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University of the Witwatersrand Johannesburg

Division of Information Systems; Faculty of Commerce, Law and Management; School of Economic and Business Sciences

Factors supporting the intention to use e-Prescribing Systems: Health Professionals' use of technology in a voluntary setting

A research report submitted in partial fulfilment of the degree of Master of Commerce (Information Systems)

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Supervisor: Mr. Jean-Marie Bancilhon

Date Submitted: 26 February, 2013

I. DEDICATION

To my wife: for supporting me while I pursue this goal, at the expense of so many things.

To part time students: who have both day work and night work.

II. ACKNOWLEDGEMENTS

My full gratitude goes to my supervisor, Jean-Marie Bancilhon, who has guided me in areas reaching far outside the scope of this course, to ensure I remained on track within it.

Thank you to my employer and colleagues who allow me the flexibility I have regularly required. Thank you to the suppliers of contact data for the survey, and Arnold Ho who supplied me with his factor loadings.

A special mention goes to the busy doctors who took the time to fill out my survey.

III. DECLARATION

I declare that this research report is my own, unaided work. It is being submitted for the degree of Master of Commerce in the University of the Witwatersrand, Johannesburg.

It has not been submitted before for any degree or examination in any other University.

Signature of Candidate

_____
Michael Jones

This _____ day of _____ 2013

IV. ABSTRACT

Illegible written prescriptions and "Doctor's handwriting" may have been synonymous, but this stereotype has begun to change with the gradual uptake of e-prescriptions. These e-prescriptions are electronically captured and delivered prescriptions, and are touted as the solution to the many medical risks caused by written prescriptions. Whilst there is published support for the benefits of e-prescriptions, the uptake of e-prescribing has been too gradual for all patients to enjoy these benefits. The inadequate research into physicians' adoption of e-prescribing systems presents a need for further study in this area, in an effort to improve the general use of these systems.

Based on a review of literature, this study proposes six factors which may explain physicians' intentions to use e-prescribing systems. These factors are based upon the Unified Theory of Acceptance and Use of Technology (UTAUT). This model is extended in this study by Social Dominance Theory, Commitment-Trust Theory and the Product Evaluation Model. Quantitative data was collected to test the proposed hypotheses. This data was gathered from physicians who have had some exposure to an e-prescription system. 72 usable responses were obtained for this study.

The results of the study suggest that Performance Expectancy and Price Value have the highest influence on Behavioural Intention. Effort Expectancy and Social Influence had no direct influence on Behavioural Intention when in the presence of other variables, but they, along with Trust, had an indirect effect on Behavioural Intention through Performance Expectancy. Surprisingly, Social Dominance Orientation was not found to have an influence on Behavioural Intention. Implications, contributions and further research are discussed.

Keywords: E-prescribing, e-prescription, physician, acceptance, UTAUT, Social Dominance Theory, Commitment-Trust Theory, Product Evaluation Model

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CHAPTER 1: INTRODUCTION

1.1 Context of the Study

1.1.1 *Background*

Prescription errors, whether in the writing or reading of written prescriptions, can account for up to 7000 patient deaths and 1.3 million patient injuries in the United States annually (Werner, Nelson & Boehm-Davis, 2012; Ammenwerth, Schnell-Inderst, Machan & Siebert, 2008). The likelihood of these prescription errors occurring may, however, be reduced when computer systems in medical practices are involved in prescribing medicine through the electronic capture of patient medical scripts (Kaushal, Kern, Barrón, Quaresimo & Abramson, 2010; Ammenwerth et al., 2008). Electronic prescribing, or e-prescribing, is the use of computers to enter, modify, review, issue and/or transmit medication prescriptions (Johnson & FitzHenry, 2006). This electronic practice may be used in place of the regular written prescription, where instead of a paper form being filled out by the physician, an online form is filled in. The resultant e-prescription is then made available to the dispensing pharmacist in electronic or printed form. Due to the electronic element, an e-prescription no longer falls under the ills of poor handwriting or pharmacist interpretation, and can be reprinted at will if lost by the patient.

The prescription process, which occurs between the physician, the patient and the pharmacist, is initiated by the physician when consulting with the patient. The physician is the primary agent in this prescription process and plays a critical role in the decision to use or not to use e-prescriptions (Smith, 2006). Unfortunately, it has been argued that e-prescribing won't be adopted very quickly by physicians (Crosson, Etz, Wu, Straus, Eisenman & Bell, 2011; Smith, 2006; Chin, 2003). As a consequence this study will focus on the physician.

1.1.2 *Written Prescription Risks, E-prescribing Benefits*

Writing prescriptions is fundamental to every physician's day (Blair, 2006). The repetitive nature of this task, however, does not discount the risks to the health of the patient involved, often with prescriptions which are either incorrectly filled out by the

physician, or incorrectly interpreted by the pharmacist. This may result in incorrect medicines or doses being dispensed, or incompatible medicines being dispensed together, creating a potential hazard for patients and their health (Ammenwerth et al., 2008).

These prescription risks may be lowered by making use of the potential benefits of e-prescriptions, which include:

- Overcoming the problem of illegible written prescriptions and the consequent dispensing problems such as incorrect dispensing or repeat call backs to the physician.
- Lowered rate of adverse effects, by up to 86% (Kaushal et al., 2010), from mixing incompatible drugs or basic physician errors being lowered through decision support and drug safety alerts on the system.
- Accurate patient drug history of past prescriptions from multiple physicians for drug history and complications, where available.

(Tamblyn, Huang, Kawasumi, Bartlett, Grad, Jacques, Dawes, Abrahamowicz, Perreault, Taylor, Winslade, Poissant & Pinsonneault, 2006; Ammenwerth et al., 2008; Devine, Hollingworth, Hansen, Lawless, Wilson-Norton, Martin, Blough & Sullivan, 2010; van Doormaal, van den Bemt, Zaal, Egberts, Lenderink, Kosterink, Haaijer-Ruskamp & Mol, 2009; Halamka, Aranow, Ascenzo, Bates, Berry, Debor, Fefferman, Glaser, Heinold, Stanley, Stone, Sullivan, Tripathi & Wilkinson, 2006; van der Sijs, Aarts, Vulto & Berg, 2006).

Given how e-prescribing systems can reduce the risks associated with written prescriptions, it is critical that e-prescriptions are adopted with a view to reduce these health risks, potentially lowering the patient death rate from these errors.

1.1.3 *Additional E-prescribing Benefits*

E-prescribing goes beyond dealing with the prevention of the potential health risks caused by errors in written prescriptions, bringing additional, second order, benefits. These include cost and time savings, for both patients and medical practitioners. Patients benefit through broader generic drug choice, potentially fewer days in hospital or even fewer admissions to hospital altogether (Halamka et al., 2006). Savings are found for medical practitioners when pharmacists no longer need to call them back on prescriptions

due to illegible handwriting, or where the physician can be bypassed altogether for prescription refills pre-defined on the system (Tamblyn et al., 2006, Halamka et al., 2006). E-prescription systems also allow for better tracking of leaked prescriptions, indicating whether patients are in fact going to the pharmacist and obtaining the medication prescribed by the physician (Halamka et al., 2006).

1.1.4 *Acceptance of E-prescriptions*

E-prescribing is at least ten years old (Wang, Patel, Schueth, Bradley, Wu, Crosson, Glassman & Bell, 2009), and given the potential benefits it is surprising that the acceptance of e-prescriptions by physicians has not increased as quickly as it could (Mäkinen, Rautava, Forsström & Äärimaa, 2011). Some explanations for low adoption may be due to e-prescriptions least benefiting the physician, with the financial cost of the system placed to their account (Chin, 2003; Crosson et al., 2011). Furthermore, some studies suggest e-prescriptions may cause a physician to spend longer working with the prescription than using written prescriptions might do (Eslami, Abu-Hanna & de Keizer, 2007; Devine et al., 2010). Although steps are being put in place to encourage physicians to adopt e-prescriptions, such as financial incentives and possible legislative force in some countries (Crosson et al., 2011), further focus needs to be placed on understanding physician acceptance of e-prescription systems, especially where physicians have not had prior exposure to such systems. Given that the current use of e-prescriptions is not mandatory, the study of physician acceptance of e-prescriptions will take place in a voluntary setting. South Africa has a long standing shortage of doctors, with no expected improvement in the short term (Breier, 2008). The use of e-prescribing in South Africa may help alleviate the impact of having such a shortage of doctors. This could be achieved through prescribing efficiencies which allow physicians to see more patients per day, and through lowered dispensing errors which would lessen the need for additional, corrective treatment of previously treated patients. Based on the potential benefits e-prescribing may bring to South Africa, it is a useful test context for this study.

1.2 Problem Statement

1.2.1 *Main Problem*

- To what extent do physicians intend to use e-prescribing systems?

1.2.2 *Sub-Problems*

- To what extent does the perceived change in performance from e-prescribing affect physicians' intention to use an e-prescribing system?
- To what extent does the perceived usability of an e-prescribing system affect physicians' intention to use such a system?
- To what extent does the degree to which a physician is socially influenced to use an e-prescribing system affect the physician's intention to use such a system?
- To what extent does the degree to which a physician is social dominance orientated affect the physician's intention to use an e-prescribing system?
- To what extent does the perceived price value of an e-prescribing system affect physicians' intention to use such a system?
- To what extent does the perceived change in performance mediate the relationship between perceived usability and physicians' intention to use the system?
- To what extent does the perceived change in performance mediate the relationship between social influence and physicians' intention to use the system?
- To what extent does the perceived change in performance mediate the relationship between confidence in the system's reliability and physicians' intention to use the system?

1.3 Research Model

This section presents the model of the study, which will be further elaborated upon in the next chapter.

This study makes use of the Unified Theory of Acceptance and Use of Technology (UTAUT) of Venkatesh, Morris, Davis & Davis (2003). The existing model uses Behavioural Intention (BI) as the dependent variable, with Performance Expectancy (PE), Effort Expectancy (EE), and Social Influence (SI) as independent variables of BI.

In the context of physicians' intention to use e-prescribing systems the model is extended by adding Trust in technology, Social Dominance Orientation (SDO) and Price Value as independent variables. The adapted model can be found in Figure 1.1.

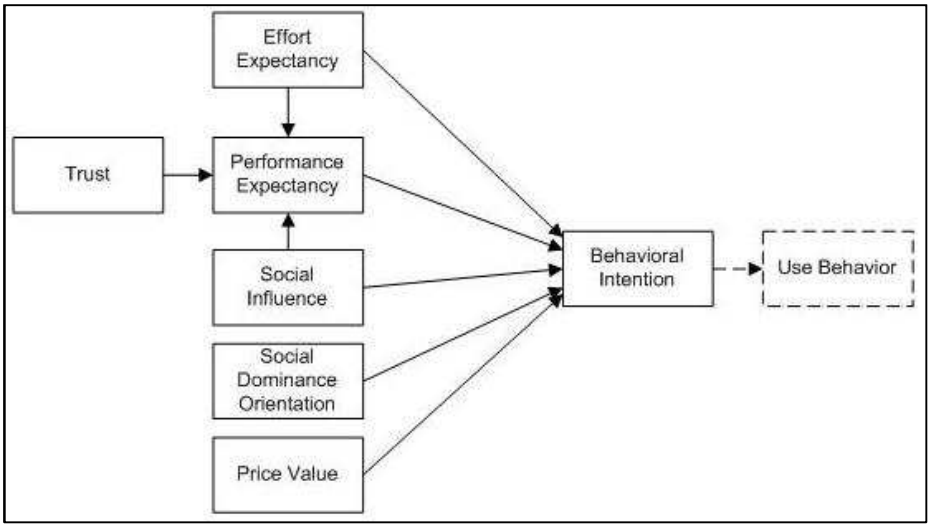

Figure 1.1 - Model of factors and their relationships with Intention, adapted from Venkatesh et al. (2003).

1.4 Significance of the Study

1.4.1 *Theoretical Impact*

This study extends the traditional UTAUT by adding Trust as an independent variable of intention to use. This may introduce the concept that before adopting a technology, a potential user needs to believe the technology will demonstrate the expected effects. The study also extends UTAUT by introducing Social Dominance Orientation (SDO). If it is found that higher SDO levels explain physicians' lower intention to use e-prescribing systems it may indicate why other factors, such as Performance Expectancy (PE) and Effort Expectancy (EE), did not necessarily lead to higher intentions to use e-prescription systems. This study may shed further light on the impact of Price Value upon individuals' intention to use a system, and how these potential users consider the monetary cost of a system prior to use.

1.4.2 *Practical Impact*

An improved understanding of e-prescribing acceptance amongst physicians may assist practically in successfully rolling out e-prescribing systems. Focus may need to be placed on addressing change through the social dominance orientation of an individual, such as having another member from the same professional or dominance group initiate the change rather than an individual from an out-group. Thus an improvement in intention to use may occur when other physicians encourage physicians to use the system, rather than those outside of the physician profession. This makes use of positive social influence to encourage the use of e-prescribing, while at the same time preventing any possible negative effects brought in through higher social dominance orientation. Through this it is expected that an improved uptake of e-prescribing may benefit patients and lower the incidence of prescription errors.

Further understanding may be gained upon the role of trust in technology, and how it may affect the perceived performance improvements of an e-prescribing system. This may lead to subsequent efforts to build up trust in the technology through long term stability and reliability in order to encourage use.

The study may also indicate that the price of a system could have an impact on physicians' intention to use e-prescriptions, indicating an additional area to focus on to encourage the use of e-prescription. This is especially relevant as it is the physicians who need to pay the bill for these systems.

1.5 Aims of the Study

Despite e-prescribing being available for more than ten years, the uptake of e-prescribing has not reached levels expected (Mäkinen et al., 2011). This may be due to lower acceptance by physicians, who play a pivotal role in adoption of such systems. Consequently, there is a need to better understand why physicians, in a non-compulsory setting, may choose to accept e-prescribing. Once these factors are better understood, steps can be taken in practice to address any concerns around them with physicians, in order to maximise adoption of e-prescribing systems, potentially resulting in lowered risks currently found with handwritten prescriptions. The theoretical findings may gain

further understanding around physicians' decisions to use e-prescriptions, a context not yet highly researched.

This study shall construct hypotheses, after which it will collect and measure empirical data to test the hypotheses.

1.6 Delimitations of the Study

This study is limited to physicians who have had some interaction with e-prescribing systems. This is to allow them to have formed an opinion on e-prescribing based on personal exposure. For this to occur, the respondents would need to be those who are linked to an existing system. Health-Soft, a company based in South Africa, is one such provider of an e-prescribing system, and would be able to supply a database of physicians who have had personal exposure to their e-prescribing system.

1.7 Chapter Summary and Structure of Report

This chapter considers the potential mitigation of risks surrounding written prescriptions and additional benefits made available through e-prescribing systems, contrasted against the lower than expected uptake of these systems by physicians. The study is initiated to measure the extent to which physicians intend to use e-prescribing systems, and the extent to which the intention of physicians is affected by various factors. These factors are perceived change in performance, perceived usability, the degree to which the physician feels socially obligated to change, the social dominance orientation of the physician, the level of confidence in the system and the perceived monetary value of the system.

The subsequent chapters will include:

Chapter 2 – Literature review: This chapter will consider prior research in the field. It will explain the theoretical underpinnings of the study, and also describe the conceptual model and hypotheses.

Chapter 3 – Research methods: This chapter will describe the specific questions and data collection process in order to test the hypotheses in the chosen model.

Chapter 4 - Data analysis: This chapter will collate the surveyed data, demonstrating the validity of the hypotheses through statistical analysis.

Chapter 5 –Discussion: This chapter will comment on the statistical results from the data collected, linking to prior research.

Chapter 6 – Conclusion: This chapter will summarise the previous chapters, and consider the results, giving suggestions for further study.

CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Introduction

This chapter provides a literature review of the intention of physicians to use e-prescribing systems, with a view of exploring what factors may support this intention. The proposed model to explain physicians' intention to use these systems will be described, covering the factors of Performance Expectancy, Effort Expectancy, Social Influence, Social Dominance Orientation, Price Value and Trust in technology. These are derived from four theoretical underpinnings, being the Unified Theory of Acceptance and Use of Technology, Trust in Technology, Social Dominance Theory and the Product Evaluation Model.

The chapter will begin by examining the existing research into adoption of e-prescribing systems, after which it will explore the theoretical background of the context, and present a model and hypotheses based upon the theoretical underpinnings.

2.2 Theoretical Background

2.2.1 *Definitions and Explanation*

Electronic Health Records (EHRs) have provided the platform for a number of information systems for physicians (Simon, Soran, Kaushal, Jenter, Volk, Burdick, Cleary, Orav, Poon & Bates, 2009). These information systems include computerised provider order entry systems (CPOE), the most common of which are e-prescription systems (Bell, Cretin, Marken & Landman, 2004; Simon et al., 2009; Devine et al., 2010; Schade, Sullivan, De Lusignan & Madeley, 2006). E-prescribing is the use of computers to enter, modify, review, issue and/or transmit medication prescriptions (Johnson & FitzHenry, 2006). This process replaces the written prescription, where a physician may use a computer system to capture and confirm medicinal dosage, details and instructions for a patient. The dispensing pharmacist may obtain these details electronically, with these details then being viewed on a screen or printed out. In addition to its primary use of replacing written prescriptions, e-prescribing systems provide decision support through safety warnings for inter-medicine incompatibilities (Johnson, Ho, Cala & Davidson, 2010), medicine recall notices, patients' medicine history, and allergic reactions (van der Sijs et al., 2006).

Image 2.1 is an example of an e-prescribing system interface. The main part of the screen in this example allows the physician to select a medication to prescribe, along with its strength and delivery method. This example also provides inter-drug compatibility details, patient medication history and it supplies fields for extra information to be recorded such as special instructions from the physician.

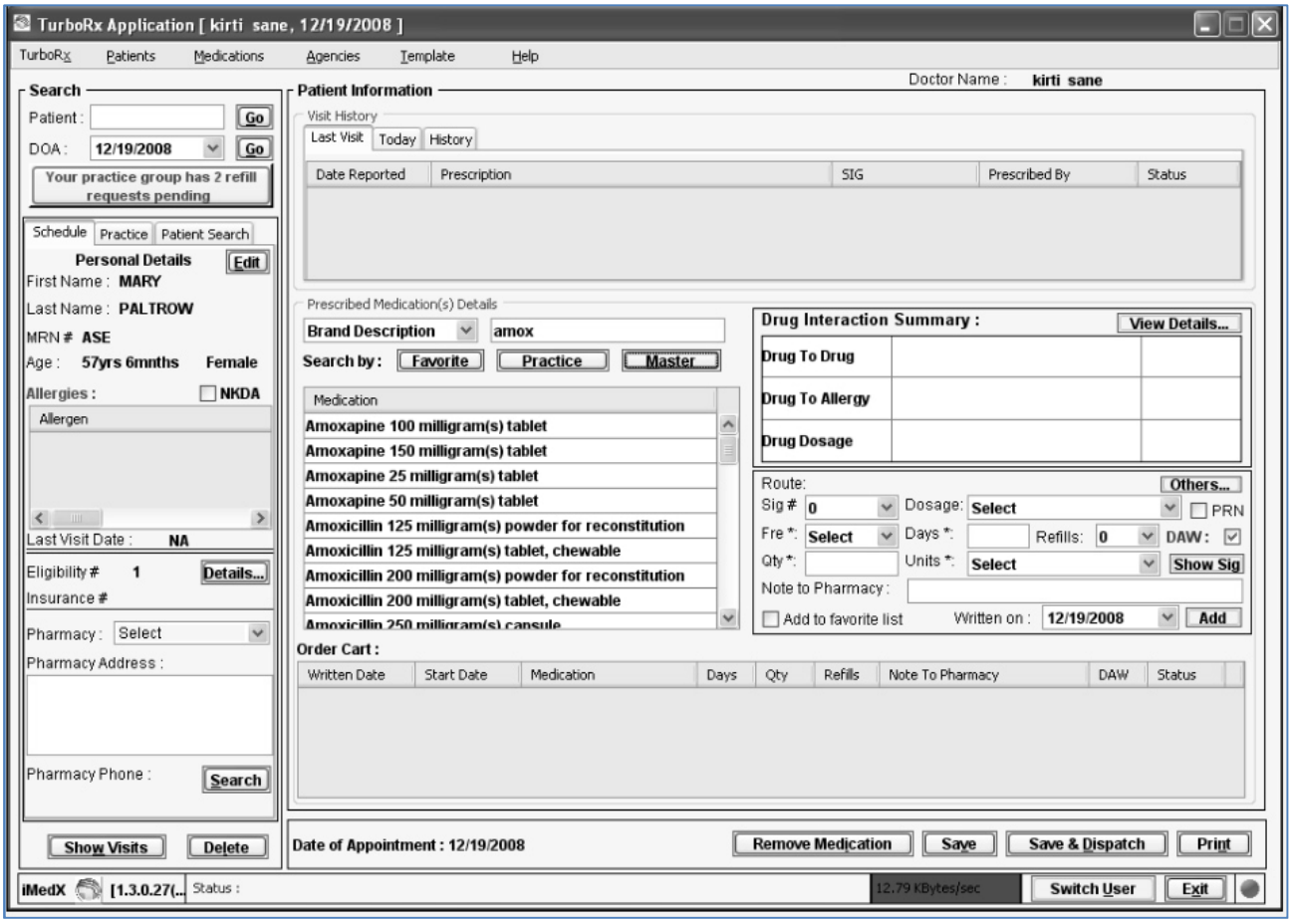

Image 2.1 – An example of an e-prescribing system interface, taken from iMedx (http://www.imedx.com/turborx)

E-prescription systems have been in use for over a decade (Wang et al., 2009), with these systems predominantly being used in the USA (Fischer, Vogeli, Stedman, Ferris & Weissman, 2007), but are also used in the UK (Smith, 2006), Sweden (Hellström, Waern, Montelius, Åstrand & Petersson, 2009), Canada (Pare, Sicotte & Jacques, 2006), Australia (Smith, 2006), Singapore and a number of other countries (Ammenwerth et al., 2008). The European Union has also identified e-prescriptions as an important strategic policy for the coming years (Kierkegaard, 2013).

E-prescription systems have been shown to lower prescription errors by up to 40% (van Doormaal et al., 2009). Unfortunately, notwithstanding the benefits of e-prescription systems, e-prescribing has not reached the level of use initially hoped for (Mäkinen et al., 2011). Some of the reasons given for slow adoption of e-prescription systems are the cost of the systems and a low trust in the technology by physicians (Smith, 2006), and concerns of the additional time it takes to use such systems in day to day processes (Devine et al., 2010).

2.2.2 *Contributions and Shortcomings of Prior Research*

In order to identify prior research on physicians' adoption of e-prescribing, two online databases, EBSCOhost and ProQuest, were searched with the following search strings: "Electronic Prescription", "Electronic Prescribing", "e-prescribing", "e-prescription", "eprescribing" and "eprescription". The results were checked by title and abstract for studies involving physician acceptance of e-prescription systems. Due to a larger ratio of results coming from the Journal of the American Medical Informatics Association, a further search with the same strings was done on that particular journal. The final result list counted 39 related journal articles, seven of which focussed on physicians and their acceptance of e-prescribing. Further constraints on the search strings were unnecessary as they returned the same results, albeit less in number.

These e-prescribing studies followed two distinct approaches, a theoretical acceptance model based approach (Tamblyn et al., 2006; Wang et al., 2009; Pare et al., 2006; Boonstra, 2003) and a descriptive research approach (Simon et al., 2009; Fischer et al., 2007; Pagán, Pratt & Sun, 2009). The acceptance model research made use primarily of the Technology Acceptance Model (TAM) from the study of Davis (1989), with one instance of borrowed constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT) of Venkatesh et al. (2003).

The previous e-prescribing studies were based upon Davis' (1989) argument that users' perceptions of usefulness (PU) and ease of use (PEOU) of a technology have a relationship with the acceptance and intention to use that technology. This argument, based on PU and PEOU, has been tested with some success in the general health care context (Holden & Karsh, 2009), and was corroborated within this context of physicians'

acceptance of e-prescribing through studies by Boonstra (2003), Pare et al. (2006) and Tamblyn et al. (2006). Wang et al. (2009) used the UTAUT model and demonstrated results which suggested that both performance expectancy (PE) and effort expectancy (EE) had an association with physicians' acceptance of e-prescribing systems. If one accepts the argument that PE and EE are conceptually synonymous with PU and PEOU (Venkatesh et al., 2003; Holden & Karsh, 2009), then it can be put forward that all four acceptance model based studies show that PU (PE) and PEOU (EE) may have a relationship with physicians' acceptance of e-prescription systems.

Notwithstanding the strong corroboration between studies on PU and PEOU, Boonstra (2003) argues that PU and PEOU in isolation are not sufficient to explain acceptance in the e-prescribing context, with additional factors such as social or environmental factors being suggested for future investigation. In support of this argument, some studies suggest other factors, such as concerns whether the systems will function as they are expected to do (Rosenbloom, 2006; Tamblyn et al., 2006), financial cost factors (Halamka et al., 2006), and various other potential factors (Fischer et al., 2007; Simon et al., 2009). Boonstra's (2003) observations that PE and PEOU are not sufficient to explain acceptance of e-prescribing may tie in with Davis, Bagozzi & Warshaw (1989, pg. 989) when they point out that PU and PEOU are in place to "*provide a foundation for studying the impact of external variables on user behaviour*". It thus follows that further external factors need to be investigated in the context of physicians' acceptance of e-prescribing.

The standard UTAUT model, which builds partly upon TAM, includes other variables with PU and PEOU. Within the e-prescribing context, however, existing literature has not fully explored UTAUT, with only one study found which made use of it (Wang et al., 2009), albeit focussing mainly on PE (PU) and EE (PEOU). Consequently it is suggested that existing literature does not adequately account for, nor synthesise, additional factors into a broader understanding of the context beyond PU and PEOU. These shortcomings suggest a need for further research to test existing and additional concepts which may better account for why physicians might choose to accept e-prescribing. A summary of these contributions and shortcomings can be found in Table 2.1.

Table 2.1: Summary of Contributions and Shortcomings

Reference	Theoretical Model	Contribution	Shortcoming
Boonstra (2003)	TAM	- Supported PU and PEOU as having positive relationships with acceptance - Highlighted external factors (time delays, cultural factors, financial factors, environmental factors)	- Qualitative, unable to measure relative strengths. - Time delays may need to fall under PU
Tamblyn et al. (2006)	TAM	- Supported PU and PEOU as having positive relationships with acceptance - Experience of use on a computer is considered.	- Low respondent rate, study may not be generalisable. - Does not seem to test hypotheses
Wang et al. (2009)	UTAUT (limited use of constructs)	- Supported PE (PU) and EE (PEOU) as having positive relationships with acceptance	- Little info given on moderators and other factors found within UTAUT, such as social influence. - Counted non-users as those which stopped using the system, excluding those who had no behavioural intention to start. The moderators are different between these two different variables.
Pare et al. (2006)	TAM	- Psychological ownership shown to have a strong positive relationship with PU and PEOU. - Supported PE (PU) and EE (PEOU) as having positive relationships with acceptance	- Item factor loading caused the psychological results to be viewed with caution, and are excluded from this study
Simon et al. (2009)	Study based on practice characteristics and physician perceptions post adoption.	- Physician's attributes which may be indicative of adoption.	- Descriptive only - Seeks to understand acceptance through human and practice attributes rather than system attributes

2.3 Theoretical Framework

Wang et al. (2009) address some of the variables presented in Table 2.1 by making use of UTAUT, such as social influence and facilitating conditions. Wang et al. (2009), however, make inadequate use of UTAUT by focussing only on PE (PU) and EE (PEOU), which discounts any explanative power UTAUT may have over TAM in explaining acceptance of e-prescribing systems. It has been argued that the UTAUT model explains up to 70% of general user acceptance and use of technology (Venkatesh et al., 2003). This model has been tested across cultures (Im, Hong & Kang, 2011) and

has been used multiple times in the medical technology acceptance context (Holden & Karsh, 2009). UTAUT focuses on perceptions of individuals to understand their subjective view of a system in order to explain their subjective intention to use a system. This model proposes that four independent variables, being PE, EE and Social Influence (SI) are factors of the dependent variable of behavioural intention (BI). The variable Facilitating Conditions (FC) is included in the standard UTAUT, but this is a factor of actual Use Behaviour, rather than Behavioural Intention (Venkatesh et al., 2003; Ajzen, 1991). Due to this study focussing on Behavioural Intention (as discussed later in this chapter), rather than actual use behaviour, FC will be excluded in this study.

The moderators within this model affect the pertinence of the relationship between the independent and dependent variables. These are gender, age, experience on the system and voluntariness of use. Some studies which focussed on UTAUT placed less emphasis on the moderators (e.g. Im et al., 2011), including studies within the medical context (Holden & Karsh, 2009). Wang et al. (2009) supported the findings of these studies when it found no support for the moderating role of age, gender and experience in the e-prescribing context. In following of these previous results, and in an effort to gain simplicity in the model, these moderators will not form part of this study, but age and gender will be retained for demographic information.

Venkatesh et al. (2003) devised UTAUT by comparing eight similar acceptance models. Two of these models, TAM (Davis, 1989), and TAM2 (Venkatesh & Davis, 2000), included mediating relationships of PE between EE and BI, and between SI and BI. These relationships are excluded from the original UTAUT, thus precluding possible effects brought about by these relationships. The existence of these relationships between EE and PE, and SI and PE are, however, demonstrated and supported again in TAM3 (Venkatesh & Bala, 2008). The relationships between EE and PE, and between SI and PE, will be investigated in this study due to the support of these relationships in UTAUT's underlying models (TAM, TAM2) and later models (TAM3).

The inclusion of Social Influence, or the positive influence on one's behaviour brought upon by important others, does not take into account the possible negative influence brought about by unimportant others. This social behavioural phenomenon, named social dominance orientation or SDO, is defined by Pratto, Sidanius, Stallworth & Malle (1994,

pg. 742) as "*the extent to which one desires that one's in-group dominate and be superior to out-groups*". This describes an individual's general attitude toward inter-group relations. This attitude could, in turn, drive that individual to seek, join and reinforce either hierarchical-enhancing or hierarchical-attenuating ideologies, social structures or professional structures (Pratto et al., 1994). SDO further infers that individuals may react in the opposite way to what out-group members suggest they should (Pratto et al., 1994). This theory has regularly been used when measuring power-based views of specific societal groups such as race, religion and culture (e.g. Ho; Sidanius; Pratto; Levin; Thomsen; Kteily & Sheehy-Skeffington, 2012), but it is also argued that SDO is a generalisable orientation across contexts (Kteily, Ho & Sidanius, 2012), which includes the professional dominance of physicians (Freidson, 2007). A demonstration of this generalisability is the use of SDO in corporate hierarchy dominance (e.g. Kwesiga, 2006; Magee & Galinsky, 2008). Physicians have been linked to higher levels of SDO (Freidson, 2007, Pratto et al., 1994), and individuals who have high levels of SDO are more likely to resist changes which alter the status quo (Sidanius & Pratto, 1999), such as physicians being resistant to changing their methods to use e-prescribing systems (Smith, 2006). In supporting the link between physicians and SDO, it has been demonstrated that physicians are less likely to take on new systems when these systems are suggested by individuals from other professions, i.e. not part of the legitimate in-group (Gollop, Whitby, Buchanan & Ketley, 2004; Davies, Powell & Rushmer, 2007). This may indicate that physicians are less likely to adopt new systems due to a potentially high SDO level. The UTAUT model will thus be extended by adding SDO in the context of physicians' intention to use e-prescribing systems.

