



**Empirical examination of decision making core technology adoption theory to
explain youth preferences for HIV preventive actions**

By

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DECLARATION

I, Njabulo Samson Melusi Shongwe certify that the work presented in this thesis is, to the best of my knowledge and belief, original, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university. Its only prior publication was in the form of conference paper and journal article enlisted in the publications arising from this thesis section.

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ABSTRACT

This study reports on the application of decision making core technology adoption theory to empirically examine youth preferences for Human Immunodeficiency Virus (HIV) preventive actions. In order to contribute to the open discourse on whether technology adoption rate is higher for male or female, goal desire, goal intention, action desire and action intention elements of decision making core theory were tested. A mobile health information system was implemented as an HIV information disseminating tool and used for experimentation to determine adoption by youths. A dataset of 118 pupils from two high schools was used for pilot investigation. A dataset of 292 undergraduate youths aged 10-24 years from two universities in South Africa was generated to validate the research model. The Partial Least Square (PLS) analytic modelling technique was used to determine the predictive power of decision making core model from the input dataset. Results of experimentation show that regardless of the gender youth accepts to use mobile information system to access HIV information. The predictive power of the decision making core model was found to be independent of gender factor, which was also not found to moderate the relationship between Perceived Behavioural Control (PBC) and action intention. In addition, gender was not found to moderate the order of importance in factors that predict youth preferences for HIV preventive action. PBC, action desire and goal desire were selected as the most important predictors of HIV preventive actions. The factor of action desire was found to mediate the relationship between PBC and action intention such that the mediation effect was stronger for male youth (68%) than for female youth (19%). Finally, the decision making core model better predicted youth preferences for HIV preventive actions as compared to two models based on Theory of Reason Action (TRA) and Theory of Planned Behaviour (TPB).

CHAPTER 1

INTRODUCTION

This study applies the decision making core technology adoption theory to examine gender differential in factors influencing youth preferences for HIV preventive actions. The prevention of HIV transmission remains an important issue to governments, interest groups, parents and individuals. The need to implement effective preventive actions to stop the transmission of HIV disease has received considerable acceptance worldwide. In particular, reducing the spread of HIV among youth aged 10-24 years is a health millennium development goal (Kaplan, 2006; Kim *et al.*, 2011). Certain authors have expressed concern that youth within the age group of 13 to 24 years are mostly affected by HIV because of their high risk sexual behaviour (Rehle *et al.*, 2007; MacPhail *et al.*, 2009; Cornelius *et al.*, 2011). HIV infectious disease is predominantly heterosexually transmitted and is ascribed to a range of factors such as individual, environmental and socio-cultural (Niveau, 2006; MacPhail *et al.*, 2009).

The information, training and education are the most acceptable preventive actions for disease infection (Polonsky *et al.*, 1994; Lavanchy, 2005; Niveau, 2006). Preventive actions such as using condoms contraceptive to avoid sexually transmitted diseases, and technology to access relevant health information for example through mobile information system can help to minimize the transmission of HIV and improve health outcomes. The approach of preventive action is metaphorically premised on analogies that prevention is better than cure and ignorance is worse than the disease. Decision making errors can be significantly reduced by having relevant information readily available at all places using mobile information system, at all times and to the right people to help increase awareness (Shongwe and Olugbara, 2012).

Youth-Oriented HIV/AIDS Mobile Information System (YOHAMIS) was implemented for youth to access HIV information. A mobile information system supports user mobility and enables information services to be ubiquitously accessible to a larger group of consumers. The technical obstacles like limited storage and network coverage associated with mobile devices are gradually being eliminated, but the question of how mobile technology will influence the life of youth has no real answer. In fact, according to (Alatalo *et al.*, 2001), mobile technologies have already affected the ways we socialize, but that is not all about the relationship between people and technology. One challenge of distributing HIV information is the existence of different levels of targets with different factors and settings. For this reason, this study limit sample targets

to youth aged 10 – 24 years. The youth of this internet generation are avid users of a new technology innovation. They are always desirous to adopt a new technology and feel no need for formal training. The speed at which they master the use of a new technology is amazing. They are keen and fast at locating and learning a new software, hardware and internet technology. In a nutshell, youth are characterized by social traits like curious, independent, contrarian, confident, intelligent, focused, adaptable and conscious (Skiba and Barton, 2006).

In addition, this study also examines action desire mediating effects and gender moderating effects on relationship between factors of the research model. A mediator is a factor that explains the relationship between two other factors such that when the effect of the mediator is removed, the relationship no longer exist (Baron and Kenny, 1986; Chin *et al.*, 2003; Henseler and Fassott, 2010). Mediation analysis is a research activity suggested to enhance the testing of health behaviour theory to understand the underlying mechanism that brings about changes in dependent factors (Noar and Mehrotra, 2011). A moderator is a categorical factor such as gender, age, experience and education that influences the strength or direction of a relationship between an independent and a dependent factor. Researchers are interested in studying moderators of PBC and action or behavioural or implementation intention to understand the intention-behaviour gap that remains to be understood or explained (Sheeran, 2002; Amireault *et al.*, 2008; Bhattacharjee and Sanford, 2009).

The interaction effects of gender on factors of technology adoption and health behaviour have been always topics of research interest (Michie and Nelson, 2006; Jarrin *et al.*, 2008; Li *et al.*, 2008; Hwang, 2009). However, there are contradictory research results regarding the effects of gender on technology adoption and health behaviour. On one hand, some authors have discovered that men often adopt technology more than women (Wood and Li, 2005; Michie and Nelson, 2006), but others have found that gender gaps are diminishing (Ray *et al.*, 1999; Rainer *et al.*, 2003). On the other hand, certain authors have discovered that women are often more health conscious than men (Nicastri *et al.*, 2005; Prins *et al.*, 2005; Jarrin *et al.*, 2008), while others have found that social structure and psychosocial determinants of health are more salient to women and behavioural determinants are more salient to men (Meisenhelder, 2003; Denton *et al.*, 2004; Mokhtar *et al.*, 2009).

Moreover, the complexity of hypothesized relationships has steadily increased. Besides the examination of direct effects, researchers are interested in interaction effects to understand

complex relationships among factors (Chin *et al.*, 2003; Norton *et al.*, 2004; Sun and Zhang, 2006; Henseler and Fassott, 2010). Moreover, an investigation into interaction effects is valuable in prevention research to obtain information on the process by which an intervention achieves its effects (Chin *et al.*, 2003; Henseler and Fassott, 2010). Given the contradictory nature of research results on gender differential in technology adoption and health behaviour studies, it is necessary to conduct more research to help shed light on the role that gender plays (Li *et al.*, 2008). Furthermore, previous research focus has been on professionals and adults, but research on factors influencing technology adoption and health behaviour among youth has been limited (Umrani and Ghadially, 2008). Moreover, due to the paucity of gender related data, whether the predictive power of a technology adoption model is higher for men or women remains an open discourse (Umrani and Ghadially, 2008). The understanding of factors influencing youth preferences for HIV preventive actions will help healthcare practitioners to implement innovative prevention strategies. This will also enable developers to develop specific health technology solutions that are suitable for the needs of youth who have personal, social and cognitive differences from adults (Beals and Bers, 2009).

1.1 Purpose of the Study

The purpose of this study is to develop a research model based on decision making core technology adoption theory to predict youth preferences for HIV preventive actions and examine gender differential. Technology adoption and usage has been extensively studied in the field of Information Systems (IS) and in several other domains. Among the different models that have been proposed, is the Technology Acceptance Model (TAM) (Davis, 1989) adapted from the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), a recent extension of TAM, offers a powerful explanation for user adoption and usage behaviour. However, because of the shortcomings of these models, Bagozzi (2007) proposed a unified theory of decision making about how the many splinters of knowledge cohere and explain decision making. The decision making core technology theory has been used in predicting consumer behaviour but has not been used in technology adoption in the healthcare context. Hence, this study finds it important to validate this model and add more insight to gender and technology adoption in the healthcare context more especially reducing the spread of deadly diseases such as HIV.

1.2 Overview of Research Plan

The objectives of this study are to (a) test the elements of decision making core model in predicting youth preferences for HIV preventive actions (b) investigate through gender lens, the psychological decision making process behind factors influencing youth preferences for HIV preventive actions and (c) determine the superiority of the research model against the TRA and TPB in predicting youth preferences for HIV preventive actions. A detailed overview of these research objectives is as follows.

Research objective 1 - Based on theories of technology adoption, health and decision making, possible factors that predict youth preferences for HIV preventive are validated through survey data collected from undergraduate university students aged 13 to 24 years using PLS analytic method. The output of this objective is an integrated research model that can be used to predict youth preferences for HIV preventive.

Research objective 2 - Examines gender differential in the research model predictive power, moderating effect, mediating effect, order of importance in factors that predict youth preferences for HIV preventive actions and in goal-action pattern. The output of this objective is a conclusion on whether there is gender differential in the adoption of HIV preventive actions.

Research objective 3 - Determines and compares the predictive power of this study's research model against well established technology adoption models such as TRA and TPB in predicting youth preferences for HIV preventive actions. The output of this objective is the model that better predicts youth preferences for HIV preventive actions.

1.3 Definition of Terms

This study applies the decision making core technology adoption theory to determine factors influencing youth preferences for HIV preventive actions. HIV preventive actions are broadly defined as the use of any contraceptives to prevent HIV contamination. However, in the context of this study, it refers to the use of condoms and mobile phone technology as tools to alleviate the spread of HIV. Condom is a widely used contraceptive for preventing pregnancy as well as the spread of HIV and other sexually transmitted infections (STIs). A mobile, ubiquitous, nomadic, or pervasive application refers to an application that uses small portal devices such as Personal Digital Assistance (PDA) and mobile phone to wirelessly communicate to deliver services. Mobile techniques enable access to computer networks and services all the time, at any

location and by any person. Mobile applications have mobile features that do not exist in traditional desktop applications, thus providing more functionality.

This study recognizes that the adoption of HIV prevention actions is a prerequisite to long time usage. Hence this study finds it important to determine the utility of HIV preventive actions before its use. User acceptance or adoption of technology has been studied in many related disciplines such as information systems (IS), human-computer interaction (HCI), and communication studies and many more. It can be defined as “the demonstrable willingness within a user group to employ information technology (HIV preventive actions) for the tasks it is designed to support” (Wu, 2009). This definition emphasizes the actual adoption action (“demonstrable”) rather than the self reported intention of use. However, action intention is still the most important subject in technology adoption research (Wu, 2009). Action intention is a measurement of strength or intent of a person to adopt a technology. The metrics for technology adoption are classified into two classes, (a) those that measure the actual adoption and (b) those that help to predict the success or failure of a system (Scholtz and Consolvo, 2004). This study pays attention to the determinants of adoption behaviour of the youth towards the use of condom and mobile phone technology.

1.4 Contribution of the Study

This study has both theoretical contributions and practical implications.

The decision making core model has enabled this study to unify technology adoption and health behaviour through its goal and action components. This brings new insight to technology adoption in the healthcare domain because the model has not been validated in this context before. This study contributes to the open issue of gender differential in technology adoption by examining the effects of gender (as a moderator) on factors predicting youth preferences for HIV preventive actions. Another theoretical contribution is the validation of other existing related technology adoption models (TRA and TPB) to compare them with the research model of this study and determines its superiority.

This study also has practical contributions. Firstly, the results of the study will inform government, health practitioners and all interested groups about the youth preferences for HIV preventive actions among males and females. Secondly, both the methodology and the findings of this study may be applied to studying youth intention behaviour towards HIV preventive

actions not only in developing countries but also in developed ones. Lastly, factors identified to predict youth preferences for HIV preventive actions can be used to improve future intervention strategies that will be well accepted by the youth.

1.5 Chapter Synopsis

Chapter 1 begins with an introduction to this study and its purpose is discussed and an overview of the research plan is provided. The research objectives are proposed and a set of key concepts used in this study are defined and discussed. Finally, the expected contributions of this study are described.

Chapter 2 provides a review of the literature that lays the theoretical foundation for the research model and the research objectives of this study. The key concepts defined in Chapter 1 are revisited in much richer intellectual contexts. This chapter provides literature review of the two research domains that are relevant to this study: technology adoption and health behaviour. Lastly this chapter provides a review of existing mobile health information systems.

Chapter 3 provides all the steps carried out to achieve this study's objectives in details. These include the development of a mobile health information system and a conceptual model based on decision making core model to predict youth adoption of HIV preventive actions, the survey data elicitation method used and the PLS analytic modelling technique used for data analysis are all discussed.

Chapter 4 describes the survey study, with an emphasis on statistical data analyses. Hypotheses proposed in the research methodology chapter are tested and the results are presented. A discussion of the empirical findings in light of the theoretical framework developed and the main research objectives is provided.

Chapter 5 provides overview information about this study and its results and possible future work arising from this study.

CHAPTER 2

LITERATURE REVIEW

This chapter provides literature review of the two research domains that are relevant to this study: technology adoption and health behaviour. Relevant theories of technology adoption and health behaviour are discussed to guide the process of solving the research questions raised and to ultimately achieve the objectives of this study. To capture the conceptual theory of technology adoption research, an overview of the six most prominent user behaviour models is presented. These are the (a) Theory of Reasoned Action, (b) Theory of Planned Behaviour, (c) Technology Acceptance Model, (d) Unified Theory of Acceptance and Usage of Technology, (e) Innovation Diffusion Theory and (f) Decision Making Core Theory. The final research area is based on health behaviour research that stems from the healthcare field. Health behaviour theories have been used for years to measure the success of health promotion measures. Hence, an overview of the conceptual foundation of two theories that have been applied to the healthcare domain is covered. These theories are (a) Health Belief Model and (b) Social Cognitive Theory which in conjunction with technology adoption theories provide the foundation for this study. In addition, this chapter provides a review of existing health based mobile information system.

2.1 Technology Adoption Studies

The goal of every Information Communication Technology (ICT) tool is to generate system usage. Technology adoption is about how people accept and use new technology. Umrani and Ghadially (2008) define technology adoption as the approval, favourable reception and ongoing use of newly introduced devices and systems. ICT solutions follow methodologies that ensure that new technology is accepted by users, but user adoption of such technologies should not be assumed. Technology adoption at an individual level is the acceptance and use of technologies among people. However, the need arises to determine the utility of a technology before its use (Scholtz and Consolvo, 2004). This is because people are often unwilling to adopt a certain technology even if the usage will result in an improved performance (Davis *et al.*, 1989; Nah *et al.*, 2004; Ancarani *et al.*, 2010). The evaluation of a technology is often considered to reveal its direct impacts, help stakeholders get its uniform view, support appropriate views of diverse stakeholders and protect intellectual properties (Olugbara *et al.*, 2011). Hence, technology

adoption theories have been extensively applied in diverse domains to understand how and why people adopt innovations.

The theories of technology adoption have been extensively applied to several application areas, including electronic business adoption by small and medium enterprises (Ramayah *et al.*, 2009; Ifinedo, 2011), diffusion of different information technologies within organizations (Tanoglu *et al.*, 2010), user adoption of mobile banking (Zhou *et al.*, 2010), health information technology adoption (Kijisanayotin *et al.*, 2009), instructor adoption of web-based learning systems (Wang and Wang, 2009), intention of public health nurses towards web-based learning (Chen *et al.*, 2008), internet adoption (Porter and Donthu, 2006) and adoption of mobile communication standards (Tan, 2002).

2.1.1 Theory of Reasoned Action (TRA)

The TRA (Fishbein and Ajzen, 1975) is a psychological model of decision making. It has its origins from Fishbein's work on the psychological processes by which attitudes cause behaviour (Fishbein, 1967) and in an analysis of the failure to predict behaviour from individuals' attitudes. TRA postulate that beliefs about an object lead to attitudes towards the object which lead to behavioural intentions that determine actual behaviour (Fishbein and Ajzen, 1975). Based on an analysis of previous studies of the relationship between attitudes and behaviour, (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1977) developed the principle of compatibility (Ajzen, 1988). This principle holds that any behaviour consists of (a) an action (or behaviour), (b) performed on or towards a target or object, (c) in a particular context, (d) at a specified time or occasion. General attitudes should predict general classes of behaviours and specific attitudes should predict specific behaviours. Figure 2.1 illustrates the relationships between factors of TRA.

2.1.1.1 Attitude

TRA is considered to be a deliberative processing model, which implies that people's attitudes are formed after careful consideration of available information. Behavioural intention represents a person's motivation in the sense of her or his conscious plan, decision or self-instruction to exert effort to perform the target behaviour. Attitudes towards a specific behaviour impact on performance of the behaviour via intentions (Conner and Norman, 2005). Ajzen (1991) defines attitude towards behaviour as the degree to which a person has favourable or unfavourable

evaluation or appraisal of the behaviour in question. Prior studies on computer attitude found that males were more positive to computers than females (Colley *et al.*, 1994; Schumacher and Morahan-Martin, 2001), while other studies have implied opposite findings (Siann *et al.*, 1990). Still in the context of technology adoption, Venkatesh *et al.* (2000) found that in the United States of America (USA) men are strongly influenced by attitude than women. These results were suggested to be valid only in North America and not generalized to other cultures especially developing countries (Dong and Zhang, 2011) like South Africa. TRA is often criticized to lack clarity about the factors that lead attitudes to be translated into intentions (Conner and Norman, 2005).

2.1.1.2 Subjective Norms

The TRA includes a second determinant of intention, the social factor termed subjective norms. This component represents the perceived social pressure from others to perform the target behaviour. It is a function of normative beliefs, which represent perceptions of specific significant others' preferences about whether one should or should not engage in a behaviour (Conner and Norman, 2005). Ajzen (1991) defines subjective norm as the social pressure to perform or not perform the behaviour in question. Subjective norm is salient in the case of mandatory technology usage and in the initial stage where direct experience is limited (Venkatesh and Davis, 2000). Venkatesh and Davis (2000) suggested that the direct link between subject norms and behavioural intention in mandatory context might cause subject norms to have direct effect on behavioural intention while in voluntary context might not. Moreover, subjective norms are related to self-confidence as less confident persons tend to depend more on others' opinions. Prior studies show that social norms are important determinants of HIV-preventive behaviour and that the effect of health beliefs can be accounted for by intentions (Fishbein *et al.*, 2001; Conner and Norman, 2005).

2.1.1.3 Behavioural Intention and Behaviour

Behavioural intention is the indication of an individual's readiness to perform a given behaviour. It is assumed to be an immediate antecedent of behaviour. TRA suggests that a person's behavioural intention depends on the person's attitude about the behaviour and subjective norms ($BI = A + SN$). If a person intends to do behaviour, then it is likely that the person will do it.

Behavioural intention measures a person's relative strength of intention to perform behaviour (Fishbein and Ajzen, 1975). According to the TRA, an individual's volitional (voluntary) behaviour is predicted by his or her attitude towards that behaviour and how he or she thinks other people would view them if they perform the behaviour. A person's attitude, combined with subjective norms, forms his or her behavioural intention. Behavioural intention is a function of both attitudes towards behaviour and subjective norms towards that behaviour, which has been found to predict actual behaviour (Fishbein and Ajzen, 1975).

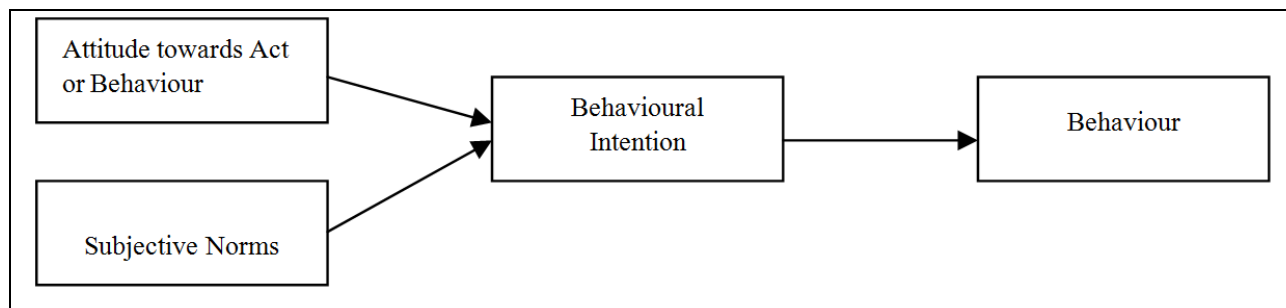


Figure 2.1: Theory of Reasoned Action (Ajzen and Fishbein, 1980).

