (2012)	1. My supervisor shows his/her displeasure if I do not use the system. 2. I will use the system to avoid being punished for not using it. 3. I will use the system because i believe that it is the right thing to do. 4. I will use the system to keep my work at an acceptable level. Liang et al. (2012) and Podsakoff et al. (1984)	Independent
Facilitating Conditions (FC)	The extent to which an employee believes that there is existing support technical support and organizational support to use of the system Venkatesh et al. (2003)	1. I have the knowledge necessary to use the system 2. There is a specific person or group available to assist with system challenges 3. I am equipped with the necessary resources to use the system 4. The system is not compatible with other systems that I use.	Independent

		Reference: Venaktesh et al. (2003), Zuiderwijk et al. (2015), Decman (2015) and Venkatesh et al. (2012)	
Behavioural Intention	This is the users' initial decision on whether to use or not to use the technology. Venkatesh et al. (2003)	1. I intend to use the system in the next two months. 2. I predict that I will use the system in the next two months. 3. I plan to use the system in the next two months. Refernce: Venkatesh et al. (2003)	Dependent
IT Compliance Behaviour	An employees' behaviour towards complying with the organization's IT policies while performing their job. Liang et al. (2012)	1. I am aware of the policies that I am expected to following using the system. 2. I intend to comply with the stipulated rules for using the system. 3. I will always adhere to the prescribed policies while using the system. Reference: Liang et al. (2012)	Dependent
Use Behaviour	This is regarded as the actual usage of the technology. Venkatesh et al. (2012)	1. I use the system for a variety of tasks (reports, projects, decision making, etc.). 2. I use the system once a week. 3. I use the system for 2-4 days in a week. 4. Overall I use the system a lot. Reference: Harwick and Barki (1994) and Davis et al. (1989)	Dependent

3.4.1. Sampling and Respondents

It is often not possible to acquire information from all people about whom the researchers would want to make inferences. According to Rossouw (2003:p107), the aim of a research design is the optimization of the use of resources and that drawing a sample is one of the ways to achieve that. Hence, researchers use sampling to decide who to observe.

A national government department is a focal organizational resource in this study. The National Department of Water and Sanitation is responsible for the water resources in South Africa according to the National Water Act 36 of 1998. The Department has a number of National Information Systems like WMS, WARMS and HYDSTRA which were mandated to be developed.

The targeted group comprised operational officials who should ideally interact with the technology on a regular basis. This targeted group were employees who likely to be knowledgeable with the IT assets of the organization.

The sample for this research comprise all employees or users of these systems at the National Department of Water and Sanitation in South Africa and these individuals were based at the National Head Office and others at the Regional Offices. The study focused on the three National Information Systems, Water Management System (WMS) with approximately 74 users; Water Authorisation and Registration Management System (WARMS) with approximately 199 users and Hydrological Information System (HYDSTRA) with approximately 285 users.

Sampling Procedure

The number of the registered users of the three Information Systems was used as the sampling frame for this study. The researcher consulted was provided with the data from the databases of the three Information Systems. The databases displayed the number of the active users, their email addresses and other data which the researcher did not consider to be relevant for the purpose of conducting the study.

The researcher determined the size of each sample from the sampling frame through the verification of the email addresses of the active users.

Data were collected from the registered users of these three systems in their databases. From the three information systems and based on the number of responses received from the users of each system, the researcher decided to settle with the larger sample in order to conduct further analysis. Hence the two other systems with low response rate were dropped from further analysis.

The HYDSTRA system yielded 130 responses and it was considered for analysis.

The sample was considered justifiable noting that Huang and Hsu (2009) had a sample of 112 workers to assess technology acceptance and use in a mandatory setting. Liang et al. (2012) collected data from 218 randomly selected participants from a population of about 970. Decman (2015) collected data from 228 participants in their study in a mandatory environment.

In this study the workers are expected to utilize the systems for sourcing data and for other tasks in pursuit of their job responsibilities. Data were collected by using a survey questionnaire which comprised age, gender, experience and multiple items from construct variables as indicated in the research model.

3.4.2 Strategies for pre- and pilot testing

Pretesting is often done to refine measuring instruments with the aim of identifying and changing awkward and confusing or offensive questions (Cooper & Schindler, 1998). To effect pretesting, the researcher gave the questionnaire to two academics in the field of Information Systems at the Wits University to assess the questions and advice on possible changes to be made. This exercise was intended to help in revealing strange meanings, seemingly wrong order of questions, questions that were leading to the respondents and responses that were deemed awkward (Sreejesh, Mohapatra, and Anusree 2014). Pre-testing enabled the researcher to check whether the questionnaire needed to be amended if the respondents highlighted the questions that were confusing to them and thus confirm content validity.

The pre-test results:

It was recommended that the Sub-headings that precede the questionnaire items be re-phrased as indicated in Appendix A.

Question 2a: My interaction with HYDSTRA Information System enables me to accomplish my tasks more quickly. The word, quickly, was removed as it was not regarded as a measure of effort. The question was changed to Question 2a as indicated in Section 1B, Appendix A.

It was suggested that Question 4a and Question 4d change their order and the re-ordered questions appear in Section 1D, Appendix A.

Question 8a: I use the HYDSTRA Information System frequently (many times per months). The use of the phrase, many times per month was recommended to be changed as the researcher might not get enough variance if people. The question was re-phrased to Question 8a, as indicated in Section 1H, Appendix A.

Question 8b: I use the HYDSTRA Information System intensively (many hours per months). The use of the phrase, many hours per month was recommended to be changed as the researcher might not get enough variance if people use the system fairly often. The question was re-phrased to Question 8b, as indicated in Section 1H, Appendix A.

The researcher performed pilot testing in order to determine whether the indicated items were properly worded. This enabled the researcher to ensure that the items presented did not lead respondents into giving unrealistically narrow answers. (Rosnow and Rosenthal 1999). The researcher ensured that the questions were properly formulated because as Rossouw (2003) indicated, questionnaires that are hastily prepared potentially yield unnecessary, slightly off-target and irrelevant information.

The pilot test results:

After refining the questionnaire items from feedback received from the pilot test, the questionnaire items were sent to 10 people who were located in the different Regions. The purpose was to check whether the questions were making sense and thus provided the researcher with the questionnaires' face validity. The researcher received feedback from 8 respondents responding to all the questionnaire items without new suggestions. There was no further refinement of the questionnaire items.

3.4.3 Data Collection Procedure

i) Measurement

Measurement is an activity that involves assigning numbers to objects in order to represent the amount of a particular attribute comprised by the object (Terre Blanche and Durrheim, 1999). Measurement also allows researchers to be able to differentiate between objects on the basis of their relative understanding of the shared attributes (Terre Blanche and Durrheim, 1999).

According to Terre Blanche and Durrheim (1999), measurement has enabled researchers to turn phenomena that are abstract into variables that are quantitative. The questionnaire items were presented in numbers to provide means by which objects that were being investigated. The 7-point Likert scale was used to measure items whereby 1= strongly disagree and 7= strongly agree. The likert scale was applied to the questionnaire statements. On the demographic factors, the respondents were given the choice on the gender and to choose the Region where they were based and indicate their age group by ticking the appropriate box.

ii) Questionnaire Administration

This study employed survey questionnaire as surveys are associated with the deductive approach. Surveys are known to allow for the collection of acceptable amounts of data from a considerable population which is regarded as an economical way of collecting data (Saunders et al., 2009).

The researcher used an online Survey Monkey software platform to conduct the survey. The researcher first tested the Survey Monkey software by using own email address and also tested with another identified individual's email address. This was done to check whether a participant was able to participate more than once in the survey. After ensuring that a participant cannot respond to the same survey more than once, the email addresses which were identified from the system's database and verified with the administrators of the systems, were uploaded to the Survey Monkey software.

The survey questionnaires were administered to three samples and collected data was separately analysed for the three information systems. The analysed data was comparatively easy to explain and to understand as it was standardized.

The use of survey questionnaire was convenient in that the researcher managed to administer the questionnaire to large numbers of people through emails (Rosnow and Rosenthal 1999).

3.5 Ethical Considerations

The researcher used the ethics protocol number CINFO/1168 to receive informed consent from the participants by not only through the signing of a form but as a voluntary exercise. The researcher ensured that tasks that were expected from participants were fully and clearly explained to them so that they can decide on their own whether to participate or not (Terre Blanche and Durrheim, 1999). The researcher also made himself available to answer questions from participants.

The researcher also assured participants about the parameters of confidentiality of the information that they were expected to supply as that could help protect their privacy and also maintain integrity. The researcher remained objective and did not exercise bias when engaging with the participants.

The researcher acted responsibly and exercised responsibility by taking care to protect the identities of individuals (Terre Blanche and Durrheim, 1999). According to Rosenthal (1994), some investigators knowingly allocate control conditions to the participants who will support their hypothesis, in this study the researcher will ensure that there will be no intentional misrepresentation of data collected.

3.6 Data Analysis Methods

In this study, Cronbach's alpha was used to analyse the variance and the internal consistency or reliability was also determined.

3.6.1 Reliability

Reliability refers to consistency or stability that relates to whether the measurements can be repeated and confirmed by further repeated measurements (Rosnow and Rosenthal, 1999).

Reliability determines whether the measuring process is reproducible. The scales assessed for their loadings in order to measure their reliability. The measurements were done and the stable measures were recorded for use in further analyses (Sreejesh et al., 2014).

The researcher used the Cronbach alpha to measure the amount of internal consistency across the specified multiple set of items. The researcher checked whether there was measurement error depicted by a Cronbach alpha of zero. If the internal consistency is low, the measurement

error becomes greater. The reliability measure of scale items enabled the researcher to assess whether the questionnaire will produce consistent findings from the different respondents (Saunders, Lewis and Thornhill, 2009).

3.6.2 Validity

The principal component analysis was performed to identify the best combination of variables that would account for most of the variance in the data (Sreejesh et al., 2014). Results of the correlated matrix for all the composite variables were determined.

Validity of the scales was performed to determine whether the items measured what they were supposed to measure. The items that were considered for further analysis were retained while those that did not display validity were dropped (Rosnow and Rosenthal, 1999).

Convergent Validity

This is the extent of correlation among different measures that are intended to measure the same concept (Sreejesh et. al., 2014). In this measure, a correlation is established between the values of the indicators of a construct when compared with the indicators of the same construct (Battacherjee, 2012). The Varimax rotation method was used to assess the correlations for items that were intended to measure the same constructs. Items that were found to have cross-loaded were removed and items that converged around the same component to indicate convergent validity were kept and analysed further.

Discriminant Validity

It is a phenomenon in which there is no discrimination between the construct and what the construct should measure (Battacherjee, 2012). According to Sreejesh et al. (2014) discrimination denotes low correlation among the items that are supposed to be different. The discriminant validity was determined for cross-loading items and this assisted the researcher in deciding which items to drop off and which ones to retain for further analyses.

Internal Validity

The researcher performed the internal validity to check the existence of the relationship between the variables. This assisted in establishing whether one variable had an effect on the other.

External Validity

The associations that were observed were not tested for their generalizability with other populations. The tests were performed on the data from the users of specific information systems.

3.6.3 Hypotheses Testing

Hypothesis testing as indicated by Bless & Kathuria (1993) aims at evaluating the probability of the truth as stated by the hypothesis being sufficiently high to accept that hypothesis.