The use of PE within UTAUT measures whether the technology may be useful in its functional state, but it does not necessarily measure whether it is trusted to remain functional, and perform that useful function reliably and without error. Trust, in relation to acceptance, was put forward by Gefen, Karahanna & Straub (2003), who suggest that trust in the vendor who provides a technology may lead to adoption of that technology. The approach of Gefen et al. (2003), however, implies that the trust is based on user perceptions of the vendor rather than the technology in question. An alternative view of trust which focuses on the actual service is defined by Garbarino & Johnson (1999, pg. 71) as "*confidence in the quality and reliability of the services offered*". This is based upon Commitment-Trust Theory (Morgan & Hunt, 1994). Support for this is found in the

e-prescribing context by Smith (2006) who points to physicians' lack of trust in new technology as a hindrance to their adoption. Consequently, Trust in technology will extend UTAUT in this study.

UTAUT does not address the concerns which exist around the funding of e-prescription systems, especially as physicians generally need to carry the financial burden (Crosson et al., 2011; Chin, 2003; Smith, 2006; Halamka et al., 2006). This potential stumbling block to the use of e-prescriptions may be explained by the product evaluation model (Dodds, Monroe & Grewal, 1991). This model aims to explain that individuals are more likely to use a product if they perceive that the value of the product outweighs the monetary cost. It thus follows that there is a relationship between an individual's perception of the Price Value (PV) of the product and any subsequent intention to use a product. The use of the product evaluation model has been used successfully in prior acceptance research (Venkatesh, Thong & Xu, 2012; Chu & Lu, 2007), and will extend UTAUT in this study.

The research into the intention of physicians to use e-prescribing systems will therefore measure the relationship between BI and PE, EE and SI, based on UTAUT (Venkatesh et al., 2003), and will be extended by SDO (Pratto et al., 1994), Trust (Morgan & Hunt, 1994) and PV (Dodds et al., 1991).

A summary of the theoretical underpinnings can be found in Table 2.2.

Table 2.2: Summary of Theoretical Underpinnings

Reference	Theoretical Model
Venkatesh, Morris, Davis & Davis (2003)	- Unified Theory of Acceptance and Use of Technology (UTAUT)
Pratto, Sidanius, Stallworth & Malle (1994)	- Social Dominance Theory
Morgan & Hunt (1994)	- Commitment-Trust Theory
Dodds, Monroe & Grewal (1991)	- Product Evaluation Model

2.4 Model and Hypotheses

2.4.1 *Dependent Variable*

Behavioural Intention (BI) denotes the intention of an individual to undertake a particular behaviour. This is based on Ajzen's Theory of Planned Behaviour (TPB) (Ajzen, 1991). Davis et al. (1989) references Ajzen (1991) when arguing that BI is a measure of the strength of an individual's intention to perform a specific behaviour, and Bandura (2001) suggests that intentions focus on expected action. These claims that intention can be used to measure action are corroborated by empirical studies suggesting that actual behaviour follows behavioural intention (Venkatesh et al., 2003; Davis et al., 1989). By taking this view, the potential use of an e-prescribing system by physicians may be estimated by the measure of Behavioural Intention, even where actual use cannot be measured.

Due to intention being the process of acting "*mindfully to make desired things happen*" (Bandura, 2001, pg. 5), it may be proposed that where behavioural intention exists, an active acceptance of that system exists too. This view is supported by Ajzen (1991) who argues that intentions lead to actual behaviour. Equally, BI is used to represent actual acceptance across multiple intention based studies (Holden & Karsh, 2009). Thus for the purposes of this paper the behavioural intention variable will be the proxy for acceptance, and the dependent variable in the model.

2.4.2 *Independent Variables*

To what extent does the perceived change in performance from e-prescribing affect physicians' intention to use an e-prescribing system?

The independent variable Performance Expectancy (PE) denotes the perceived gains a user will achieve from using the system in their job context through direct improvement in work quality and quantity (Venkatesh et al., 2003). These perceived gains are potential outcomes of using e-prescriptions, thus reflecting the attitude of the physician toward the outcomes (Ajzen & Fishbein, 1973)[1]. PE is used interchangeably with perceived usefulness (PU) from TAM due to PE being derived from PU (Venkatesh et al., 2003; Holden & Karsh, 2009), but for the purposes of this study will be referred to as PE as per

[1] Attitudinal considerations are based on expected outcomes while normative considerations refer to one's perceived expectations of others (Ajzen & Fishbein, 1973).

the UTAUT model. PE is relevant in the e-prescribing context due to empirical studies suggesting that e-prescribing will improve the performance of physicians by improving the quality of prescribing and dispensing, and lowering medication risks for patients (Kaushal et al., 2010; Tamblyn et al., 2006; Ammenwerth et al., 2008; Devine et al., 2010; van Doormaal et al., 2009; Halamka et al., 2006; van der Sijs et al., 2006).

PE is expected to have a positive relationship with BI (Venkatesh et al., 2003), due to physicians expected aim of achieving improved quality of medical care (Boonstra, 2003; Tamblyn et al., 2006; Wang et al., 2009; Pare et al., 2006). Indications are that lessened call-backs and time savings on refills of prescriptions may improve the performance perception of the system by physicians (Tamblyn et al., 2006; Halamka et al., 2006), and the perceived indirect gains of their patients and subsequent pharmacists (Kaushal et al., 2010; Ammenwerth et al., 2008; Devine et al., 2010; van Doormaal et al., 2009; Halamka et al., 2006; van der Sijs et al., 2006). It thus follows that the degree of PE perceived by the physician may affect their intention to accept the system.

H1: Performance Expectancy will be positively related to Behavioural Intention.

To what extent does the perceived usability of an e-prescribing system affect physicians' intention to use such a system?
To what extent does the perceived change in performance mediate the relationship between perceived usability and physicians' intention to use the system?

Effort Expectancy (EE) denotes the degree of ease, or degree to which the use is perceived to be free from physical or mental efforts, associated with using the system to get the desired results (Davis, 1989). EE is sometimes used interchangeably with perceived ease of use from TAM (Holden & Karsh, 2009), but for the purposes of this study will be referred to as EE in order to maintain consistent variable names as presented by UTAUT (Venkatesh et al., 2003). EE is relevant in the e-prescribing context where the introduction of a new system may increase the level of effort and time required of the physician, rather than diminish it (Eslami et al., 2007; Devine et al., 2010). This increased level of effort and time may discourage physicians from using an e-prescribing system.

Studies have suggested that EE has a positive relationship with BI due to positive perceptions about the effort involved in using a new system (Venkatesh et al., 2003; Davis et al., 1989). This is further supported in the e-prescribing context by empirical results (Boonstra, 2003; Tamblyn et al., 2006; Wang et al., 2009; Pare et al., 2006). This suggests that the degree of EE perceived by the physician may affect the choice to accept the system.

In earlier discussions within this study it was stated that there was empirical support for relationships between EE and PE (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). Within the e-prescribing context this may be justified where difficulty in using the system may impede its usability, and thus its effectiveness. Some studies raised concerns that using an online system took much longer than simply writing a script (Eslami et al., 2007; Devine et al., 2010), which would lower the expected improvements in job performance brought about by using e-prescriptions. This study will thus extend UTAUT by including PE as a mediator between EE and BI.

H2a: Effort Expectancy will be positively related to Behavioural Intention.

H2b: Performance Expectancy will mediate the relationship between Effort Expectancy and Behavioural Intention

To what extent does the degree to which a physician is socially influenced to use an e-prescribing system affect the physician's intention to use such a system?
To what extent does the perceived change in performance mediate the relationship between social influence and physicians' intention to use the system?

Social Influence (SI) comprises social norms and social factors (Venkatesh et al., 2003; Holden & Karsh, 2009) and denotes the level to which the participant believes others, of perceived importance to the participant, believe the system should be used. This precludes the physician's personal attitude of the system, and focusses on the expectations of others (Ajzen & Fishbein, 1973). This is relevant due to physicians perceiving that e-prescribing may affect their immediate social status, being influenced into the behaviour by other parties (Boonstra, 2003). Furthermore there are indications

that the social makeup of the practice may affect physicians' acceptance (Simon et al., 2009; Fischer et al., 2007).

Higher levels of SI are suggested to increase the intention to change behaviour, due to a feeling of social obligation to take part, or not take part, in that behaviour (Ajzen, 1991). It has been suggested that SI has no significant relationship with behavioural intention within voluntary settings (Venkatesh et al., 2003), but other studies do not support this view, and rather suggest that voluntariness has no effect on the relationship between SI and behavioural intention (Ajzen, 1991; Fischer et al., 2007). Due to the lack of consensus, this study will test the relationship between SI and physicians' intention to use an e-prescribing system in a voluntary setting.

The original TAM excluded SI, partly due to psychometric problems, but it did acknowledge that further research should investigate the impact of social influence on usage behaviour (Davis et al., 1989). One element of this is the effect on PE by SI, where SI may influence the user's expectations of performance from the system, especially at the early adoption phase (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). This proposed effect ties in with e-prescribing studies (eg Halamka et al., 2006) where the benefits of the systems were communicated through colleagues that the doctors would listen to. This study will extend UTAUT by including PE as a mediator between SI and BI.

H3a: Social Influence will be positively related to Behavioural Intention.

H3b: Performance Expectancy will mediate the relationship between Social Influence and Behavioural Intention

To what extent does the degree to which a physician is social dominance orientated affect the physician's intention to use an e-prescribing system?

SI's inclusion in UTAUT, as mentioned in hypothesis H3a, pertains to the positive influence on one's behaviour brought upon by important others. SI does not, however, take into account the possible negative influence, or individual's reluctance to use a system, should those who are not part of the important others believe he or she should use

the system. This phenomenon, where an individual is reluctant to use a system because certain others encourage the use of the system, is referred to as social dominance orientation or SDO.

Individuals who are highly SDO rated may actively seek out corporate structures which tend to favour hierarchy-enhancing ideologies and policies (Pratto et al., 1994). Furthermore, these social dominance stereotypes are easily learned and activated by being within such hierarchy-enhancing social structures (Sidanius & Pratto, 1999). Given that the profession of physicians is generally considered to be a highly hierarchical and dominant profession (Freidson, 2007), it follows that physicians are susceptible to high levels of SDO.

Sidanius & Pratto (1999) argue that individuals with high levels of SDO are more likely to resist changes to the status quo, such as those brought about through new systems, and Mittelstaedt, Grossbart, Curtis & Devere (1976) state that individuals with higher levels of social stereotypical views are less likely to adopt new innovations due to their "c*losed-mindedness*". The argument of lower adoption by high level SDO individuals is corroborated by suggestions of lower adoption rates amongst physicians of new quality improvement systems compared to other professions (Shekelle, 2002; Gollop et al., 2004; Davies et al., 2007). Physicians have been shown to be less likely to take on new systems, especially when these systems are suggested by individuals from other professions (Gollop et al., 2004; Davies et al., 2007). Thus it follows that intolerant views about changes brought about by the implementation of e-prescribing systems leads partly to the lower adoption of these e-prescribing systems.

SDO thus extends the UTAUT model in the context of physicians' intention to use e-prescribing systems.

H4: Social Dominance Orientation will be negatively related to Behavioural Intention.

To what extent does the perceived price value of an e-prescribing system affect physicians' intention to use such a system?

UTAUT does not cater for the impact of the financial cost of a system on an individual's intention to use the system. Within the e-prescribing context it has been suggested that financial incentives should be introduced to encourage physicians to use e-prescriptions (Crosson et al., 2011). This focus on the financial aspect is due to concerns that e-prescribing systems are a hard sell because the physician generally has to bear the cost of this technology (Chin, 2003; Crosson et al., 2011). In support of this concern, some studies have cited the cost of e-prescribing systems as a barrier to their use (Smith, 2006; Halamka et al., 2006).

The impact of financial costs on the use of systems may be explained by the Product Evaluation Model proposed by Dodds et al. (1991), which suggests that a willingness to pay for a product is related to the perceived value of that product. Perceived value is built from a combination of the perceived quality of the product, versus the perceived monetary cost of using the product (Dodds et al., 1991). This suggests that a higher price for a product would lower the perceived value, and consequently lower the willingness or intention to buy and use. Where physicians may be required to bear an element of the cost of a product, in this case an e-prescribing system, a lower perceived cost value of the system may cause a lower acceptance of the system, and thus a lower intention to use.

The product evaluation model of Dodds et al. (1991) has been used in studies modelling acceptance where perceived value may lead to the acceptance of a product (Chu & Lu, 2007). This broad view of product value leading to acceptance took a general approach to perceptions of cost, without limiting it to direct monetary cost. An example of this is where Chu & Lu (2007) described a low perceived ease of use as a potential cost detracting from the value of the system. A more focussed approach, however, is taken by Venkatesh et al. (2012), where the perceived price value variable is restricted to monetary cost, in line with the original model of Dodds et al. (1991). Venkatesh et al.'s (2012) study focused on the perceived value variable, rather than the factors leading to that perceived value variable. This approach to price value enables the cost factor's expected relationship with acceptance to be measured, without adding considerable complexity to the model (Venkatesh et al., 2012).

The variable of perceived price value is thus denoted by Price Value (PV) and represents the trade-off between perceived benefit of a system and its price (Venkatesh et al., 2012; Dodds et al., 1991). Price Value extends the UTAUT model in this study, where price value is a factor of behavioural intention in the context of physicians' intention to use e-prescribing systems.

H5: Price Value will be positively related to Behavioural Intention.

To what extent does the perceived change in performance mediate the relationship between confidence in the system's reliability and physicians' intention to use the system?

UTAUT is further extended by Trust in technology, which denotes the willingness to depend on a trusted system (Gefen et al., 2003), where a lack of trust will deter one from entering into the transaction (Dasgupta, 2000). This is relevant in the e-prescribing context due to the potential medical risks if the e-prescribing system should prove to be unreliable or faulty, such as displaying incorrect medication or patient information to physicians or pharmacists. While the concept of low trust in e-prescribing has been discussed as a potential barrier to acceptance of e-prescribing systems (Smith, 2006; van der Sijs et al., 2006; Crosson et al., 2011) it has not been empirically tested with physicians.

If a physician believes that an e-prescription system will not function in a way that warrants use, it is unlikely that the physician will use the system. Gefen et al. (2003) demonstrated a relationship between trust in a system vendor and the subsequent acceptance of that system vendor's technology, where the users had previous experience with the vendor of that technology. In the current study there is no expected prior experience of the physicians with any particular related vendor, and thus the trust needs to be based on the perceived quality and reliability of the service, as is inferred by Morgan & Hunt (1994) and suggested by Garbarino & Johnson (1999). This indicates that the physician's trust would need to be placed in the expected performance of the system in the functionality that it is expected to provide. Hence it follows that trust in the

system may to lead to an expectation of performance, and subsequently to an intention to use the system.

H6: Performance Expectancy will mediate the relationship between Trust and Behavioural Intention.

The adapted model based on the hypotheses is shown in Figure 2.1.