TRA has been applied in various domains including health, social networking and education. For example, it has been used to examine attitudes and beliefs related to drink and drive and to predict actual behaviour. Using regression as an analysis technique, both attitudes and subjective norms accounted for significant portions of the variance in intention, but attitudes was a stronger predictor than subjective norms. Intention was the strongest predictor of behaviour followed by attitude measure (Beck, 1981; Nejad *et al.*, 2005).

However, the theory has limitations. It assumes that individuals are rational in their decision-making process, a presumption that may not be relevant for HIV related behaviours (Airhihenbuwa and Obregon, 2000). As an improvement, Ajzen (1991) extended the TRA to the theory of planned behaviour by adding a predictor called 'perceived behavioural control', which is seen to be synonymous with self-efficacy. Another improvement of the TRA was conducted by Ajzen's long-time co-author, Fishbein (2001) who simply incorporated self-efficacy into his own revision of their TRA.

2.1.2 Theory of Planned Behaviour (TPB)

The TPB (Ajzen, 1991) is a behaviour change model that has received considerable attention in literature. Ajzen (1991) extended the TRA to include a measure of perceived behavioural control (PBC) which is seen to be synonymous with self-efficacy. PBC is a variable that had received a great deal of attention in social cognition models designed to predict health behaviours (Armitage and Conner, 2001). One of the limitations of TRA is the inability to predict behaviours where there are constraints on action, hence PBC was incorporated to improve the predictive power of the model (Armitage and Conner, 2001). The TPB describes three predictors of behaviour and these are (a) attitude, (b) subjective norms and (c) perceived behavioural control (Ajzen, 1988; Ajzen, 1991) as illustrated in Figure 2.2. The TPB retained the two antecedents of intention from TRA namely subjective norms and attitude.

2.1.2.1 Subjective Norms

Subjective norms refers to the individual's perceptions of general social pressure to perform (or not to perform) the behaviour. An individual's elaborative thoughts on subjective norms are perceptions on whether they are expected by their friends, family and the society to perform the recommended behaviour. If a person perceives that others endorse (or disapprove of) the behaviour, they are more (or less) likely to intend to perform it (Armitage and Conner, 2001).

2.1.2.2 Attitude

Attitude towards the behaviour reflects the individual's global positive or negative evaluations of performing a particular behaviour. In general, the more favorable the attitude towards the behaviour, the stronger should be the individual's intention to perform it (Armitage and Conner, 2001). People's evaluations of, or attitudes towards behaviour are determined by their accessible beliefs about the behaviour. Specifically, the evaluation of each outcome produced by behaviour contributes to the attitude (Fishbein and Ajzen, 1975).

2.1.2.3 Perceived Behavioural Control (PBC)

The TRA is particular valuable when describing behaviours that are totally under volitional control. But, most behaviours are completely out of control. The individual has total control when there are no constraints of any type to the adoption of a given behaviour. At the opposite

extreme, there is a complete lack of control if adoption of the behaviour requires opportunities, resources, or skills which are currently lacking (Godin *et al.*, 1993). PBC can influence intention and it can also predict behaviour directly, in parallel with the potential influence of intention in situation where behaviour is not under total control of an individual (Ajzen, 1991; Godin *et al.*, 1993).

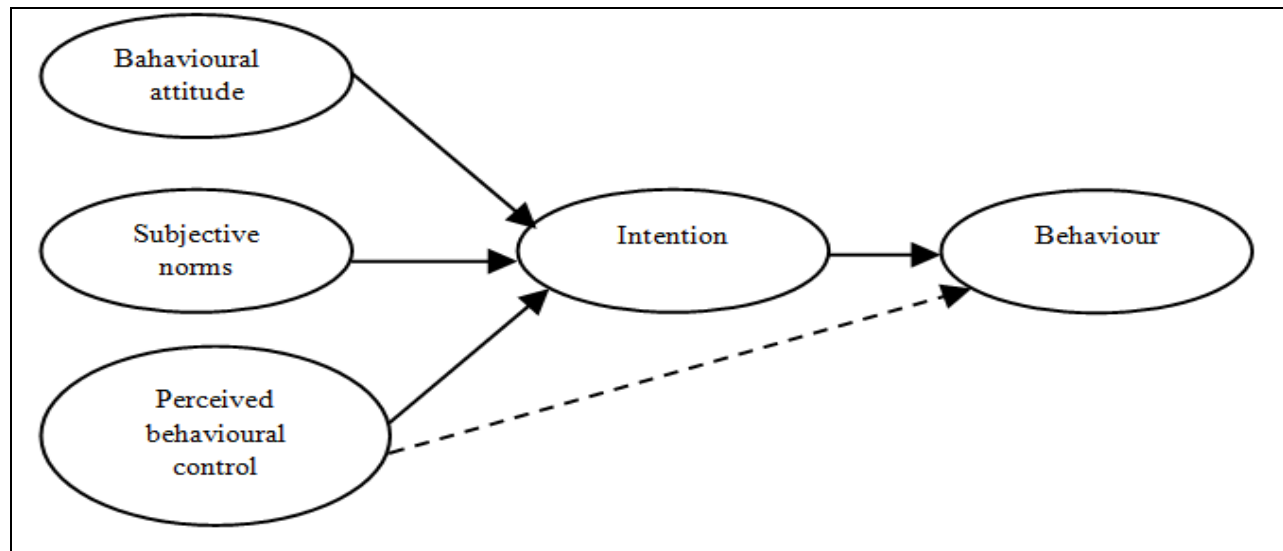


Figure 2.2: Theory of Planned Behaviour (Ajzen, 1991).

2.1.2.4 Behavioural Intention and Behaviour

Behavioural intention indicates an individual's readiness to perform a given behaviour. It is assumed to be an immediate antecedent of behaviour. TPB suggests that behavioural is based on attitude towards the behaviour, subjective norms, and perceived behavioural control. Whereas, behaviour is an individual's observable responses in a given situation with respect to a given target. Ajzen (1991) said behaviour is a function of compatible intentions and perceptions of behavioural control in that PBC is expected to moderate the effect of intention on behaviour.

Ajzen (1991) found that intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes towards the behaviour, subjective norms and PBC. TPB has been used in numerous studies that have successfully predicted intention and subsequent behaviour in a wide range of settings (Taylor and Todd, 1995; Harrison *et al.*, 1997). In a study that investigated gender differences in the context of individual adoption and sustained usage of technology in the workplace using the TPB, it was found that the decisions of men were

more strongly influenced by their attitudes towards using the new technology. In contrast, women were more strongly influenced by subjective norms and PBC Venkatesh *et al.* (2000).

The TPB can provide general guideline but it does not tell what kind of intervention will be most effective (Conner and Norman, 2005). Ajzen (1991) suggested the openness of the TPB to developments; the TPB is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of variance in intention or behaviour after the theory's current variables have been taken into account.

2.1.3 Technology Acceptance Model (TAM)

TAM (Davis, 1989) is an adaption of the TRA for understanding user adoption of information systems, considers perceived usefulness and perceived ease of use as major determinants of intention (Umrani and Ghadially, 2008). TAM has sprawled the most significant amount of direct or indirect research (Lee *et al.*, 2003). The reason for this can be attributed to the prominent role that TAM has been playing in defining technology adoption in general and information technology in particular (Negahban, 2008). TAM has been used in a wide variety of studies and has been shown to be useful in predicting behavioural intentions with respect to the adoption and usage of technology (Moon and Kim, 2001; Benamati and Rajkumar, 2002; Gefen *et al.*, 2003). TAM postulates that technology adoption is determined by behavioural intention (Liao *et al.*, 2009), which is determined by a combination of technology perceived usefulness and perceived ease of use (Wu, 2009). Figure 2.3 illustrates the relationship between factors of TAM.

2.1.3.1 Perceived Usefulness

Perceived usefulness is defined as the “degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989). Across studies, perceived usefulness is highlighted as the most significant determinant of behavioural intention to use and actual usage of technology (Horst *et al.*, 2007; Umrani and Ghadially, 2008). Studies conducted in the USA indicate that for men, behavioural intention is more strongly influenced by perceived usefulness than for women (Umrani and Ghadially, 2008). Whereas studies conducted in China indicate that either perceived usefulness are more important determinant of behavioural intention

to use computers for females or the two sexes do not differ on this dimension (Yuen and Ma, 2002; Umrani and Ghadially, 2008).

2.1.3.2 Perceived Ease of Use

Perceived ease of use is defined as the “degree to which a person believes that using a particular system would be free of effort” (Davis, 1989). The relevance of perceived ease of use in determining behavioural intention is affected by time gap between adoption of a technology and test of TAM (Sun and Zhang, 2006; Umrani and Ghadially, 2008). Prior studies differ on the centrality of perceived ease of use for the two sexes depending on the culture and nature of technology studied (Umrani and Ghadially, 2008). A study on adoption of data and information retrieval system among workers in the USA by Venkatesh and Morris (2000) found that perceived ease of use strongly affect technology usage intention of females but not males. Whereas a study conducted in Korea, examining students’ adoption of World Wide Web indicated that perceived ease of use is rated more highly by males than females in determining behavioural intention to use new technology (Moon and Kim, 2001; Umrani and Ghadially, 2008).

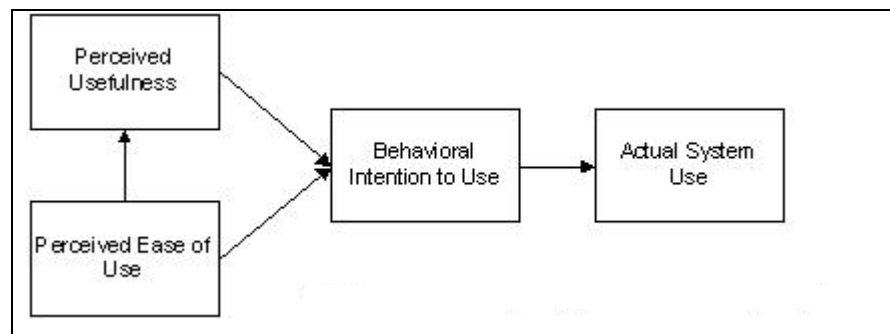


Figure 2.3: Technology Acceptance Model (Davis *et al.*, 1989).

The predictive power of TAM varies according to the cultural context. Its power to prediction is higher in West Korea (45-75%) than in East Korea (10-35%). Psychological factors are less important in technology adoption in developing countries (Umrani and Ghadially, 2008). Subsequent studies on TAM have included other variables such as computer self-efficacy, computer attitude and subjective norms. TAM2 (Venkatesh and Davis, 2000) and UTAUT Venkatesh *et al.* (2003) are two major upgrades of the original TAM which generally modeled technology adoption at an individual level.

Despite the numerous empirical use of TAM and its modification, Bagozzi (2007) indicates that no research has deepened TAM in the sense of explaining the factors proposed by the model, re-conceptualizing existing variables in the model, or introducing new variables explaining how the existing variables produce the effects they do. But in the past, researchers have introduced moderators and added predictors to broaden the scope of the theory instead of deepening the model. According to Bagozzi (2007) these researchers have focused on demographic variables like gender, age and experience (Venkatesh *et al.*, 2003). Moreover, less theoretical explanation is provided to support the addition of such variables.

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

UTAUTA (Venkatesh *et al.*, 2003) is a more recent technology adoption theory that consolidates factors of eight older technology adoption theories. This theory can explain up to 70% variations of behavioural intention to adopt a new technology, but TAM only explained about 40% variations (Wills *et al.*, 2008). It is arguably the most used framework for studying technology adoption (Wu, 2009). Even though UTAUT change the terminologies used in TAM but it still confirm the validity of the core constructs of TAM that have been tested and validated (Wu, 2009). UTAUT incorporated relevant human and social factors to improve its prediction and explanation powers. The model is sometimes modified or extended to fit the undertaken study (Cody-Allen and Kishore, 2006). UTAUT indicates that behavioural intention to use a technology is influenced by perception of people of performance expectance, effort expectance, social influence and facilitating conditions. The four determinants of user adoption in UTAUT are moderated by gender, age, experience and voluntariness. Figure 2.4 illustrates the relationships between factors of UTAUT.

2.1.4.1 Performance Expectance

The root constructs of performance expectance is perceived usefulness from Davis's TAM, defined as the degree to which an individual believes that using an information system will help him or her attain benefits in his or her job (Cody-Allen and Kishore, 2006). In later studies perceived usefulness was termed performance expectancy. Any technology is useful to an individual if he or she has the ability to use it without extraordinary effort. Performance expectance is an integration of similar concepts namely perceived usefulness, outcome

expectancy, and relative advantage, job-fit and extrinsic motivation from other models (Kijasanayotin *et al.*, 2009). UTAUT suggests that the effect of performance expectancy on behavioural intention is moderated by gender and age such that it is more salient to the youth, more particularly to males. Several previous studies have shown performance expectancy to be a strong predictor of intention to use technology (Venkatesh and Davis, 2000; Chang *et al.*, 2007; Kijasanayotin *et al.*, 2009). Venkatesh *et al.* (2003) used data from four organizations over a period of six months to validate UTAUT. The effect of performance expectancy on behavioural intention was found to be stronger for men as compared to women.

2.1.4.2 Effort Expectance

Effort expectancy is defined as the degree of effort an individual believes is required for using an Information System (IS) (Assadi and Hassanein, 2009). The concept is similar to the perceived ease of use factor in TAM and the Innovation Diffusion Theory. Effort expectancies is one of the most important factors required for accepting a new IS (Schaper *et al.*, 2007), however some researchers did not find this factor to significantly influence intention to use behaviour (Chau and Hu, 2002). Effort expectancies effects have been postulated as determinants of an individual's intentions to use a new technology (Cody-Allen and Kishore, 2006). However the relationship is moderated by age, gender and experience, such that it is more salient to women, more particularly young women. Venkatesh *et al.* (2003) found the effect of effort expectancy on behavioural intention to be stronger for women as compared to men.

2.1.4.3 Social Influence

Social influence is defined as the degree to which an individual perceived that important people believe he or she should use the new system (Venkatesh *et al.*, 2003). Social influence integrates factors from other models, namely subjective norms in TRA, TPB and TAM2 and social factors from Model of PC Utilization (MPCU). The effect of social influence on intention to use new technology has been shown to be significant in several previous studies (Venkatesh and Davis, 2000) however some exhibited a non-significant effect (Chau and Hu, 2002). UTAUT postulates that the effect of social influence on action intention is moderated by gender, age, experience and voluntariness of use. A study conducted by Venkatesh *et al.* (2003) revealed that

the effect of social influence on behavioural intention was stronger for women than men and the effect was more important in the context of mandatory use, more so among older women.

2.1.4.4 Facilitating Conditions

Facilitating condition is defined as the degree to which an individual believes that organizational and technical infrastructure exists to support use of new technology (Venkatesh *et al.*, 2003). This factor integrates concepts from PBC in TPB, facilitating conditions in MPCU and compatibility in Innovation Diffusion Theory (Venkatesh *et al.*, 2003; Kijasanayotin *et al.*, 2009). Previous studies on technology adoption found that facilitating conditions predict technology use but did not predict intention when both performance expectancy and effort expectancy factors are present in the model (Chau *et al.*, 2002; Venkatesh *et al.*, 2003; Chang *et al.*, 2007). According to UTAUT the effect of facilitating conditions on behavioural intention is moderated by age and voluntariness of use.

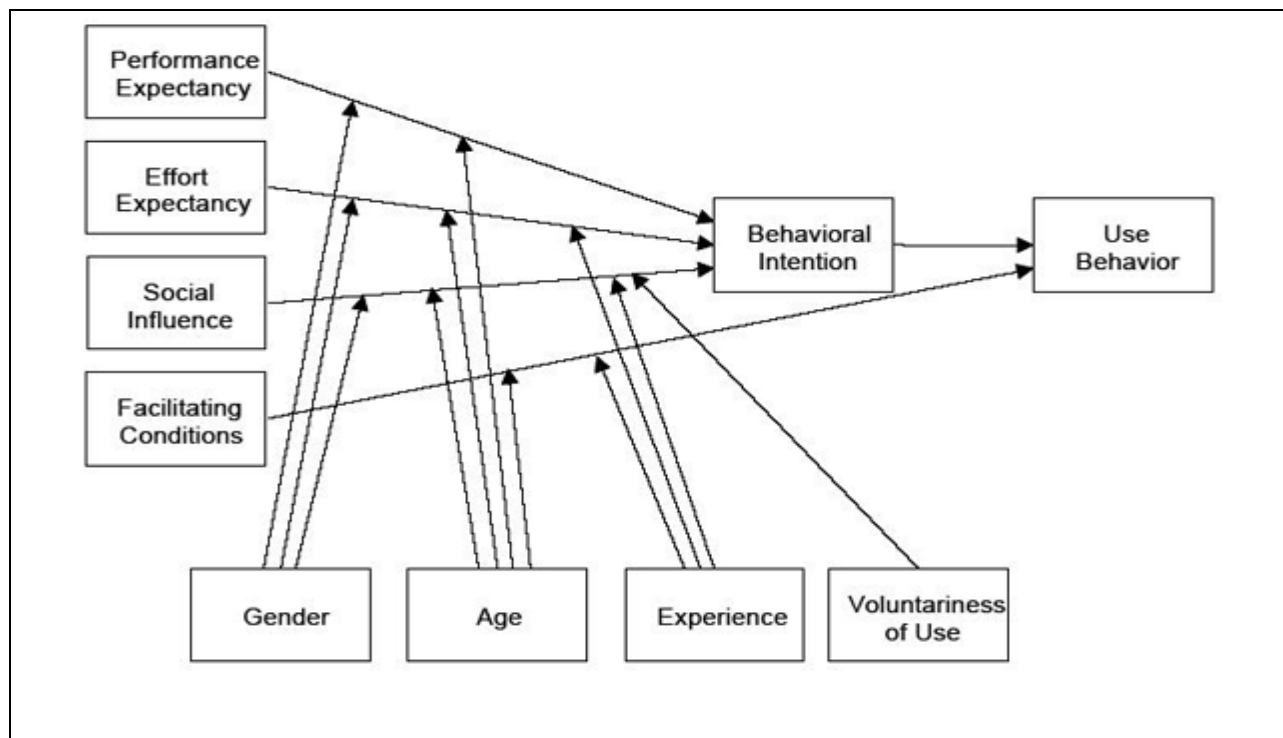


Figure 2.4: Unified Theory of Acceptance and Use of Technology Model (Venkatesh *et al.*, 2003).

Since the inception of UTAUT, it has been applied and modified in several works in the healthcare context to study IT adoption and use. The studies show that UTAUT and its modified model are applicable in explaining IT adoption in healthcare settings (Kijasanayotin *et al.*, 2009). However, a majority of these studies were conducted in developed countries (Chang *et al.*, 2007; Schaper, *et al.*, 2007) with very little studies employing UTAUT model in developing countries healthcare context (Kijasanayotin *et al.*, 2009).

UTAUT has attracted many scholars in IS research, Moran (2006) studied the adoption of Tablet Personal Computers and modified UTAUT by introducing self-efficacy and anxiety determinants because of their significance in other technology adoption models. The results showed a high correlation between attitude towards technology use and anxiety. Cody-Allen and Kishore (2006) extended UTAUT by adding e-quality, trust and satisfaction factors to develop an E-Business quality model. Engebresten (2005) validated UTAUT factors in health research project to study the adoption of EpiHandy in Uganda and South Africa. The results indicated that health workers in Uganda accept EpiHandy more than their counterparts in South Africa. Wills *et al.* (2008) conducted a study that utilize UTAUT as the theoretical model, using Partial Least Square (PLS) analysis technique to assess adoption of Electronic Medical Records (EMR) by health care professionals. The results indicated that UTAUT was able to provide a reasonable variance in adoption of EMR.