To test the hypothesis, the researcher performed correlation analysis and the regression analysis techniques.

i) Correlation Analysis

The researcher performed co-relational analysis to measure the degree of the relationship between variables and observed the correlation coefficient. The correlation coefficient was used to calculate the degree of co-variation of two variables. The derived value of r^2 provided an indication to the researcher on whether the behaviour of one variable is 100% determined by the behaviour of the other (Bless & Kathuria, 1993).

The researcher performed bivariate correlation analysis to determine the effects of independent variables on the dependent variables. The researcher determined the set of items that displayed the high correlations among themselves.

The researcher performed the parametric test and checked the Pearson's correlation results. The results were intended to assess whether data was approximately distributed. Appendix E2 provides the results of the distribution of data.

ii) Regression Analysis

As Rosnow and Rosenthal (1999) indicated that the choice of the statistical test depends on the research question and the design of the study and this study adopted the multiple regression test technique.

The researcher performed the multiple regression analysis in order to understand the underlying relationships between the variables. The results indicated the variance that the model explained

with respect to the measured variables. The results for the multiple regression analysis are indicated in Appendix E.

3.6.4 The t-Test

The t-test method conveniently allows a researcher to test for the statistically significant difference between the two samples. It enables the researcher determine and compare their means and identify items that display high t-values (Rosnow and Rosenthal, 1999).

The researcher performed the t-test on the three information systems only to determine the possibility of analysing them together. The t-tests were performed for the determination of the means and the differences that might exist. This was performed for each of the system with one another to determine the level of significant difference between the samples

3.7 Chapter Summary

The chapter introduced the research design and methodology for this study. The instrument construct for the study was derived from literature and it is indicated in a tabular format. The sampling and data collection mechanism are outlined. Consideration of ethical conduct is also highlighted. The process of hypotheses testing was also detailed. The next chapter introduces collected data and also analyses the results from the survey.

CHAPTER 4: DATA ANALYSIS

4.1 Introduction

The chapter introduces the analysis of the results as described in the methodology outlined in the previous chapter. The results are derived from the analysis of the data using Version 24 of the Statistical Package for the Social Sciences (SPSS) tool. Data were collected using the Survey Monkey tool and it was exported to SPSS via an Excel software package.

As indicated in Chapter 1, three National Information Systems were surveyed in the Department of Water and Sanitation in South Africa. Due to the possibility that existed that a single user could be a potential user of all three information systems, three identical questionnaires except for the targeted information system, i.e. HYDSTRA, were prepared and sent to the respective registered users of these information systems.

Survey questionnaires were sent to a combined total of 558 registered users of Hydrological Information System (HYDSTRA), Water Management System (WMS) and Water Authorization and Registration Management System (WARMS). The three surveys yielded a total of 241 responses. There were 130 responses received for HYDSTRA, 75 responses for WARMS and 37 responses for WMS. Table 4.2 provides the description of data on the surveys of the three information systems.

4.2 Survey Results on three Information Systems

The responses for WMS and WARMS yielded small sizes and according to Saunders et al. (2009), small samples can make statistical tests insensitive.

Table 4.1 Survey data on three Information Systems

Information System	Sampling Frame	Responses	Incomplete & Excluded Responses	Complete Responses	Response Rate
HYDSTRA	285	130	13	117	46%
WARMS	199	75	12	63	38%
WMS	74	37	0	37	50%
Total	**558**	**242**	**25**	**217**	**-**

Due to the fact that WARMS and WMS yielded smaller responses as compared to HYDSTRA, the independent samples t-tests were performed. The t-test method was used to compare the difference in the means of the three information systems groups by measuring the spread of the

scores from two samples (Saunders et al., 2009). This was done to check whether the compared samples could yield statistically significant difference between them. Table 4.2 below indicates the results for HYDSTRA and WAMRS Data.

Table 4.2 HYDSTRA-WARMS t-test results

Variable	Sig.(2-tailed)	Mean Difference	Std. Error Difference
PE(Q1)	0.698	-0.0374	0.0962
PE(Q2)	0.391	-0.0957	0.1113
PE(Q3)	0.115	-0.2121	0.1340
PE(Q4)	**0.002**	-0.8760	0.2775
EE(Q5)	0.187	-0.1750	0.1320
EE(Q6)	0.676	0.0671	0.1604
EE(Q7)	**0.000**	-0.4638	0.1252
EE(Q8)	0.092	-0.2480	0.1463
RE(Q9)	0.792	-0.0718	0.2726
RE(Q10)	0.221	0.3661	0.2979
RE(Q11)	0.679	0.1216	0.2932
RE(Q12)	0.318	-0.2767	0.2762
PUNEXP(Q13)	0.909	0.0309	0.2699
PUNEXP(Q14)	0.471	-0.1985	0.2751
PUNEXP(Q15)	**0.039**	-0.5239	0.2517
PUNEXP(Q16)	0.952	-0.0105	0.1726
FC(Q17)	0.533	0.0619	0.0990
FC(Q18)	0.480	0.0721	0.1019
FC(Q19)	0.208	-0.1661	0.1313
FC(Q20)	0.068	-0.5009	0.2723
BI(Q21)	**0.000**	0.8892	0.1976
BI(Q22)	**0.000**	1.0569	0.2068
BI(Q23)	**0.000**	0.9983	0.2018
ITComB(Q24)	**0.004**	-0.7123	0.2432
ITComB(Q25)	**0.017**	-0.2494	0.1030
ITComB(Q26)	**0.025**	-0.2166	0.0957
UB(Q27)	**0.007**	0.4082	0.1502
UB(Q28)	**0.000**	1.1732	0.3021
UB(Q29)	**0.001**	1.0430	0.3149
UB(Q30)	**0.000**	-0.7643	0.2138

PE=Performance Expectancy; EE=Effort Expectancy; RE= Reward Expectancy; PunExp = Punishment Expectancy; Bi = Behavioural Intention; ITCompB = IT Compliance Behaviour; UB = Usage Behaviour

In Table 4.2 above, the 30 items were compared for their significant difference. The results of the equal variances assumed between HYDSTRA and WARMS indicated 17 items with a significant value above 0.05 (Field, 2005) and 13 items with a value that is less than .005. A value less than 0.05 means that the variability observed between the two groups is not the same, thus implying the existence of statistically significant difference. This implies that 43% of the variables between the two samples indicate statistically significant difference. These results indicate that the two samples cannot justifiably be pooled together for the same analysis.

Table 4.3 HYDSTRA - WMS t-test results

Variable	Sig.(2-tailed)	Mean Difference	Std. Error Difference
PE(Q1)	0.392	0.1187	0.1382
PE(Q2)	**0.004**	0.5082	0.1714
PE(Q3)	0.091	0.3413	0.2007
PE(Q4)	0.997	-0.0014	0.3344
EE(Q5)	**0.003**	0.5594	0.1876
EE(Q6)	0.504	0.1504	0.2234
EE(Q7)	0.271	0.2268	0.2054
EE(Q8)	0.568	0.1173	0.2052
RE(Q9)	0.677	0.1370	0.3280
RE(Q10)	**0.000**	1.2929	0.3344
RE(Q11)	**0.042**	0.6918	0.3377
RE(Q12)	0.223	0.4100	0.3348
PUNEXP(Q13)	0.630	0.1581	0.3272
PUNEXP(Q14)	0.135	0.4719	0.3145
PUNEXP(Q15)	0.400	-0.2619	0.3106
PUNEXP(Q16)	0.209	0.3564	0.2825
FC(Q17)	0.540	-0.1107	0.1949
FC(Q18)	0.473	-0.1049	0.1456
FC(Q19)	0.576	-0.1026	0.1828
FC(Q20)	**0.004**	-0.8954	0.3104
BI(Q21)	0.089	0.4153	0.2424
BI(Q22)	0.083	0.4523	0.2592
BI(Q23)	**0.010**	0.6147	0.2372
ITComB(Q24)	0.847	-0.0580	0.2994
ITComB(Q25)	0.407	0.1197	0.1438
ITComB(Q26)	0.496	0.0959	0.1406
UB(Q27)	0.461	0.1679	0.2270
UB(Q28)	0.323	0.3500	0.3532
UB(Q29)	0.211	0.4596	0.3659
UB(Q30)	**0.045**	0.6706	0.3315

In Table 4.3 above, 7 of the variables indicate a Sig. Value of less than 0.05 of the equal variances assumed. This implies that 23% of the similar variables between the two samples indicate existence of statistically significant difference. The results are thus not favourable for both samples to be pooled and analyzed together.

Table 4.4 WARMS - WMS t-test results

Variable	Sig.(2-tailed)	Mean Difference	Std. Error Difference
PE(Q1)	0.306	0.1192	0.1158
PE(Q2)	0.348	0.1174	0.1246
PE(Q3)	0.237	0.1750	0.1471
PE(Q4)	**0.027**	0.8746	0.3892
EE(Q5)	**0.020**	0.4813	0.2036
EE(Q6)	0.644	0.1260	0.2720
EE(Q7)	**0.002**	0.5058	0.1574
EE(Q8)	0.141	0.3143	0.2119
RE(Q9)	0.583	0.2088	0.3794
RE(Q10)	**0.016**	0.9268	0.3774
RE(Q11)	0.151	0.5702	0.3943
RE(Q12)	0.066	0.6868	0.3691
PUNEXP(Q13)	0.728	0.1272	0.3641
PUNEXP(Q14)	0.059	0.6704	0.3502
PUNEXP(Q15)	0.429	0.2620	0.3300
PUNEXP(Q16)	0.515	0.1595	0.2444
FC(Q17)	0.934	-0.0118	01411
FC(Q18)	0.338	-0.1257	0.1304
FC(Q19)	0.713	-0.0545	0.1475
FC(Q20)	0.294	-0.3945	0.3736
BI(Q21)	0.141	-0.4935	0.3329
BI(Q22)	0.191	-0.4905	0.3724
BI(Q23)	0.327	-0.3636	0.3693
ITComB(Q24)	0.155	0.3570	0.2494
ITComB(Q25)	0.396	0.1059	0.1242
ITComB(Q26)	0.439	0.1007	0.1296
UB(Q27)	0.189	-0.3126	0.2362
UB(Q28)	**0.041**	-0.8232	0.3967
UB(Q29)	0.171	-0.5833	0.4227
UB(Q30)	**0.000**	1.4690	0.22827

PE=Performance Expectancy; EE=Effort Expectancy; RE= Reward Expectancy; PunExp = Punishment Expectancy; Bi = Behavioural Intention; ITCompB = IT Compliance Behaviour; UB = Usage Behaviour

In Table 4.4 above, about 20% of the variables show significant value that is less than 0.05, of the equal variances assumed. This implies that 80% of similar variables between the two samples show a significant level of greater than 0.05. The results are thus not favourable for both samples to be pooled together.

The results from the three information systems indicated that the analysis can be performed separately for each information system. Due to the fact that WARMS and WMS had relatively small sample sizes, the two systems were not considered for further analysis as the results might be statistically insensitive (Saunders et al. 2009).

4.3 Data Screening, missing values and outliers

The screening of data was performed to determine the missing values and the outliers. The missing values are those values that the respondent would have either intentionally or unintentionally failed to provide answers to the questions. All the cases that missed 10% of the questionnaire items were excluded and the remaining missing values were imputed through the series mean strategy in the SPSS version 24.