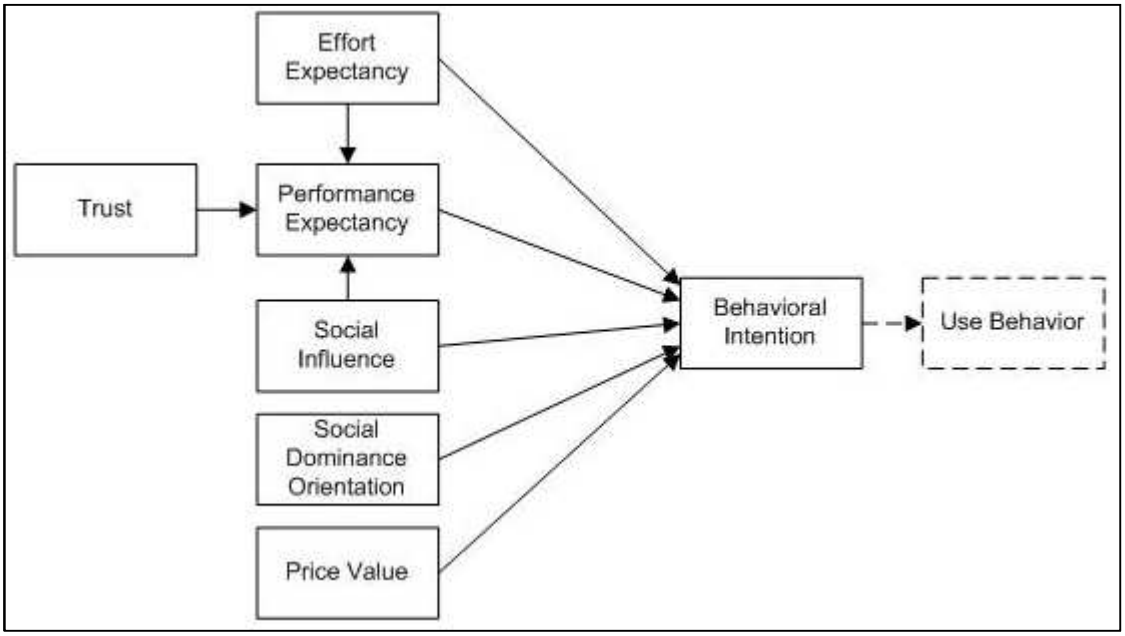

Figure 2.1 - Model of factors and their relationships with Intention, adapted from Venkatesh et al. (2003).

2.4.3 *Controls*

Additional controls for Age and Gender are included in this study. The UTAUT model includes Age and Gender (Venkatesh et al., 2003), however these variables are given less emphasis in some studies (Holden & Karsh, 2009; Im et al., 2011). Within the e-prescribing context Wang et al. (2009) used the UTAUT model, but failed to find support for the effect of Age and Gender. Consequently, Age and Gender are not used as moderators within the model, but will be used as control variables to ensure they have no material effect on the hypothesised relationships.

2.5 Chapter Summary

This chapter reviewed existing literature in the context of adoption of e-prescribing systems by physicians. Through this process, a research gap was identified, and a number of factors were proposed as determinants of physicians' intention to adopt e-prescribing systems.

The following hypotheses were formed:

- H1: Performance Expectancy will be positively related to Behavioural Intention.
- H2a: Effort Expectancy will be positively related to Behavioural Intention.
- H2b: Performance Expectancy will mediate the relationship between Effort Expectancy and Behavioural Intention.
- H3a: Social Influence will be positively related to Behavioural Intention.
- H3b: Performance Expectancy will mediate the relationship between Social Influence and Behavioural Intention.
- H4: Social Dominance Orientation will be negatively related to Behavioural Intention.
- H5: Price Value will be positively related to Behavioural Intention.
- H6: Performance Expectancy will mediate the relationship between Trust and Behavioural Intention.

The following chapter will build a data collection and analysis strategy to test these hypotheses.

CHAPTER 3: RESEARCH METHODS

3.1 Chapter Introduction

This chapter describes the research method and tools used to collect data for the research into the factors supporting physicians' Behavioural Intention (BI) to use e-prescribing. These factors are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Social Dominance orientation (SDO), Price Value (PV) and Trust. The methods and tools selected are done so as to achieve valid and reliable results, generalisability of conclusions and repeatability of the research.

3.2 Research Methodology

Two main paradigms can generally be identified in existing information systems research, these being the positivist and interpretivist paradigms (Orlikowski & Baroudi, 1991; Gregor, 2006). Positivist studies typically test theory, generally making use of quantitative measures (Orlikowski & Baroudi, 1991), allowing reductionist, statistical analysis techniques such as regression analysis and correlation analysis to be conducted on the data (Punch, 2005; Bhattacherjee, 2012). A limitation in this method may exist due to its isolationist approach, where variables not included in the survey may have been relevant, but were never measured (Bhattacherjee, 2012). Interpretivist studies generally aim to understand the phenomena through evaluating the participants and the contextual setting of the study (Orlikowski & Baroudi, 1991). Qualitative research typically lends itself to subjective interpretation of phenomena by evaluating participants within contexts (Punch, 2005). The qualitative approach allows for a holistic view, where interpretations can be made on the meaning of the response based on language and context of the answers, but this also can allow for some limitations, such as observer bias (Bhattacherjee, 2012).

The current study lends itself to a positivist, quantitative approach because it aims to test existing and modified models, rather than to build theory. The quantitative, numerical data collection method aims to empirically test the stated hypotheses in a manner which is repeatable, reliable and valid, and the results generalisable. This method is selected in order to measure statistically significant relationships between the dependent variable BI and the relevant independent variables (PE, EE, SI, SDO, PV and Trust). The

quantitative study makes use of an online survey, the results of which are measured numerically. This method is able to suggest relationships between the relevant variables, in order to support the hypotheses, or fail to support the hypotheses.

3.3 Research Design

The survey is presented through an online survey (Appendix B) which is emailed to the respondents, along with a cover letter explaining the purpose of the survey (Appendix E). Surveys are useful when individual people are the unit of analysis (Bhattacherjee, 2012), such as the individual physicians of this study. The online survey made use of the form function on Google Docs, a free, online document management and storage application. All items used the same 5-point Likert scale, ranging from 'Strongly Disagree' through to 'Strongly Agree'.

3.3.1 *Items Section*

The first two sections of the questionnaire are made up of the items discussed later in this chapter in Section 3.5. These were separated into two sections for ease of understanding for the respondent, one pertaining to the respondent's perceptions on the system, and the other pertaining to the respondent's perceptions on people. In order to avoid the negative impression of a large number of questions, new pages were used every 15 questions, or closest to 15 for logical flow. The response headings ('Strongly Disagree' through to 'Strongly Agree') were repeated on the same page where natural scrolling in the page may hide the original headings at the top of the page.

It was not deemed necessary for any scales to have a 'none' or 'not applicable' option. This was because no scales were conditional to specific respondent categories, and it was expected that all scales would be applicable to all respondents.

3.3.2 *Demographics*

The third section of the questionnaire captures demographic data. This is placed at the end of the survey after the respondent has committed their time to filling out the survey as these are seen to be less threatening (Bhattacherjee, 2012). The respondent's age and

gender are placed in this section. These are based on Venkatesh et al. (2003), and are used to add richness to the study.

3.3.3 *Respondents' Exposure to E-prescribing*

Respondents would need to have had some direct exposure or experience with the relevant systems to give meaningful responses (Fazio & Zanna, 1981). Davis (1989) needed to ensure respondents' familiarity with the system in his two initial studies when testing TAM. The first study simply asked respondents whether they have used the relevant system and excluded those who had not, and the second study allowed the respondents just one hour of training on the system before the surveys were distributed. In a similar approach for the initial UTAUT test, Venkatesh et al. (2003) delivered the surveys to the respondents as they completed the system training. This approach around training sessions was not always possible with other acceptance and intention studies because the respondents were not within a controlled group in an organisation (e.g. Venkatesh et al., 2012; Bhattacherjee, 2001). Instead, by using contact details from databases of existing system users, they could assume respondents had direct exposure to the systems in the respective surveys.

In the current study the respondents were not part of a controlled training group. Consequently, a combination method of identification was used in order to ensure that the respondents had sufficient exposure to e-prescription systems. All surveys included questions to establish the nature of the exposure that the respondent had had to e-prescribing systems, similar to the method adopted by Davis (1989). Where possible, respondent names were extracted from actual e-prescription system databases for the cover letter salutation, much as Bhattacherjee's (2001) method.

Due to the possibility that some of the respondents may have been using e-prescriptions for a few months, and the concern that the behavioural intention items may not be phrased correctly for respondents with extended exposure to e-prescribing, a preliminary test was done to check the tense of the questions. This was done with a group of individuals in a private company who had started using a new risk system a few months prior. Two sets of the same questions were provided, with different tenses, and then the respondents were asked whether one set made more or less sense than the other. All

respondents felt that the tenses made no difference to their understanding of the questions. As a result of this, the survey for this research could use one generic set of questions for all respondents.

3.4 Population and Sample

The study is directed at practicing physicians who have had exposure to e-prescribing systems. The sample group was collected from two sources. The first source was from a database of an e-prescribing application provider, Health-Soft. The data provider granted permission (Appendix C) after having sight of the survey questionnaire, and on condition of ethical clearance from the University's ethics committee. This provider had 421 email addresses of physicians who had had exposure to their e-prescribing system, although not all the physicians on the list were actively using the system. Of the 421 entries on this list, 379 were valid email addresses. The cover letter sent to these respondents included the Health-Soft logo, as requested by the provider (Appendix E).

The second list was extracted programmatically from the South African Yellow Pages, a free online contact directory. This list held details of over ten thousand physicians, but only 260 of these entries had email addresses. Cover letters sent to these potential respondents did not include Health-Soft's logo.

Due to the generic set of questions mentioned above, and the conditional questions confirming the respondent's exposure to e-prescribing, the data set from the Health-Soft could be joined with the data set from the South African Yellow Pages into one sample group. The nature of the sample, comprising individual physicians who are not instructed to use e-prescription systems, indicates that the study is conducted in a voluntary setting.

This provided a combined sample of 639 potential respondents.

3.5 Instrument Construction

The survey made use of standardised 5 point Likert scales for respondents to mark their perceptions related to the specific question. Content validity of the items is based on previous use and validation of the items, ensuring they fully represent the relevant variables. Where applicable, items were adjusted to the context of e-prescribing, and the

tenses of questions were changed to be aligned to one another. All questions related to an e-prescribing system were generalised to 'e-prescribing system' rather than a specific system's name. This is to allow for an understanding of the technological concept itself, rather than a system developed by a particular provider. This generalised naming approach has previously been used with UTUAT (Venkatesh et al., 2012).

3.5.1 *Behavioural Intention*

The items operationalising this variable aim to measure the respondent's intention to use an e-prescription system, and are based on the items used by Venkatesh et al. (2003). These items are: I intend to use e-prescriptions, given the opportunity; I predict I would use e-prescriptions, given the opportunity; I plan to use e-prescriptions, given the opportunity.

3.5.2 *Performance Expectancy*

H1*: Performance Expectancy will be positively related to Behavioural Intention.*

The items representing this variable aim to measure the respondent's expectation of improved work performance resulting from the use of an e-prescribing system. These items are based on the study done by Davis (1989). The UTAUT items of PE from Venkatesh et al. (2003) were not used in this study due to UTAUT's inclusion of some items pertaining to salary benefits which were not relevant to this study. Due to the similarities between PE and Perceived Usefulness (Venkatesh et al., 2003; Holden & Karsh, 2009), mentioned earlier in this study, the items were used interchangeably. These include: Using e-prescriptions in my job would enable me to accomplish tasks more quickly; Using e-prescriptions would improve my job performance; Using e-prescriptions would enhance my effectiveness on the job.

3.5.3 *Effort Expectancy*

H2a*: Effort Expectancy will be positively related to Behavioural Intention.*

H2b*: Performance Expectancy will mediate the relationship between Effort Expectancy and Behavioural Intention.*

The variable representing the respondent's expected effort to learn the system was operationalised through items based on Davis (1989). Due to the similarities between EE from UTAUT and Perceived Ease of Use from TAM (Venkatesh et al., 2003; Holden & Karsh, 2009), the items were used interchangeably. Davis (1989) had a greater number of validated items than UTAUT, and as a result those items were selected in preference to those of UTAUT. The items include: Learning to operate e-prescriptions would be easy for me; I would understand how to interact with e-prescriptions; I would find e-prescriptions easy to use.

3.5.4 *Social Influence*

***H3a**: Social Influence will be positively related to Behavioural Intention.*

***H3b**: Performance Expectancy will mediate the relationship between Social Influence and Behavioural Intention*

The items used to operationalise Social Influence are adapted from Ajzen's (1991) subjective norms items. The full list of items of SI from Venkatesh et al. (2003) were not used due to some items being relevant only in larger organisations, which would appear irrelevant in small medical practices. Ajzen (1991) makes only two items available, so in order to increase the number of items operationalising the SI variable for improved reliability, an extra item presented by Yi, Jackson, Park & Probst (2006) was included. Thus the items for SI are: People who influence my behaviour think that I should use e-prescriptions; People who are important to me think that I should use e-prescriptions; People whose opinions I value think I should use e-prescriptions.

3.5.5 *Social Dominance Orientation*

***H4**: Social Dominance Orientation will be negatively related to Behavioural Intention.*

This variable's items aim to measure the respondent's social dominance orientation level. The items selected for this study are based on Pratto et al. (1994). Commonly there are 16 items used to measure SDO, which, for the purposes of this study were considered too onerous for a respondent to fill out, so the item count was reduced to a manageable four for questionnaire purposes. The source study did not supply sufficient information to

identify the four highest loading items (Pratto et al., 1994). A recent study made use of the same SDO items (Ho et al., 2012), which allowed easier access to the current authors, to obtain the factor loadings of the 16 SDO items, and thus allow the items in this study to be limited to the top four loading items. Email correspondence with the author of the recent study (Ho, 2012, pers. comm. 6 June) confirmed the four top loading items, which were used in this study. These include: It's probably a good thing that certain staff are at the top and others are at the bottom; If certain categories of staff stayed in their place, we would have fewer problems.

3.5.6 *Price Value*

***H5**: Price Value will be positively related to Behavioural Intention.*

This variable's items aim to measure the respondent's perception of the monetary cost of using the system, compared to the perceived value of using the system. The PV items used in this study are based on Venkatesh et al. (2012), and are adapted to the e-prescribing context. They include: e-Prescriptions are reasonably priced; e-Prescriptions is good value for money.

3.5.7 *Trust*

***H6**: Performance Expectancy will mediate the relationship between Trust and Behavioural Intention.*

The items used to measure the respondent's trust in the system were based upon the items from Garbarino & Johnson's (1999) study. After adjustment for the e-prescribing context, the items included: I believe e-prescriptions can be counted on to fulfil their function well; I believe e-prescriptions will be reliable; I believe e-prescriptions cannot always be trusted.

One item under Trust, *I believe e-prescriptions cannot always be trusted*, was reverse coded in the source text. Some deliberation was made toward changing this question into a standard coding for ease of reading. The proposed item ran as such: "*I believe e-prescriptions can always be trusted*", but this wording appeared to the researcher to have little face validity. As a result, the item was kept as a reverse coded question.

A full list of item numbers, items and sources is available in Appendix A, and the final survey is available in Appendix B.

3.6 Permission, Ethical Considerations and Delivery

Prior to any questionnaires being sent to potential respondents, ethical clearance was unconditionally approved by the sponsoring University with protocol number CINFO/1021 (Appendix D). Permission to use the data from Health-Soft was agreed (Appendix C) after a lengthy process to meet their requirements. One of these was to include their logo on emails sent to respondents from their list. The list taken from the Yellow Pages, however, is in the public domain, and no explicit permission was requested.