Some researchers (Bagozzi, 2007; Benbasat and Barki, 2007) have pointed out several deficiencies of extant technology adoption theories like UTAUT. These deficiencies include naivety of extant theories, lack of any practical value and falsifiability, questionable heuristic value, limited explanatory and predictive powers, creation of an illusion of progress in knowledge accumulation and theoretically chaotic.

2.1.5 Innovation Diffusion Theory (IDT)

IDT defines technology adoption as a process by which the new technology is communicated through certain channels over time among members of a social system (Rogers, 2003). The theory suggests that perception of user characteristics of innovation affect adoption (Aggelidis and Chatzoglou, 2009). The theory has been widely used in studying diffusion of technological innovations in organizational and business contexts. Its primary intention is to provide an account of the manner in which any technological innovation moves from the stage of invention

to widespread use (Wu, 2009). IDT provides details about the characteristics of user groups who adopt a technology at different stages, or the characteristics inherent in the technology that may influence specific groups to adopt it. However, it does not account for the social and cognitive determinants that determine an individual user motivation for accepting a technology (Wu, 2009). IDT is grounded on four main elements; innovation, communication channels, time, and social system (Hung *et al.*, 2003) as shown in Figure 2.5. Diffusion is the process through which an innovation is communicated through certain channels over time among members of a social system (Rogers, 1995). Moore and Benbasat (1996) adapted the characteristics of innovation and refine a set of constructs that could be used to study technology adoption by individuals. The constructs were named; relative advantage, compatibility, ease of use, results demonstrability, image, visibility, trialability, and voluntariness.

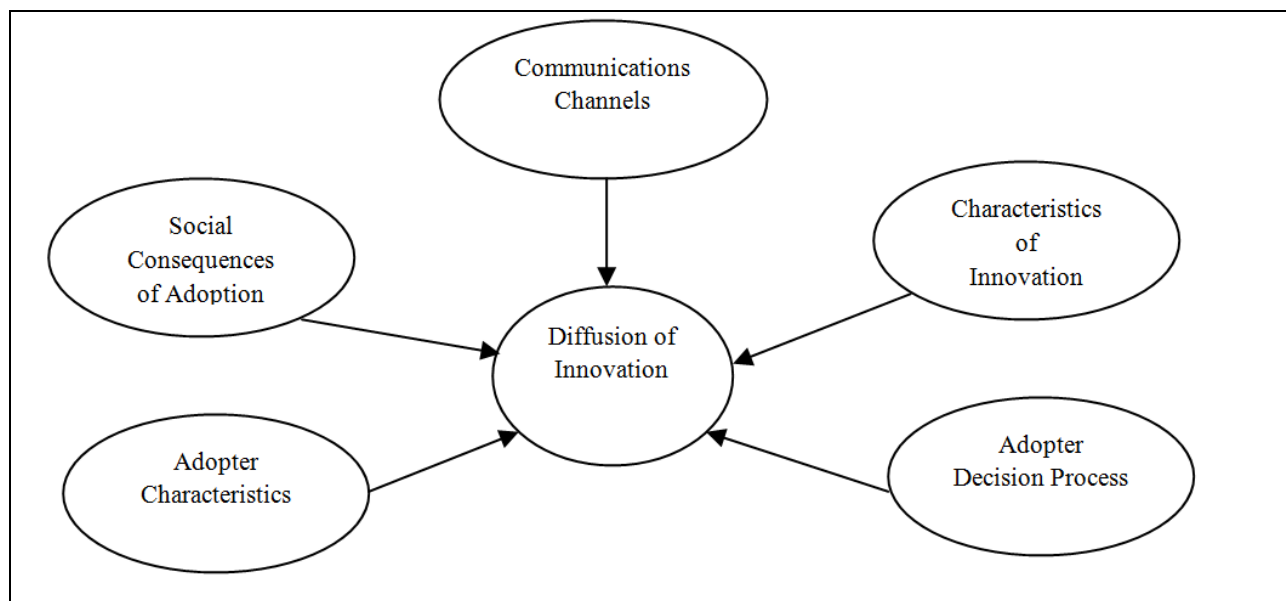


Figure 2.5: Diffusion of Innovation Theory (Rogers, 1995).

2.1.5.1 Characteristics of Innovation

Rogers (1995) proposed that an innovation is an idea, a practice or objective perceived as new by an individual, group, or organization. The characteristics of an innovation, as perceived by members of a social group, determine its rate of adoption. The characteristics that determine innovation's rate of adoption are relative advantage, compatibility, complexity, trialability and observability (Rogers, 2002). Relative advantage is the degree to which an innovation is

perceived as better than the current idea or practice. The greater the perceived relative advantage of an innovation, the more rapid is its rate of adoption. Compatibility is the degree to which an innovation is perceived as consistent with the individual's existing values beliefs, past experience and needs. Complexity is the degree to which an innovation is perceived as difficult to understand or use. Trialability refers to the degree to which users can alter or implement an innovation on a small scale. Observability is the degree to which the results of an innovation are visible to others. Innovations whose outcomes are easily observed tend to be adopted faster than those with more subtle outcomes (Rogers, 1995). Innovations that are perceived as having greater relative advantage, compatibility, trialability, observability and less complexity are more likely to be adopted rapidly than other innovations.

2.1.5.2 Communication Channels

Communication channels are made up of both the mass media and interpersonal communications. Mass media communication channels have more effect in creating initial knowledge of innovations, whereas interpersonal communication channels are more effective in forming and changing attitudes towards an innovation, and thus in influencing the decision to support new innovations. Interpersonal communication was found to be dominant in all phases of adoption decision making to adopt spreadsheet softwares among 500 professionals in 24 business units from 18 large businesses in manufacturing and services (Brancheau and Wetherbe, 1990). Interpersonal communication influences the speed and shape of the diffusion process over time, as such diffusion's focus is on interpersonal communications within social systems over time as it relates to the spread of innovations (Gatignon and Robertson, 1985) and it emphasizes that the norms and beliefs of the social system must be considered in any diffusion process of innovation (Gregor and Jones, 1999).

2.1.5.3 Decision Process

The Innovation Decision Process is the mental process which an individual (or other decision-making unit) passes through five stages: (a) knowledge of an innovation, (b) forming an attitude towards the innovation, (c) decision to adopt or reject the new idea, (d) implementation of the new idea and (e) confirmation of this decision (Rogers, 1995). Potential adopters of an innovation must learn about the innovation, be persuaded as to the merits of the innovation,

decide to adopt, implement the innovation, and confirm (reaffirm or reject) the decision to adopt the innovation.

2.1.5.4 Adopter Characteristics

It is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system. Five adopter classifications of members of a social system on the basis of their innovativeness are: (a) innovators, (b) early adopters, (c) early majority, (d) late majority and (e) laggards (Rogers, 2002). Members of each category typically possess certain distinguishing characteristics. Rogers (2002) describes characteristics of each of these categories briefly, as follows: innovators are venturesome, early adopters are respectable, the early majority are deliberate, the late majority are skeptical, and laggards are traditional. In addition, socioeconomic characteristics, personality variables, and communication behaviours are analyzed across adopter categories in an attempt to further define the individuals from each category.

Several health interventions identified opinion leaders in a community of medical practitioners or members of the public, and then introduce innovations through these opinion leaders, thus speeding up the diffusion process (Farquhar *et al.*, 1990; Rogers, 2002). Since the early applications of IDT to IS research the theory has been applied and adapted in numerous ways. Research has, however, consistently found that technical compatibility, technical complexity, and relative advantage are important antecedents to the adoption of innovations (Crum *et al.*, 1996; Bradford and Florin, 2003) leading to a generalized model by (Agarwal and Prasad, 1998) as shown in Figure 2.6.

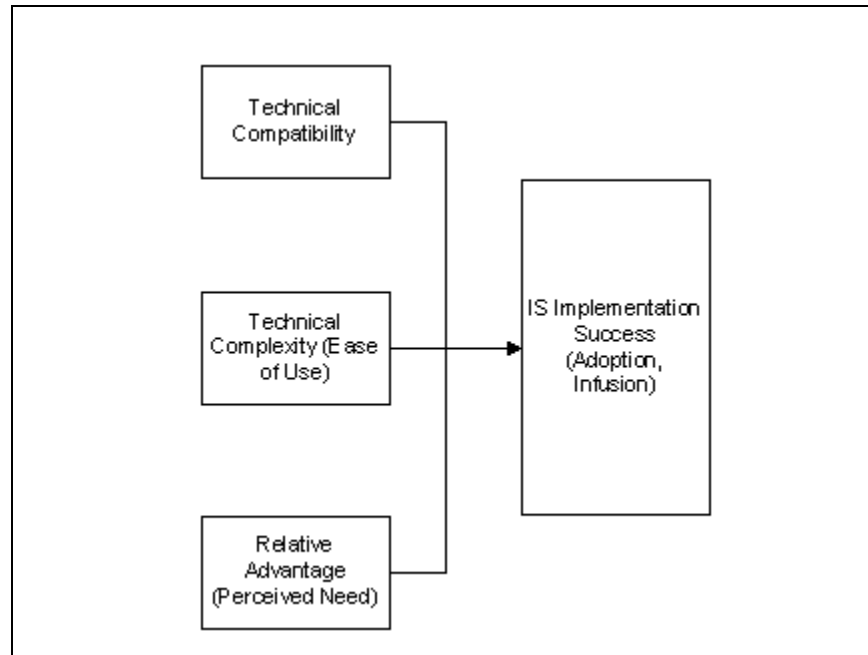


Figure 2.6: IS Diffusion Variance Model (Agarwal and Prasad, 1998).

2.1.6 Decision Making Core Theory

In recent times, some researchers have highlighted the several deficiencies of classical theories of technology adoption. These deficiencies include naivety of the theories, lack of any practical value and falsifiability, questionable heuristic value, limited explanatory and predictive powers, creation of an illusion of progress in knowledge accumulation and theoretically chaotic (Bagozzi, 2007; Benbasat and Barki, 2007). The theory of decision making core (Bagozzi, 2006; Bagozzi, 2007), was proposed to address the deficiencies of classical technology adoption theories. The decision making core has been successful in modelling consumer behaviour and marketing based decision process (Bagozzi *et al.*, 2003; Bagozzi, 2006; Bagozzi, 2007). This individual level model has been extended to an organization level technology adoption framework. The extension was achieved by formalizing the likelihood that there is a portfolio of focal goals arising from super-ordinate goals of differing levels of perceived importance to be considered during a decision process (Brandyberry, 2011). The decision making core model presents five central elements that constitute the heart of consumer decision making with regard to goal striving (Bagozzi, 2006). These elements are identified to be goal desire, goal intention, action desire, action intention and self-regulation as shown in Figure 2.7.

2.1.6.1 Goal Desire

A goal desire is the result of deliberative or spontaneous goal setting processes. In a sense, goal desire represents a necessary condition for the decision-making process to proceed to goal choice in the motivated functioning of the decision maker (Bagozzi *et al.*, 2003). In addition, goal desire is influenced by factors discussed below.

2.1.6.2 Goal Intention

A goal intention is a self-commitment to strive towards attaining a desired end state and is stimulated by a goal desire. The formation of a goal intention implies that through various decision-making processes, the individual has chosen one goal and is committed to attain it.

2.1.6.3 Action Desire

An action desire, which is also known as instrumental or behaviour desire moderates the effects of a goal desire on a goal intention and the effects of a goal intention on an action intention. It is the process of transforming reasons and motives for choosing a goal and one's goal intention into an implementation intention (Bagozzi *et al.*, 2003). It reflects how strongly the decision maker wants to enact specific goal-directed behaviour(s).

2.1.6.4 Action Intention

An action intention, which is also known as implementation or behaviour intention is a self-commitment to perform a particular action that leads to the realization of an end goal. It refers to the process of considering and finalizing details regarding when, where, how, and how long to perform a behaviour.

2.1.6.5 Self-regulation

A self-regulation is an active imposition of personal moral or self-evaluative standards to decide on one's desires. The decision making core theory suggests that human agency involves an additional feature of decision making that is more executive in function. Self-regulation serves to moderate the effects, if any, of desires on intentions, and the processes are reflective ones based on reasoning (Bagozzi, 2007).

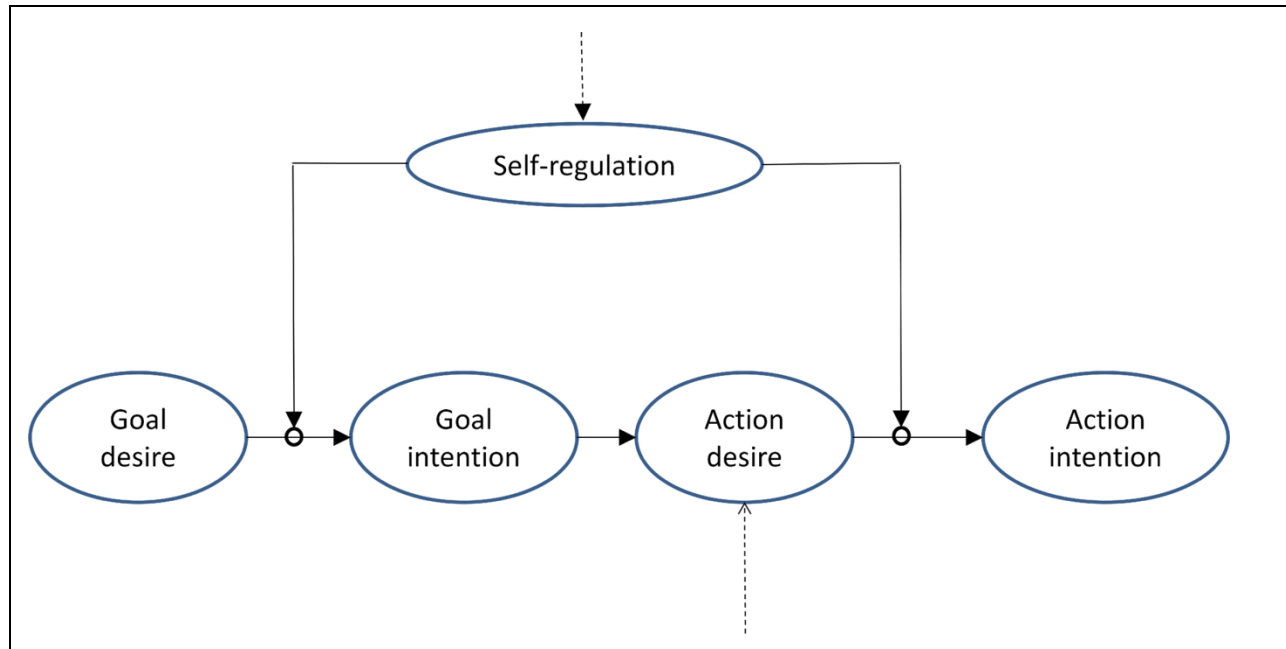


Figure 2.7: The Decision Making Core (Bagozzi, 2007).

2.2 Theory of Health Behaviour

Due to the health context of this study, there is a need to consider relevant theories from the health literature. Health professionals are realizing that, in their work to encourage healthy behaviours, they are competing against powerful forces, involving social, psychological and environmental conditions. Information is not enough and some methods to predict health behaviour under such factors were needed. Formal theories in relation to health are defined as principles and methods about prevention and behaviour change that have already proven useful in some areas of disease prevention and behaviour change. They help to provide a framework for the goals of an intervention or help explain aspects of risk-taking behaviour when working with a new population. Using theories to design intervention tools helps to improve such tools thereby save time and resources.

2.2.1 Health Belief Model (HBM)

HBM (Rosenstock, 1974) is one of the most commonly used individual-level theories of health behaviours and behavioural changes (Noar *et al.*, 2008). HBM is a psychological tool that explains and predicts health behaviours based on attitude and belief of an individual (Airhihenbuwa and Obregon, 2000; Wu, 2009). Due to its flexibility, the model is widely used in

health-related studies to predict behavioural changes (Rosenstock *et al.*, 1988; Nejad *et al.*, 2005; Phuanukoonnon *et al.*, 2006; Wu, 2009). HBM suggests that health related actions depend upon the simultaneous occurrence of sufficient motivation to promote health issues, perceived diseases threat, perceived benefits of undertaking health behaviour and perceived barriers. The model originally defines four main factors of perceived susceptibility, perceived seriousness, perceived benefits and perceived barriers to explain and predict behavioural changes (Rosenstock *et al.*, 1994) as illustrated in Figure 2.8.

2.2.1.1 Perceived Susceptibility

Personal risk or susceptibility to a condition is a strong perception in encouraging people to adopt health behaviour. The greater the risk the higher the likelihood of engaging in behaviours that reduces the risk. Gerrard *et al.* (1996) examined four prospective studies that measured perceived susceptibility to HIV infection and subsequent safer sexual behaviour. They found no evidence that perceived susceptibility predicts behaviour when the effects of past behaviour were controlled. Furthermore, Gerrard *et al.* (1996) found that individual differences moderate the relationship between past risk behaviour and perceived susceptibility; the relationship was stronger among older respondents, women (as compared to men), gay (as compared to straight) men, and college (as compared to clinic) samples. In a recent study conducted by Lin *et al.* (2005) on Taiwanese students, based on an online survey they found that perceived susceptibility had no substantial relationship with HIV prevention behaviour.

2.2.1.2 Perceived Seriousness

Perceived seriousness is the belief of an individual about the severity of a disease. The perception of seriousness is often based on medical knowledge or beliefs a person has about the difficulties a disease would create or the effect it would have on his or her life in general. Fear is an intervening variable between perceptions of severity and vulnerability and the level of appraised threat. Thus, greater levels of fear will be aroused if an individual perceives him or herself to be vulnerable to a serious health threat and this will increase an individual's motivation to engage in protective behaviour (Conner and Norman, 2005). Lin *et al.* (2005) studied sexual behaviour among Taiwanese immigrants based on an online survey they found that perceived severity was a significant predictor of adoption of HIV prevention behaviour.

2.2.1.3 Perceived Benefits

Perceived benefits refer to the degree to which one believes taking a specific action to prevent a condition will be useful. The beneficial an individual believes a behaviour to be, the more it will be practiced (Graham, 2002). People tend to adopt healthier behaviours when they believe the new behaviour will decrease their chances of developing a disease. Results of quantitative reviews of perceived benefits suggest that this factor is often found to be significant predictor of health behaviour (Boerema, 2009). A study on the adoption of screening as a secondary prevention behaviour of colon cancer found that women who perceived a benefit from colonoscopy (early detection) are more likely to undergo screening (New York-Presbyterian Hospital, 2006).

2.2.1.4 Perceived Barriers

Perceived barriers are the perception of potential obstacles to implement the desired behaviour (Phuanukoonnon *et al.*, 2006). It is an individual's own evaluation of the obstacles in relation to adopting a new behaviour. Janz and Becker (1984) found that out of all the constructs, perceived barriers are the most significant in determining behaviour change. Previous studies have found perceived barriers to be a significant predictor of health-related behaviours (Lin *et al.*, 2005; Boerema, 2009)

2.2.1.5 Self-Efficacy

Self efficacy were introduced in the extended versions of HBM to improve its predictive power (Rosenstock *et al.*, 1988). Self efficacy is the belief of an individual in his/her capability to perform certain behaviour (Bandura, 1977; Huang *et al.*, 2011). People generally do not attempt something new unless they perceive a fair chance of success.

2.2.1.6 Perceived Cues to Action

Another expansion of the HBM was conducted by (Becker, 1974) who included the factor of perceived cues to action to HBM. It refers to things that move people into actions (Becker, 1974). Cues to action are events, people, or things that move people to change their behaviour. It can be internal or external, internal cue includes diseases symptoms or conditions of a related ill person. But external cues might include media campaigns or social influences (Ali, 2002).