According to Saunders et al. (2009), outliers influence the linearity which is the extent to which the dependent and the independent variables relate to each other. Since the relationship between the variables will be investigated, the outliers were identified. The outliers are the extreme values on one or more variables and these were excluded from the regression analysis. According to Sreejesh et al. (2014), outliers are observations where certain items are not in the range where other items are observed to be. This is viewed as an unusual behaviour from certain values that are relatively on the outskirt when compared to the others. The Boxplot was used to determine the outliers and three of the questions had outliers that were less than three for each case. Four were deleted from the case and three of those outliers were transformed in order reduce the impact (Field, 2005).

All the cases that had less than 10% of the missing values were imputed through the series mean strategy. There were four cases that had no more than three of the missing values. This constituted about 3% of the total response population and about 10% of those imputed.

After the completion of the data cleaning of the 130 responses received, 117 items were left for further analysis.

4.4 Respondents' Profile

4.4.1 Experience

The descriptive analysis of the experience of users of HYDSTRA is depicted in Tables 4.5 below.

Table 4.5

Experience in using HYDSTRA			
Years	Frequency	Percent	Cumulative Percent
0 - 1	15	12.8	12.8
2 - 3	25	21.4	45.3
4 - 5	17	14.5	60.7
6 - 7	9	7.7	67.5
8 - 9	13	11.1	78.6
10 - 11	13	11.1	23.9
> 11 years	25	21.4	100
Missing Data	0	0	0
Total	117	100	

*Cumulative percent calculated according to de Vos, Strydom, Fouche and Delport (2011).

de Vos et al. (2011) state that the cumulative percentage is simply a rolling sum of each of the percentage.

As per Table 4.5 above, there is a fairly spread and varying experience across all the users of HYDSTRA. The highest numbers of users who have more years of experience in using the system are those with between 2 and 3 years as well as those with more than 11 years. These two categories both have 25 users. There is also significant number of those who have just started using the system with only less than a year of experience but representing about 13% of the total users. This could suggest that the system is firmly entrenched in the organization.

4.4.2 Age

The age descriptive statistics of the age of HYDSTRA users is depicted in Table 4.6 below.

HYDSTRA			
Category	Number	Percent	Cumulative Percent
18-25	11	9.4	10.3
26-30	25	21.4	31.6
31-35	19	16.2	47.9
36-40	20	17.1	65.0
41-45	15	12.8	77.8
46-50	12	10.3	88.0
51-55	7	6.0	94.0
56-60	4	3.4	97.4
61-65	2	1.7	99.1
>66	1	0.9	100
Missing data	1	0.9	0.9

There are quite a number of mature age users who are above the age of 40, constituting about 35, 1% of the overall users. However, 47% of the users are aged 35 and below and these users assume the status of youth. This suggests that the majority of users under the age of 35 surpass those that are nearing the retirement age and thus should those that are nearing their retirement age leave the organization, there would still be an organizational memory preserved in the organization.

4.4.3 Gender

Table 4.7

HYDSTRA			
Category	**Number of responses**	**Percentage**	**Cumulative percent**
Male	68	58.1	59.1
Female	42	35.9	95.7
Prefer not to say	5	4.3	100
Data missing	2	1.7	1.7

Results of the gender descriptive indicate that HYDSTRA is dominated by male users with 58%. There were also about 4% of the users who did not want to be classified as either male or female. The cumulative percentage is simply a rolling sum of each of the percentages (de Vos, Strydom, Fouche and Delport, 2011). According to STATS SA's report of 21 August 2017, women comprise 51% of the total population in South Africa and 44% are working. This

sample comprises almost 36% of women. According to the report that was published by the Institute of Information Technology Professionals on 2 April 2014, the ICT workforce in South Africa is comprised of only 20% of women. Later that year, a similar study was done by the Joburg Centre for Software Engineering and the study revealed that 21% of the jobs in ICT were held by women. According to this study, men are still dominating over women in the IT environment. Men account for 58.1% while women are represented by 35, 9%. According to this study, there is growth of women representation in the IICT environment.

4.5 Inter-item Correlation

Correlation analysis aims at measuring the degree of relationship between two variables and expressing it through a correlation coefficient (Bless & Kathuria, 1993). By calculating a correlation between the two measures, the researcher can determine to what degree and in what direction the two measures are related. According to de Vos et al. (2011), a correlation can serve two useful functions which are i) that any consistent relationship can be used to predict future events and ii) to provide data that are either consistent or inconsistent with some scientific theory.

According to Saunders et al. (2009), a correlation between variables where a change in one variable is accompanied by a change in another variable without being clear of what causes that change needs to be assessed. The correlation co-efficient was employed to quantify the strength of the linear relationship between two numerical variables. An average of inter-item correlation provides an estimation of the internal consistency reliability which is a measure of consistency between different items of the same construct (Sreejesh et al., 2014).

Prior to performing the Principal Component Analysis, the inter-item correlation matrix was performed to determine the items that were not correlating above 0.3 with the other items that intend to measure the same construct. Q4 and Q20 were found not to be correlating above .300 and were thus dropped from the subsequent analysis.

4.6 Descriptive Statistics

Table 4.8 Descriptive Statistics

Construct	Mean	Std. Deviation	Variance	Skewness	Kurtosis
PE1	6.52	0.551	0.303	-0.558	-0.799
PE2	6.32	0.597	0.356	-0.243	-0.609
PE3	6.11	0.720	0.518	-0.171	-1.039
EE1	5.79	0.763	0.583	-0.703	0.514
EE2	5.76	0.806	0.649	-0.341	-0.229
RE1	3.30	1.698	2.884	0.486	-0.713
RE2	3.91	1.850	3.424	0.044	-1.270
RE3	4.37	1.803	3.252	-0.207	-1.182
RE4	4.25	1.761	3.102	-0.338	-0.884
PUN_EXP3	5.01	1.644	2.704	-0.862	-0.101
PUN_EXP4	5.74	1.010	1.020	-0.434	-0.858
FC1	6.21	0.609	0.371	-0.136	-0.459
FC3	5.91	0.886	0.786	-0.813	1.243
BI1	6.18	0.773	0.597	-0.323	-1.253
BI2	6.19	0.765	0.585	-0.334	-1.215
BI3	6.26	0.745	0.554	-0.456	-1.067
IT_COMP_BEHAV1	5.24	1.638	2.684	-1.004	0.168
IT_COMP_BEHAV2	6.15	0.665	0.442	-0.181	-0.734
IT_COMP_BEHAV3	6.16	0.584	0.341	-0.030	-0.188
UB2	4.03	1.896	3.594	-0.130	-1.397
UB3	4.63	1.967	3.868	-0.498	-1.143

The results in Table 4.8 above indicate the normal values of between -1 and 1 for both skewness and kurtosis. The skewness of a distribution reflects the population that is not normally distributed. It is represented by the graph that is either skewed to the left or to the right. (Bless & Kathuria, 1993). This simply implies that the population distribution has no symmetry.

According to Saunders et al. (2009), kurtosis indicates a population distribution that is not reflected by a peak but rather a flat distribution. The positive and negative values of kurtosis inform the researcher about the shape of the population distribution. From Table 4.8 above, Facilitating Condition3 and IT Compliance Behaviour1 possess positive values representing the distribution peak.

4.7 Principal Component Analysis (PCA)

4.7.1 Validity

Items that correlate highly with each other when measuring the same intended construct indicate convergent validity while those that correlate with others that they do not intend to measure, display discriminate validity (Bhattarcherjee, 2012). Thus, the matrix of the inter-item correlations were be examined in section 4.8 to confirm these validity measures.

Testing validity of the scales used in the constructs was performed prior to testing the hypotheses. This was performed by testing and observing the Cronbach's alpha for reliability and employing the principal component analysis for validity.

Following the examination of the inter-item correlation, the principal component analysis technique was employed to examine the dimensionality of the data. The principal component analysis assisted the researcher with reducing the variables in order to attain the number of components that would explain the majority of variance. It assists with the identification of items that load together onto a single component and thus provide evidence of unidimentionality.

Principal Component Analysis was employed to determine the dimensionality of the observed data. This approach was to assist in finding an explanation for the correlation among the data. Following this determination, the remaining variables were assessed for their loadings with each other through the Varimax rotation approach.

As Sreejesh et al. (2014), indicate that factor analysis allows the researcher to summarize and reduce data form a large pool of items to a few representative factors or dimensions and the Varimax rotation method was employed to provide a much cleaner and easy to interpret picture of the structure. The KMO which is a measure of sampling adequacy was also determined through the use of the principal component factor analysis. This measure was found to be above an acceptable level of .70. This level of measurement according to Sreejesh et al. (2014), together with the significance in Bartlett's test, provides adequate evidence of good interrelationship between the items under study and their measures.

The tests in reliability followed through the measures of item-total correlations. Following the dropping of the non-correlating items, the scale reliability was determined and the average correlation, Cronbach alpha for the remaining items was determined

The independent variables were first run together to observe their loadings. When the first test was run for PCA, Question 8 (Effort Expectancy 4) loaded with Facilitating Conditions construct. On the other hand, both Question 13 (Punishment Expectancy1) and Question 14 (Punishment Expectancy 2) loaded with Reward Expectancy. Upon inspecting the questionnaire, it was found that Question 8 (EE4) says "Learning to use the National Information system is easy for me". This question could have been sounded familiar with one of the questions in the Facilitating Conditions' construct, "I have the knowledge necessary to use the National Information System". Question 8 (EE) was then dropped. Both Question 13 (Punishment Expectancy1), Question 14 (Punishment Expectancy 14) as well as Question 7(EE3) that indicated cross loadings with the other constructs were dropped.

For ease of interpretation, the abbreviations used in the context are as follows:

PE – Performance Expectancy

EE – Effort Expectancy

RE – Reward Expectancy

PunExp – Punishment Expectancy

FC – Facilitating Conditions

Table 4.9 PCA results for independent variables

	PE	EE	RE	PunExp	FC
PE1	.598				
PE2	.820				
PE3	.800				
EE1		.870			
EE2		.839			
RE1			.829		
RE2			.704		
RE3			.663		
RE4			.714		
PunExp3				.864	
PunExp4				.837	
FC1					.899
FC3					.582
Cronbach's alpha	**.733**	**.738**	**.768**	**.708**	**.495**

*EE3 (Q7), EE4 (Q8), PunExp1 (Q13), PunExp2 (Q14) and FC2 (Q18) were dropped

Table 4-9 above displays five components that explain the majority of variance between the independent variables. The principal component factor was run to determine the majority of the loadings and the results indicated a percentage higher than the 60% that accounts for the desired outcome of the cumulative percentage.

The results in Table 4.9 above indicate that all the items of the independent variables loaded together following the dropping of the variables that were cross-loading. The respective items load together in a single component. The scale reliability tests were also performed on the remaining items following the dropping of the non-correlating items earlier. According to Bhattercherjee (2012), items need to converge onto the same component as a sign of convergent validity. This investigation was carried out in order to find out if there was evidence of acceptable scale validity. The corrected item-total correlation measured above .400 for all the items under investigation. This suggested that no item needed to be dropped from further analysis. The scores for all the items have converged and except for Facilitating Conditions (FC3), they are greater than 0.6 which is a good sign of evidence for validity.

The next exercise was to test the dependent variables in order to determine whether the questions intended to measure the construct were also loading together.