The potential participants would be invited to take part in the survey via a cover letter (Appendix E), without any obligation being placed upon them to do so, and without any monetary reward should they choose to respond to the survey. Contact details were made available for them to put their questions forward if they had any queries relating to the survey or the study. Participants remain anonymous because no personal identification information will be stored, and any published results are reported in aggregated form.

3.7 Pre-Test

Senior researchers assisted with a pre-test on the survey. This sample of researchers were selected and contacted from Information Systems and Economic Sciences disciplines from the sponsoring university. Once willingness to assist was received from the researcher, the pre-test was forwarded to them in the same format as it would be to respondents. Of the sample of senior researchers, four pre-tests responses were received. A number of grammatical errors in the cover letter and questionnaire were identified and corrected through this process. Further to these changes were alterations to the question order, with the dependent variable placed at the end of section 1 of the survey.

The pre-test also raised concerns around the SDO questions, which were considered to be of a sensitive nature regarding perceptions or stigma of other groups of people. An example of this was the phrase ‘inferior groups’, which may have implied that the respondent was obliged to believe that inferior groups existed. This SDO item was

tempered to be more neutral by using the phrase ‘certain groups’ instead of ‘inferior groups’.

3.8 Pilots

An initial pilot study was conducted by selecting a random sample from the list of potential respondents. This random approach was achieved by selecting one potential respondent from every 20 to 30 row items on the list. These were marked so they would not be picked up in future iterations. This first pilot had 12 in the group, and despite follow up emails, a low response rate of 25% was returned, with only two of those responses being fully completed from this pilot, lowering the effective response rate down to 16%.

The low response rate was raised as a concern for the main study, as the potential sample group indicated that a response rate in the region of 20% may be required for sufficient statistical testing. A number of strategies were devised in order to improve the response rate, which were tested in two further pilot studies. These extra pilot groups were selected using the same method as the initial pilot.

The second pilot study involved personal phone calls to 8 potential respondents prior to the email being sent to them. This allowed the researcher to introduce himself personally to the potential respondent, and explain the purpose of the study. This approach was very onerous and achieved only limited success. It took up to four phone calls per respondent to get hold of the relevant person, sometimes while they were resting at home, and still returned a low response rate. Due to the poor results obtained this onerous approach was abandoned.

The final pilot study combined a personalised salutation and an update to the cover letter emphasising that the study was for degree purposes rather than commercial purposes. This pilot study sent emails to 15 potential respondents. After follow up emails, this pilot had an improved response rate of 20%, and the responses from the pilot were usable for the main study, as no further changes were required.

3.9 Main Data Collection

After the pilot tests, 599 valid email addresses of potential respondents remained. Given the smaller size of the list of potential respondents, the emails were sent to every valid email address on the list which remained after the pilots. Some of the email addresses were indicative of a receptionist or administrative role, but during the pilots it was found through some responses that the admin staff would forward the email on to their physician. Follow up emails were sent twice before the cut-off date, and these follow up mails also suggested passing the survey onto other potential respondents if possible.

Based on the response rate from the final pilot test, it was expected that a response rate of between 15 to 20% would be achieved during the main data collection, putting the response count at approximately 100.

3.10 Data Analysis

3.10.1 *Reliability, Validity and Consistency*

The data will be cleansed of incomplete or outlying responses, and any responses from mandatory settings will be excluded. Convergent validity will be confirmed through principal component factor analysis, conducted across the item groups using varimax rotation, expecting a minimum loading of .60. This method has been used with UTAUT (Im et al., 2011) and with technology acceptance (Gefen et al., 2003). Statistical validity and reliability of variables will be checked using a Cronbach Alpha test, with an alpha level expected above 0.70. Individual items may need to be removed from groups should the alpha result be too low. Composite variables will be created from the grouped items, and skewness and kurtosis will be checked on these, with acceptable ranges being within -3 and +3 (Hair, Babin, Money & Samouel, 2007).

3.10.2 *Individual Relationships*

Correlation analysis will be conducted in order to do preliminary relationship tests between variables. P values below 0.05 will be used to measure statistical significance of the relationships between variables (Hair et al., 2007). This method is used as a preliminary test to identify relationships between two variables in isolation, without the effects of other variables in the model, for initial partial support of hypotheses. It also

serves as a precursor for the mediator tests, where correlation between PE and EE, SI or Trust may begin to indicate the meditating effect of PE (Baron & Kenny, 1986).

The correlation analysis results will be checked for any bias caused by the control variables of Age and Gender. This is done to check whether the control variables have any influence on the relationships between the other variables (Hair et al., 2007). The test will look for any material change in the correlation analysis results when Age and Gender are controlled for. An absence of any material change in the results may suggest that the control variables could have no influence on the correlation in question (Hair et al., 2007).

3.10.3 *Model Tests*

Multicollinearity tests will be conducted on the variables to confirm that there are no independent variables which are too highly correlated. The Variance Inflation Factor (VIF) value is to be below 5.0 and the minimum tolerance is 0.10, (Hair et al., 2007).

Multiple-regression will be used on the centralised variables for testing hypotheses H1 to H6, expecting correlation between the dependent variable BI and the independent variables PE (H1), EE (H2a), SI (H3a), SDO (H4) and PV (H5). Significance will be checked against the $p < 0.05$ level.

In order to test the mediating effect of PE on the relationship between BI and EE (H2b), SI (H2b) and Trust (H6), the steps laid out by Baron & Kenny (1986) will be followed. These steps are (1) to confirm regression between the mediator (PE) onto the mediated independent variables (EE, SI and Trust); (2) to run regression analysis between the dependent variable (BI) and the mediated variables, and then (3) to run regression analysis between the dependent variable and the other individual variables. If the first two tests have statistical significance, and the 3rd test has statistical significance for the mediator and dependent, and no statistical significance for the independent and dependent, then the mediated relationship will be supported.

3.11 Constraints

The broad reach of potential respondents across South Africa may improve the generalisability of the study, as site specific factors may play less of a role in the results. However, with the respondents requiring access to email and the Internet, and being advertised on the Yellow Pages or linked through one software provider, certain sample representative limitations may creep in. It is likely that any physician who does not have an email account, or whose contact details are not on the Yellow Pages or is linked to another e-prescribing provider, will not be contacted via the survey, causing sample bias. Equally those who are the listed physician on any database may be a central contact in the practice, potentially omitting junior physicians in a practice not listed. This is partially addressed by follow up emails to inform the reader that the survey may be passed onto others to whom the survey may be relevant.

The study may encounter bias where physicians who are against the idea may choose not to respond, whereas those who are more open to the idea make up the bulk of the responses, who in turn may attempt to answer in such a way to promote their views. This limitation may be minimised to a degree by follow up emails to coax responses from a full range of potential responders.

The questionnaire contains all variables in the research, being captured by the same person at the same time, which may create a common method bias. This bias may be limited by conducting the Harman's one-factor test as described by Podsakoff & Organ (1986).

3.12 Chapter Summary

This chapter describes the tools and methods used to gather and analyse the items in order to measure the variables and test the model.

The items are adapted from previous studies (see Table 3.1), and they will be delivered to potential respondents through an online survey which will be emailed to them. The responses will be validated and tested against the model to test the various hypotheses.

Table 3.1: Summary of items

Variable	Items Source
Behavioral intention	Venkatesh et al. (2003)
Performance Expectancy	Davis (1989)
Effort Expectancy	Davis (1989)
Social Influence	Ajzen (1991) with extra item from Yi et al. (2006)
Level of Social Dominance Orientation	Pratto et al. (1994), with factor analysis from Ho et al. (2012)
Trust	Garbarino & Johnson (1999)
Price Value	Venkatesh et al. (2012)

The next chapter will describe the data results of the survey, and the analysis thereof.

CHAPTER 4: DATA ANALYSIS

4.1 Chapter Introduction

This chapter reports the statistical analysis process and results of the data collected to test the hypotheses. These hypotheses consider the relationships between Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Social Dominance orientation (SDO), Price Value (PV) and Trust, and the Behavioural Intention (BI) to use e-prescribing.

The characteristics of the sample are described, after which reliability and validity tests are conducted on the variables for further analysis. This analysis comprises descriptive results such as mean and standard deviation of the variables. To test the hypotheses, correlation and multiple regression analysis are performed to measure the strength of the relationships.

4.2 Sample Profile and Screening

4.2.1 *Data Preparation*

The final pilot study and the main study combined to create a list of 614 potential respondents. These resulted in a total of 78 responses, which equates to a response rate of 12.7%. This response rate was lower than expected based on the final pilot study conducted which returned a response rate of close to 20%, however it did closely match the response rates of the initial pilot studies. The responses were coded into Microsoft Excel by using a value of 1 for Strongly Disagree, through to 5 for Strongly Agree. The converted data was then imported into SPSS (version 17.0.1). Five responses which had more than 3 questions incomplete were identified as false captures and were manually removed, leaving 73 responses for further analysis.

4.2.2 *Frequency Distributions*

Prior to data screening and setting of missing values, a frequency distribution was done on the items. This frequency table is available in Appendix F. This indicated high frequencies of Agree and Strongly Agree for Behavioural Intention items, Performance Expectancy items and Effort Expectancy items. This suggests that, in general, most of

the respondents had a higher level of agreement toward their intention to use e-prescribing systems, and that they believed the system would improve their work performance, and require little effort to use the system. The clustering of these results may result in frequency symmetry problems, such as distribution skewness.

4.2.3 *Reverse Coded Items*

The single reverse coded item (T4: "*I believe e-prescriptions cannot always be trusted*") was reversed to align its scale with the rest of the items. This required changing the responses of this item in a structured manner, without falsifying any responses. Responses of 1 were changed to 5; responses of 2 were changed to 4; responses of 4 were changed to 2 and responses of 5 were changed to 1. This was achieved on the data set by subtracting 6 from each value, and multiplying the result by -1. This effectively switched the coding of a variable's values in line with the other variables in the study which use 5 point Likert scales.

4.2.4 *Missing Values*

Across the 73 responses, and 29 individual items, there were 12 missing values, with no response having more than 3 missing responses. These missing values were set to the series mean. This process provides missing values with replacement values which are similar to the others in the series. This prevents incomplete data sets from affecting the results. (Hair, Celsi, Money, Samouel & Page, 2011).

4.2.5 *Outliers*

Z-score, or standard score, analysis was conducted using the univariate method on the responses to determine the normality of the distribution of the data in a variable. The z-score value counts the number of standard deviations away from the mean value in the variable (Hair et al., 2011). Based on the z-scores, one additional response was removed, because three values of that response were below -3.0.

This left 72 responses (n=72) for further analysis.

4.2.6 *Characteristics of Respondents: Current Use*

A higher percentage of the respondents are current users of e-prescriptions than those who are not currently using e-prescriptions. Over 60% of respondents in this study indicated that they are currently using e-prescribing systems. This higher percentage is not unexpected due to the sample being taken largely from a database of an e-prescribing system provider, which could suggest that most of those respondents are current users. The full details of current use can be viewed in Table 4.1.

Table 4.1: Characteristics of respondents: Current Use

	Number	Percentage (%)
Currently using e-Prescriptions		
Yes	45	62.5
No	25	34.7
Not stated	2	2.8
Total	72	100.0

Note - 'Not stated' indicates responses where the relevant questions were not completed

4.2.7 *Characteristics of Respondents: Gender*

The majority of responses were obtained from male respondents, with only 21% coming from female respondents (see Table 4.2). This skewed ratio between genders in this study is not unexpected, as the percentage of female physicians in South Africa has ranged between 25% and 30% in recent years (Breier, 2008). The difference between genders in their intention to use e-prescribing is negligible. This could indicate that gender plays little direct role in the use of e-prescribing. 4.2% of the responses did not indicate their gender, which made it impossible to infer anything from them related to gender. The responses which had not indicated a gender will still be included in the hypotheses testing due to gender relationships not being tested as part of the model.

Table 4.2: Characteristics of respondents: Gender

	Number of responses	Percentage (%)	Intention to use
Gender			
Female	15	20.8	4.07
Male	54	75.0	4.20
Not stated	3	4.2	2.45
Total	72	100.0	

Note - 'Intention to use' represents the mean of the relevant group, 1 = low and 5 = high
- 'Not stated' indicates responses where the relevant questions were not completed

4.2.8 *Characteristics of Respondents: Age*

The time required to become a medical doctor in South Africa is six of years study, two years internship and a year of community practice (UCT, 2013). This means that an average school leaver, who is 18 years old, going on 19, would have to be 27 years old, going on 28, before they can begin practicing medicine, presuming no specialisation. This may explain why no responses were attained from respondents below 30 (see Table 4.3), as 9 years of preparation might leave very little time for a newly practicing doctor to be in the position to be making decisions about e-prescription systems. Table 4.3 indicates that, above the age of 30, respondents were from a variety of age groups. The majority of respondents were between the ages 45 to 59, which may be the age that most physicians' have established practices, and thus are in a position to be investigating e-prescribing systems. The group of respondents who are over the age of 70 is the only group with a low intention to use, perhaps because they are close to retirement and that they do not wish to change the way they do things.

Table 4.3: Characteristics of respondents: Age

	Number of responses	Percentage (%)	Intention to use
Age			
Below 30 years	0	0.0	-
30-34	4	5.6	3.59
35-39	6	8.3	4.11
40-44	7	9.7	4.00
45-49	11	15.3	3.93
50-54	15	20.8	4.51
55-59	12	16.7	4.30
60-64	8	11.1	4.04
65-69	2	2.8	4.50
70 years and over	7	9.7	2.76
Not stated	0	0.0	-
Total	72	100.0	

Note - 'Intention to use' represents the mean of the relevant group, 1 = low and 5 = high
- 'Not stated' indicates responses where the relevant questions were not completed

4.2.9 *Characteristics of Respondents: Cross Tabulation of Gender and Age*

Breier (2008) indicates that while the overall percentage of female physicians in South Africa has been between 25% and 30% in recent years, there has been a recent increase in the percentage of female graduate doctors. Breier's (2008) assertion of recent change in percentage of female physicians is partially supported by viewing Table 4.4 in this current study. Table 4.4 shows a crosstab of Age and Gender which demonstrates that at the lower ages (or rather the most recent graduates) there are more Females than Males responding, and at the higher ages there are more Males than Females responding.

Table 4.4: Characteristics of respondents: Cross-tabulation

Age	Male	Female	Percentage of Women
Below 30 years	0	0	-
30-34	1	3	75%
35-39	2	3	60%
40-44	5	2	29%
45-49	9	2	18%
50-54	13	1	7%
55-59	10	2	16%
60-64	7	2	22%
65-69	2	0	0%
70 years and over	5	0	0%
Total	54	15	22%

Note - Responses with no gender submitted were omitted from this table

4.2.10 *Characteristics of Respondents: Source of e-Prescribing System Knowledge*

When asked how they came to know of e-prescribing, the majority of respondents had found an e-prescribing system through their own research (see Table 4.5). Interestingly, those who had heard about e-prescribing through a fellow medical professional were the ones with the highest intentions to use e-prescribing. This may be indicative of some social influence playing a role in their intention, where the in-group legitimacy of fellow colleagues may have a positive influence on a physician's intention to use e-prescribing systems.

Table 4.5: Characteristics of respondents: Source of e-Prescribing knowledge

	Number of responses	Percentage (%)	Intention to use
How did you hear about e-prescribing			
Personal research	35	48.6	3.97
Someone who is a medical professional	20	27.8	4.32
Someone who isn't a medical professional	16	22.2	3.8
Not stated	1	1.4	4
Total	72	100.0	

Note - 'Intention to use' represents the mean of the relevant group, 1 = low and 5 = high
- 'Not stated' indicates responses where the relevant questions were not completed

The group who had heard of e-prescribing through non-medical professionals had the lowest intention to use, which may be linked to SDO levels in physicians. These descriptive results should however be viewed with caution due to the lower response rate.