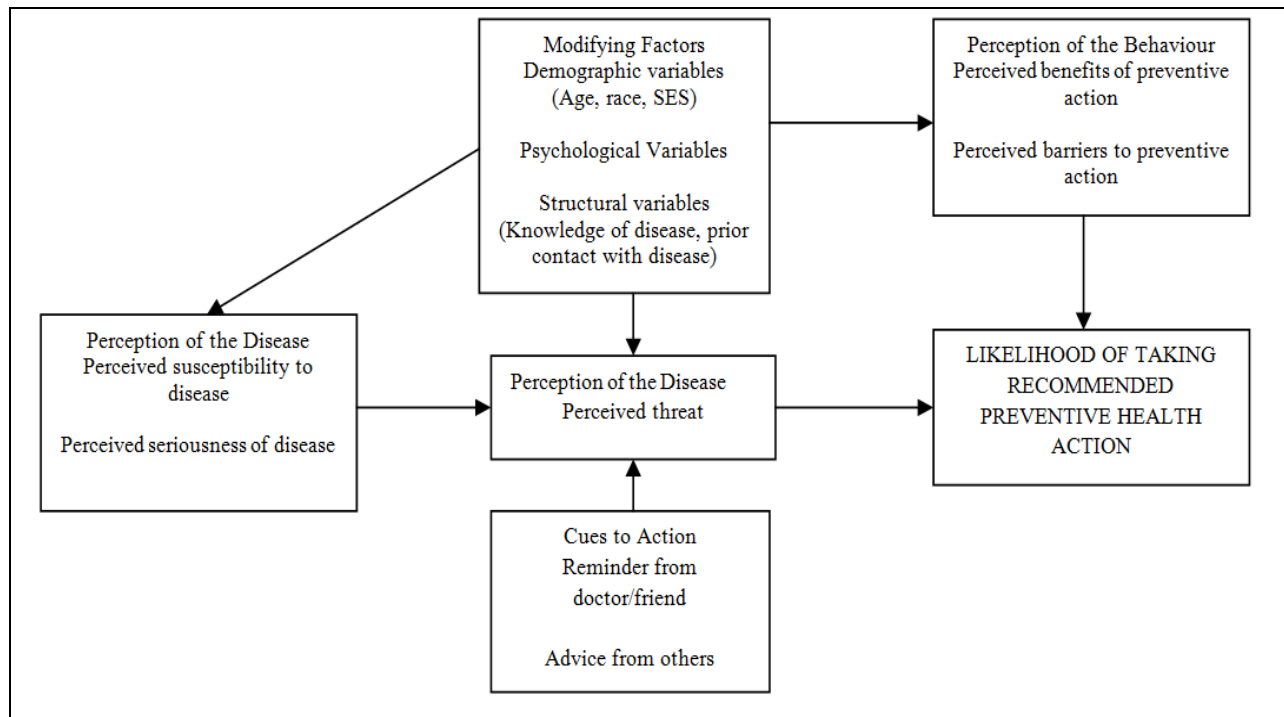


Figure 2.8: Health Belief Model (Rosenstock *et al.*, 1994).

2.2.1.7 Modifying Factors

The five major factors of HBM (susceptibility, seriousness, benefits, barriers, and self efficacy) are modified by other variables, which are individual characteristics that influence personal perception. These demographic variables are gender, age, education level, income, race and many more, socio-psychological variables (personality, social class, peer and reference group pressure and many more), and structural variables (knowledge about the disease, prior contact with the disease and many more).

The HBM has been used in numerous research studies covering a variety of medical conditions, detection screenings, and prevention techniques. Examples of research using the HBM can be found in research relating to HIV, AIDS, and sexually transmitted disease prevention (Lewis and Malow, 1997; Belcher *et al.*, 2005). However, HBM excludes cognitions that have been shown to be powerful predictors of behaviour and in contrast to the TRA, it fails to address the importance of intention formation or the influence that others' approval may have upon behaviour (Conner and Norman, 2005). It has therefore been suggested that the theory of reasoned action may offer a better account of HIV preventive behaviour than the HBM, because it acknowledges the importance of others' approval in the subjective norm construct and because

intention formation provides a mechanism through which beliefs might influence behaviour (Sheeran *et al.*, 1999; Conner and Norman, 2005).

2.2.2 Social Cognitive Theory (SCT)

According to the SCT (Bandura, 1977), behavioural change is made possible by a personal sense of control. If people believe that they can take action to solve a problem instrumentally, they become more inclined to do so and feel more committed to the decision (Conner and Norman, 2005). SCT is accepted in explaining individual's behaviour in the information systems area. The theory states that behaviour is determined by expectancies and incentives, the former is divided into three types: a) expectancies about environmental cues (how events are connected- what leads to what), b) expectancies about the results of one's own actions and c) expectancies about one's own competence to perform the behaviour needed to influence outcomes. The latter is defined as the value or outcome of a particular object (Rosenstock *et al.*, 1988). The outcome may be health status, physical appearance, approval of others, economic gain and many more. Assadi and Hassanein (2009) concluded that under the SCT human behaviour is an interaction between behavioural, environmental and personal factors.

2.2.2.1 Outcome Expectancies

Outcome expectation is a key construct of the SCT defined as a person's estimate that a given behaviour will lead to certain outcome. It is the belief about the consequences of one's action. One's behaviour may provoke bodily changes (Physical or behaviour), responses from others (social or environmental), or feelings about oneself (self-evaluative or personal factors). Together with self-efficacy they influence goal setting and goal pursuit.

2.2.2.2 Self-Efficacy

Perceived self-efficacy pertains to personal action control or agency. People who believe that they can cause events may live more active and self-determined lives. Broos and Roe (2006) defined self-efficacy as an individual's belief about his or her ability to perform certain tasks successfully. In short, self-efficacy is about the actual possession of skills than the individual's judgment about using the skill. Those with less competence will be easily discouraged if they fail in what they are doing but those with high competences (believe in their self-efficacy) will

continue even if they fail, until they succeed. It has been shown that important people around an individual supporting the use of a certain technology have a positive impact on the individual's self-efficacy. A previous study on self-efficacy in explaining unprotected sexual behaviour found that teenage women with a high rate of intercourse have been found to use contraceptives more effectively if they believed they could exercise control over their sexual activities (Wang *et al.*, 2003).

2.2.2.3 Goals, Socio-Structural Factors

Besides the two cognitions (outcome expectation and self-efficacy), SCT also includes goals and perceived impediments and opportunity structures as shown in Figure 2. 9. In adopting a desired behaviour, individuals first form a goal and then attempt to execute the action. Goals serve as self-incentives and guides to health behaviours (Conner and Norman, 2005). People set goals for themselves because they thought they have advantage in pursuing those goals. Thus, outcome expectancies are seen as important determinants in the initial formation of intentions. Self-efficacy influences which challenges people decide to meet and how high they set their goals. People with high self efficacy in a specific domain select more challenging and ambitious goals (Conner and Norman, 2005). Goal setting also depends on socio-structural factors which refer to the impediments (barriers) or opportunities that reside in living conditions, health systems, political, economic or environmental systems (Bandura, 1997).

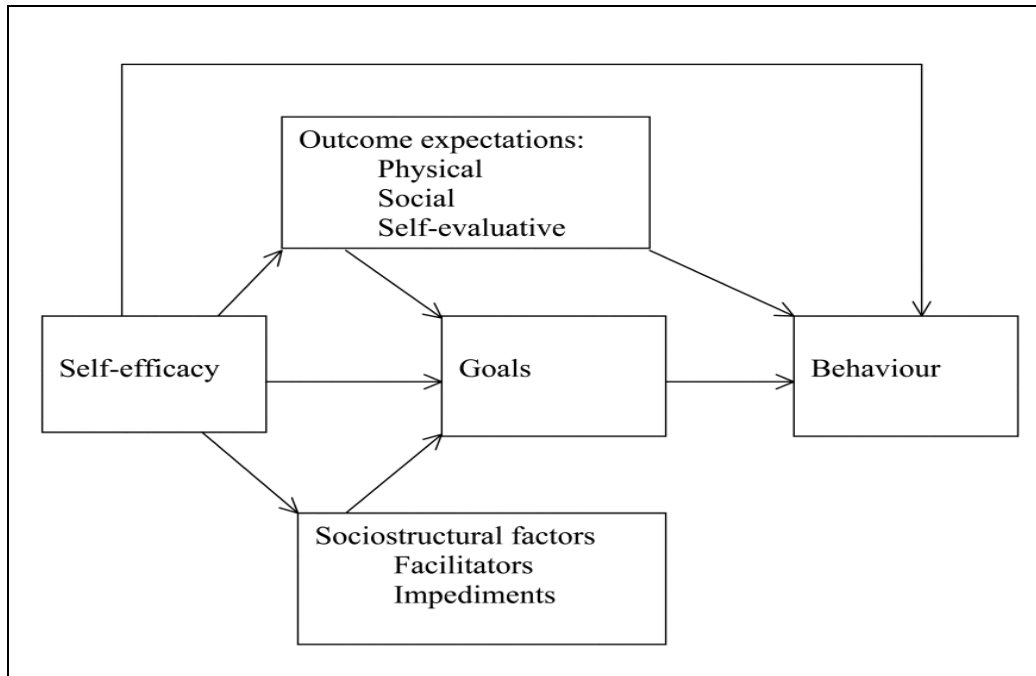


Figure 2.9: Social Cognitive Theory (Bandura, 2000).

A number of studies have tested SCT components as predictors of health behaviours, all examining the role of self-efficacy. SCT emphasizes self-efficacy as the main and the most proximal predictor and antecedent of human behaviour (Conner and Norman, 2005). Some authors seem to believe that SCT is equivalent to self-efficacy theory, provoking repeated statements by Bandura (1997) that SCT is not a ‘one factor theory’.

2.3 Evaluation of Extant Technology Adoption Theories

There have been many tests of extant technology adoption models, but only a few studies reporting empirical-based comparison of two or more of existing technology adoption models. This study compares existing technology adoption theories using a metric of 4 criteria which are (a) classification, (b) data analysis technique used, (c) results obtained and (d) factors used to measure technology adoption. Table 2.1 provides a comparison overview of existing major technology adoption.

2.3.1 Using Classification

Technology adoption models can be classified into intention-based, motivation-based and goal-based categories. Intention-based models postulate that technology adoption is determined by

user behaviour intention (Davis, 1989; Venkatesh and Davis, 2000). Many existing technology adoption models fall into this category, but with differing assumptions about the underlying factors that dictate user intention. Examples of these models are TAM, TRA, TPB and UTAUT. Motivation-based models postulate that technology adoption is a response that can be explained or predicted by user motivation (Davis *et al.*, 1992). TAM model and HBM are motivation-based models. In particular, HBM suggests that health related actions depend upon the simultaneous occurrence of sufficient motivation to promote health behaviours and behavioural change (Nejad *et al.*, 2005; Phuanukoonnon *et al.*, 2006; Noar *et al.*, 2008).

The intention and motivation based technology adoption models often lack tying adoption decisions to goal attainment as motivation and outcome to represent technology values (Brandyberry, 2011). In general, intention-based models, especially TAM and its variants have received a lot of criticisms. For example, intention may not always influence behaviours in a consistent manner, naivety of the theories, lack of any practical value, falsifiability, questionable heuristic value and limited predictive powers (Bagozzi, 2007; Benbasat and Barki, 2007; Bhattacharjee and Sanford, 2009; Brandyberry, 2011). Goal-based models (Bagozzi, 2006; Bagozzi, 2007; Brandyberry, 2011) were introduced to address the deficiencies of intention and motivation based models. Goal-based models are suitable for representing the decision making process behind technology adoption. SCT can fit into the category of goal-based models because it states that behaviour should be determined by motivation and outcome. This study applies a goal-based model to examine gender differential in youth preferences for HIV preventive actions.

Table 2.1: Empirical studies of technology adoption and health behaviour

Authors	Context	Source of Data	Independent Variables	Analysis Method	Major Results
	Theory or Model				
Bosompra (2001)	Student's intention to use condoms	Surveyed 30 student from a university located in the southern part of Ghana.	attitude and subjective norms	Regression	Subjective norms and the perceived disadvantages of condom use were significant determinants of intention, with the former being more important.
	TRA				

Zhikun and Fungfai (2009)	knowledge-sharing behaviour	Surveyed architects from A-level architectural design institutes in Beijing, Shanghai and Qingdao.	Attitudes and subjective norms	Structural equation modelling (SEM)	Attitude towards knowledge sharing was more important than subjective norms in determining architects' willingness to share knowledge.
	TRA				
Peslak <i>et al.</i> (2011)	Social networking (SN)	A survey and pretest of 196 students at Northeastern USA university.	Attitude and subjective norm	Confirmatory factor analysis	Attitude towards social networking and subjective norm are positively associated with intention to use social networking. In addition, intention was found to influence the use of social networking.
	TRA				
Jemmott <i>et al.</i> (2007)	Use of condoms among Adolescents	Surveyed 390 Xhosa-speaking grade 6 students in public school in South African.	Attitude towards condom use, subjective norm regarding condom use, PBC, behavioural beliefs, normative beliefs and control beliefs.	Multiple regression	Attitude and PBC were significantly related to the intention to use condoms, whereas subjective norm was not.
	TPB				
Mausbacha <i>et al.</i> (2009)	Predicting safe sex behaviour among heterosexual methamphetamine users	Surveyed 228 HIV negative heterosexual	Safer sex practices, intentions for sex, attitudes toward safer sex practices, methamphetamine use, depressive symptoms, desire to stop unsafe sex, normative beliefs and control beliefs	Hierarchical linear regression	Less negative attitudes towards safer sex, greater normative beliefs, greater control beliefs, less methamphetamine use, less intent to have sex, and greater desire to stop unsafe sex emerging as significant predictors of greater safer sex intentions
	TPB				

Molla <i>et al.</i> (2007)	Self reported condom use	802 adults were interviewed in the rural area of southern Ethiopia.	Attitude towards using a condom, subjective norm, descriptive norm, PBC and previous condom use (PCU).	MANOVA and multiple linear regression.	The TPB and PCU explained 36% and 2.2% of the variance in intended condom use respectively. Subjective norms discriminated strongly between individuals with and without PCU. The TPB and PCU accounted for 5.3% and 8.5% of the variance in reported condom use.
	TPB				
Gu <i>et al.</i> (2009)	Users' intention to use mobile banking	Web-based survey was employed and it yielded 910 usable responses.	Social influence, system quality, self-efficacy, facilitating conditions, situational normality, structural assurances, calculative-based trust, perceived usefulness, trust, perceived and ease of use	Structural equation modelling (SEM)	The results indicated strong support for the validity of the model with 72.2% of the variance in behavioural intention to mobile banking.
	TAM				
Kim and Garrison (2009)	Mobile wireless technology acceptance	Online survey which resulted in 242 responses from employees of a medium-sized Korean company.	Technological influence processes (perceived ubiquity, perceived reachability) and cognitive influence processes (job relevance, perceived usefulness, and perceived ease of use)	Chi-square (χ^2/df), goodness of fit index (GFI), normed fit index (NFI), comparative fit index (CFI), root mean square residual (RMSR), and structural equation model (SEM)	Both technological and cognitive influence processes accounted for 58.7% of the variance explained in an individual's behavioural intention toward using mobile wireless technology.
	TAM				

Macharia and Nyakwende (2011)	Gender difference in ICT usage	Surveyed 1092 university students in Kenya using questionnaire.	Perceived usefulness, perceived ease of use, computer self-efficacy, computer anxiety, perceived enjoyment, voluntariness, relevance to studies	Structural equation modelling (SEM)	The influences of perceived ease of use, relevance to studies, and perceived enjoyment had significant influence on intentions for both males and females. In addition, females had a higher anxiety than males in using the internet. However, they had greater usage of the internet for their studies.
	TAM				
Chen and Chang (2011)	Mobile phones with built-in near-field communication (NFC) capability	Surveyed 215 citizens of Taiwan using Questionnaire.	Performance expectancy, social influence, facilitating conditions and anxiety	Structural equation modelling (SEM)	Effort expectancy has a positive effect on performance expectancy, also, performance expectancy and social influence have a positive effect on attitude towards use of technology, but anxiety has a negative effect on it. Attitude towards use of technology was found to be more significant than facilitating conditions in affecting behavioural intention.
	UTAUT				
Adam <i>et al.</i> (2011)	Adoption of enterprise resource planning (ERP) systems by small enterprises in South Africa.	Literature study, surveyed 16 small manufacturing enterprises and interviewed 2 ERP system consultants.	Performance expectancy, effort expectancy, social influence and facilitating conditions	Textual analysis and descriptive data analysis	All four determinates of UTAUT affected the adoption of ERP systems.
	UTAUT				
Cheng <i>et al.</i> (2011)	Differences of gender, age, and occupation for m-learning	Surveyed 1600 enterprises in Taiwan yielding 350 usable	Performance expectancy, effort expectancy and social influence	Confirmatory factors analysis, correlation analysis and	Gender and age caused significant inference to the derivation of the path of social influence influenced

	UTAUT	responses		structural equation modelling (SEM)	behavioural intention. Social influence influenced behavioural intention to use m-learning more strongly for women than for men.
Eder and Igbaria (2001)	Adoption of internal internet technology (intranet)	A cross-sectional survey of senior level computer executives representing 1000 organizations across USA.	Earliness of adoption, top management support, organizational structure, organizational size, IT infrastructure and IS structure.	Hierarchical multiple regression was used to test the research model	Earliness of adoption, top management support, and organizational size were positively associated with intranet diffusion.
	IDT				
Bradford and Florin (2003)	Enterprise resource planning (ERP) implementation success.	A survey on members of America's SAP User Group (ASUG)	Technical compatibility, perceived complexity, business process reengineering, top management support, organizational objectives consensus, training and competitive pressure.	Stepwise linear regression models	Top management support and training are positively related to user satisfaction. Perceived complexity of ERP and competitive pressure show a negative relationship.
	IDT				
Greenhalgh <i>et al.</i> (2008)	Exploring the introduction of a centrally stored, shared electronic patient record (SCR) in England.	Interviewed 250 staff, 1500 hours of ethnographic observation, focus groups with 170 patients and carers,	Material properties of the technology, concerns of potential adopters, communication and influence, organizational antecedents for innovation, organizational readiness for innovation, the implementation and routinisation process,	Theory driven thematic content analysis for qualitative data and narrative synthesis	SCR programme were largely explained by eight interacting influences. These are, in a chronological order: material properties, adopters' concerns, interpersonal influence, organizational antecedents for innovation, organizational readiness for the SCR, implementation process, nature and quality of links between different parts of the system and the wider environment.
	IDT	2500 pages of correspondence and documentary evidence, and incorporation of relevant surveys and statistics			

		produced by others.	linkage and the wider environment.		
Carpenter (2010)	Meta-analysis	Meta-analysis of 18 studies (2,702 subjects) on HBM.	Perceive seriousness, perceive susceptibility, perceive benefits, and perceive barriers to adopting behaviour	Variance-centered meta analysis Method	Benefits and barriers were consistently the strongest predictors. The length of time between measurement of the HBM beliefs and behaviour, prevention versus treatment behaviours, and drug-taking regimens versus other behaviours were identified as moderators of the HBM variables' predictive power.
	HBM				
Bosch <i>et al.</i> (2010)	Attitude towards personal protective measures among	Two focus-group discussions with 12 biologists each from 10 parks.	Perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues-to-action and self-efficacy	Majority views	Participants described cautious, but not overly concerned, perceptions of risk. Barriers to personal protective measures included challenges associated with field environments and lack of mandatory continuing education on zoonotic diseases as determinants of biologist's attitudes towards personal protective measures.
	HBM				
Bonar and Rosenberg (2011)	Drug injection	Surveyed 91 participants recruited from three needle	Perceived susceptibility to and severity of two injection-related health	Regression and ANOVA	Perceived susceptibility to non-fatal and over dose predicted intentions to do test shots, but only when participants

	HBM	exchange programs (NEPs) located in northeastern Ohio, western Michigan and southeastern Michigan in the USA.	conditions (non-fatal overdose and bacterial infections), perceived benefits of, barriers to, self-efficacy to, social acceptance of, and recent use of two harm-reduction behaviours (injecting test shots and pre-injection skin cleaning)		imagined not being in withdrawal or injecting when alone. Perceived self-efficacy to clean one's skin predicted intentions to engage in this behaviour, but only when participants imagined injecting while not in withdrawal. Participants' ratings of how often others in their social network engage in pre-injection skin cleaning was also a significant positive predictor of intentions to clean one's skin, but only when they imagined being in withdrawal
Lent <i>et al.</i> (2009)	Academic adjustment and life satisfaction	Surveyed 252 students at a university in northern Portugal.	Self-efficacy, goal progress, environmental supports, domain adjustment and positive effect	Covariance matrices	Self-efficacy and environmental support were predictive of goal progress and academic adjustment. Self-efficacy and positive affect were found to be reciprocally related to one another. Expectations, goal progress did not contribute uniquely to the prediction of academic adjustment or life satisfaction.
	SCT				
Netz and Raviv (2004)	Examine age, gender, level of education, and level of activity in relation to physical activities	Surveyed 2,298 Australians aged between 18 and 78.	self-efficacy, outcome expectations, age, gender, education level, and level of physical activity	Regression analyses	The older individual felt lower self-efficacy in relation to physical activity and expected fewer benefits from participating in physical activity. However, older individuals who engaged in physical activity rated themselves as more active and fit than nonexercisers of their
	SCT				

					same age and gender. Physical activity and level of education were positively correlated with self-efficacy, and men were more efficacious than women.
Shu <i>et al.</i> (2011)	Technology related stress (Technostress)	Surveyed 305 IT professionals and general end-users mainly located in Xi'an, Beijing, Suzhou, Changchun, and Shenzhen in China.	Computer self-efficacy and computer-related technology dependence	Factor analysis and structural equation modelling (SEM)	Results show that; (a) employees with higher level of computer self-efficacy have lower level of computer-related technostress, (b) employees with higher level of technology dependence have higher level of computer-related technostress, and (c) employees under different individual situations may perceive different levels of technostress.
	SCT				

2.3.2 Using Data Analysis Techniques

Literature on technology adoption and health behaviour indicates that studies apply or modify existing models, hence, as part of the analysis, test for possible relationship between factors is common in all the studies with different analysis techniques used. There are several methods of analyzing relationships between variables each with its own merits and this includes multiple Regression Analysis (MRA), Path Analysis (PA), Factor Analysis (FA) and Structural Equation Model (SEM). However, it can be seen in Table 2.1, the widely used method is regression (TRA, TPB, HBM, SCT and IDT), followed by SEM (TRA, TAM, UTAUT and SCT) and lastly, FA (TRA, UTAUT and SCT). FA, MRA, and PA are suitable for studies that deal with relationship between single dependent variables and many independent observable variables. However, some studies have more than one dependent variable. Therefore these analysis methods may not be appropriate. MRA does not provide any test on validation or reliability for measuring latent variables (Aibinu and Al-Lawati, 2010). PA and MRA deals with observed variables rather than latent variables and assume that the data used is normally distributed.