The abbreviations used for the dependent variables are as follows: BI = Behavioural Intention; ITCompB = IT Compliance Behaviour and UB = Usage Behaviour.

When the first test was run for PCA, IT Compliance Behaviour was also tested as it was adopted as a dependent variable in the model. The initial results indicated that Use Behaviour 1 (UB1) together with the IT Compliance Behaviour items loaded in the same component. The item was dropped and the subsequent results are indicated in Table 4-10 below.

Table 4.10 Rotated Component Matrix for Dependent Variables

	BI	UB	IT_Comp_Behav
BI1	.937		
BI2	.916		
BI3	.943		
UB2		.874	
UB3		.825	
IT_Comp_Behav1			.798
IT_Comp_Behav2			.864
IT_Comp_Behav3			.806
Cronbach's alpha scores	**.956**	**.682**	**.679**

The results in Table 4.10 above indicate that the items used to measure the dependent variables do not cross load but converge into single components. The Cronbach's alpha scores also indicate evidence of reliability with BI scoring the highest reliability score.

The results in Table 4.10 above indicate the results of the item correlation for their respective constructs. The scale reliability tests were performed on the remaining items following the dropping of the non-correlating items earlier. According to Bhattercherjee (2012), convergent validity is attained when the items that are intended to measure the same construct converge. This investigation was carried out in order to find out if there was evidence of acceptable scale reliability. The measured corrected item-total correlation indicated measures above .400 for all the items that were intended to be measured. This suggested that no item needed to be dropped from further analysis. The Cronbach's alpha was measured above .70 for BI and very close to .70 for IT Compliance Behaviour and Use Behaviour, which was a sign of good evidence of reliability.

This consistency of the independent questionnaire items indicates their convergent validity by loading onto the single components. This loading also provides evidence of discriminant

validity as these items do not correlate with items that are intended to measure other constructs. The new composite constructs were derived from the results from the component factor analysis. These results will then be used to derive the descriptive statistics of the composite scores.

4.8 Correlations

Before regression analysis could begin, the strength of the relationship between variables was determined. In essence, that assisted in determining the accuracy with which the regression line describes the relationship (Bless & Kathuria, 1993). The coefficient of correlation, r was then assessed to determine whether it is significant or not. This approach assisted the researcher to conclude on whether the observed relationship was real or driven by chance factors.

Table 4.11 represents the correlation matrix of the composite items which were derived from the PCFA earlier. Correlations for the composite items of Performance Expectancy (PE), Effort Expectancy (EE), Reward Expectancy (RE), Punishment Expectancy (PunExp), Facilitating Conditions (FC), Behavioural Intention (BI), IT Compliance Behaviour (ITCompB) and Use Behaviour (UB) were all significant at p<.001.

Table 4.11 Correlation Matrix

		PE	EE	RE	PunExp	FC	BI	ITCompB	UB
PE	Pearson Correlation	1	.243**	.411**	.296**	.301**	.508**	.427**	-0.036
EE	Pearson Correlation	.243**	1	.255**	.244**	.288**	.214*	.347**	0.137
RE	Pearson Correlation	.411**	.255**	1	.237*	.199*	.320**	.188*	0.082
PunExp	Pearson Correlation	.296**	.244**	.237*	**1**	.187*	.311**	0.135	0.033
FC	Pearson Correlation	.301**	.288**	.199*	.187*	**1**	.263**	.551**	.273**
BI	Pearson Correlation	.508**	.214*	.320**	.311**	.263**	**1**	.350**	.195*
ITCompB	Pearson Correlation	.427**	.347**	.188*	0.135	.551**	.350**	**1**	.353**
UB	Pearson Correlation	-0.036	0.137	0.082	0.033	.273**	.195*	.353**	**1**

*p < .05, **p < .001

PE = Punishment Expectancy, EE = Effort Expectancy, RE = Reward Expectancy, PunExp = Punishment Expectancy, IT CompB = IT Compliance Behaviour

The results in Table 4.11 above represent the correlation of the items of the composite constructs that were derived from the PCFA. Correlations between the Independent Variables and their dependent variables were al significant at $p < 0.05$. The strongest correlation was shown by PE and BI which was significant at $p < .0001$.and the lowest correlation was found to be between BI and UB. The determination of the variables scores were considered for the regression analysis in the next section.

4.9 Regression Analysis

Babbie (2004) defines regression analysis as a method of analysing data in which the regression equations are used to investigate the relationship among the variables and present their analysed data for interpretation.

According to Bless & Kathuria (1993), regression analysis relies on the assumption that the relationship between the two variables is a systematic one which can therefore be depicted or approximated mathematically. It is used to analyse each construct and predict the possible effect that each construct would have on their dependencies (Saunders et al., 2009).

The regression model is displayed and understood better when a linear regression analysis performed and the linear association between two variables are depicted in various forms that also include the graphs the researcher wants to display the results in different formats. Linear regression analysis helps in statistically analysing the relationships between different variables (Babbie, 2004). Appendix E indicates the analysis of multiple regression assumptions.

Linear regression analysis was thus used to test the hypotheses. Basically, hypothesis testing aims at evaluating the probability of the truth of a stated hypothesis.

Table 4.12 Output of Dependent and the Independent Variables

Independent Variable	**Dependent Variable**	**Unstandardized Coefficients**		**Standardized Coefficients**		**R-Square**	**Sig.**
		Beta	Std. Error	Beta	t		
(Constant)		3.053	1.812		1.686		.095
Cmposite_PE	Composite_BI	.766	.122	.508	6.302	0.258	**.000**
				p < .05			
(Constant)		11.411			8.717		
Composite_EE	Composite_BI	.351	.150	.214	2.344	0.046	**.021**
					p < .05		
(Constant)		12.245	.612		19.999		.000
Composite_RE	Composite_ITCompB	.093	.046	.188	2.04	0.035	**.044**
				p < .05			
(Constant)		12.219	.840		14.554		.000
Composite_PunExp	Composite_ITCompB	.150	.103	.135	1.448	0.018	**.150**
				p > .05			
(Constant)		-1.094	.2475		-0.442		.659
Composite_FC	Composite_UB	.812	.270	.273	3.013	0.074	**.003**
					p < .05		
(Constant)		.124	.006		1.059		.292
Composite_BI	Composite_UB	.292	.138	.195	2.112	0.038	**.037**
					p<.05		
(Constant)		.854	.384		0.617		.538
Composite_ITCompB	Composite_UB	.407	.102	.353	3.99	0.124	**.000**
				p <. 05			

PE=Performance Expectancy; EE=Effort Expectancy; RE= Reward Expectancy; PunExp = Punishment Expectancy; Bi = Behavioural Intention; ITCompB = IT Compliance Behaviour; UB = Use Behaviour

4.9.1 Hypothesis 1 testing: Effect of Performance Expectancy on Behavioural Intention

Hypothesis 1: Performance Expectancy will have a positive influence towards the workers' behavioural intention to use the mandatory National Information Systems.

In Table 4.12, above, the significant value of .000 indicates that $p < .001$ and that there exists a significant relationship between the independent variable (PE) and the dependent variable (BI).

The R-square of .258 indicates that the model explains about 25.8% of the variance in Behavioural Intention. The standardized beta coefficient of .508 signals a significant effect of Performance Expectancy on Behavioural Intention. This hypothesis is thus supported.

4.9.2 Hypothesis 2 testing: Effect of Effort Expectancy on Behavioural Intention

Hypothesis 2: Effort Expectancy will have a positive influence on the workers' behavioural intention to use the National Information Systems.

The results in Table 4.12 indicate that there is a positive relationship between Effort Expectancy and Behavioural Intention. However, comparing the beta value of EE and that of PE indicates that PE has a higher significant effect on BI than EE. The r-square is only .046 indicating that the model only explains 4.6% of the variance in Behavioural Intention. With the $p<.05$, the hypothesis is supported.

4.9.3 Hypothesis 3 testing: Effect of Reward Expectancy on IT Compliance Behaviour

Hypothesis 3: Reward Expectancy positively affects the worker's IT compliance behaviour towards using the National Information Systems.

In Table 4-12 above, R-square is .035 indicating that the model explains only about 4% of the variance in IT Compliance Behavior. At .045, the $p < .05$ thus indicates that the hypothesis is supported. However, the significant effect of RE on IT_Compliance Behaviour is very low at .188.

4.9.4 Hypothesis 4 testing: Effect of Punishment Expectancy on IT Compliance Behaviour

Hypothesis 4: Punishment Expectancy positively affects the workers' IT compliance behaviour towards using the National Information Systems.

In Table 4-12 above, R-square is 0.018 indicating that the model explains only 2% of the variance in IT Compliance Behaviour. The $p>.05$ thus the hypothesis is not supported. The significant effect of Punishment expectancy on IT Compliance Behaviour is only about .135 which is significant at $p >.05$.

4.9.5 Hypothesis 5 testing: Effect of Facilitating Conditions on Use Behaviour

Hypothesis 5: Facilitating Conditions have a positive influence on the mandatory usage of the National Information Systems.

In Table 4.12 above, for FC the R-square of .074 explains about 7% of the variance in Use behaviour. The standardized beta coefficient is .273 and this is significant at $p < .05$ level. The hypothesis is thus supported.

4.9.6 Hypothesis 6 testing: Effect of Behavioural Intention on Use Behaviour

Hypothesis 6: The behavioural intention to use the technology is positively related to the mandatory usage of the National Information Systems.

In Table 4.12 above, R-square is 0.038 and the variance in Use Behaviour explained by the model is only 3.8% and it has a standardized beta coefficient of .195 which is significant at the $p < .05$. This implies that the hypothesis is supported.

4.9.7 Hypothesis 7 testing: Effect of IT Compliance Behaviour on Use Behaviour

Hypothesis 7: The need for IT compliance affects mandatory use of the National Information Systems

In Table 4-12 above, the R-square is .124, thus explaining about 12% of the variance in Use Behaviour and this is significant at $p < .05$. The standardized beta coefficient is .353 and it is significant at $p < .001$. This implies that the hypothesis is supported.

4.4.1 Regression Analysis of the control Variables

Table: 4.13 Output of effects of Age on PE, EE and FC

Independent Variable	**Dependent Variable**	**Unstandardized Coefficients**		**Standardized Coefficients**		**R-Square**	**Sig.**
		Beta	Std. Error	Beta	t		
(Constant)		14.838	.228		64.970		.000
Age	Composite_PE	.007	.051	.012	0.133	.508	**.894**
	Composite_EE	8.731	.211		41.351		.000
		-.014	.047	-.027	-.288	.001	**.774**
	Composite_FC	8.775	.170		51.644		.000
		.098	.038	.233	2.572	.054	**.011**

Dependents: PE, EE&FC (PE=Performance Expectancy, EE=Effort Expectancy, FC=Facilitating Conditions

Both PE & EE indicate that age has no significant effect on them. Their standard coefficients were .012 and -.027 respectively. However, age indicated the highest standard coefficient of .233 on FC which was significant at p< .05. This implies that age has significant effect on Facilitating Conditions and but it did not have significant effect on both Performance Expectancy and Effort Expectancy.