4.3 Psychometric Properties

4.3.1 *Common Method Variance*

Common method variance is explained by Podsakoff & Organ (1986) as the problematic result of two or more variables' measures being collected from the same source, where any defect in the source contaminates both, or all, measures. In this study all the measures are taken from one source, being physicians, so it is open to the problems associated with common method variance. Harman's one-factor test, as described by Podsakoff & Organ (1986), makes use of an unrotated factor analysis, and should only one factor emerge, it is considered likely that the data suffers from common method variance. In this study, the unrotated factor analysis produced 6 separate factors, which may suggest that this study is not overly affected by common method variance.

4.3.2 *Principal Component Factor Analysis*

Hair et al. (2011) describe factors as linear combinations of original variables. Factors are used to explain as much as possible of the variance in the data by a few components (Hair et al., 2011). These factors are derived by making use of Principal Component Factor Analysis (PCFA), in this case using the varimax rotation, which is the most widely used (Hair et al., 2011), with loadings below 0.60 being suppressed (Hair et al., 2007). The PCFA results can be seen in Table 4.6.

Table 4.6: Results of Principal Component Factor Analysis

	Performance Expectancy (PE)	Social Dominance Orientation (SDO)	Social Influence (SI)	Effort Expectancy (EE)	Price Value (PV)	Trust
SDO1		0.78				
SDO2		0.936				
SDO3		0.925				
SDO4		0.913				
PE1	0.786					
PE2	0.856					
PE3	0.889					
PE4	0.912					
PE5	0.889					
PE6	0.807					
EE1				0.627		
EE2				0.813		
EE3				0.835		
EE4				0.86		
T1						0.664
T2						0.734
T3						0.783
SI1			0.959			
SI2			0.947			
SI3			0.931			
PV1					0.91	
PV2					0.93	
PV3					0.905	
Cronbach Alpha	0.96	0.92	0.97	0.87	0.97	0.88

Three items had to be removed in order to have clean factor loadings above 0.60. These are EE4: "*I would find e-prescriptions to be flexible*"; EE6: "*I would find e-prescriptions easy to use*" and T4: "*I believe e-prescriptions cannot always be trusted*". The question for T4 had been reverse coded, and was raised as a potential problem prior to the survey, but the decision was made to keep it in the original form as taken from Garbarino & Johnson's (1999). The results from the factor loadings suggest that the item did not load well with the others, which was not unexpected due to its reverse coding. The dropped items are listed in Table 4.7.

Table 4.7: Excluded items

Construct	Retained Items	Item Number	Item Question
Effort Expectancy (EE)	4	EE4	I would find e-prescriptions to be flexible
		EE6	I would find e-prescriptions easy to use
Trust	3	T4	I believe e-prescriptions cannot always be trusted

4.3.3 *Internal Consistency and Reliability*

Internal consistency was checked across the resultant factors using Cronbach's alpha test. Cronbach's alpha, or coefficient alpha, returns a value between 0 and 1, with researchers generally looking for a minimum value of 0.70 (Hair et al., 2007). The following alpha values were found for the independent variables: SDO: 0.917; PE: 0.964; EE: 0.870; Trust: 0.879; SI: 0.974 and PV: 0.966. The dependent variable BI had an alpha value of: 0.971. Based on these values the internal consistency of the variables was considered to be very good. The alpha values are available in both Table 4.6 and Table 4.8.

4.3.4 *Composite Variables*

After the internal consistency tests, the relevant scales were aggregated into composite variables by taking the average across each group of scales. Further analysis would be done on the composite variables rather than the individual items.

4.3.5 *Descriptive Statistics (Composite Variables)*

All the variables had five possible values, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The composite variables' means ranged between 2.85 and 4.03. SI was the only variable which had a mean below the median of 3, and BI and EE were the only variables with means above 4. Based on the value of BI, one may deduce that most of the respondents had an intention to use e-prescribing.

The mean of SDO was 3.1, and the mode response was 3.0. The standard deviation of SDO was 0.93, which indicates the SDO responses were not very dispersed, suggesting that most SDO responses were around the neutral of 3.0. One may conclude from this

that, on average, physicians who responded were either neutral in SDO, or chose to give the impression that they are neutral in SDO.

The standard deviation of most of the variables was less than 1.0, except for SI which had the highest standard deviation at 1.06. This demonstrates that the variables were not very dispersed about their means, which is indicative of consistency of responses (Hair et al., 2011). The means and standard deviations of all the variables are available in Table 4.8.

Table 4.8: Composite variable reliabilities, validities and descriptive statistics

Variable	Number of items	Mean	Standard Deviation	Cronbach Alpha	Minimum Factor loading	Skewness	Kurtosis
Behavioural Intention	3	4.03	0.99	0.97	0.97	-1.26	1.49
Performance Expectancy	6	3.86	0.98	0.96	0.79	-0.98	0.89
Effort Expectancy	4	4.01	0.71	0.87	0.63	-0.34	-0.39
Social Influence	3	2.85	1.06	0.97	0.93	0.06	-0.53
Level of Social Dominance Orientation	4	3.10	0.93	0.92	0.78	-0.14	0.04
Trust	4	3.57	0.88	0.88	0.66	-0.41	0.33
Price Value	3	3.46	0.89	0.97	0.91	-0.28	0.48

Note - Factor loading for Behavioural Intention based on isolated analysis

4.3.6 *Skewness and Kurtosis*

Skewness checks are done to test for distribution symmetry (Hair et al., 2007; Hair et al., 2011). The checks on the composite variables indicated that all were well within the acceptable range of -3.0 and +3.0. SI had the smallest absolute skewness value of 0.06. These skewness values indicate that the distribution of the data is reasonably symmetrical

Hair et al. (2011) describe kurtosis as the measure of peakedness or flatness of a variable's distribution. Kurtosis values for this study were within the acceptable range of -3.0 and +3.0. SDO had the smallest absolute kurtosis value, being 0.04.

Based on these skewness and kurtosis values, the composite variables may be considered to have normal, symmetrical distributions. The full results are available in Table 4.8.

4.4 Correlation Analysis

A correlation analysis was conducted across all variables as a preliminary test prior to the model test (see Table 4.9). Apart from SDO, all independent variables had statistically

significant correlations with the dependent variable BI. PE had the strongest correlation of 0.788 ($p<0.001$) with BI, and SI had the lowest correlation with PE of 0.317 ($p<0.01$).

SDO had no significant relationships with any of the variables, and is excluded from further correlation analysis.

Excluding SDO, all of the independent variables had significant correlations with at least two of the other independent variables, which may support further mediation testing. PE had a significant correlation with all of the other independent variables, the strongest being Trust, at 0.676 ($p<0.001$). SI had no significant correlation with EE, PV or Trust, with its strongest significant correlation being with PE, with 0.361 ($p<0.001$). The correlation matrix is available in Table 4.9.

The correlation analysis results were checked for influence from Age and Gender by observing whether there was any material change in correlation between two measured variables when the effect of Age or Gender is controlled (Hair et al., 2007). When the effect of Age and Gender were controlled, there was no material change to the significance or correlation values between the relationships measured in the main correlation analysis. This indicates that Age and Gender may have no influence on these relationships.

Table 4.9: Correlation matrix

	Variable	1	2	3	4	5	6	7
1	Behavioural Intention	1						
2	Performance Expectancy	0.788***	1					
3	Effort Expectancy	0.347**	0.521***	1				
4	Level of Social Dominance Orientation	0.021	-0.060	0.071	1			
5	Trust	0.539***	0.676***	0.520***	0.171	1		
6	Social Influence	0.317**	0.361**	0.015	-0.128	0.224	1	
7	Price Value	0.442***	0.410***	0.386**	0.045	0.479***	0.199	1

* Correlation significant to the $p < 0.05$ level
** Correlation significant to the $p < 0.01$ level
*** Correlation significant to the $p < 0.001$ level

4.5 Model Analysis

Multiple regression analysis was used to test the proposed model. As a precursor to multiple regression analysis, a number of tests are run on the data to ensure it will support multiple regression assumptions (Hair et al., 2007).

4.5.1 *Normality*

The normality test makes use of a probability plot (p-plot), checking for the observed standardised residuals against the expected standardised residuals. To the eye, the observed residuals should cluster along the 45° line (Hair et al., 2007). The p-plots for the variables in this study are available in Appendices G1 to G7, and these demonstrate sufficient normality in the data.

4.5.2 *Linearity and Homoscedasticity*

Scatter plots enable one to look for linearity and homoscedasticity to indicate that the distribution of the variables will support regression analysis (Hair et al., 2007). This is a visual test, looking for both similarity between spread of the residuals for linearity, and looking for no evidence of changes in the variance for homoscedasticity. The scatter plots for this study are available in Appendices G2 to G7. These give evidence of both linearity and homoscedasticity.

4.5.3 *Multicollinearity*

Multicollinearity tests are conducted to prevent problems with statistical significance on the regression coefficients (Hair et al., 2007). The VIF and tolerance tests in this study demonstrated that there were no multicollinearity problems residing in the data (see Table 4.11). The VIF values for PE, EE, SI, SDO and PV ranged between 1.031 and 1.738, which are all below the 5.0 limit specified in Chapter 3. The tolerance values for the variables ranged between 0.575 and 0.970, all of which are greater than the 0.20 minimum.

4.5.4 *Multiple Regression Analysis*

The dependent variable BI was regressed on the independent variables PE (H1), EE (H2a), SI (H3a), SDO (H4) and PV (H5). The results gave an R^2 value of 0.654, but this result does not take cognisance of the meditation affects tested later. The analysis of variance, or ANOVA, gives an F value of 24.9, at a significance of $p < 0.001$. These results are displayed in Table 4.10.

Table 4.10: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.808	0.654	0.627	0.601		
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	45.029	5	9.006	24.896	0

The results of the multiple regression analysis indicate that PE had a very strong relationship with BI, with an unstandardized beta of 0.798 ($p<0.001$) and PV had a weak relationship with BI with an unstandardized beta of 0.182 ($p<0.05$). The relationships between EE, SI and SDO and BI were not found to be significant ($p>=0.05$). The multiple regression results are available in Table 4.11. The partial regression plots are available in Appendices H1 to H5.

Table 4.11: Regression model

	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	0.005	0.071		0.064	0.949		
Performance Expectancy	0.798	0.096	0.791	8.282	0.000	0.575	1.738
Effort Expectancy	-0.186	0.124	-0.134	-1.495	0.140	0.649	1.540
Social Influence	0.009	0.074	0.010	0.122	0.903	0.810	1.235
Social Dominance Orientation	0.076	0.078	0.071	0.972	0.335	0.970	1.031
Price Value	0.182	0.091	0.164	1.997	0.049	0.778	1.285

4.5.5 *Mediating Effects*

The tests for the mediating effect of PE on the relationships between BI and EE (H2b), BI and SI (H3b) and BI and Trust (H6) were conducted as laid out by Baron & Kenny (1986). These steps are (1) to test individual regression between the mediator onto the mediated independent variable; (2) to test regression between the dependent variable and the mediated variable, and then (3) to test regression between the dependent variable and the other variables combined. Should the first two tests have statistical significance, and the 3rd test have significance only for the mediator and dependent, then the mediated relationship will be supported.

The mediating effect of PE on the relationship between BI and EE is demonstrated by the following test results. Table 4.12 shows that PE and BI are significantly related, and EE and BI are significantly related, but when BI is regressed on PE and EE together there is no longer a significant relationship between BI and EE (Sig. > 0.05). This indicates that PE provides a mediating relationship between BI and EE.

Table 4.12: The mediation effect of PE on the relationship between BI and EE

Step	Regression	Variable	B	Std. Error	Beta	t	Sig.
1	PE on BI	PE	0.795	0.074	0.788	10.692	0.000
2	EE on BI	EE	0.479	0.155	0.347	3.091	0.003
3	PE and EE on BI	PE	0.841	0.087	0.833	9.658	0.000
		EE	-0.122	0.119	-0.088	-1.020	0.311

Table 4.13 displays the results from each step of the testing process which shows that PE provides a mediating effect on the relationship between BI and SI. In the final step SI does not have a significant relationship with BI (Sig. > 0.05).

Table 4.13: The mediation effect of PE on the relationship between BI and SI

Step	Regression	Variable	B	Std. Error	Beta	t	Sig.
1			0.795	0.074	0.788	10.692	0.000
2			0.293	0.105	0.317	2.798	0.007
3			0.781	0.080	0.774	9.744	0.000
			0.035	0.073	0.038	0.473	0.638

The mediating effect of PE on the relationship between Trust and BI followed was confirmed by the results in Table 4.14. Both PE and Trust have significant relationships with BI, but when tested together, Trust no longer had a significant relationship with BI (Sig. > 0.05).

Table 4.14: The mediation effect of PE on the relationship between BI and Trust

Step	Regression	Variable	B	Std. Error	Beta	t	Sig.
1			0.795	0.074	0.788	10.692	0.000
2			0.586	0.110	0.539	5.316	0.000
3			0.785	0.109	0.752	7.195	0.000
			0.033	0.114	0.030	0.292	0.772

4.6 Hypotheses Test Results

4.6.1 *The Relationship between Performance Expectancy and Behavioural Intention*

Hypothesis H1 supported.

Performance Expectancy (PE) was hypothesised to be positively related to Behavioural Intention (BI). The correlation analysis indicated a very strong, positive relationship of 0.788 ($p<0.001$) between PE and BI. In the presence of the other factors, PE was still shown to have a very strong, positive relationship of $\beta = 0.798$ ($p<0.001$) with BI. This indicates support for H1.

4.6.2 *The Relationship between Effort Expectancy and Behavioural Intention*

Hypothesis H2a not supported.

H2a proposed that Effort Expectancy (EE) would be positively related to Behavioural Intention (BI). The correlation analysis showed a moderate, positive relationship of 0.347 ($p<0.01$) between EE and BI. In the presence of the other factors, however, EE was shown to have no significant relationship with BI. This suggests a lack of support for H2a.

4.6.3 *The Mediating Effect of Performance Expectancy on the Relationship between Effort Expectancy and Behavioural Intention*

Hypothesis H2b supported.

H2b proposed that the relationship between Effort Expectancy (EE) and Behavioural Intention (BI) would be mediated by Performance Expectancy (PE). Using Baron & Kenny's (1986) method, PE was shown to mediate the relationship between EE and BI, indicating support for H2b.

4.6.4 *The Relationship between Social Influence and Behavioural Intention*

Hypothesis H3a not supported.

H3a proposed that Social Influence (SI) would be positively related to Behavioural Intention (BI). Correlation analysis showed a moderate, positive relationship of 0.317 ($p<0.01$) between SI and BI. In the presence of the other factors, however, EE was shown to have no significant relationship BI. This indicates a lack of support for H3a.

4.6.5 *The Mediating Effect of Performance Expectancy on the Relationship between Social Influence and Behavioural Intention*

Hypothesis H3b supported.

H3b proposed that the relationship between Social Influence (SI) and Behavioural Intention (BI) would be mediated by Performance Expectancy (PE). H3b was supported because PE was confirmed as a mediator of the relationship between SI and BI.

4.6.6 *The Relationship between Social Dominance Orientation and Behavioural Intention*

Hypothesis H4 not supported.

H4 proposed that Social Dominance Orientation (SDO) would be negatively related to Behavioural Intention (BI). No significant correlation was found between SDO and BI, and multiple regression showed no significant relationship between SDO and BI in the presence of other the other factors. This indicates that the data gives no support for H4.

4.6.7 *The Relationship between Price Value and Behavioural Intention*

Hypothesis H5 supported.