FA, can detect latent variable from manifest variables and can provide information on the relationship between detected latent variables and their corresponding observed variables from

them (Aibinu and Al-Lawati, 2010). This is equivalent to measurement item loadings in SEM model, however FA do not provide information about relationship among detected latent variables. SEM allows simultaneous assessment of reliability and validity of measurement items of each factor of a model and estimates relationship among latent factors and their dependent factors at the same time (Barclay *et al.*, 1995; Aibinu and Al-Lawati, 2010). This approach used by SEM has the capability to advance understanding of theoretical and empirical knowledge not possible with MRA, FA and PA.

2.3.3 Empirical Comparison

There are numerous empirical studies using social cognitive models, however there has not been enough empirical work comparing the predictive power of the different models. The lack of comparison studies means that there is little consensus on whether some variables are more influential than others and whether some models of health behaviour are more predictive than others (Weinstein, 1993; Conner and Norman, 2005). Venkatesh *et al.* (2003) noted that there has been many individual tests of IS models however, there are few empirically based comparison studies reported even those reported were not conducted in a single study. Moreover, this study found a few empirical technology adoption and social cognitive model comparisons studies.

On technology adoption, Davis *et al.* (1989) studied the predictive power of TRA and TAM to predict intention to use word processor within 107 students. Using a cross-sectional analysis they found that TRA explained 26% and TAM explained 51% of intention to use word processor. Taylor and Todd (1995) compared the variance in intention to use computing resources explained by TAM and TPB using 786 students they conducted a cross-sectional analysis. It was found that the variation of intention explained by TAM was 52%, less than 57% of TPB. Another comparison study of behavioural intention is in the context of electronic payment system using smart card to compare TAM and IDT (Plouffe *et al.*, 2001). 176 merchants were recruited and a survey was administered after 10 months of use. Using a cross-sectional analysis method, 33% variance of intention was explained by TAM and IDT explained 45%. Venkatesh *et al.* (2003) conducted an empirical comparison of the predictive power of eight models to predictive intention to use information system. Using data from four organisations over a six-month period with three measurement points they used a Partial Least

Squares (PLS) analysis technique. The results revealed that UTAUT had the highest predictive power of about 70% followed by TAM with 39%, then IDT and SCT with 38%. TRA had the lowest predictive power of 26%.

On social cognitive models a comparison of HBM and TRA by Beck (1981) revealed that beliefs measure from HBM relate more to the TRA's attitude measure than to intention or behaviour. The author concluded that HBM factors could be used to understand and explain the attitude measure of TRA. HBM was also compared with TPB the extension of TRA as they applied to dieting and fasting intention and behaviour using regressions as an analysis technique (Nejad *et al.*, 2005). Intention and indirect perceived control of TRA were predictors of dieting and explained 35% of variance in dieting. However, benefits of dieting and self-rated susceptibility were best predictors of weight loss behaviours of HBM and explained 29% of dieting variance. However, Conner and Norman (2005) examined the determinants of attendance at a health clinic and found the models that predict intentions and behaviour to be at a similar level.

Dzewaltowski (1989) compared the predictive utility of the TRA and SCT in the field of exercise motivation. The exercise behaviour of 328 students was recorded for seven weeks and then related to prior measures of different cognitive factors. The TRA factors (intention, attitude and behavioural control beliefs) did not account for any unique variance in exercise behaviour after controlling for the social cognitive factors. These findings indicate that SCT provides powerful explanatory factors (self-efficacy, outcome expectancies, dissatisfaction) towards explaining exercise behaviour.

2.3.4 Theoretical Comparison

There has been a considerable overlap between constructs contained in models of the same domain more especial social cognition models (Armitage and Conner, 2001; Conner and Norman, 2005). Moreover, differences do appear in labeling rather than differences in underlying constructs. As noted by Conner and Norman (2005), this suggests that there might be some benefit in developing integrated social cognition models. Such an integrated model has been conducted in the field of IS by Venkatesh *et al.* (2003), they consolidated constructs of existing IS models to develop UTAUT. Key constructs of health behaviour and technology adoption models are discussed below.

The HBM is one of the earliest models to predict health behaviours. According to the model, disease threat is measured by perceived susceptibility and perceived severity, whereas SCT focuses on expectancies about environmental cues. In contrast, the TPB does not explicitly cater for emotional or arousal variables, leading some authors to suggest that the TPB may be limited to the rational part of a health decision (Oliver and Berger, 1979). Most social cognition models of health behaviour focus on the perceived consequences of performing a behaviour (Rosenstock *et al.*, 1988; Conner and Norman, 2005) behavioural beliefs in TPB, benefits and costs of performing a health behaviour in HBM, outcome expectancies in SCT, perceived usefulness in TAM, performance expectancy in UTAUT and relative advantage in IDT. It has been noted that a number of models also focus on behaviour control issues. Thus, a similarity between control beliefs in the TPB and perceived barriers of the HBM can be noted. More recent models have sought to outline the variables that are important in the volitional phase of health behaviour (Conner and Norman, 2005). In particular, these models emphasize the need for individuals to deploy a range of self-regulatory skills and strategies to ensure that strong intentions are translated into behaviour. The models (TRA, TPB, TAM, UTAUT and SCT) include an intervening variable which is seen to mediate the relationship between other factors and behaviour. These models use intention and or usage as the main dependent factor. Technology adoption models like TAM, TRA, TPB and IDT tend to treat the technology adoption decision as static and each decision is viewed in isolation. However, according to Brandyberry (2011) there are believes that real world organizational adoption decisions are affected by previous decisions and outcomes and that the parameters treated as static are actually dynamic.

2.4 Mobile Health Information Systems

There are many studies on the HIV problem and different methods have been proposed to solve the problem. All these methods can be classified into two main groups: biomedical approach, which involves research studies in the fields of medicine, chemistry and nano-science and non-biomedical approach, which involves the use of ICT to reduce the spread of HIV. The second approach is immediately relevant to this study and we shall endeavour to review previous studies in this direction in an attempt to identify an existing gap.

The president of the United States of America (USA) funded a mobile phone based project called Phones for Health, which resulted in the development of a mobile application system to reduce the spread of HIV/AIDS in Sub-Saharan Africa. This system is used by nurses and other healthcare practitioners to capture health data through a normal mobile telephone interface. The data is made immediately available to health authorities via the internet (Abbott and Coenen, 2008). However, this system only serves the practitioners' purpose of data capturing for decision making and is not suitable for information sharing. A company in India called ZMQ Software Systems has developed a number of games on HIV awareness for mobile phones (Ghosh, 2007). But the major problems with the mobile games are (a) it is sports based, so to a person who does not like or understand the sporting, such applications are irrelevant, (b) some people categorise games as something for leisure not for learning and (c) they do not offer up to date information on HIV.

In South Africa, Cell-Life, a Non-Governmental Organization (NGO), in collaboration with Vodacom, a mobile phone company, have developed a mobile phone application used by counsellors for monitoring treatment and health status of HIV patients (Lucas, 2008). This mobile application suffers from the same disadvantages with the Phones for Health mobile application early discussed. Apart from reducing HIV in South Africa, patients with Tuberculosis (TB) are reminded via mobile phone text messages to take medication at pre-determined times by a company called On Cue (Lucas, 2008). Another mobile application by Metropolitan Foundation South Africa (MFSa) is called Bthefuture. It is a cell-phone book that delivers information on HIV (Metropolitan Foundation, 2009). Its main disadvantages are (a) poor design, it is just a cell book, (b) offers static content, and (c) does not cover information on HIV/AIDS prevalence rate and statistics. Other mobile health information system includes project maseluleke and Text to Change (Leach-Lemmens, 2009).

CHAPTER 3

RESEARCH METHODOLOGY

The methodology of this study consists of a sequence of steps to be performed to validate the research hypotheses. First, a research model based on goal-based decision making core model (Bagozzi, 2006; Bagozzi, 2007) is introduced for testing the hypotheses. Second the design of a mobile information system (YOHAMIS) to disseminate HIV information is presented. Third, youth respondents who were in a survey were presented with a set of goals related to HIV prevention and a set of actions that can be used to reach a goal. The motive was to allow respondents express preferences for preventive actions that can be used to reach their goals. Fourth, the dataset generated from the survey was analyzed using Partial Least Square (PLS) analytic modelling technique to determine the predictive power of the research model. The PLS bootstrap procedure implemented in SmartPLS 2.0 was used to examine interaction effects on relationship between PBC and action intention.

3.1 Research Model

This study develops a research model to predict youth preferences for HIV preventive actions based on the decision making core model (Bagozzi, 2007). The decision making core is a latest individual-level consumer behaviour theory that can be used to represent the decision making process behind technology adoption. Extant research explains that predicting user adoption of a technology is based on the user's perceptions of the technology (Ha *et al.*, 2007; Jung *et al.*, 2009; Kuo and Yen, 2009). However, simply focusing on user perceptions of a technology is not sufficient (Zhou *et al.*, 2010). Bandwagon effect, criticality of tasks performed and significance of function performed by a technology can have significant impacts on technology adoption among people. HBM argues that predicting health related behaviours will depend on the belief or attitude of an individual. This belief might include perceived susceptibility, perceived seriousness, perceived benefits and perceived barriers to take an action. The developed integrated model based on decision making core shown in Figure 3.1 was used to predict youth preferences for HIV preventive actions. These actions are identified to be the use of condoms contraceptive and the use of mobile phone technology to access relevant health information. Furthermore, the developed model was used to examine gender differential in youth preferences for HIV preventive actions.

The research model of this study is based upon the decision making core, which presents five central elements that constitute the heart of consumer decision making with regard to goal striving (Bagozzi, 2006). These elements are goal desire, goal intention, action desire, action intention and self-regulation. They represent fundamental universal processes because they address the essential decision making processes that occur in most user acceptance situations. The decision making core model defines a new and unified approach in explaining technology adoption (Bagozzi, 2007) and captures the basic stages in decision making.

3.1.1 Importance of Desires in Decision Making

Previous studies have indicated that action intention and technology adoption have a strong relationship and that action intention can be used to predict the actual usage of a system (Huang, 2010). Accordingly, action intention predicts technology adoption. However these studies do not show the reasons for goal attainment to be transformed into actions (Bagozzi *et al.*, 2003). The decision making core postulates that if an individual has the desire to attain a goal, it will lead to the formation of a goal intention. In a study of effortful decision making and enactment by Bagozzi *et al.* (2003), desire was found to be a central impetus for the formation of action but has received less attention from action intention studies. It has been suggested therefore that desire is a necessary antecedent of the decision maker's intentions (Bagozzi *et al.*, 2003).

3.1.2 Action Intention

This study refers action intention as an individual's decision or plan to achieve a goal or perform an action by him/herself alone. This type of intention is often referred to as personal intentions (I-intention). For example, "I intend to perform the actions necessary to achieve my health related goals". Collective intention (group and social decision making) is based on discussions in the philosophy on plural subject theory Bagozzi (2005). One kind of collective intention is actually a personal intention to do something with a group of people or to contribute to, or do one's part of, a group activity. This study examines individual's intention to adopt HIV preventive actions which is an i-intention rather than collective intention.

3.1.3 Action Desire

An action desire moderates the effects of goal desire on action intention. It is responsible for transforming reasons and motives for choosing a goal and the goal intention into an implementation intention (Bagozzi, 2000). Hence this study postulates that action desire will transform youths HIV goals into intention to adopt HIV based preventive actions. Action desire reflects how strongly the decision maker wants to enact specific goal-directed behaviour(s). Action desires are caused by goal intention and are antecedents to the implementation intention of the decision maker.

3.1.4 Perceived Behavioural Control (PBC)

This factor has its origin in the TPB; it reflects the decision maker's sense of control over performing the chosen actions and contributes to the selection of actions in pursuing the goal associated with such actions. In this study, action refers to technology based HIV preventive actions. PBC functions at a lower level of abstraction in the decision making hierarchy. It is primarily cognitive, rather than motivational, in its functioning (Manstead and Eekelen, 1998; Dholakia *et al.*, 2007). PBC incorporates aspects of self-regulation and was posit to function in parallel with action desire in influencing action intention in effortful decision making and enactment theory. In determining adoption of technology, actual behavioural control is self evident. The resources and opportunities available to the youth to adopt and use HIV prevention actions must to some extent dictate the likelihood of adopting and using the technology. But of more interest is the perception of behavioural control (PBC) and the impact it impose on intention (Ajzen, 1991). Bagozzi *et al.* (2003) found PBC to be a proximal antecedent to action desire and action intention. According to literature PBC influences intention and predict behaviour directly. Moreover, according to Bagozzi *et al.* (2003) PBC is a proximal antecedent to plan enactment and implementation desire.

3.1.5 Subjective Norms

Subjective norms capture the interpersonal aspects of behaviour, and reflect the impact of directly felt expectations from other people which are largely based on the need for approval (Zeelenberg, 1999; Bagozzi *et al.*, 2003). This study finds it important to differentiate between

social normative influence and role of group norms as suggested by (Negahban, 2008). Social normative also called subjective norms influence is defined as the need for approval, acceptance, or fear of reprisal from important people around an individual to adopt perform HIV preventive actions, while group norm functions differently from compliance and works in group context (Negahban, 2008). Subjective norms influence intention only to the extent that leads to a desire to act as shown in Figure 3.1.

3.1.6 Attitude

TPB suggests that attitude and subjective norms influence decision making. Attitude is believed to arise through learning, whereby a person acquires a reaction to an action over a period of time, and, once learned, the attitude can be triggered automatically when one is exposed to the action or thinks about it (Bagozzi *et al.*, 2003). Attitude reflects reason for acting, and focuses on what the decision maker does or can do as means to attain goals (Bagozzi *et al.*, 2003). Attitude is relatively stable overtime and function by thoughts about, or exposure to the relative means. From the TRA attitude was found to be predictor of action intention.

3.1.7 Goal Intention

Goal intention is a self-commitment to strive towards attaining a desired end state and is stimulated by a goal desire. Goal intention implies that through various decision-making processes, the individual has chosen one goal (HIV related goal) and is committed to attain it. Such a goal intention corresponds to an adoption decision for goals in image theory and is consistent with the theory of goal-setting (Bagozzi *et al.*, 2003). TRA and TPB suggest that goal intention has a direct effect on behaviour. However, in a study on the determinants of self-monitoring of blood glucose (SMBG) in patients with diabetes using SEM analysis method, goal intention did not independently and directly affect behaviour. Instead, the impact of goal intentions on behaviour was indirect and mediated by action desire and action intentions (Nadkarni *et al.*, 2011).

3.1.8 Goal Desire

Goal desire implies a commitment to strive to attain a goal which in this study it refers to HIV goals. It represents the necessary condition for the decision making process to proceed to goal choice in the motivated functioning of the decision maker (Bagozzi *et al.*, 2003). Antecedents to goal desire consist of the goal setting process and psychological reactions as anticipated emotions (Bagozzi *et al.*, 2003) as shown Figure 3.1. In a study of goal striving and decision enactment goal desire was found to have a significantly influence on goal intention (Bagozzi *et al.*, 2003).

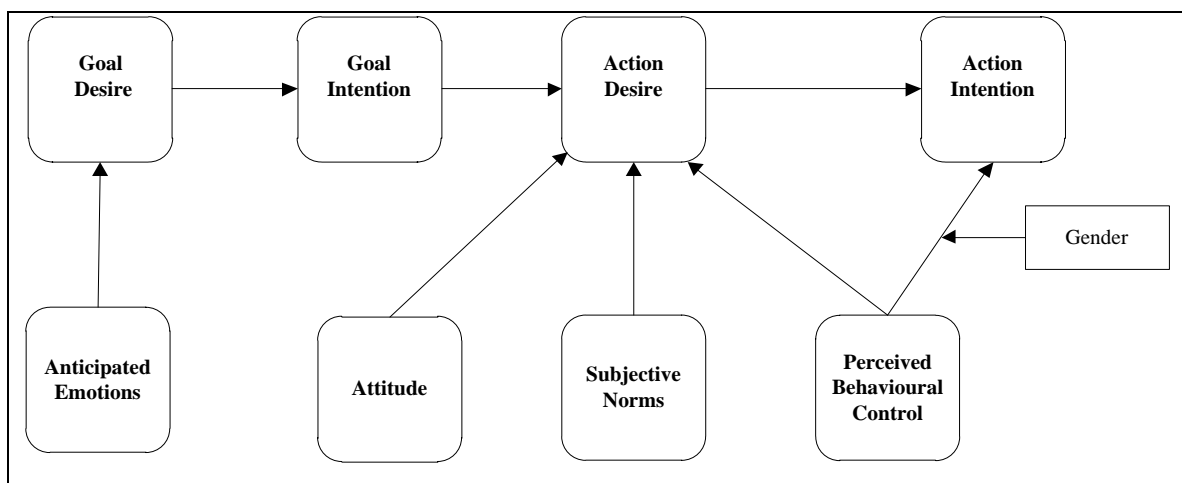


Figure 3.1: Research model

3.1.9 Anticipated Emotions

An anticipated emotion is the notion of hope for success and the fear of failure. It represents an important way in which emotions determine what decision makers choose, and how they choose it (Zeelenberg, 1999; Bagozzi *et al.*, 2003). It is consistent with the idea of prospect-based emotions elicited by events. Anticipated emotions have been studied by Ordonez *et al.* (1999) and they showed that emotions influence the pre-screening process of decision making prior choice. However, previous frameworks focus on events that have already occurred but do not deny the possibilities of anticipatory emotions (Bagozzi and Pieters, 1998). Anticipated emotions can be negative or positive, most researched focused on negative anticipated emotions, however, Bagozzi *et al.* (2003) on their study on how effortful decision get enacted revealed that negative anticipated emotions significantly influence goal desire whereas positive anticipated emotions had no significantly influence.