Table: 4.14 Output of Gender effect on PE and EE

Independent Variable	Dependent Variable	Unstandardized Coefficients		Standardized Coefficients		R-Square	Sig.
		Beta	Std. Error	Beta	t		
(Constant)		14.931	0.136				0.095
Gender	Cmposite_PE	-0.154	0.184	-0.079	-0.837	0.508	**0.404**
				p < .05			
	Composite_ EE	0.063	0.173	0.035	0.369		0.713
				p>.05			

In Table 4-14 above Gender indicates that it does not have effect on both Performance Expectancy and Effort Expectancy.

Table 4.15 Output of Experience on EE & FC

Independent Variable	Dependent Variable	Unstandardized Coefficients		Standardized Coefficients		R-Square	Sig.
		Beta	Std. Error	Beta	t		
(Constant)		8.477	0.206		41.078		0
Experience	Cmposite_EE	0.049	0.045	.102	1.096	0.01	**0.275**
				p > .05			
	Composite_ FC	8.82	0.167		52.933		0
		0.085	.036	.213	2.334		**0.021**
				P<.05			

EE = Effort Expectancy and FC = Facilitating Conditions

In Table 4-15 above, Experience indicates highest effect on Facilitating Conditions than Effort Expectancy. The standardized beta coefficient is .213 and it is significant at $p < .05$. Experience indicated no significant effect on Effort Expectancy.

4.10 Chapter Summary

In this chapter, the hypotheses were tested by using the Pearson correlation and the regression analysis. Two of the items, Q4 and Q20 were dropped after the inter-item correlation analysis due to non-correlation of the required .300 margin. The subsequent PCFA determined the items which indicated unidimentionality by loading with each other into a single component. Some of the items like EE3 (Q7), EE4 (Q8), PunExp1 (Q13), PunExp2 (Q14) and FC2 (Q18) were dropped due to their cross-loadings with other items. These items displayed correlations of above .30 with these items were thus dropped from further analysis.

The resulting items were used to test the hypotheses and each hypothesis was supported except for Punishment Expectancy which did not show any effect on the users' IT compliance behaviour. The next chapter deals with the interpretation of the findings in line with the existing literature.

CHAPTER 5: DISCUSSION OF FINDINGS

5.1 Introduction

This chapter focuses on interpreting the results that have been analysed in the previous chapter. The previous chapter presented the analysis of the data that was obtained from the conducted survey. These results were interpreted based on what they presented in relation to what the literature about the mandatory use of Information Systems indicates.

Due to the low response on WARMS and WMS, the t-tests were performed to determine the significant difference between the three samples. The t-tests results indicated significantly different results between the three systems that were surveyed. WARMS and WMS, which could not produce the required statistical power, hence the two systems were not considered for further analysis.

The study indicated that in mandatory environments, where the use of IT is presumed to be compulsory (Brown et al. 2002), there are other factors such as policies that would be required to ensure that such technologies are being used and used in appropriate manner.

The dependent variables Use Behaviour, Behavioural Intention and IT Compliance Behaviour were measured using the constructs adopted in the model. The three dependent variables were measured for their reliability and validity in order to ensure that they measure the correct constructs. At an average of .956, Behavioural Intention indicated the highest reliability scale and the Use Behaviour and IT Compliance also indicated good evidence for their reliability as indicated in Table 4.5.

5.2 Recapping Objectives and their Outcomes

Table 4.16: The objectives and the outcomes as highlighted in chapter 1

Objectives	Outcomes
To test whether Performance Expectancy has effect on Behavioural Intention	Performance Expectancy had the highest significant effect on Behavioural Intention
To test whether Effort Expectancy has effect on Behavioural Intention	Effort Expectancy had positive influence on Behavioural Intention although its effect was found to be weak
To test whether Reward Expectancy on IT Behavioural Compliance	Reward Expectancy had positive effect on employees' IT Compliance Behaviour
To test whether Punishment Expectancy had effect on IT Behavioural Compliance	Punishment Expectancy did not have any effect on IT Compliance Behaviour
To test whether Facilitating Conditions had effect on Use Behaviour	Facilitating had weak effect on Use Behaviour
To test whether Behavioural Intention had effect on Use Behaviour	Behavioural Intention had effect on Use behaviour but this was found to be weak
To test whether IT Compliance had effect on Use Behaviour	IT Compliance Behaviour had significant effect on Use Behaviour

5.3 Supported Hypotheses

5.3.1 ***Hypothesis 1***: Performance Expectancy will have a positive influence towards the workers' behavioural intention to use the mandatory National Information Systems.

Performance expectancy is the use of technology by an individual which is motivated by their belief that it will improve their performance at work (Venkatesh et al, (2003). This variable was found to have strong effect on individual's intention to use the technology.

Decman's (2015) study employed UTAUT to test the influence of the models' constructs in an e-learning environment where e-learning was compulsory. The researcher investigated the effects of Performance Expectancy (PE), Effort Expectancy (EE) and Social Influence on Behavioural Intention (BI) and the results indicated that Performance Expectancy significantly positively influenced BI and that it was the strongest indicator of the three UTAUT's constructs that they used. Decman (2015) found that EE did not have any significant effect on BI in the study on e-learning in mandatory environments.

Maillet, Mathieu and Sicotte (2014) in their study that explored the factors that explain acceptance and actual use of an Electronic Patient Record system through an extended

UTAUT, the authors tested Performance Expectancy on the actual use of the system in a mandatory setting. They also found that PE had a significantly high effect on the actual use than EE.

During the analysis of the results for this study, PE indicated the highest significant effect on Behavioural Intention than EE and this was found to be consistent with the other studies on the effect of PE on BI.

H1 was supported and it indicated the strongest effect on BI. While there may be studies such as that of Howard, et al. (2017) that found that PE does not affect BI, many other studies found PE to have significant effect on Behavioural Intention (Venkatesh et al., 2003, Gupta et al., 2008, Liu et al., 2014, Decman, 2015 and Zuiderwijk et al., 2016). This might be due to the users believing that the kind of work that they were performing could not be done without the use of the system. It could be that the users did not see the need of trying out alternative systems but to believe that the system should work for them.

5.3.2 ***Hypothesis 2***: Effort Expectancy will have a positive influence on the workers' behavioural intention to use the National Information Systems.

In this study Effort Expectancy was significant but it indicated to have a weak effect on BI. The finding was consistent with other studies that found EE to have significant effect on BI (Venkatesh et al. 2003, Gupta et al., 2008, Keong et al., 2012 and Casey & Wilson-Evered, 2012) although that was not the case with Decman (2015) who found EE to have no effect on BI. This could have been driven by the user's belief that they could only exert their efforts to a limited extent.

Like in this study, Barnett, Pearson, Pearson and Kellermanns (2015) found that the relationship between Effort Expectancy and the Use Behaviour was fully mediated by individuals' behavioural intentions.

5.3.3 ***Hypothesis H3*** **-** Reward Expectancy positively affects the worker's IT compliance behaviour towards using the National Information Systems

In the study by Liang et al. (2012), IT compliance Behaviour was examined as the dependent variable and it was used to study the effects of both reward and punishment on it. This study established the relationship between reward, punishment and IT Compliance.

For the purpose of this study in a government environment, these constructs were assessed and correlations were found to exist between them.

In this study, reward expectancy had an effect on employees' IT compliance Behaviour. Reward expectancy is defined as the individual's expectation that IT Compliance will be rewarded. According to the authors, individuals change their behaviour if they expect to be rewarded. An expectation for rewards prompts the users to improve their attitudes in compliance with the stipulated IT policies.

This study found reward expectancy to have more effect on IT compliance than punishment expectancy which was contrary to Liang et al. (2012) who found punishment expectancy to have more effect on IT compliance Behaviour than reward expectancy. This might be explained by the reason that the users believe that they are working to be compensated and if they are promised certain incentives, they might work harder believing that they will be compensated for their hard work.

5.3.4 Hypothesis (H5) – Facilitating Conditions have a positive influence on the mandatory usage of the National Information Systems

According to Venkatesh et al. (2003), Facilitating Conditions (FC) posits that technology users will expect the organization to provide them with the necessary support when they need it. The construct is the only one that the authors used to test its influence on use behaviour.

In the study of modelling the acceptance of e-learning environments, Decman (2015) indicate that FC was not well defined and that its items did not load well on the construct itself. The author suggested that it might be that users found FC questions to be similar to those of Behavioural Intention. This phenomenon was also observed in this study as only two of the questions from FC managed to load together while the other two loaded with the other constructs which lead to them being dropped.

The indication of weak effect of FC on BI might suggest poor infrastructure or lack of support from the organization. Keong et al. (2012) indicate that if the system is mandated, the organization must ensure that training is provided as a compulsory measure to ensure that users gain the necessary knowledge to be able to use the technology.

Although H5 was found to be significant, the effect of Facilitating Conditions on Use Behaviour was found to be weak. This could be attributed the users' belief that some of technical issues with the system were beyond their control but with the other party like the technicians or management.

5.3.5 Hypothesis (H6) – The behavioural intention to use the technology is positively related to the mandatory usage of the National Information Systems.

As Xue et al. (2011) indicated that IT Compliance encompasses both IT use and mandatory elements specifying how IT should be used; the two constructs complement each other to fulfil the IT use in a compliant manner. That implies that IT compliance is a proxy to actual use in an appropriate manner. Thus, if the users understand the policies and believe in them, they will be prompted to use the system.

Hypothesis 6 and Hypothesis 7 were supported. However, IT Compliance Behaviour was found to have more significant effect on Use Behaviour than Behavioural Intention.

5.3.6 Hypothesis (H7) – The need for IT compliance affects mandatory use of the National Information Systems.

When the effect of IT Compliance Behaviour on Use Behaviour was investigated, it was found to have influence on Use Behaviour. Liang et al. (2012) define IT Compliance as the manner in which employees alter their behaviour to comply with the stipulated IT policies in their organization. Chae and Poole (2005) indicate that mandates like mandatory systems are not just simple directives or orders, but they generally possess more detailed policies and procedures. These policies and procedures needs to be well explained so that they leave no room for interpretation if they are to be adhered to. Thus, the policy bearers need to be involved in the interpretive process and ensure that the interpretation is cascaded down through the organization and to the individuals who will be affected by the policies (Chae and Poole, 2005).

According to Liang et al. (2012), despite the expectation that employees' job performance will improve as a result of using IT, the policies are necessary to address the many factors that contribute to the non-use or misuse of IT. The support of this hypothesis could be due to the users believing that the systems is the only tool to assist them to perform their duties, thus they might have seen the need to comply with the requirements of using the system.

5.4 Unsupported Hypothesis

5.4.1 Hypothesis (H4) – Punishment Expectancy positively affects the workers' IT compliance behaviour towards using the National Information Systems.

Xue et al. (2011) found in their study that punishment was a strong determinant of IT compliance intention in mandatory setting. However, while testing their model they found that punishment expectancy does not influence compliance intention. The researchers suggested that this failure could have been brought by the fact that in mandatory settings, employees' view punishment expectancy as a lesser concern if they perceive the IT policies to be fair.

In the context of this particular study, punishment expectancy did not yield any positive effect on the IT Compliance Behaviour. This implies that the findings of this study were consistent with that of Xue et al. (2011). Non-support of this hypothesis could be that the users do not believe that the kind of punishment that could be carried out by management might not be severe and hence they concern themselves less with any possible punishment.

5.5 Chapter Summary

All the tested hypotheses showed results that indicate that they are supported except for hypothesis 4. It was hypothesised in hypothesis 4 that Punishment expectancy will positively affect the user's IT Compliance behaviour towards using the National Information System. This could mean that the users did not foresee themselves being punished for not using it as they were using it anyway. In comparison with Rewards Expectancy which was supported, the users' could only anticipate being rewarded for putting more effort in their work through the use of the system.