Price Value (PV) was hypothesised to be positively related to Behavioural Intention (BI). The correlation analysis indicated a moderate-to-strong, positive relationship of 0.442 ($p<0.001$) between PV and BI. In the presence of the other factors, PV was shown to have a weak, positive relationship of $\beta = 0.182$ ($p<0.05$) with BI. This demonstrates support for H5.

4.6.8 *The Mediating Effect of Performance Expectancy on the Relationship between Trust and Behavioural Intention*

Hypothesis H6 supported.

H6 proposed that the relationship between Trust and Behavioural Intention (BI) would be mediated by Performance Expectancy (PE). PE was shown to be a mediator of the relationship between Trust and BI, which indicates support for H6.

4.7 Chapter Summary

This chapter described the nature of the data and the statistical analysis to test the hypotheses. Most respondents had an intention to use e-prescribing systems, but only two factors were directly linked to behavioural intention. These were Performance Expectancy and Price Value. Performance Expectancy played a mediating role between Behavioural Intention, Effort Expectancy, Social Influence and Trust. Effort Expectancy, Social Influence and Social Dominance Orientation had no direct relationship with Behavioural Intention, and thus their related hypotheses (H2a, H3a and H4 respectively) were not supported. All other hypotheses were supported. The summary of the hypotheses testing is available in Table 4.15.

Table 4.15: Summary of hypotheses and results

Hypothesis	Result
H1: Performance Expectancy will be positively related to Behavioural Intention	Supported
H2a: Effort Expectancy will be positively related to Behavioural Intention	Not supported
H2b: Performance Expectancy will mediate the relationship between Effort Expectancy and Behavioural Intention	Supported
H3a: Social Influence will be positively related to Behavioural Intention	Not supported
H3b: Performance Expectancy will mediate the relationship between Social Influence and Behavioural Intention	Supported
H4: Social Dominance Orientation will be negatively related to Behavioural Intention	Not supported
H5: Price Value will be positively related to Behavioural Intention	Supported
H6: Performance Expectancy will mediate the relationship between Trust and Behavioural Intention	Supported

Although the response rate was not as high as expected, the very good factor analysis and internal validity and reliability results suggested that the sample size was sufficient for statistical analysis. This may be a result of using previously tested items with strong content validity.

The next chapter will discuss the results of the statistical analysis of this chapter, and will link these results to literature and the stated hypotheses.

CHAPTER 5: DISCUSSION

5.1 Chapter Introduction

This chapter reviews and discusses the results of the statistical tests conducted in the previous chapter. These discussions aim to give insight to the results, reflecting on the original hypotheses and the literature which supported them. Hypotheses which are not supported are investigated in order to explain the reason for the failure to support.

This chapter proceeds by first reviewing the study objective, then discussing the results of the various hypotheses.

5.2 Study Objective

The aim of the study was to investigate the factors supporting physicians' intention to use e-prescribing systems. A review of literature identified Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Social Dominance Orientation (SDO) and Price Value (PV) as potential factors of Behavioural Intention (BI), with EE, SI and Trust being mediated factors of BI.

5.3 Hypotheses

5.3.1 *The Effect of Performance Expectancy upon Behavioural Intention*

Hypothesis H1 supported.

Performance Expectancy (PE) was hypothesised to be positively related to Behavioural Intention (BI). Correlation and multiple regression analysis support this hypothesis. This result corroborates prior e-prescription acceptance research (Boonstra, 2003; Pare et al., 2006; Tamblyn et al., 2006), and is consistent with the UTAUT model where PE has a positive relationship with BI (Venkatesh et al., 2003). The very strong relationship shown between PE and BI, whether in isolation or in the presence of other factors, suggests that PE is a very important factor in physicians' intentions to use e-prescribing systems. These results support previous studies which indicated that e-prescribing systems should chiefly be used due to the expected improvement in the quality of prescribing and dispensing of medicine (e.g. Kaushal et al., 2010; Devine et al., 2010).

These results further indicate that e-prescribing systems have not yet been adopted where the benefits are not immediately apparent.

5.3.2 *The Effect of Price Value upon Behavioural Intention*

Hypothesis H5 supported.

The monetary cost of the system was proposed as a factor of intention when Price Value (PV) was hypothesised in this study to be positively related to Behavioural Intention (BI). This hypothesis was supported by the data through correlation analysis and multiple regression analysis. This result supports suggestions that the monetary cost of an e-prescribing system may deter physicians from using it (Crosson et al., 2011; Smith, 2006; Halamka et al., 2006), much like the monetary cost has been suggested to be preventative in other contexts (e.g. Venkatesh, 2012). The results are also consistent with the Product Evaluation Model of Dodds et al. (1991), which postulates that a product is more likely to be used when the perceived value outweighs the monetary cost.

PV was positively related to BI, even when in the presence of other variables, although it had a weaker relationship with BI than PE had with BI. This supports the argument that PV is a very pertinent factor in physicians' intentions to use e-prescribing systems, albeit a less pertinent factor than PE.

Based on PV's effect on BI in the context of physician's adoption of e-prescribing, PV could be an important factor to focus on to encourage the use of e-prescriptions. In order to achieve this, providers would need to control system prices to keep them at a reasonable level, providers could selectively subsidise the costs depending on inter-physician shared usage (Ozdemir, Barron & Bandyopadhyay, 2011) or alternatively government organisations could give financial support and incentives to cover these system costs, as suggested by (Crosson et al., 2011).

5.3.3 *Mediated Effects*

Davis et al. (1989) argue that Performance Expectancy (PE) should provide a foundation for studying the impact of external variables. This study demonstrates PE's ability to

provide a foundation for other variables (Davis et al., 1989), specifically in the e-prescribing context with Trust, Social Influence and Effort Expectancy. It was demonstrated in this study that the relationships between BI and the three variables of Effort Expectancy, Social Influence and Trust were mediated by Performance Expectancy.

Hypothesis H2b supported.

The first variable mediated by PE was Effort Expectancy. This mediated relationship is consistent with expectations based upon the various TAM models (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). It was argued earlier in this study that any difficulty in using e-prescription systems may prevent the expected benefits of e-prescriptions from being realised. The results of this study support this view, demonstrating that the degree of ease of using a system may have an effect on the expected performance of e-prescribing systems.

These results suggest that while performance expectancy appears to be the most important factor leading to intention, effort expectancy cannot be ignored, especially as performance expectancy may be affected by effort expectancy itself. Some studies found that capturing e-prescriptions took considerably longer than writing up a prescription (Eslami et al., 2007; Devine et al., 2010). Such challenges would need to be looked at through the design of the system, to allow for speedy and unobtrusive use in the consultation room.

Hypothesis H3b supported.

Social Influence (SI) was hypothesised to be related to Behavioural Intention (BI) through the mediating effect of Performance Expectancy (PE). This hypothesis was supported by the data. This result is consistent with expectations based upon acceptance literature indicating that SI's relationship with BI may be mediated by PE (Venkatesh & Bala, 2008; Venkatesh & Davis, 2000). One's perception of the usefulness of an e-prescribing system may be enhanced or reduced by influence brought upon by important others. The relationship between SI and PE is highlighted as the highest relationship that SI has with any of the variables in isolation. This could indicate that social forces may

best influence a physician's adoption of e-prescriptions by focussing on the improvement in performance brought about by these systems.

SI relates better with PE than it relates to any of the other variables, which could be indicative of the impact that social influence has on the expected performance improvements brought about through using e-prescribing systems.

Hypothesis H6 supported.

H6 predicted that the relationship between Trust and Behavioural Intention (BI) would be mediated by Performance Expectancy (PE). This hypothesis was supported by the data.

This finding adds support to literature which intimated that lowered trust in an e-prescribing system may be a hindrance to the use of e-prescribing systems (Smith, 2006; van der Sijs et al., 2006; Crosson et al., 2011). It also supports the inclusion of Trust as a factor leading to physicians' adoption of e-prescribing systems. The strong relationship between Trust and PE, leading on to BI, indicates the important role that trust plays for physicians in the adoption of e-prescribing systems. Based on this, one could say that a physician would not adopt an e-prescribing system unless the physician trusts that it can deliver upon its expectations, even if those expectations are about performance benefits. In the medical field it is relevant to trust the systems, where a patient's health, or life, is dependent on the accuracy of the system's results and process.

This indicates that the confidence of physicians in the reliability of e-prescribing systems should lead to improved adoption of such systems.

Trust also has strong, positive relationships with BI, PE, EE and PV, with the strongest relationship being with PE. It is interesting that the Trust in a system is so closely linked with other perceptions of use and value of the system, indicating the high relevance of Trust to other factors of adoption. Just as Trust in a system's reliability could lead to improved adoption of such systems, so it may also be that Trust in a system's reliability may be linked with the effort and time required to use a trustworthy system, and the perceived value of a trustworthy system in relation to its cost.

5.3.4 *The Effect of Effort Expectancy upon Behavioural Intention*

Hypothesis H2a not supported.

It was anticipated that Effort Expectancy (EE) would be positively related to Behavioural Intention (BI). Correlation analysis initially supported this hypothesis, which corroborated prior e-prescription acceptance research (Boonstra, 2003; Pare et al., 2006; Tamblyn et al., 2006). Multiple regression analysis, however, did not corroborate the correlation analysis, and thus the hypothesis was not supported.

It was unexpected to find that EE did not have a relationship with BI when in the presence of other factors, such as PE. This finding was unexpected because the hypothesised relationship had been supported in previous studies, including being integral to the UTAUT model of Venkatesh et al. (2003), and other acceptance models such as TAM (Davis, 1989). Furthermore, EE was shown to be a factor of BI in the presence of PE within the medical context by a number of previous studies (Holden & Karsh, 2009).

The result in the current study could be owing to the very strong impact that PE has on BI. This would be due to any performance improvement brought about by electronic prescriptions being much more important than any perceived difficulty in using the system. Much like this study, other studies have also found that EE does not consistently have a direct effect on intention: the reason for this is argued to be a consequence of the purpose of the system itself (Gefen & Straub, 2000). This view of EE's role in adoption suggests that where the purpose of the system is to obtain and generate a product (such as a prescription of medicine), rather than where the purpose of the system is to create awareness of a product (such as obtaining product information), then EE will not have a direct effect on adoption of that system (Gefen & Straub, 2000). In the case of e-prescribing, the electronic prescription itself is the valued product, rather than information about the prescription, and thus Gefen & Straub's (2000) view of adoption could explain why EE had no direct effect on intention in this study.

Alternatively, the result in this study could be a consequence of varying degrees of experience of the respondents on the e-prescribing systems. This is due to suggestions that the significance of EE diminishes with increasing experience of the users (Venkatesh

et al., 2003). This study did not measure experience based on previous studies in the e-prescribing context finding that experience had no moderating effect on EE (Wang et al., 2009).

5.3.5 *The Effect of Social Influence upon Behavioural Intention*

Hypothesis H3a not supported.

Social Influence (SI) is described as the level to which the participant believes others, of perceived importance to the participant, believe the system should be used (Venkatesh et al., 2003). Within the context of e-prescribing, prior literature proposed that SI may be a factor in the context of physicians' use of e-prescribing systems (Boonstra, 2003). This current study demonstrated that SI does indeed have a relationship with BI when tested in isolation. This result supports prior e-prescription acceptance research (Simon et al., 2009; Fischer et al., 2007), which suggested that social influence would affect a physician's intention to use e-prescribing.

When compared to other factors, however, SI was found to have no relative importance in explaining BI. This is contrary to the UTAUT model of Venkatesh et al. (2003), which predicts that SI will have a relationship with BI, even in the presence of other factors like PE. A potential explanation for this unforeseen result, much like with EE, is that in the presence of PE's very strong effect on BI, SI would not have a direct effect on BI. This could indicate that the influence of significant others would not have a direct bearing on a physician's intention to use e-prescribing where there already exists an expectation of improved performance through the system.

5.3.6 *The Effect of Social Dominance Orientation upon Behavioural Intention*

Hypothesis H4 not supported.

Social Dominance Orientation (SDO) was proposed to be negatively related to Behavioural Intention (BI). No support for this hypothesis was found through correlation analysis or multiple regression analysis.

This result was not anticipated due firstly to literature suggesting that physicians are likely to have high levels of SDO (Freidson, 2007), and secondly to literature suggesting that individuals with high levels of SDO, are less likely to adopt new innovations (Sidanius & Pratto, 1999). It should thus have followed that physicians would be less likely to adopt e-prescriptions where they had higher levels of SDO. The lack of support for this hypothesis may indicate a weakness in the theorising which led to the suggested relationship between SDO and BI.

SDO was not found to be related to SI. This is surprising as SDO could have had a negative relationship with SI. This was expected because SI is the *positive* influence brought about by *important* others, and SDO is the *negative* influence brought about by *un-important* others.

The unanticipated results in this study could be explained by the neutral responses given by respondents for the SDO variable. The neutral SDO level of physicians measured in this study is contrary to Freidson's (2007) assertion of a higher than neutral SDO level among physicians. The very neutral response, in contrast to literature's predictions, could indicate that the SDO responses given in this study were tempered by respondents, based on the sensitivity pertaining to stigma of other groups of people. During the pre-tests of this study the sensitive nature of the questions was raised as a concern, and an attempt was made to lower the tone of any overtly worded items. Further tempering of the answers on these questions by respondents may have negatively affected the explanative ability of the results obtained, such that any theorised relationship between SDO and BI would consequently not be found.

5.4 Chapter Summary

This chapter investigated and discussed the results of the survey in relation to the theoretically based hypotheses.

Performance Expectancy was found to have a major bearing on the intention to use e-prescribing systems, and should be an area of focus in design of e-prescribing systems. Should the system not cater for the operational needs of e-prescriptions, and bring improved performance, it is unlikely that the systems will be used. Price Value was also

found to be a direct factor of intention, indicating that the cost of using e-prescribing systems should be controlled or subsidised to enable their use.

Effort Expectancy, Social Influence and Trust were found to have an effect through performance expectancy on physicians' intention to use e-prescription systems. Effort Expectancy thus shows that the usability of an e-prescribing system affects a physician's perceptions of the performance gain from the system. Social Influence demonstrates that others who are important to a physician can influence that physician's expectation of the performance of the system, and consequently its use. Trust indicates that a physician's confidence in the system delivering intended results affects the physician's expectations of improved performance through the system.

Social Dominance Orientation was not found to have an effect on intention. This may be due to a weakness in the theorising which hypothesised the relationship between SDO and BI, but there are indications that the responses on those questions may have been tempered by the respondents to a more neutral result. This could make way for an alternative study to retest this factor under different conditions to encourage less restrained results.

The next chapter will conclude and summarise the study, highlighting contributions to theory and practice, and will make suggestions for future research.

CHAPTER 6: CONCLUSION

6.1 Chapter Introduction

This chapter concludes the report by giving an overview of the objectives and findings of the study. The contributions made by the study to practice and to theory are discussed, and the limitations of the study are described. The chapter ends with opportunities for further research based on the findings of this study, followed by concluding remarks.

6.2 Summary of Objectives

This study aimed to examine factors which support physicians' intentions to use e-prescribing systems. Prior research suggested that Performance Expectancy and Effort Expectancy were factors of intention, but these two factors on their own were not sufficient to explain physicians' intention to use e-prescribing systems (Boonstra, 2003). This study consequently investigated additional factors supporting physicians' intention to use E-prescribing Systems, which were Social Influence, Social Dominance Orientation, Price Value and Trust, along with the original Performance Expectancy and Effort Expectancy factors. This was done to investigate the following problems:

To what extent does:

- The perceived change in performance from e-prescribing affect physicians' intention to use an e-prescribing system?
- The perceived usability of an e-prescribing system affect physicians' intention to use such a system?
- The degree to which a physician is socially influenced to use an e-prescribing system affect the physician's intention to use such a system?
- The degree to which a physician is social dominance orientated affect the physician's intention to use an e-prescribing system?
- The perceived price value of an e-prescribing system affect physicians' intention to use such a system?
- The perceived change in performance mediate the relationship between perceived usability and physicians' intention to use the system?