3.1.10 Interaction Effect

Literature review on TAM, TPB, and TRA reveals that the group, culture, and social aspects of technology adoption are not considered in any of these models as one of their shortcomings (Bagozzi, 2007). As indicated by Negahban (2008), group, cultural, or social aspects of decision making has not been thoroughly considered in technology adoption studies. In order to integrate these aspects into technology adoption Bagozzi (2007) recommends the inclusion of subjective norms in technology adoption model and in addition this study included gender as a moderating factor. Studies on gender differential often required reference to age (Venkatesh *et al.*, 2003). However, this study did not consider age as being critical because youth members are in the same age group of 15-24 years with about 88% of them in the age group of 20-24 years. Figure 3.1 shows the structural model of the factors influencing decision making towards performing HIV preventive actions.

There is evidence to suggest that constraints to technology use is more salient to women, who are more aware of the constraints setting put on them (Venkatesh *et al.*, 2000) as compared to men. But men assign more importance to the analysis of the information required to carry out the decision and to the definition of the goals of the decision. Therefore, this study hypothesized that:

H1 – The predictive power of a decision making core technology adoption model used to examine youth preferences for HIV preventive actions will be higher for male youth.

H2 – The relationship between PBC and action intention will be moderated by gender such that the effect is stronger for male youth.

H3 – The relationship between PBC and action intention will be mediated by action desire factor such that the effect is stronger for male youth.

H4 – The order of importance in factors influencing youth preferences for HIV preventive actions will statistically differ depending on gender.

H5 – There will be gender difference on the selection of goals and actions by the youths.

The developed research model shown in Figure 3.1 includes some of the factors used by the theoretical model of effortful decision making and enactment, TRA and TPB. However, the strength of the developed model lies in the fact that it examines not only the decision making or

the goal intention component of the decision process and its antecedents but it also considers the processes involved in transforming an intention into action and ultimately goal achievement (Nadkarni *et al.*, 2011). Considering that the developed model share common factors with TRA and TPB, it is reasonable to compare its predictive power with these models to determine its superiority.

3.2 Mobile Information System (The YOHAMIS)

The YOHAMIS mobile phone based software was developed in this study as an experimentation system for youth to access HIV information. The system disseminates static and dynamic information contents on HIV. A static content does not change overtime and it is built into YOHAMIS to minimize information access cost. A dynamic content changes overtime with the support of a back end MYSQL database management system. The database is used by information providers to feed latest information on HIV. In order to access dynamic contents in YOHAMIS, users will have to pay for internet connection. For this cost demand, we implemented about 90% of YOHAMIS contents to be static. The information provided by the system is organized in four categories of a) HIV/AIDS prevalence, b) use of condom, c) ratio of school attendance of orphans to school attendance of non-orphans aged 10-24 years and d) proportion of the population aged 10-24 years with comprehensive HIV knowledge (Baliamoune-Lutz, 2010). See Appendix A for some screen snapshots.

In addition, the experimentation system has three main functionalities a) interaction forum accessible to only authenticated users, b) news feed to provide updated news on HIV and c) settings to allow users to customize the system. The interaction forum and news feed functionalities require a mobile phone to have internet connectivity. The data used to populate YOHAMIS database were collected from different online trusted sources. For examples, Joint United Nations Programme on HIV/AIDS (UNAIDS) report on the global aids epidemic in South Africa (UNAIDS, 2010) and HIV/AIDS epidemiological surveillance report for the World Health Organization (WHO) African region 2007 update (WHO, 2009) . The data were customized and presented in a simple language format to make contents appealing to youth. The system was deployed on Nokia 5230 and Nokia N97 mobile phones. However, we could not install the system on the mobile phone of an individual respondent because of financial constraint to procure many mobile phones for the experimentation. Instead, using Cute (Qt)

emulator, which is a resemblance of a Nokia N900 for Maemo or the N97 for Symbian mobile phone, the system was simulated for all respondents on personal computers available in their school computer laboratories (See Appendix B).

Existing HIV mobile information systems such as a) On Cue (Lucas, 2008), b) Bthefuture (Metropolitan-Life, 2009), c) Text for Change (Leach-Lemens, 2009) and d) Project Masiluleke (Leach-Lemens, 2009) could not suite our purpose. Their limitations include a) being healthcare practitioner based and not youth oriented, b) relying on mobile phone message that is limited to less than 160 characters and c) not providing current information on HIV. For these reasons, we have developed YOHAMIS as an intervention tool to help in the global realization of millennium development goal of reducing the spread of HIV prevalence among youth of the population aged 10-24 years (Kaplan, 2006). Moreover, according to Beals and Bers (2009) youth have personal, social and cognitive differences from adult. This implies that systems that are specifically developed for adults or general usage may not easily adapt to the specific context of youth.

3.3 Measures

Two different survey instruments were used to elicit data for this study. The first survey sorts to find out the acceptance of YOHAMIS as an HIV information disseminating tool by the youths using four items measured on a 5 point likert scale of 1 to 5. The second survey had 26 measurement items and two sections A and B. Section A was designed to reflect demographic information such as age, gender, experience with mobile phone, residence and the university where respondents were enrolled at, whereas Section B focused on conceptual measures of our SEM. In Section A, respondents were asked to provide their demographic information and select their HIV related goals and the actions they would need to perform in order to achieve these goals. In Section B, respondents were asked to answer simple objective questions in relation to the selected HIV goals and actions. For a complete list of survey items, please refer to Appendix C.

The factors of the research model were measured using a survey method, wherein youth respondents were asked to answer objective questions in relation to their preferences for HIV goals and actions. Respondents were allowed to simultaneously express preferences for more than one goal and one action. Goals were introduced with the statement “which of the following best describe your health related goals?” Response alternatives were (GL1) “to avoid being HIV

infected throughout my life time”, (GL2) “to avoid being killed by HIV in my life time”, (GL3) “to avoid being a transmitter of HIV throughout my life time”, (GL4) “to contribute towards building an HIV free society” and (GL5) “I have no health goals related to HIV”.

Depending on the goals that respondents had chosen, they were asked to select the actions necessary to achieve those goals. Actions were introduced with the statement “which of the following actions will you undertake to achieve your health related goals?” Response alternatives were (AC1) “I will abstain from casual sex to achieve my health related goals”, (AC2) “I will use condoms during sexual intercourse to achieve my health related goals”, (AC3) “I will not share toothbrush and haircuts to achieve my health related goals”, (AC4) “I will use mobile technology to access HIV information to keep me informed on how to achieve my health related goals”, (AC5) “I will promote the use of HIV mobile technology to provide preventive guidelines to achieve my health related goals” and (AC6) “I will share relevant information about HIV using mobile technology to achieve my health related goals”.

3.3.1 Goal Desire

The factor of goal desire was measured by three measurement items. The first item sought response to the statement, (GD1) “my desire to reach my health related goals can best be described as” and a seven-point scale is used with the response alternatives “no desire at all”, “very weak desire”, “weak desire”, “moderate desire”, “strong desire”, “very strong desire”, “very very strong desire”. The second item was worded as (GD2) “I feel an urge or need to attain my health goals I have chosen”. A seven-point scale was used, anchored by “does not describe me at all”, “does not describe me very well”, “does not describe me”, “describe me moderately well”, “describe me”, “describe me well” and “describe me very well”. The third item read, (GD3) “my overall wish to attain the goal I have chosen can be summarized as follows” and the provided response alternatives were, “no wish at all”, “slight wish”, “moderate wish”, “strong wish” and “very strong wish”.

In addition to these three items, the factor of anticipated emotions was also used to measure goal desire. Anticipated emotions refer to prefactual processes whereby a consumer considers how they would feel if they were to achieve a goal (anticipated positive emotion) and how they would feel if they failed to achieve a goal (anticipated negative emotion) (Bagozzi and Pieters, 1998). The factor of anticipated emotions represents an important way in which

emotions determine the actions that decision makers choose to perform (Zeelenberg, 1999; Bagozzi *et al.*, 2003). Anticipated emotions were measured with items of positive anticipated emotions. The scale for positive anticipated emotions were introduced with “please take a moment to consider how you would feel if you were to succeed to achieve your health related goals.” Respondents were asked to express the felt intensity of each emotion presented using the subjunctive condition, (PA1) “if I succeed to achieve my health related goals, I will feel”, seven positive emotions were excited, delighted, happy, glad, satisfied, proud and self-assured.

3.3.2 Goal Intention

The factor of goal intention was measured using a single item, seeking a response to the statement (GI1) “I feel certain that I will be able to attain my health related goals”. A seven-point scale anchored “does not describe me at all”, “does not describe me very well”, “does not describe me”, “describe me moderately well”, “describe me”, “describe me well” and “describe me very well” was used to measure goal intention.

3.3.3 Action Desire

The factor of action desire was measured by three items that were introduced with the directive “please express the overall strength of your desire to perform the actions necessary to achieve your chosen health related goals”. The first item (AD1) was “my desire to perform the actions necessary to achieve my goals can best be expressed as” and a seven-point scale similar to the first item for goal desire was used. The second item (AD2) sought agreement with “I want to perform the actions necessary to achieve my goals” on a seven-point anchored “strongly disagree”, “moderately disagree”, “slightly disagree”, “neither disagree nor agree”, “moderately agree”, “slightly agree” and “strongly agree” was used to measure this item. The third item (AD3) sought response to “my overall wish to perform the actions necessary to achieve my goals can be summarized as follows” and response alternatives were “no wish at all”, “slight wish”, “moderate wish”, “strong wish” and “very strong wish”.

In addition to measuring action desire with three items, factors of attitude, subjective norms and PBC were also used for the measurement. The theory of planned behaviour suggests that attitude, subjective norm and PBC do influence the process of decision making. These factors have been found to be strong determinants of behaviour (Ajzen, 1991; Armitage and

Conner 2001). Attitudes are believed to arise through learning, whereby a person acquires a reaction to an action over a period of time and once learned the attitude can be automatically triggered when one is exposed to the action or thinks about it (Bagozzi *et al.*, 2003). A subjective norm is the influence that is based on the need for approval, acceptance, bandwagon effect or fear of reprisal, while group norm functions differently from compliance and works in group context (Kelman, 1974). The factor of PBC reflects a sense of control by a decision maker over performing the chosen actions. It is primarily cognitive and contributes to the selection of actions in pursuing a goal (Manstead and Eekelen, 1998; Dholakia *et al.*, 2007).

The factor of attitudes were assessed by asking the respondent to react to the statement (AT1) “on the following scale, please express your attitudes towards performing the actions necessary to achieve your health related goals”, one seven-point semantic differential scale of bad (1) - good (7) was used to measure attitude. Subjective norms were measured with two seven-point items and were introduced with the directive “please express how strongly most people who are important to you feel you should or should not perform the actions necessary to achieve your health related goals.” The first item (SN1) stated “most people who are important in my life think I should perform the actions necessary to achieve my health related goals”. Seven-point scale anchored “extremely unlikely”, “strongly unlikely”, “slightly unlikely”, “likely”, “most likely”, “strongly likely”, “extremely likely” was used to measure subjective norms. The second item (SN2) was phrased “most people who are important to me would approve me performing the actions necessary to achieve my health related goals”. These items are frequently used to measure subjective norms (Ajzen, 1991; Bagozzi *et al.*, 2003). PBC was measured with a single item (BC1) asking “how much of control do you have over performing the actions necessary to achieve your goals?” The scale was anchored with “no control”, “moderate control” and “total control”.

3.3.4 Action Intention

The factor of action intention was measured using three items. The first item (AI1) stated “the strength of my actual intention to perform the chosen actions necessary to achieve my health related goals can best be described as” a six-point scale was used with response alternatives labeled, “no intention”, “very weak intention”, “weak intention”, “moderately strong intention”, “strong intention” and “very strong intention”. The second item (AI2) stated “I intend to perform

the actions necessary to achieve my health related goals” and had five response alternatives labeled “no chance at all”, “highly unlikely”, “neither unlikely nor likely”, “likely” and “highly likely”. The third item (AI3) stated “I feel the need to perform the actions I have chosen to achieve my health related goals” and a seven-point scale similar to the first item for goal intention was used. In addition to the three items used to measure behaviour intention, PBC was also used.

3.4 Profile of Respondents

The data for this study was obtained by a survey that was administered to high school and undergraduate students aged 10-24 years. The respondents are presumed to be attending high schools or tertiary institutions which serve as a better source of respondents as the youth showed cooperation and enthusiasm interacting with computer and mobile technologies. Therefore, respondents were from Sibusiwe Comprehensive High School, Siyabonga High School and Durban University of Technology located in KwaZulu-Natal province and Tshwane University of Technology in Gauteng province of South Africa. HIV prevalence is a major public health problem among South African youth (MacPhail *et al.*, 2009). The number of new HIV infection in South Africa is reported to be at 34% for youth (Rehle *et al.*, 2007). The educational setting seems to be a social entity for transmission of infectious disease among youth who mostly enjoy freedom of socialization and are not under rigid parental and university management controls (Jahanfar *et al.*, 2009; Muhammad and Shanaz, 2012).

The KwaZulu-Natal province is the largest and mostly affected by HIV among the nine provinces in South Africa. The population of this province is about 11 million out of 50 million population of South Africa. The Tshwane University of Technology is the largest Campus University in South Africa with over 65,000 students. The targeted age group of respondents was 10 to 24 years to contribute to achieving health millennium goal. Overall, 470 surveys were distributed to the sampled high schools (60 per school) and universities (175 per university) out of which 457 were returned. Among the returned surveys, 37 were unusable because 8 had cases of missing data, 15 had cases of respondents not having HIV related goals and 14 had cases of over age respondents. Teachers and lecturers from the participating school and universities assisted the researchers to administer the survey and this yielded a high response rate of about 97%. Out of the 215 surveys obtained for men, 10 were randomly selected and excluded from

analysis resulting into equal number of 205 surveys used for male and female youth. Hence, 118 pupils and 292 students' with equal number of male and female responses were used for data analysis to avoid biasness that can occur as a result of different data sample sizes being used for male and female respondents.

Table 3.1: Profile of respondents (N=292)

Characteristic	Content	Frequency (%)
Age of respondent	10 – 14 years	0 (0.0)
	15 - 19 years	35 (12.0)
	20 - 24 years	257 (88.0)
Gender of respondent	Male	146 (50.0)
	Female	146 (50.0)
Experience with mobile phone	Less than 6 months	5 (01.7)
	6 months to less a year	13 (04.5)
	1 year to 2 years	14 (04.8)
	Greater than 2 years	260 (89.0)
Own a mobile phone	Yes	288 (98.6)
	No	4 (01.4)
Environment of stay	Township	100 (34.2)
	Urban	66 (22.6)
	Rural	126 (43.2)
University of study	Durban University of Technology	187 (64.0)
	Tshwane University of Technology	105 (36.0)

High school responses were used to determine if the youth would accept to use a mobile information system to access HIV information as compared to university respondents who were used to validate the research model of this study since they are deemed matured to make better judgment on their HIV goals and actions. Table 3.1 shows the analysis of demographic data for university respondents. The results reflect that no respondents in the age group of 10-14 years, 12% of respondents were in the age group of 15-19 years and 88% respondents were in the age group of 20 to 24 years. About 89% of respondents had more than 2 years of experience using mobile phones. Only 1 respondent did not own a mobile phone. Respondents were asked to select the type of human settlement they reside. In all, 43.2% respondents were from urban

environment, 34.2% were from township areas and 22.6% were from rural areas. There were sufficient representations from different human settlements.

3.5 Data Analysis

There are a number of techniques that can be used to analyze relationships between model factors, each with its own merits and requirements. These techniques include MRA, FA, PA and SEM. The SEM analytic modelling technique is able to handle measurement errors when compared to MRA, which assumes that measurements are freed of error and sample data are of normal distribution (Chin *et al.*, 2003). In this study, it is assumed that sample data collected are of unknown distribution because measurements are based on subjective perception of respondents.

SEM techniques can be classified into covariance based SEM, which is implemented by AMOS software and component based SEM, which is generally called Partial Least square (PLS) that is implemented by SmartPLS software. Covariance based SEM requires that sample data under study be of normal distribution. In contrast, PLS makes no assumption about data distribution, so it can effectively work with unobservable factors and it takes measurement errors into consideration (Aibinu and Al-Lawati, 2010). Hence, PLS would appear to be superior to covariance based SEM because of its generality. PLS is certainly gaining more popularity as an alternative to covariance based SEM because of its ability to handle heterogeneous data with a small sample size (Rigdon *et al.*, 2010).

3.5.1 Reliability and Validity

Reliability was measured by the estimate of internal consistency and composite reliability. Individual item reliability is the extent to which the measurements of factors measured with multiple-item scale reflects the true score of the factors relative to the error (Hulland, 1999; Aibinu and Al-Lawati, 2010). Internal consistency of a factor estimates how consistently individuals response to the items within a scale (Shin, 2009). Composite reliability is a measure of the overall reliability of a collection of heterogeneous, but similar items (Roca *et al.*, 2009). Composite Reliability (CR) is estimated in terms of the outer loading of an item λ_i to represent correlations between item and factor and is calculated as (Henseler *et al.*, 2009):

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum (1 - \lambda_i^2)} \quad (1)$$

Internal consistency is calculated for the number of model items (N) and mean inter-correlation among items (\bar{r}) using Cronbach alpha (α). The Cronbach alpha measures how well a set of items or factors measures a single unidimensional factor and is calculated as (Cronbach, 1951):

$$\alpha = \frac{N - \bar{r}}{1 + (N - 1) - \bar{r}} \quad (2)$$

Validity was measured by the estimate of convergent validity and discriminate validity of model factors. Validity tells whether a measuring instrument measures what it is supposed to measure in the context in which it is applied (Raykov, 2011). Convergent validity is the extent to which items of a factor represent the same factor (Fornell and Larcker, 1981). Discriminate validity indicates the extent to which a given factor differs from other factors (Pahnila and Warsta, 2010). Convergent validity is measured by Average Variance Expected (AVE), which is calculated to determine the amount of variance that a factor captures from its measurement items and is calculated as (Henseler *et al.*, 2009):

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum (1 - \lambda_i^2)} \quad (3)$$

Discriminate validity is measured by calculating the Pearson product moment correlation between all pairs of factors. The Pearson product moment correlation r between factors x and y with means \bar{x} and \bar{y} respectively is calculated as (Spiegel, 1972):

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}} \quad (4)$$

3.5.2 Model Predictive Power

The coefficient of determination (R^2) of a dependent factor is the criterion often used to assess the predictive power of a research model. R^2 is the amount of variance in a dependent factor that is explained by the research model and is computed as (Cornell and Berger, 1987):

$$R^2 = 1 - \frac{\sum (y_i - \hat{y})^2}{\sum (y_i - \bar{y})^2} \quad (5)$$

Where y_i is the i^{th} observation of the dependent factor, x_i is the value of the independent factor at which y_i is observed, \bar{y}_i is the predicted responses at each point x_i obtained with a fitted regression equation and \bar{y} is the mean of y_i . R^2 values of 0.67, 0.33 and 0.19 are respectively considered to be substantial, moderate and weak (Chin, 1998). In addition, R^2 values can be analyzed to determine whether they are statistically significant from zero using F-test (Aibinu and Al-Lawati, 2010):

$$F = \frac{R^2(N - M - 1)}{M(1 - R^2)} \quad (6)$$

Where N is the total number of sample size, M is the number of independent factors and M and (N-M-1) are degrees of freedom. In the situation where the R^2 has to be compared to an arbitrary point, the effect size approach Equation (7) has to be applied.