The effect of performance Expectancy on Behavioural Intention indicated the strongest effect on Behavioural Intention and was consistent with previously researched work as indicated in section 5.3.1 of this chapter. The study also found that Reward Expectancy had more significant effect on IT Compliance behaviour than Punishment Expectancy.

Summary on Hypotheses'

Hypothesis	Outcome
Hypothesis 1: Performance Expectancy will have a positive influence towards the workers' behavioural intention to use the mandatory National Information Systems.	Supported
Hypothesis 2: Effort Expectancy will have a positive influence on the workers' behavioural intention to use the National Information Systems.	Supported
Hypothesis (H3) **-** Reward Expectancy positively affects the worker's IT compliance behaviour towards using the National Information Systems	Supported
Hypothesis (H4) – Punishment Expectancy positively affects the workers' IT compliance behaviour towards using the National Information Systems.	Rejected
Hypothesis (H5) – Facilitating Conditions have a positive influence on the mandatory usage of the National Information Systems	Supported
Hypothesis (H6) – The behavioural intention to use the technology is positively related to the mandatory usage of the National Information Systems	Supported
Hypothesis (H7) – The need for IT compliance affects mandatory use of the National Information Systems	Supported

Hypothesis (4) which is linked to Punishment Expectancy relative to non-compliance of using the National Information System was not supported. This could be that the system is already deployed and the users might not have heard of anyone who has ever been punished for not using it. The fact that the study is conducted in a government environment could also provide reasons for the outcome. As opposed to the private sector which is driven by maximizing profits, government is service delivery oriented. As a result, punishment in government in South Africa is not as severe as it is in the private sector.

Age displaced having an effect on the Facilitating Conditions and this could be due to the fact that the users of the systems are relatively mature and that they could be assisting each other with the challenges that they encounter.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter discusses the summary of the findings, the contribution of this research to both academia and practice. The limitations of research and recommendations on future research are also highlighted later in the chapter.

6.2 Summary of the findings

This study focused on the acceptance and use of information systems in a mandatory environment. Chan et al. (2010) indicated that few of the known studies on acceptance and use of technology have explored and assessed the antecedents and consequences of adoption of technology in a mandatory setting. The study employs three of the four UTAUT's constructs and extended these with two other independent constructs, Reward Expectancy and Punishment Expectancy from literature. According to Williams et al. (2015), examining each of the constructs in a "real world" researchers and practitioners will be able to assess an individual's intention to use a specific system, thus allowing identification of the key influences on acceptance in any given context.

The hydrological information system, HYDSTRA, which is a mandated system in the Department of Water and Sanitation in South Africa, was the focus of the study. Performance Expectancy indicated the strongest effect on the employees' Behavioural Intention to use HYDSTRA. Effort Expectancy which Venkatesh et al. (2003) found to be having a significant effect on Behavioural Intention to use the system was also found to be significant although its effect was very weak when compared to Performance Expectancy.

Reward Expectancy which was added to the UTAUT model was also tested against employee's IT Compliance Behaviour. IT Compliance Behaviour was found to be correlating with Behavioural Intention. Reward Expectancy was found to have significant effect on IT compliance which was rather inconsistent with Liang et al. (2012).

Punishment expectancy was not supported in this study and the finding was consistent with that of Xue et al. (2011) but inconsistent with that of Liang et al. (2012). It could be that since the employees were using the system already and that it was mandatory to use it, rewards than punishment for non-compliance was more concerning to them.

Although the Facilitating Conditions construct was found to be significant in this study, it indicated weak effect on actual use of the system. In Decman (2015), the researcher dropped the Facilitating Conditions construct after finding that its items did not load together when tested for their convergent validity. Howard et al. (2017) found that FC and EE were closely related and correlated very strongly despite EE measuring BI and FC measuring Use Behaviour.

6.3 Contribution to research

It has been established in this study that rewards expectancy was a relevant construct to measure IT compliance Behaviour which correlated highly with Behavioural Intention and formed proxies for the actual use of the system. The addition of this construct has not been examined before and this brings another dimension to the studies of information systems in mandatory settings.

The employee's IT Compliance Behaviour and individuals' Behavioural intentions' constructs correlated well indicating that it is not only the personal behaviour of individuals that matters for the actual use but also the confidence they have in existing policies that guides them.as well.

This study thus responds to Williams et al. (2015) who indicated that there are ample opportunities available for researchers to introduce variables by exploring alternative relationships between other components constituted by UTAUT in various contexts and different environments in order to further shape and develop the field.

6.4 Contribution to practice

Although Facilitating Conditions construct displayed relatively weak effect on Use Behaviour it was still significant in the mandatory environment (Venkatesh et al. 2003). FC is the only construct from the key constructs that was used to test its actual usage of the system. Its effect indicates that even if the system is mandatory to use, some users still look up to the organization for both organizational and technical support.

Effort expectancy is an important aspect that influences individual's behavioural intention to use the system thus it becomes imperative that the developers must consider involving the users

during the development of the systems. The weak effect of EE on BI suggests that not all of the users believe that the system is easy to use.

Reward expectancy indicated a significant effect on the IT Compliance Behaviour. This could indicate that Individuals that are focused on being promoted will feel inclined to comply with the relevant policies so as to gain promotion. On the other hand, punishment expectancy did not indicate any effect on IT compliance behaviour. This might suggest that employees deemed the IT policies that were in place to be fair and effective to compel them to use the system. The users seem less concerned with punishment expectancy but focused on working for potential rewards for their efforts.

6.5 Limitations of the study

This study was conducted in a single National Department and due to the fact that other National Departments might have different policies that govern the IT compliance, different results might be attained with different Departments.

The fact that the study analysed only one system, different results could be attained with systems that yield high percentage of responses even though the sample size might be relatively small.

This study was also carried out in a government environment where policies and culture could be different than in private and thus different results could also be attained. Considering that this study was also carried out in a developing country where IT sophistication might be a limiting factor when compared to the developed countries.

Considering that different other factors could still be investigated in conjunction with UTAUT, there could still be different results attained in such instances.

6.6 Recommendations to future research

It is recommended that future research should revisit the Facilitating Conditions construct and its effect on the actual use of the systems in mandatory settings. The construct's items did not load well with the others; hence only two items were eventually used. Focus should also be directed to Effort Expectancy on behavioural Intention in mandatory settings. Items that were used to measure these two constructs need to be checked again and be tested in different

organizations in mandatory settings. Punishment Expectancy should be investigated further in mandatory settings to assess its influence by different cultures.

Studies in mandatory settings still needs to be explored further in order to better understand other factors that might have an influence on the actual use of systems in such environments.

6.7 Conclusion

This study provided an insight on the individuals' behavioural intentions to use the mandatory systems. This was achieved by using both constructs on behaviour, IT compliance and Behavioural intention.

This study confirmed that even in mandated environments where there is seemingly no option but to use the mandated technologies, expectation of rewards by users still exists. The users' belief in their expectation for rewards as well as accepting IT policies in place, tend to compel the users not to devise means to work around the system but rather to use it accordingly and appropriately.

The introduction of the IT Compliance Behaviour has added another dimension to studying IT acceptance in mandatory settings. Behavioural Intention was the only variable that was used to determine the actual usage but through this study, IT compliance behaviour indicated having more effect on the actual usage of the system. It is evident that policies that govern usage behaviour play a significant role in the usage when IT use is mandated.

Through these findings, it is evident that use of information systems in mandatory settings might still require assessment of other factors that could influence the users' intention.

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APPENDIX A

TITLE OF STUDY: Mandatory Use of National Information Systems in Government in South Africa: an Extended UTAUT perspective

The purpose of this study is to perform an assessment of the factors that influence the Government worker's behavioural intention to use, IT compliance behaviour and actual usage of Information Systems in a National Government mandatory setting

Please answer the following questions based on your experience with the Hydrological Information System (HYDSTRA)

1. Section 1A (Four Statements):

Indicate the extent to which you agree with each of the following statements regarding the effect of the HYDSTRA Information System on your job performance

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) I find the HYDSTRA Information System to be useful in my job							
b) Using the HYDSTRA Information System will help me to accomplish my tasks quickly							

c) Using the HYDSTRA Information System will help me increase my productivity							
d) If I use the HYDSTRA Information System, I will be increasing my chances of getting a salary increase or promotion							

2. Section 1B (Four Statements):

Indicate the extent to which you agree with each of the following statements regarding the effort needed to use the HYDSTRA Information System.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) My interaction with the HYDSTRA Information System would be clear and understandable							
b) It would be easy for me to become skilful at using the HYDSTRA Information System							
c) I find the HYDSTRA Information system easy to use							
d) Learning to use the HYDSTRA Information system is easy for me							

3. Section 1C (Four Statements):

Indicate the extent to which you agree with each of the following statements relating to rewards you expect to receivefor usingthe HYDSTRAInformation System

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) I expect to be rewarded when I use the HYDSTRA Information system							
b) I will use the HYDSTRA Information System if my supervisor acknowledges improvement in the quality of my work							
c) If I do well in my job I believe that my supervisor will reward me							
d) My supervisor would do all that he or she could to help me progress if I use the HYDSTRA Information System							

4. Section 1D (Four Statements):

Indicate the extent to which you agree with each of the following statements relating to any expected punishment you believe is associated with not using the HYDSTRA Information System

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) My supervisor shows his/her displeasure if I do not use the HYDSTRA Information System							
b) I will use the HYDSTRA Information System to avoid being punished for not using it							
c) I will use the HYDSTRA Information System because I believe that it is the right thing to do							
d) I will use the HYDSTRA Information System to keep my work at an acceptable level							

5. Section 1E (Four Statements):

Indicate the extent to which you agree with each of the following statements relating to the support and resources that are available to you to use the HYDSTRA Information System

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) I have the knowledge necessary to use the HYDSTRA Information System							

b) There is a specific person or group available to assist with the HYDSTRA Information System challenges							
c) I am equipped with the necessary resources to use the HYDSTRA Information System							
d) The HYDSTRA Information System is not compatible with other Information Systems that I use							

6. Section 1F (Three Statements):

Indicate the extent to which you agree with each of the following statements reflecting your intention to use the HYDSTRA Information System

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) I intend to use the HYDSTRA InformationSystem in the next two months							
b) I predict that I will use the HYDSTRA Information System in the next two months							
c) I plan to use the HYDSTRA Information System in the next two months							

7. Section 1G (Three Statements):

Indicate the extent to which you agree with each of the following statements reflecting your awareness and compliance with policies associated with using HYDSTRA Information System

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) I am aware of the policies that I am expected to follow in using the HYDSTRA Information System							
b) I intend to comply with the stipulated rules for using the HYDSTRA Information System							
c) I will always adhere to the prescribed policies while using the HYDSTRA Information System							

8. Section 1H (Four Statements):

Indicate the extent to which you agree with each of the following statements reflecting your actual usage of the HYDSTRA Information System

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Agree	Strongly Agree
a) I use the HYDSTRA Information System for a variety of tasks (reports, projects, decision making, etc.)							

b) I use the HYDSTRA Information System once a week							
c) I use the HYDSTRA Information System 2-4 days in a week							
d) Overall I use the HYDSTRA Information System a lot							

Section 2

General Questions about HYDSTRA users in the Department

9. Gender

Male ☐

Female ☐

Prefer not to say ☐

10. Please indicate your age group:

18-25 ☐ 26 – 30 ☐ 31 - 35 ☐ 36 - 40 ☐ 41-45 ☐

46 - 50 ☐ 51 -55 ☐ 55 – 60 ☐ 65+ ☐

11. Please indicate years of experience in using the HYDSTRA Information System

0-1 year ☐ 1-3 years ☐ 3-5 years ☐ 5 -7 years ☐

7 -10 years ☐ more than 10 years ☐

12. Please indicate your Region

Gauteng ☐ Free State ☐ Mpumalanga ☐ Eastern Cape ☐

Limpopo ☐ North West ☐ Kwazulu- Natal ☐ Western Cape ☐

Northern Cape ☐ Prefer not to say ☐

Thank you for participating.

APPENDIX B – Participation Letter

Date: 17 October 2017

Good Day

My name is Sehloho Moletsane and I am a Masters student in the Information Systems Division at the University of the Witwatersrand, Johannesburg. I am conducting research on the Mandatory Use of National Information Systems in Government in South Africa.

As users of Information Systems, Water Management System (WMS), Water Authorisation and Registration Management System (WARMS) and Hydrological Information System (HYDSTRA), you are **invited** to take part in this survey. The purpose of this survey is to find out the extent to which these Information Systems are adopted and used as mandated by the Department of Water and Sanitation. Your response is important and there are no right or wrong answers.

This survey is both confidential and anonymous. Anonymity and confidentiality are guaranteed by not needing to enter your name on the questionnaire. Your participation is completely voluntary and involves no risk, penalty, or loss of benefits whether or not you participate. You may withdraw from the survey at any stage.

The first part of the survey comprises 30 statements. Please indicate the extent to which you agree with each statement, by ticking in the appropriate box. The second part of the survey captures some demographic data. Please tick whichever boxes are applicable. The entire survey should take between 15 to 18 minutes to complete.

The survey was approved by the SEBS Ethics Committee (Non-Medical), Protocol Number: CINFO/1168.

Thank you for considering participating. Should you have any questions, or should you wish to obtain a copy of the results of the survey, please contact me on (082) 329-3820 or at 1305506@students.wits.ac.za

My supervisor's name and email are: Jean-Marie Bancilhon and his email is – Jean-Marie.Bancilhon@wits.ac.za

Kind regards
Sehloho Moletsane
Masters Student: Division of Information Systems
School of Economic and Business Sciences
University of the Witwatersrand, Johannesburg

APPENDIX C– ETHICS CERTIFICATE

Faculty of Commerce, Law and Management
University of the Witwatersrand, Johannesburg

School of Economic and Business Sciences
Private Bag X3, WITS, 2050, South Africa • **Telephone:** + 27 11 717 8004 •
email: Siyabonga.Molaba@wits.ac.za

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: CINFO/1168**

PROJECT: **MANDATORY USE OF NATIONAL INFORMATION SYSTEMS IN GOVERNMENT IN SOUTH AFRICA**

INVESTIGATOR: Sehloho Moletsane

STUDENT NUMBER: **1305506**

SCHOOL: SEBS

DATE CONSIDERED: 28 September 2017

DECISION OF THE ETHICS COMMITTEE: Approved

NOTE

Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application.
Please remember to include the protocol number above to your participation letter.

DATE: 17/10/2017 **CHAIRPERSON: Jean-Marie Bancilhon**

cc: Supervisor:

Jean-Marie Bancilhon

pp

SCHOOL OF ECONOMIC & BUSINESS SCIENCES

APPENDIX D– Letter from Organization

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 /SedibengBuilding, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Eng: Mirriam Moagi **Tel**: 012 336 7447 **Fax**: 086650 6241 **Email**: MoagiM@dws.gov.za
Ref: Approval to conduct research

Mr S Moletsane
Masters Student: Division of Information Systems
School of Economic and Business Sciences
University of the Witwatersrand, Johannesburg

Dear Mr Moletsane

APPROVAL TO CONDUCT RESEARCH IN THE DEPARTMENT OF WATER AND SANITATION IN FULFILLMENT OF A POSTGRADUATE DEGREE

Your request to conduct research in the Department of Water and Sanitation dated 15 September 2017 refers.

The Department supports and approves your request for conducting the research in the Department. You are, however, requested that upon completion of the research, prior to publication of your findings, you submit a draft copy to the office of the Director-General of the Department of Water and Sanitation for concurrence and future use by this Department.

I wish you all the best with your studies.

Yours sincerely

Mr C Greve
CHIEF DIRECTOR: HUMAN RESOURCE
DATE: 2017-9-15

APPENDIX E: Testing of Multiple Regression Assumptions

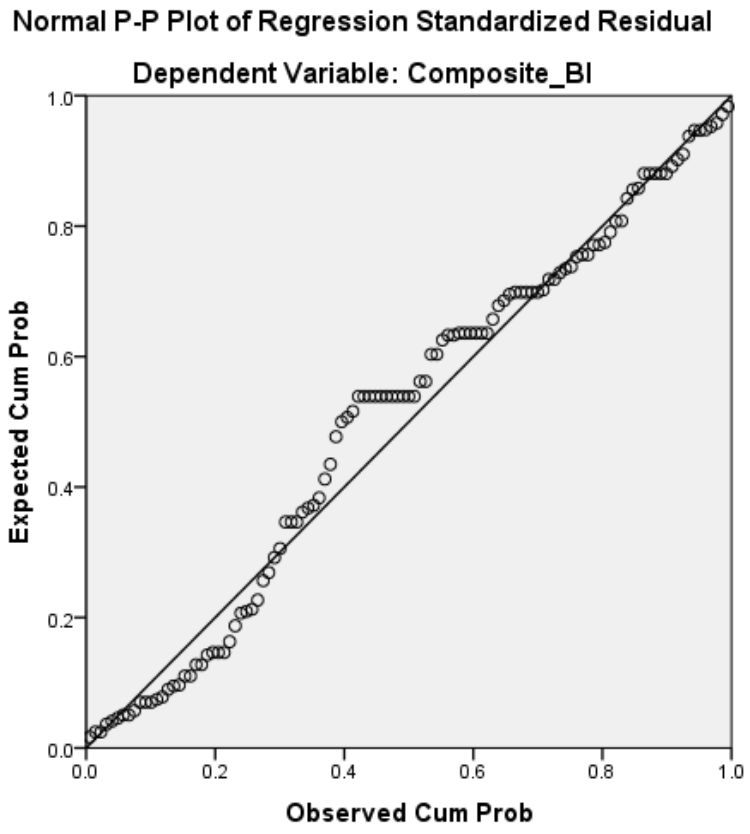
Appendix E1

Independent Variable	Dependent Variable	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		Beta	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	Composite_BI	2.076	1.963		1.058	.292		
Cmposite_PE		.731	.126	.483	5.801	.000	.941	1.062
Composite_EE		.171	.136	.105	1.261	.210	.941	1.062

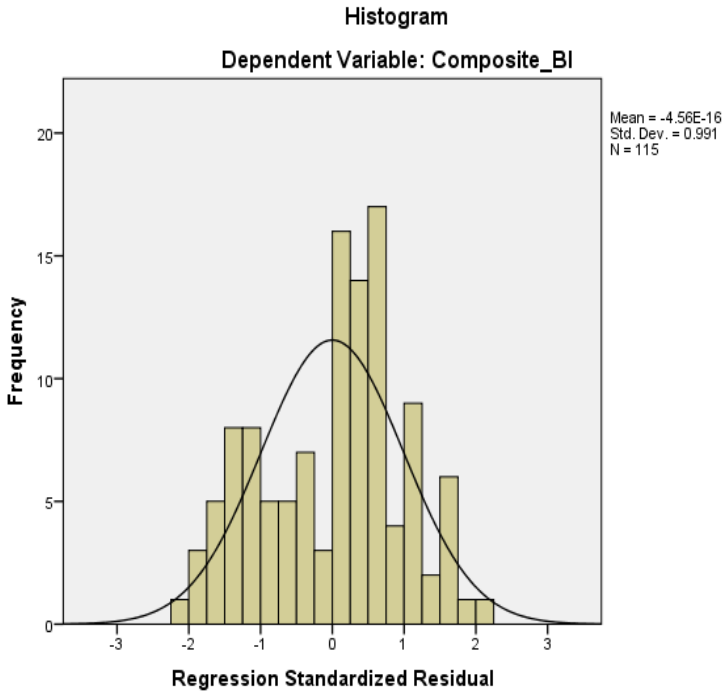
Dependent Variable: Composite_BI

The indicated tolerance values are .941 which are very close to 1 and the VIF values are below 5, hence a sign that the collinearity of the independent variables is not problematic.

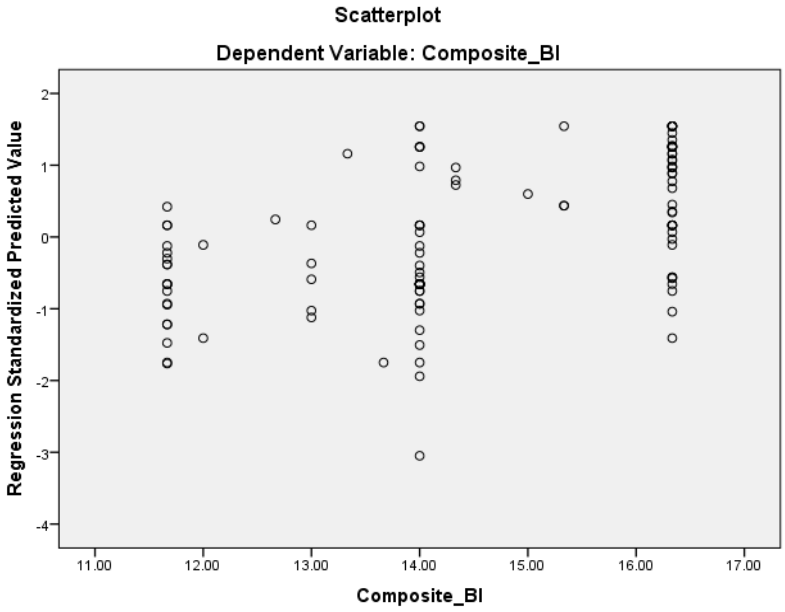
The scatter plot below suggests that the residuals are approximately normally distributed



The histogram below indicates the distribution of residuals.