3.5.3 Moderating effect

The test for moderating effect can be assessed by determining its strength or effect size and then testing for its significance. The effect size f^2 is calculated in terms of $R^2(i)$ with moderating effects and $R^2(e)$ with main effects as (Helm *et al.*, 2010):

$$f^2 = \frac{R^2(i) - R^2(e)}{1 - R^2(i)} \quad (7)$$

The effect size is considered large, medium and small if greater than 0.35, 0.15 and 0.02 respectively (Cohen, 1988). The significance of the effect size is tested using the F-test as (Aibinu and Al-Lawati, 2010):

$$F = (f^2)(N - M - 1) \quad (8)$$

3.5.4 Mediating Effect

The test for significance of a mediating effect induced by a factor F3 on relationship between two factors F1 and F2 is based on the path coefficients of indirect relationships from F1 to F3 and F3 to F2. Let these path coefficients be denoted by (a) and (b) with their corresponding standard errors (s_a) and (s_b) respectively. The test for significance can be performed using z-statistics (z) defined as (Sobel, 1982):

$$z = \frac{a * b}{\sqrt{b^2 * s_a^2 + a^2 * s_b^2}} \quad (9)$$

The mediation effect size can be estimated using the Variance Accounted For (VAF) that represents the ratio of interaction effect to main effect. The VAF is computed for path coefficient (c) of direct relationship from F1 to F2 and path coefficients a, b as (Helm *et al.*, 2010):

$$VAF = \frac{a * b}{a * b + c} \quad (10)$$

CHAPTER 4

RESULTS AND DISCUSSION

This chapter reports on both experimental and empirical results of this study and further provides a detailed discussion about the implication of the results.

4.1 Results

The results of this study are presented in three themes. First, youth's willing to adopt mobile information system to access HIV information is determined. Second, the results of the research model's predictive power are presented. Third, gender differential results in (a) predictive power of the research model, (b) moderating effect, (c) action desire mediating effect, (d) ranking of model factors that predict youth preferences for HIV preventive actions and (e) HIV goal-action selection pattern are presented. Fourth, comparison results of the research model's predictive power with TPB and TRA are presented.

4.1.1 Willingness to Adopt Mobile HIV Information Systems

A one sample t-test analysis was used to determine the willingness of youths to adopt mobile information system to access HIV information. Mean score of items measuring youth willingness to adopt YOHAMIS is used for this purpose. If the mean score is at least 4 on likert scale of 1 to 5, it is assumed that youths are willing to adopt mobile information systems to access HIV information. The mean of willingness to adopt mobile information systems to access HIV information and t-values and significance are computed. This result shows that both male and female youths are willing to adopt mobile systems to access HIV information and at the same level. This is because their mean scores (3.90 and 3.91 respectively) of willingness of youth to adopt mobile system is not significantly ($p = 0.23$ and $p = 0.26$ respectively) different from 4 threshold value and is not significantly different from each other.

4.1.2 Predictive Power of Research Model

The predictive power of the research model of this study was determined after the estimation of model quality, which was assessed in terms of reliability and validity metrics. Equations (1) to (4) can manually be used for this purpose. However, to achieve greater efficiency, Confirmatory Factor Analysis (CFA) was performed using SmartPLS Version 2.0 software to test the quality

of research model of this study. For the CFA analysis, all measured items were specified as reflective indicators of their corresponding factors and each factor was allowed to co-vary freely with all other factors. The raw dataset was used as input to the PLS software and path significances were estimated using the bootstrapping re-sampling technique with 500 sub-samples.

4.1.2.1 Reliability and Validity

Convergent validity of scale items was assessed using three important criteria (a) all item factor loadings should be significant and exceed 0.50 (Hair *et al.*, 2006; Pahnla and Warsta, 2010), (b) composite reliability for each factor should exceed 0.70 (Pahnla and Warsta, 2010) and (c) average variance extracted for each factor should exceed 0.50 (Fornell and Larcker, 1981; Bhattacharjee and Sanford, 2009; Pahnla and Warsta, 2010). Table 4.1 shows the result of CFA, wherein it can be seen that factor loadings were significant at p at 0.05 and exceeded 0.50, with a minimum loading of 0.65 for action desire item AD2.

Table 4.1: Confirmatory factor analysis

Scale item	Item mean	Item standard deviation	Item loading
AD1	2.56	1.362	0.79
AD2	2.07	1.723	0.65
AD3	2.03	0.828	0.85
AI1	2.17	0.91	0.85
AI2	1.88	0.81	0.70
AI3	2.64	1.162	0.66
AT1	5.94	1.167	1.00
PA1	1.47	0.52	1.00
GD1	2.34	1.259	0.76
GD2	2.74	1.422	0.76
GD3	1.88	0.824	0.75
GI1	2.83	1.284	1.00
BC1	2.98	1.961	1.00
SN1	2.43	1.396	0.94
SN2	2.27	1.419	0.82

Discriminate validity was assessed using the criterion that square root of AVE for each factor should exceed the correlations between that and all other factors (Fornell and Larckers, 1981; Bhattacharjee and Sanford, 2009; Pahnla and Warsta, 2010). Table 4.2 shows the result of scale properties, wherein it can be seen that the highest correlation between any pair of factors in the CFA model was 0.67 (action desire and action intention). This value was lower than the lowest square root of AVE among all factors, which was 0.74 for knowledge. Hence, the discriminate validity criterion was also met for our data sample. Composite reliabilities of all factors also exceeded the required minimum of 0.70, with the lowest value being 0.78 for action intention factor. Furthermore, the smallest AVE value among all eight factors in the CFA model was 0.55 for action intention, which was greater than the desired minimum of 0.50. Hence, all three conditions for convergent validity were met.

Table 4.2: Scale properties

Factor	Inter-factor correlation (discriminate validity)							
	1	2	3	4	5	6	7	8
1. Action desire	1.00							
2. Action intention	0.67	1.00						
3. Attitude	-0.35	-0.37	1.00					
4. Anticipated emotions	0.18	0.09	-0.04	1.00				
5. Goal desire	0.57	0.58	-0.39	0.16	1.00			
6. Goal intention	0.44	0.46	-0.25	0.03	0.50	1.00		
7. Perceived behavioural control	0.38	0.38	-0.23	0.08	0.36	0.30	1.00	
8. Subjective norms	0.26	0.31	-0.16	0.15	0.24	0.13	0.14	1.00
Internal consistency (Alpha)	0.66	0.58	1.00	1.00	0.63	1.00	1.00	0.74
Composite reliability (CR)	0.81	0.78	1.00	1.00	0.80	1.00	1.00	0.88
Convergent validity (AVE)	0.59	0.55	1.00	1.00	0.58	1.00	1.00	0.78

The structural model was estimated after the determination of reliability and validity to assess the predictive power of the research model. The predictive power (R^2) of the main effect model was calculated using Equation (5). Figure 4.1 shows this result wherein goal desire, goal intention, action desire and action intention have R^2 values of 0.02, 0.25, 0.33 and 0.46 respectively. This result suggests that the model fit to data is of acceptable level for action intention ($R^2 = 0.46$). However, before a conclusion can be made, values of R^2 for goal desire,

goal intention, action desire and action intention have to be tested for statistical significant difference from zero using Equation (6). This result shows that for goal desire, $F = 7.43$ and $p\text{-value} = 0.0068$, for goal intention, $F = 49.19$ and $p\text{-value} = 0.0001$, for action desire, $F = 28.17$ and $p\text{-value} = 0.0001$ and finally for action intention, $F = 35.26$ and $p\text{-value} = 0.0001$. This result indicates that R^2 values of 0.02, 0.25, 0.33 and 0.46 are statistically greater than zero, so the model fit to data was statistically significant.

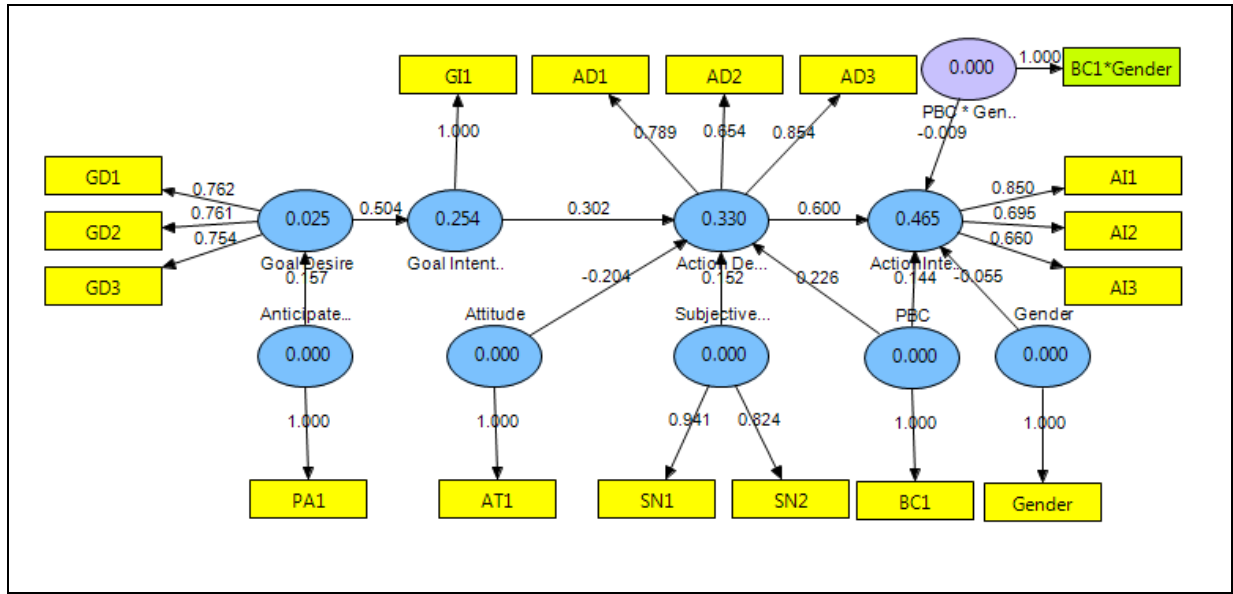


Figure 4.1: Structural model estimation

4.1.3 Gender Differential

Gender differential was assessed using the (a) model predictive power, (b) moderating effect, (c) action desire mediating effect, (d) ranking of model factors that predict youth preferences for HIV preventive actions and (e) HIV goal-action selection pattern.

4.1.3.1 Predictive Power of Research Model

The predictive power of this study's research model was determined with male and female data separately to examine gender differential. R^2 values of goal desire, goal intention, action desire and action intention for male and female were computed using Equation (5). The effect size was calculated for male and female R^2 values using Equation (7). Thereafter the significance of the calculated effect size was determined based on a pseudo F-test using Equation (8). The result

indicates that R^2 for goal desire increased from 0.020 to 0.023 ($f^2 = 0.003$ and $F = 0.85$) when validated with male data as compared to female data. Moreover, for goal intention there was no difference in R^2 values, but for action desire, R^2 increased from 0.326 to 0.390 ($f^2 = 0.104$ and $F = 29.43$) and for action intention, R^2 increased from 0.433 to 0.473 ($f^2 = 0.075$ and $F = 21.56$). The increase in R^2 values of goal desire and goal intention was insignificant as compared to action desire and action intention, which was significant. This result lead to the conclusion that the model predictive power does not depend on gender, so hypothesis (1) was rejected.

4.1.3.2 Gender Moderating Effects

The test for gender moderating effect in the relationship between PBC and action intention was determined by calculating R^2 values for action intention when gender factor was excluded and when it was included. Then the effect size based on these two R^2 values was computed using Equation (7) and tested for statistically significance using Equation (8). Table 4.3 shows this result, wherein the effect size $f^2 = 2.1234$ is insignificant ($F\text{-value} = 0.007$) implying that the relationship between PBC and action intention does not significantly differ depending on gender. As a result there was no need to test for gender differential in the relationship between PBC and action intention because gender factor was not found to be a moderator, so hypothesis (2) was rejected.

Table 4.3: Gender moderating effect analysis

Factor	R^2 included	R^2 excluded	f^2	F
Action Intention	0.465	0.461	2.1234	0.007

4.1.3.3 Action Desire Mediating Effects

In order to test for the significance of action desire mediating effect on relationship between PBC and action intention, the hypothesized causal paths were estimated using Equation (9) for male and female data separately. The action desire mediation effect size was determined using Equation (10). Table 4.4 shows that action desire mediates the relationship between PBC and action intention for male ($z\text{-statistics} = 2.15$, $p\text{-value} = 0.0316$) and female ($z\text{-statistics} = 2.66$, $p\text{-value} = 0.0078$) youth models. However, the effect size of action desire is larger for male youth (68%) as compared to female youth (19%). This means that more than half of the total effect of

PBC on action intention is explained by the factor of action desire for male youth, but only explain 19% for female youth.

Table 4.4: Action desire mediating effect analysis

Model Path	Effect	z -statistic	p-value	VAF
PBC -> Action Desire -> Action Intention	Male	2.15	0.0316*	0.68
	Female	2.66	0.0078*	0.19

*significant

The effect size of action desire on relationship between PBC and action intention was tested for gender differential. In doing so, Equation (7) was used to compute the effect size for male and female and the result was tested for statistical significance using equation (8). The result shows that $f^2 = 0.60$, $F = 175.43$ and $p = 0.0001$. This means that mediation effect of action desire is statistically different depending on gender and is stronger for male than for female youth, so hypothesis (3) is accepted.

4.1.3.4 Ranking model factors

The k-related sample Friedman test was used to select three most important factors that decision makers should consider while making decision in future HIV intervention. Table 4.5 shows this result, wherein factors that the ranked items measured were those selected as important. These factors are for male youth PBC (BC1 = 3.67), action desire (AD2 = 4.98) and goal desire (GD3 = 5.13). Similarly, for female youth these factors are PBC (BC1 = 3.78), action desire (AD2 = 4.45) and goal desire (GD3 = 4.88). The results of the Friedman test generally shows that PBC, action desire and goal desire are three most important factors that decision makers should consider while making decisions in future HIV intervention strategies.

In order to determine whether the Friedman ranks of items is significantly different depending on gender. One-way Analysis of Variance (1-ANOVA) implementation in MATLAB 7.6.0 was used to perform a significance test to compare the means of the item ranking. The result shows that there is no statistically significant difference in main effect induced by gender. The value of $p\text{-value} = 1.00 > 0.01$ gives a very strong evidence that there was no statistically significant difference between male and female youth Friedman ranks hence, hypothesis (4) was rejected.

Table 4.5: Item ranking

Item	Male Mean Rank	Female Mean Rank
AD1	6.94	6.97
AD2	4.98 (2)	4.45(2)
AD3	5.61	5.45
AT1	11.13	11.55
PA1	7.07	7.14
GD1	6.14	6.41
GD2	7.37	7.47
GD3	5.13(3)	4.88(3)
GI1	7.93	7.6
BC1	3.67(1)	3.78(1)
SN1	6.21	6.47
SN2	5.82	6.97

4.1.3.5 HIV Goal-action

This study further looks at how youth selected a set of actions to reach a certain goal. The purpose was to discover whether the selection pattern differ depending on gender. Two-way Analysis of Variance (ANOVA) implementation in MATLAB 7.6.0 was used for this purpose. Table 4.6 shows this result together with the means and standard errors of goal and action. There was significant difference in means of certain goals, $F\text{-value} = 8.99$, $p\text{-value} = 0.0004 < 0.05$ and actions, $F\text{-value} = 5.39$, $p\text{-value} = 0.0018 < 0.05$. However, there was no evidence of gender interaction effect on relationship between goal and action, $F\text{-value} = 0.45$, $p\text{-value} = 0.9445$. Hence hypothesis (5) was rejected.

Table 4.6: Goal-action selection pattern of male (M) and female (F) youth

	Goal								
	G1		G2		G3		G4		
Action	M	F	M	F	M	F	M	F	Mean
A1	31	73	14	34	9	37	31	49	34.75 ± 4.89
A2	84	79	28	41	21	45	59	63	52.50 ± 4.89
A3	29	53	14	32	14	30	23	37	29.00 ± 4.89
A4	37	54	10	31	7	37	20	48	30.50 ± 4.89
A5	18	29	10	18	9	19	23	31	19.63 ± 4.89
A6	26	41	9	25	9	25	24	40	24.88 ± 4.89
Mean	46.17 ± 3.99		22.17 ± 3.99		21.83 ± 3.99		37.33 ± 3.99		

The multiple comparison procedure implemented in MATLAB 7.6.0 was used to determine which pairs of goal and action means are significantly different and which are not. The mean of G1 (46.17 ± 3.99) is the highest when compared to the means G2, G3, G4 and G5. As a result, this study compared the mean of G1 against the means of G2 (22.17 ± 3.99), G3 (21.83 ± 3.99) and G4 (37.33 ± 3.99). Result of the comparison shows that mean of G1 is not significantly different from mean of G4, but it is significantly different from means of G2 and G3. This comparison was extended to the mean of A2 (52.50 ± 4.89) for the same reason that it is the highest. Result shows that mean of A2 is not significantly different from mean of A1 (34.75 ± 4.89), but it was significantly different from means of A3 (29.00 ± 4.89), A4 (30.50 ± 4.89), A5 (19.63 ± 4.89) and A6 (24.88 ± 4.89). The goal factor analysis results generally show that youth, irrespective of gender accepted the action (A2) of using condoms technology during sexual intercourse to achieve their health goal (G1) of avoiding being HIV infected throughout their life time.

4.1.4 Comparison of Research Model with TRA and the TPB

In order to understand the value of our research model, it was important to compare it with the well established technology adoption models, for example TRA and TPB. These models share similar factors with our research model. Both of these models were fitted to the data of this study using SmartPLS 2.0. The predictive power of the models and the effect size of PBC, subjective

norms, and attitude on the predictive power were observed. The predictive power was computed using Equation (5).

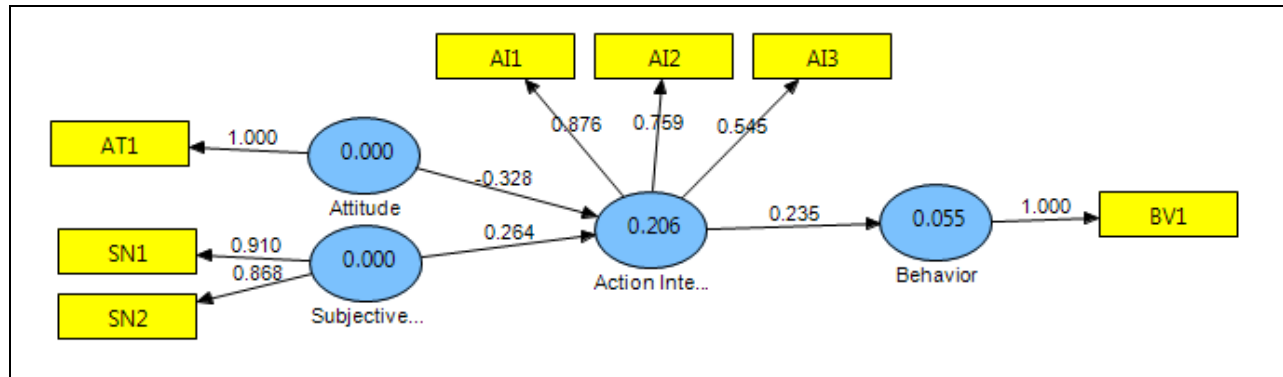


Figure 4.2: Predicting youth preferences for HIV preventive actions using TRA

The result shows that only 20% of the variance in action intention is explained by factors of TRA as shown in Figure 4.2 and 28% by factors of TPB as shown in Figure 4.3. In comparison, the research model of this study explains about 46% of the variation in action intention. This predictive power is of moderate to substantial level as compared to small to moderate level predictive power demonstrated by the TRA and TPB. It can therefore be concluded that the research model developed in this study is superior to TRA and TPB in predicting youth preferences for HIV preventive actions.