The Scatterplot below are not displaying an obviously curved pattern. There is no sign of violation of linearity assumption or heteroscedasticity assumption



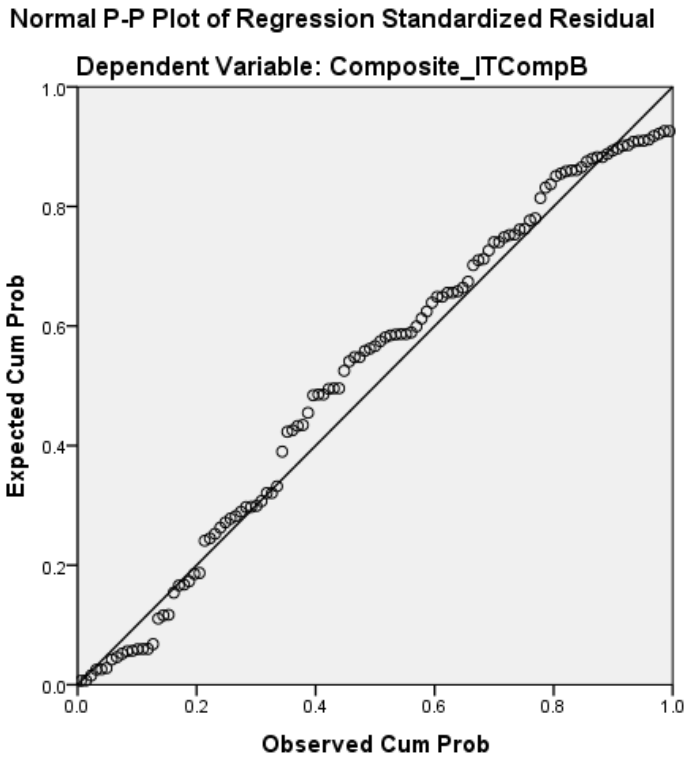
Appendix E2: Testing for Collinearity and Heteroscedasticity Assumption for Dependent Variable – Composite_IT Compliance Behaviour

Independent Variable	**Dependent Variable**	**Unstandardized Coefficients**		**Standardized Coefficients**			**Collinearity Statistics**	
		Beta	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	Composite_IT CompB	11.612	.928		12.508	.000		
Cmposite_RE		.072	.048	.143	1.496	.137	.943	1.060
Composite_PunExp		.112	.101	.101	1.058	.292	.943	1.060

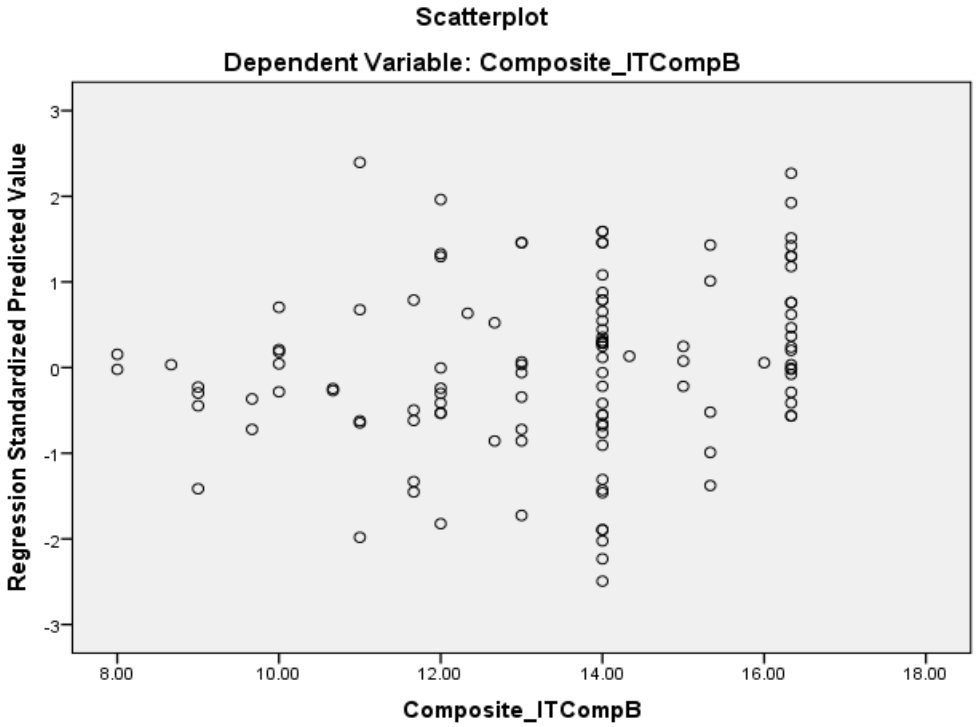
Dependent Variable: IT Compliance Behaviour

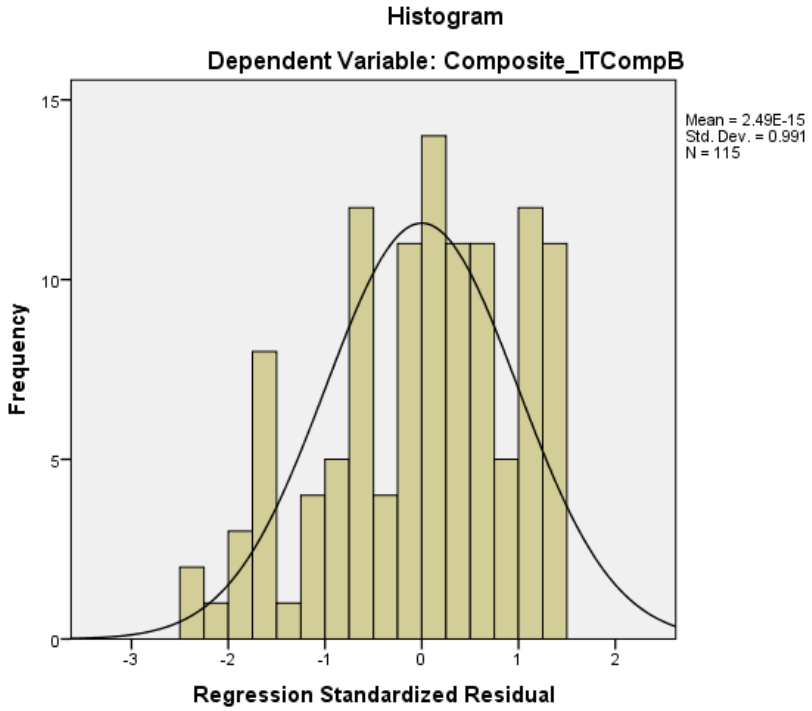
RE=Reward Expectancy, PunExp = Punishment Expectancy, IT CompB=IT Compliance Behaviour

The P-P plot below indicates that the residuals are approximately normally distributed as the points show hugging the line.



The Scatterplot below does not show points following a curved pattern nor display violation of heteroscedasticity assumption.





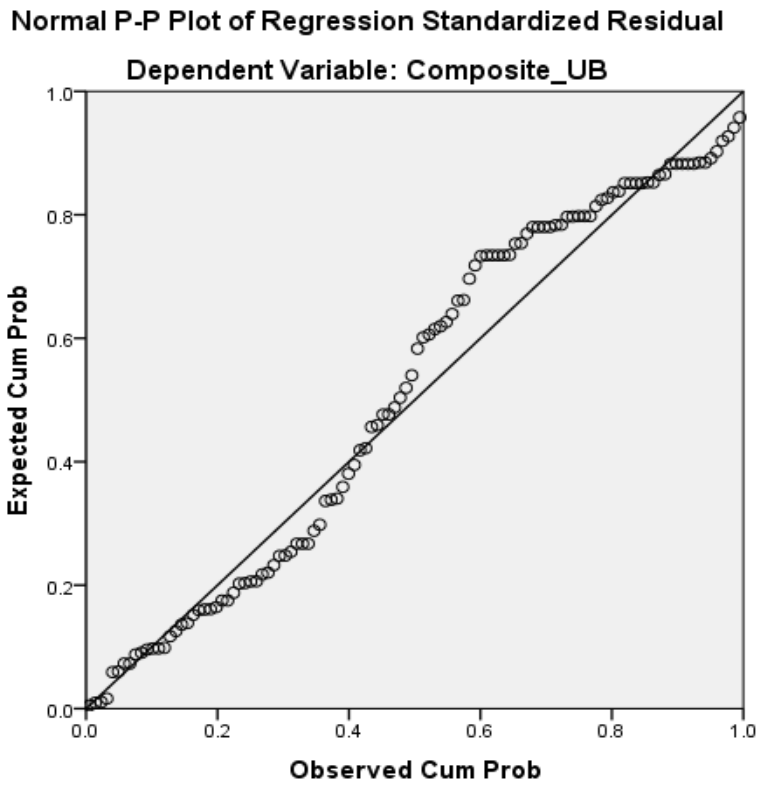
APPENDIX E3 - Testing for Collinearity and Heteroscedasticity Assumption for Dependent Variable – Composite_UB

Independent Variable	Dependent Variable	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		Beta	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	Composite_UB	-.387	2.071		-.187	.852		
Cmposite_ITCompB		.378	.108	.328	3.487	.001	.889	1.125
Composite_BI		.113	.140	.076	.807	.422	.889	1.125

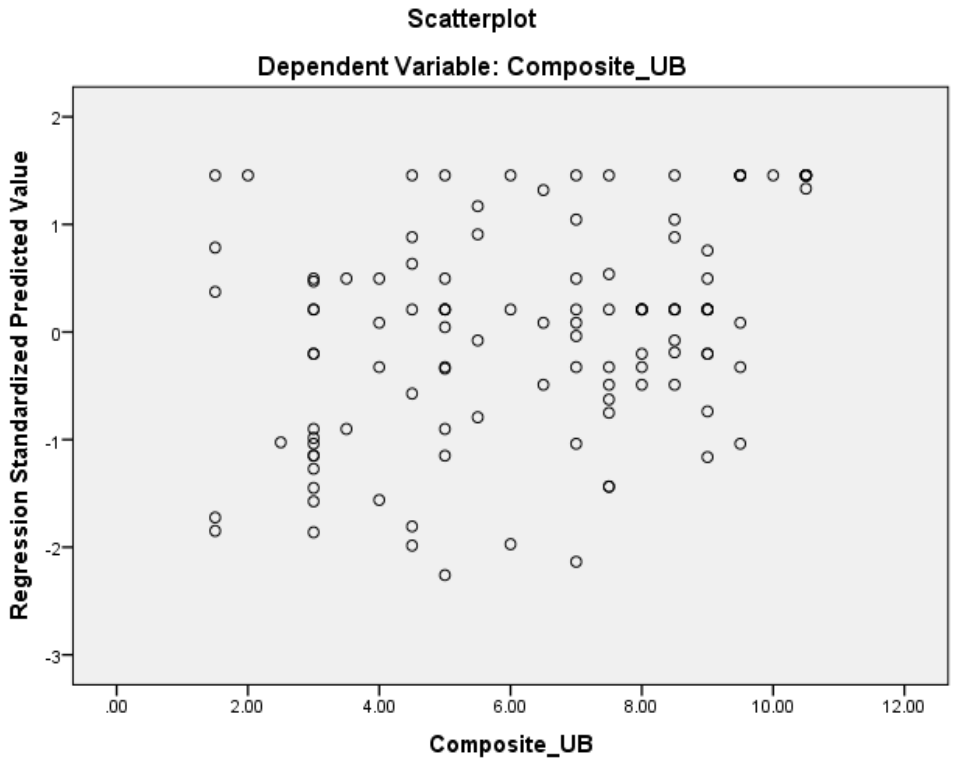
Dependent Variable: UB

UB=Use Behaviour, BI=Behavioural Intention and ITCompB = IT Compliance Behaviour

The P-P Plot below indicates that the residuals are approximately normally distributed as the points show hugging the line.



The Scatterplot show that the points are not following an obviously curved pattern which indicates violation of linearity assumption. The points do not also follow a fan-shaped platter that indicates violation of heteroscedasticity.


Scatterplot
Dependent Variable: Composite_UB
Regression Standardized Predicted Value
Composite_UB
2
1
0
-1
-2
-3
.00
2.00
4.00
6.00
8.00
10.00
12.00