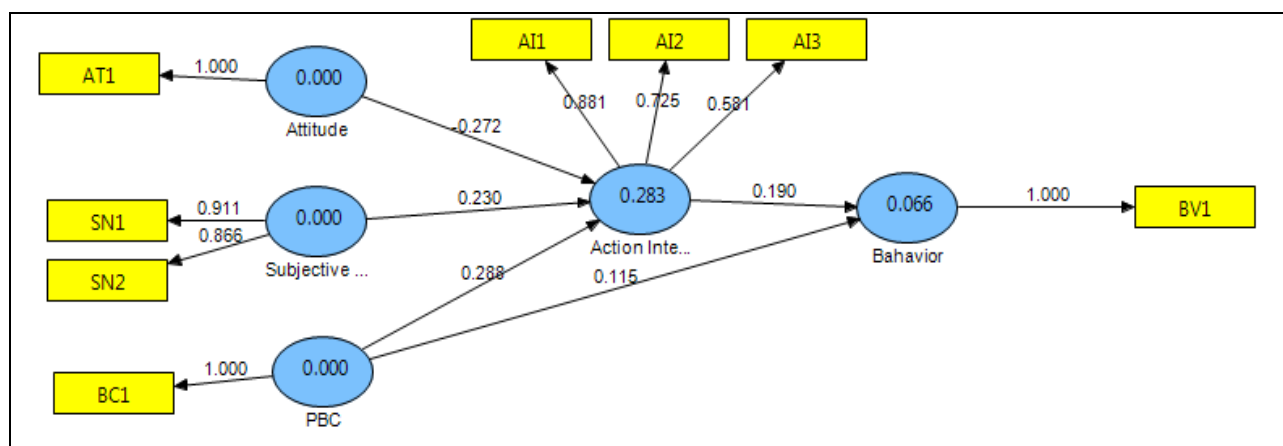


Figure 4.3: Predicting youth preferences for HIV preventive actions using TPB

A further analysis of the predictive power was performed to evaluate the contribution of each independent factor to the predictive power value of the dependent factor (action intention). The effect size of PBC, subjective norms and attitude on the willingness of youth to adopt HIV preventive actions was computed using Equation (7) and all effect sizes were tested for statistical significance using Equation (8). The results are shown in Table 4.7. It can be seen that attitude and subjective norms had a negative effect size on action intention to adopt HIV action using the research model of this study. These factors do not contribute positively to the predictive power of action intention. However, both subjective norms and attitude had a higher effect size in TRA and TPB as compared to this study's research model. A plausible explanation can be that using TRA and TPB subjective norms and attitude directly predicts action intention whereas in this study's research model these factors predict action intention indirectly (via action desire). PBC resulted in a small effect size in the developed research model however it demonstrated a medium level effect size in TPB.

Table 4.7: Comparison of model factors effect size

Factors	Theory	R ² Included	R ² Excluded	f ²	Inference	F
PBC	TPB	0.26	0.20	0.24	Medium	69.67*
	Research model	0.46	0.44	0.04	Small	11.51*
Subjective norms	TRA	0.20	0.10	0.48	Large	138.55*
	TPB	0.26	0.22	0.17	Medium	47.69*
	Research model	0.46	0.46	-0.0002	Less than smallest level	
Attitude	TRA	0.20	0.14	0.30	Medium	87.28*
	TPB	0.26	0.19	0.27	Medium	77.57*
	Research model	0.46	0.46	-0.0014	Less than smallest level	

*significant

4.2 Discussion

The three objectives of this study are, first, to determine the predictive power of a decision making core model in the context of HIV. Second, is to investigate the psychological decision making process behind youth preferences for HIV preventive actions through a gender lens. Third is to compare the research model of this study with the TRA and TPB in predicting youth preferences for HIV preventive actions. In order to achieve these objectives, a set of research

hypotheses were proposed and they were validated using a research model based on the theory of decision making core. A survey method was used to collect data from 118 pupils from two high schools and 292 student respondents from two universities in the Republic of South Africa. University respondents were used to validate the decision making core model since there are presumed to be matured compared high school respondents. The data analysis was performed using analytic PLS modelling technique.

4.2.1 Predictive Power of Research Model

The predictive power of this study's research model ($R^2 = 0.46$) for the main effect model is acceptable, although it is lower when compared to that ($R^2 = 0.71$) obtained by Bagozzi *et al.* (2003). This might likely be as a result of different factors considered in decision making core model. For example, Bagozzi *et al.* (2003) considered factors of decision process importance, decision process effort investment, decision process confident, goal feasibility, plan enactment and goal realization to examine the influence of decision making on goal striving and decision enactment among undergraduate students (Bagozzi *et al.*, 2003). However, these factors were not included in research model of this study because they were not considered critical. As a result, independent factors included in the research model explain about 46% of youth preferences for HIV preventive actions. This means that to examine youth preferences for HIV preventive actions, goal desire, goal intention, action desire, action intention, anticipated emotions, attitude, subjective norms and PBC must be taken into consideration. Moreover, the moderate level (46%) predictive power of the research model suggests that other factors that are not included in the research model also affect youth preferences for HIV preventive actions.

4.2.2 Gender Differential

In an attempt to contribute to the open issue of gender differential in technology adoption this study examined gender differences in (a) predictive power of a decision making core model, (b) moderating effect of the relationship between PBC and action intention, (c) action desire mediating effect, (d) ranking of model factors that predict youth preferences for HIV preventive actions and in (e) HIV goal-action selection pattern. This resulted in the formation of hypothesis (1, 2, 3, 4 and 5) respectively.

The first research hypothesis sought to examine whether the predictive power of a decision making core model is going to differ depending on gender factor. PLS procedure was used to test this hypothesis. The result indicates that there was no gender differential in the predictive power of the research model. Meaning that the research model of this study suit male and female youth data equally. This implies that independent factors included in the research model explain youth preferences for HIV preventive actions evenly for both male and female youths. Hence the model can be used to understand the youth's decision making process towards the adoption of HIV preventive actions independent of gender factor.

The second research hypothesis is to test whether the gender factor is a moderator of the relationship between PBC and action intention. The result shows that gender factor was not a moderator of this relationship. The relationship between PBC and action intention has been previously studied in different domains in an effort to understand the behaviour-intention gap (Amireault *et al.*, 2008; Bhattacharjee and Sanford, 2009; Kuo and Yen, 2009). For example, Amireault *et al.* (2008), using theory of planned behaviour discovered that age and income factors moderate the relationship between PBC and action intention. However, they did not consider gender as a moderator of this relationship. Nonetheless, our result means that male and female youths follow a similar pattern with respect to PBC to perform the selected HIV preventive actions. This implies that there is no need for providing gender based resources such as training and skills to perform a particular preventive action.

A third research hypothesis was tested to further the study of interaction effects and the hypothesis sought to test whether there is gender differential in the mediation effect of action desire on the relationship between PBC and action intention. The study found that action desire mediates the relationship between PBC and action intention for both male and female youth. The mediation effects account for 68% of the total effect of PBC on action intention for male youth as compared to 19% for female youth. This shows that more than half of the effect of PBC on action intention is mediated by action desire for male youth. Meaning that in the absence of action desire, even having good PBC of performing HIV preventive actions can lack most of its effects on action intention. As a result, for any HIV preventive action to be preferred by youth, the reasons and the motives for performing such an action must be highly beneficial and the availability of resources for performing the action must be guaranteed. However, this is more applicable to male youths as compared to female youths.

The fourth research hypothesis sort to examine whether the order of importance in factors influencing youth preferences for HIV preventive actions differ depending on gender. The Friedman non-parametric repeated measure of comparison was used to rank factors for male and female data separately. One-way Analysis of Variance was used to test for the significance of the two rankings. The result shows that these factors did not differ depending on gender, but PBC was by far the most important determinant of youth preferences for HIV preventive actions, followed by action desire and lastly, goal desire. This result implies that for the youth to perform any HIV preventive action they first consider the availability of resources to support performing such action, followed by the reasons and motives for performing the action and lastly, the commitment to strive to attain the HIV goal corresponding to the action to be performed is considered.

The last research hypothesis is to test for gender interaction effect on the relationship between goal and action. Two-way Analysis of Variance was used to test for this hypothesis. The result ($F\text{-value} = 0.45$, $p\text{-value} = 0.9445$) indicates that the selection of HIV preventive actions to achieve a particular HIV goal does not depend on gender. This result means strategies to persuade the youth to perform a particular HIV preventive action to achieve a certain HIV goal does not need to be gender based. Furthermore, action (A2) of using condoms technology during sexual intercourse was selected to achieve health goal (G1) of avoiding being HIV infected throughout their life time irrespective of gender.

4.2.3 Comparison of Model Predictive Power

The predictive power of our research model reflects that the model fits to data was generally well and statistically different from zero. Meaning that about 46% of the variation in action intention is as a result of PBC, action intention, attitude, subjective norms, goal intention, goal desire and goal desire predictors of action intention as shown in Figure 4.1. Even though the predictive power is acceptable, it was important to compare it against other similar models. TRA and TPB were validated with the methodology of this study for comparison purpose and the results show that the predictive power of this study's research model is of moderate to substantial level as compared to the weak to moderate level demonstrated by both the TRA (20%) and TBP (28%). It can therefore be concluded that the research model of this study better predicts youth preferences for HIV preventive actions than the TRA and TBP. However, the 46% predictive

power is still lower as compared to the theory of effortful decision making and enactment (Bagozzi *et al.*, 2003) with a predictive power of about 70%.

4.3 Implication

The research model of this study provides a better understanding of technology adoption in the context of HIV prevention in a developing country. Knowledge acquired from this study can potentially benefit individuals who are currently working with health information technology implementation in a developing country such as South Africa. The findings of this study make several theoretical contributions. First, this study draws from the decision making core model to predict youth preferences for HIV preventive actions. The examination of gender differential revealed no gender differences in the model predictive power. But, the mediation effect of action desire on the relationship between PBC and action intention was stronger for male youth as compared to female youth. However, there was no gender differential in the order of importance in factors that predict youth preferences for HIV preventive action. PBC, action desire and goal desire were selected as the most important determinants of youth preferences for HIV preventive actions. Similarly, gender did not moderate the relationship between PBC and action intention and also did not moderate the goal-action selection pattern. Second, the research model of this study better predicts youth's preference for HIV preventive action as compared to TRA and TPB. However attitude and subjective norms better predict action intention in the TRA and TPB as compared to the research model of this study.

Lastly, the findings of this study show that PBC, action desire and goal desire are the most important determinants of action intention. This implies that the youth consider these factors when formulating decisions about performing any HIV preventive actions. This finding suggest that governments, healthcare practitioners and all individuals who are concerned about HIV prevention when implementing healthcare intervention strategies must address these factors to achieve high adoption. For example such intervention should demonstrate acceptable level of user control. This might include ease of use, affordability, reliability and many other factors depending on the kind of intervention. This study has focused attention on possible factors that could serve to enable or inhibit youth preferences for HIV preventive actions. Those concerned about wanting to understand some of the reasons that youth will or will not adopt such preventive actions can benefit from the information provided herein.

CHAPTER 5

CONCLUSION

5.1 Summary

In this study, the decision making core technology adoption theory was applied to examine gender differential in factors influencing youth acceptance of HIV preventive actions. A research model based on this theory was introduced to test goal desire, goal intention, action desire and action intention elements of decision making core model and additional factors of PBC, attitude, subjective norms, and anticipated emotions. YOHAMIS a mobile health information system was implemented and used to determine its acceptance as an HIV information disseminating tool by the youths. A dataset of 118 pupils and 292 student youth respondents was generated for the study. The dataset was analyzed using PLS to determine the predictive powers of the research model for male and female youth. A one sample t-test analysis revealed that the youth accepts to use mobile information system to access HIV information. PLS analysis result proves that the decision making core model fits male and female youth concretely, leading to the conclusion that gender differential does not exist in the predictive power of the research model. Hence, the first research hypothesis that predictive power of decision making core model used to examine youth preferences for HIV preventive actions will be higher for male youth is rejected. The findings of the study also show that gender did not moderate the effects of PBC on action intention, leading to rejection of the second research hypothesis of this study.

Interestingly, action desire was found to mediate the relationship between PBC and action intention such that the mediation effect was significantly different depending on gender factor, leading to the acceptance of the third research hypothesis. The order of importance in factors that predict youth preferences for HIV preventive action was not moderated by gender which also did not moderate the selection of HIV goals and actions leading to the rejection of the fourth and fifth research hypothesis respectively. In general, the findings and contexts of this study add a new dimension of decision making core technology adoption theory to examine gender differential in factors influencing youth preferences for HIV preventive actions. This could be relevant for future comparative analysis of issues in comparable regions in advanced countries. The discourse presented in this study will hopefully benefit healthcare practitioners, government, policy makers and individuals concerned about strategies for preventing HIV transmission,

especially among youth aged 15-24 years.

5.2 Limitation

This study obviously has some few inherent limitations that were not addressed. First, the data analysis made use of 350 respondents from two different universities in South Africa. A large sample size that cut across different level of educational background and the entire country might be desirable to detect other significant effects. The findings from this study cannot be generalized for the entire country and the data from more technologically and economically developed parts of the country may be different from what is reported in this study. However, the use of robust PLS analysis method was able to alleviate the inherent problems with small sample size. Second, the research includes a variety of HIV preventive actions through the use of condoms contraceptive and mobile phone application. The possible levels of complexities in the use of such technology to predict technology adoption were not controlled and this may be a limiting factor.

5.3 Future Research

This research opens avenues for a number of future studies based upon the results presented in chapter 4, and based on the limitations observed and other questions brought up during the course of the research. An obvious addition to this study would be a replication to cover samples representing the entire country. Thereby increasing the generalizability of results obtained. There were many hypotheses not supported during the analysis of the data collected. Only through replication will the value of these hypotheses be fully known. This study used HIV preventive actions through the application of condom contraceptive and mobile phone application. However, future applications of the model could be extended to the behaviours involved in other technology based HIV preventive actions. Finally, the application of the decision making core model for explaining youth preferences for HIV preventive actions can be extended beyond HIV to study adoption behaviour of other diseases.

APPENDIX A: YOHAMIS SCREEN SHOTS



APPENDIX B: PARTICIPANTS USING YOHAMIS IN A SIMULATOR



APPENDIX C: DATA COLLECTION INSTRUMENT

Empirical examination of Decision Making Core technology adoption theory to explain youth preferences for HIV preventive actions

Answer all questions in the appropriate space to the best of your knowledge. Information collected will be used for this scientific study and identities of all people who participate will remain anonymous and will be kept confidential.

General Instructions:

Answer all questions

DEMOGRAPHICS INFORMATION

1. Age:
2. Gender: Male..... Female.....
3. Experience using Less than 6 months..... 6 months to 1 year.....
mobile phone: 1 year to 2 years Greater than 2 years.....
4. Own a mobile phone Yes..... No.....
5. Home location: Urban..... Rural..... Townships.....
6. University:

HIV HEALTH RELATED GOALS

You can select more than one goal

7. Which of the following best describe your health related goals?
- a. To avoid being HIV infected throughout my life time.
 - b. To avoid being killed by HIV in my life time.
 - c. To avoid being a transmitter of HIV throughout my life time
 - d. To contribute towards building an HIV free society.
 - e. I have no health goals related to HIV.

ACTIONS TO BE TAKEN TO ACHIEVE HEALTH RELATED GOALS

You can select more than one action.

8. Which of the following actions will you undertake to achieve your health related goals?
- a. I will abstain from casual sex in order to achieve my health related goals.
 - b. I will use condom during sexual intercourse in order to achieve my health related goals.
 - c. I will not share toothbrush and haircuts in order to achieve my health related goals.
 - d. I will use mobile technology to access HIV information in order to keep me informed to achieve my health related goals.
 - e. I will promote the use of HIV mobile technology to provide preventive guidelines to achieve my health related goals.
 - f. I will share relevant information about using HIV mobile technology to achieve my health related goals.

In the following sections select only one option.

ATTITUDE

On the following scale, please express your attitude towards performing the actions necessary to achieve your health related goals.

9. My attitude towards the actions necessary to achieve my health related goals can be best described as: (circle the appropriate number)

1						7
Bad	2	3	4	5	6	Good

SUBJECTIVE NORMS

Please express how strongly most people who are important to you feel you should or should not performing the actions necessary to achieve your health related goals.

10. Most people who are important in my life think I should perform the actions necessary to achieve my health related goals.

a. Extremely unlikely	b. Strongly unlikely	c. Slightly unlikely	d. Likely
e. Most likely	f. Strongly likely	g. Extremely likely	

11. Most people who are important in my life would approve me performing the actions necessary to achieve my health related goals.

a. Extremely unlikely	b. Strongly unlikely	c. Slightly unlikely	d. Likely
e. Most likely	f. Strongly likely	g. Extremely likely	

PERCEIVED BEHAVIOURAL CONTROL

12. How much control do you have over the performing the actions necessary to achieve your health related goals?

a. No control	b. Moderate control	c. Total control
---------------	---------------------	------------------

ANTICIPATED EMOTIONS

Please take a moment to consider how you would feel if you were to succeed to achieve your health related goals

13. If I succeed to achieve the health related goals, I will feel:

- a. Excited b. Delighted c. Happy d. Glad e. Satisfied f. Proud g. Self assured

GOAL DESIRE

14. My desire to reach my chosen health related goals can best be described as:

- a. No desire at all b. Very weak desire c. Weak desire d. Moderate desire
e. Strong desire f. Very strong desire g. Very very strong desire

15. I feel an urge or need to attain my health goals I have chosen:

- a. Does not describe me at all b. Does not describe me very well c. Does not describe me
d. Describe me moderately well e. Describes me f. Describes me well
g. Describes me very well

16. My overall wish to attain my health related goals can be summarized as follows:

- a. No wish at all b. Slight wish c. Moderate wish d. Strong wish e. Very strong wish

GOAL INTENTION

17. I feel certain that I will be able to attain my health related goals:

- a. Does not describe me at all b. Does not describe me very well c. Does not describe me
d. Describe me moderately well e. Describes me f. Describes me well
g. Describes me very well

ACTION DESIRE

Please express the overall strength of your desire to perform the actions necessary to achieve your chosen health related goals.

18. My desire to perform the actions necessary to achieve my health related goals can be expressed as:

- a. No desire at all b. Very weak desire c. Weak desire d. Moderate desire
- e. Strong desire f. Very strong desire g. Very very strong desire

19. I want to perform the actions necessary to achieve my chosen health related goals.

- a. Strongly disagree b. Moderately disagree c. Slightly disagree d. Neither disagree
- e. Moderately agree f. Slightly agree g. Strongly agree nor agree

20. My overall wish to perform the actions chosen to achieve my health related goals can be summarized as follows:

- a. No wish at all b. Slight wish c. Moderate wish d. Strong wish e. Very strong wish

ACTION INTENTION

21. The strength of my actual intention to perform the chosen actions necessary to achieve my health related goals can best be described as :

- a. No intention at all b. Very weak intention c. Weak intention d. Moderate intention e. Strong intention f. Very strong intention

22. I intend to perform the actions necessary to achieve my health related goals:

- a. No chance at all b. Highly unlikely c. Neither unlikely nor likely d. Likely e. Highly likely

23. I feel the need to perform the actions I have chosen to achieve my health related goals.

- a. Does not describe me at all b. Does not describe me very well c. Does not describe me
- d. Describe me moderately well e. Describes me f. Describes me well
- g. Describes me very well

WILLINGNESS TO ADOPT MOBILE HIV INFORMATION SYSTEMS (YOHAMIS)

Mark with a tick (✓) your chosen answer, a mistake in selection can be cancelled by marking with a cross (✗) in the wrong box. Allowed answers are:

Agreement level: 1 = strongly disagree
 2 = disagree
 3 = slightly agree
 4 = agree
 5 = strongly agree

	1	2	3	4	5
1) I would use a mobile application's forum to share ideas about HIV/AIDS.					
2) I would use a mobile application to access up to date information on HIV/AIDS.					
3) I would use mobile application often to access HIV/AIDS information.					
4) I intend to use HIV/AIDS mobile application in the next 12 month to access HIV/AIDS information.					
5) Overall, I am willing to use mobile application to access HIV/AIDS information.					

END

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