- The perceived change in performance mediate the relationship between social influence and physicians' intention to use the system?
- The perceived change in performance mediate the relationship between confidence in the system's reliability and physicians' intention to use the system?

Data was collected using a structured, online survey, from physicians which had exposure to e-prescribing systems. 72 usable results were collected.

6.3 Summary of Key Findings

6.3.1 *Main Findings*

The study found that Performance Expectancy was very closely associated with Behavioural Intention, suggesting that the expected performance of e-prescriptions would be the driving factor leading to use of the system. Price Value was found to have a direct relationship with intention, even in the presence of Performance Expectancy. This was suggestive of the importance of the perceived cost benefit of an e-prescribing system in physicians' decision to make use of it. Trust in technology was found to have an indirect, mediated relationship with Behavioural Intention. This relationship was mediated through performance expectancy. Social Dominance Orientation was found to have no direct relationship with intention, whether in isolation or in the presence of other variables.

Previous studies in the e-prescribing context found that Effort Expectancy also had an effect on Behavioural Intention. This study, however, found that Effort Expectancy did not have a direct effect on intention to use, when in the presence of Performance Expectancy. Instead, Effort Expectancy had an indirect relationship with Behavioural Intention through Performance Expectancy. Social Influence also did not have the expected direct relationship with Behavioural Intention when in the presence of other variables, but it did have an indirect relationship with Behavioural Intention when mediated by Performance Expectancy.

6.3.2 *Summarised Interpretation of the Findings*

The findings from this study suggest that in order to improve physicians' intentions to use e-prescribing systems, the systems need to be designed to best improve the performance

of the physician, rather than exclusively on the patient or pharmacist. This may be through improving the speed of interaction, shortened patient recovery periods, and the e-prescriptions would need to save the physician time through less call backs from pharmacists. The price of the system would also need to be kept low, in relation to the value of the system, or alternatively government financial support could be given to physicians for using e-prescriptions. It appears that for as long as physicians are responsible for the cost of e-prescribing systems, the price will be a sensitive point.

Additional attention should be given to supporting expectations of improved performance by making the system easy to use, thus lowering the obtrusiveness of the system to the health care process. E-prescribing systems need to be, and be seen to be, stable and to be able to perform as expected. Furthermore, relevant industry councils or educators can encourage the use of e-prescribing systems by ensuring such systems are promoted throughout the industry.

6.4 Contribution to Practice

6.4.1 *Main Implications to Practice*

This study demonstrated the importance of having an e-prescribing system instead of written prescriptions. Physicians, however, have traditionally used written prescriptions as standard practice. In order to introduce an e-prescribing system to the prescribing process, such a system would need to add *new* value to physicians, without impacting their existing ability to interact and treat their patients. Simply producing a list of ways e-prescribing benefits the patient or pharmacist might not be sufficient, as the system would need to enable the physicians themselves to perform their jobs quicker, more effectively and with better results. The introduction of enhanced e-prescribing systems can also unlock new benefits for physicians, such as checking for drug incompatibility, or displaying a full list of drug side-effects without a physician having to commit them to memory. These additional benefits should also be presented to persuade physicians to use e-prescribing systems, as they benefit the physician directly.

E-prescribing systems need to be reasonably priced for physicians, as these professionals currently need to carry the cost. This could be difficult if the technology is new and struggling to get sufficient buy-in from potential users, where the income generated from

use of the system cannot support the developers of the system. Further costs may be encountered in establishing necessary infrastructure to support e-prescribing systems, such as access to the Internet and hardware acquisition, where physicians don't currently have these in place. In order to both lower the costs to the physicians and support the system vendors, governmental support would be required. Governmental support would be through the form of subsidies for physicians who use the system. This would not only encourage physicians to use the systems, but would also support system vendors through the increased use of e-prescriptions. Based on the potential for improved medical care and lessened prescription errors, it would be beneficial to government if they gave this financial support, due to with the expectation of lowered mortality rates and long term financial savings unlocked by the improved medical care.

6.4.2 *Additional Implications to Practice*

Three further areas are highlighted to assist in improving, or supporting, physicians' perceptions of increased performance from e-prescriptions. The first area is trust in the system, where system design should ensure the stability, accuracy, responsiveness and reliability of the systems. This requires a stable system which is tested to achieve a high level of quality, with system errors and gaps ironed out, to ensure that what is captured by the physician is what is presented to the pharmacist. Furthermore the system should be stand-alone, being able to function even if the connection to the Internet is not immediately available. If physicians do not have this trust in the systems, in that they are uncertain of the consistency of the performance of these systems, they will be less likely to use them.

The second area to focus on is the usability of the system. This can be achieved through sufficient system and process design to make the e-prescribing interface unobtrusive, such as being used on a tablet PC instead of a desktop PC, and for the interface of the system to be intuitive and streamlined with a least-click approach. Should the physician be struggling to use functionality it is likely that they won't achieve the performance benefits expected, and would revert to hand written prescriptions.

The third area of focus is the social influence of colleagues and others in the industry. This study indicated that social influence can improve the likelihood of physicians

perceiving that e-prescribing will be of benefit to them, and consequently should be more likely to begin using e-prescription systems. This could be achieved through conferences where fellow physicians present and demonstrate such systems, and how useful the systems can be when used in practice.

6.5 Contribution to Theory

This study contributes to the existing body of knowledge in the context of the adoption of e-prescription systems. This area of study has not been extensively explored. The majority of the previous studies comprised case studies and descriptive analysis studies, with only a few studies exploring the factors leading to improved adoption of e-prescriptions. Those which did investigate adoption focussed on performance expectancy and effort expectancy (Wang et al., 2009; Tamblyn et al., 2006; Pare et al., 2006; Boonstra, 2003). This current study went further than previous studies by supporting additional factors of physicians' adoption of e-prescribing systems, thus expanding and enriching the current knowledge in this context. These supported factors were Social Influence, Trust and Price Value.

The Unified Theory of Acceptance and Use of Technology, or the UTAUT model, was extended in this study with the Commitment-Trust Theory, the Product Evaluation Model and Social Dominance Theory. The empirical tests in this study demonstrate a new, successful combination of UTAUT, Commitment-Trust Theory and the Product Evaluation Model in the process of explaining physicians' intention to use e-prescribing systems. This combination of theories would add to future studies where potential users of systems are those who have to pay for the use of the systems, or where users' confidence in a system's expected behaviour is important to their particular decision to use the system.

Effort Expectancy, normally a reliable factor leading to adoption, was not a direct factor of intention when used in the combination of UTAUT and the Product Evaluation Model, and within the context of physicians' adoption of e-prescriptions. This presented an interesting perspective as to the impact of Effort Expectancy on Behavioural Intention when the system in question is not the final product itself.

The inclusion of Social Dominance Orientation (SDO), taken from Social Dominance Theory, presented a new area of learning in adoption studies. Literature suggests that SDO has an effect on intention to use, or adopt, a new system. The results in this study showed that SDO needs further research and theorising in order to find its place in adoption based research, if at all. Certain limitations in this study should also guide future researchers to an improved survey approach to encourage less tempered responses for SDO based variables.

6.6 Limitations of the Study

This study makes claims based on previous literature and empirical tests. Certain limitations in this study may cause certain results to be viewed with caution.

6.6.1 *Sampling Limitations*

The response sample was limited in three ways. Firstly it was restricted to physicians who had access to email and the Internet, and were available either through an existing medical software provider, or through public online records. The broad approach within these data sources may counteract the limitations to some degree, but the results may not be generalisable due to this limitation. The second limitation is the smaller response size, being 72 usable responses. Notwithstanding the statistical reliability and validity of the data, this small response sample may have affected the degree to which the results could be generalisable.

6.6.2 *Methodological Limitations*

Using a quantitative approach is limited in that it does not consider intangible factors such as the respondent's mood or emotional state whilst filling out the survey. A qualitative approach would have allowed a further exploration of physicians' intentions and perceptions of e-prescriptions. A qualitative approach does not, however, measure the relative strengths of the variables, which consequently required a quantitative approach in this study to test the modified model.

Based on the responses, the majority of the respondents had an intention to use e-prescribing systems already. This might indicate a response bias where most respondents

chose to respond due to their current use or intended use of e-prescribing systems, rather than a general response of all potential users. The questionnaire contains all variables in the research, being captured by the same person at the same time, which may create a common method bias. The method of collecting the sample, through specific databases, may allow for a sample bias, where the sample is limited based on the collection delimitations.

This study makes use of a cross-sectional survey, where the independent and dependent variables are measured at the same point in time, which can make it difficult to infer causality in the relationships (Bhattacherjee, 2012). This can be mitigated through causal inferences of the relationships being based upon the underlying theories predicting the correlations.

6.6.3 *Contextual Limitations*

The study was conducted in the South African context which may limit the generalisability of the results. It is possible that South African respondents are more sensitive to SDO based questions, thus limiting the effectiveness of the SDO variable, due to the changing social identification found in Postapartheid South Africa (Bornman, 2010). The low response ratios may have been due to potential respondents in South Africa being unaccustomed to being contacted for social science research (Department of Higher Education and Training, 2012).

6.6.4 *Limitations of the Model*

The proposed model had support for most of its proposed relationships, but the model might have excluded alternative factors, which could have had relevance and value in this study. The risk of this was mitigated by literature review within the adoption and e-prescribing contexts. The model was further limited by making use of Behavioural Intention as a proxy for actual use. While literature supports this approach, the actual adoption of e-prescribing systems by physicians was not directly tested.

Given that the hypotheses were constructed from literature, and most of these were supported by data, it is likely that the limitations in the study did not overtly undermine the results.

6.7 Opportunities for Further Research

A number of opportunities for further research are suggested as a result of the conclusion of this study. Due to limitations in the empirical testing, further studies may aim to corroborate the claims of this current study, in the same context, by collecting larger data sets across broader groups of physicians, with the aim of improved generalisability of the results. This may be achieved through studies which pay respondents to respond. These have resulted in higher response rates, e.g. Wang et al. (2009) who paid $100 per response and got a response rate close to 60%.

Further studies in this context may aim to measure other factors leading to physicians' use of e-prescribing systems, such as the physician's exposure to e-prescribing systems during medical education and training. This sort of study would need to measure the intentions of physicians who had used e-prescription systems as part of their studies and training. This study may only be currently possible in regions where e-prescriptions are already part of medical training.

Future research would have an opportunity of using this study's model in different contexts, such as those where users of systems are required to pay for its use to test Price Value (e.g. non-organisational studies), or alternatively studies where underperformance of the system is a critical issue to test Trust (e.g. other medical or safety based systems).

While the proposed role of SDO was not supported in this study, further research may identify SDO's role in adoption or resistance to change, where other variables not explored in this study may control for, or be affected by SDO. A potential solution to this is to conduct such studies in the USA where previous studies achieved less tempered, more meaningful results from their SDO responses (e.g. Ho et al., 2012).

6.8 Conclusion

E-prescriptions have been proposed as a viable solution to the high rates of patient health complications and deaths from incorrectly prescribed or incorrectly dispensed medication (Tamblyn et al., 2006; Ammenwerth et al., 2008; Devine et al., 2010). Despite the benefits of e-prescription systems, there has been little research into the factors which

lead to the adoption of these systems. This study contributes to the understanding of factors leading to physicians' adoption of e-prescribing systems.

The study conducted a survey of South African physicians with exposure to e-prescriptions. The results of the survey indicated that the expected gain in performance from using e-prescription systems was a strong driver of the use of these systems. Furthermore, the cognitive trade-off between the pricing and the perceived value of the system was also found to be a driver of the intended use of the system. The results of this study also demonstrated that the expected performance benefit of using e-prescriptions was affected by the physician's trust in the system, or confidence in the reliability of the system, along with the ease of use of the system and social influence regarding the usefulness of the system.

Based on the findings of this report, there are various factors, over and above Performance Expectancy and Effort Expectancy, which should be areas of focus to encourage physicians' use of e-prescribing systems. These additional factors tell us that a collaborative effort is required from software vendors, government and medical councils to provide quality systems, financial support and social impetus for an accelerated change from written to electronic prescriptions. This collaboration around e-prescriptions has begun in the European Union where it has become strategic policy (Kierkegaard, 2013), and similar energies would be required in other regions, such as South Africa. Given the patient deaths and extended illnesses resulting from written prescription errors and illegibility, considerable effort should be placed on putting e-prescribing systems into meaningful use for the benefit of all patients.

CHAPTER 7: REFERENCES

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CHAPTER 8: APPENDIX

13.1 Appendix A: List of Items and Sources

Item Num.	Items	Variable	Items Source
BI1.	- I intend to use e-prescriptions, given the opportunity	Behavioural intention	Venkatesh et al. (2003)
BI2.	- I predict I would use e-prescriptions, given the opportunity		
BI3.	- I plan to use e-prescriptions, given the opportunity		
PE1.	- Using e-prescriptions in my job would enable me to accomplish tasks more quickly	Performance Expectancy	Davis (1989)
PE2.	- Using e-prescriptions would improve my job performance		
PE3.	- Using e-prescriptions in my job would increase my productivity		
PE4.	- Using e-prescriptions would enhance my effectiveness on the job		
PE5.	- Using e-prescriptions would make it easier to do my job		
PE6.	- I would find e-prescriptions useful in my job		
EE1.	- Learning to operate e-prescriptions would be easy for me	Effort Expectancy	Davis (1989)
EE2.	- I would find it easy to get e-prescriptions to do what I want it to do		
EE3.	- I would understand how to interact with e-prescriptions		
EE4.	- I would find e-prescriptions to be flexible		
EE5.	- It would be easy for me to become skilful at using e-prescriptions		
EE6.	- I would find e-prescriptions easy to use		
SI1.	- People who influence my behaviour think that I should use e-prescriptions	Social Influence	Ajzen (1991) with extra item from Yi et al. (2006)
SI2.	- People who are important to me think that I should use e-prescriptions		
SI3.	- People whose opinions I value think I should use e-prescriptions		
SDO1.	- It's probably a good thing that certain staff are at the top and others are at the bottom	Level of Social Dominance Orientation	Pratto et al. (1994), with factor analysis from Ho et al. (2012)
SDO2.	- Certain staff should stay in their place		
SDO3.	- If certain categories of staff stayed in their place, we would have fewer problems		
.			
SDO4.	- Sometimes other staff must be kept in their place		
T1.	- I believe e-prescriptions will always meet my expectations	Trust	Garbarino & Johnson (1999)
T2.	- I believe e-prescriptions can be counted on to fulfil their function well		
T3.	- I believe e-prescriptions will be reliable		
T4.	- I believe e-prescriptions cannot always be trusted		
PV1.	- E-prescriptions are reasonably priced	Price Value	Venkatesh, Thong & Xu (2012)
PV2.	- E-prescriptions is good value for money		
PV3.	- At the current price, e-prescriptions provide good value		

13.2 Appendix B: Online Survey

E-prescribing Questionnaire

This questionnaire measures your level of agreement towards various elements of e-prescribing. The first part of the questionnaire, on pages 1 and 2, comprises 25 questions, and the second part, on page 3, comprises 4 questions. The final section, on pages 4 and 5, captures demographic data. There are five pages of questions. For the statements which follow, please indicate your level of agreement towards each question by ticking the appropriate box among the options available (strongly disagree through to strongly agree).

This section deals with your perceptions of e-prescribing. Please indicate your level of agreement towards each question by ticking the appropriate box among the options available

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Using e-prescriptions in my job would enable me to accomplish tasks more quickly	☐	☐	☐	☐	☐
Using e-prescriptions would improve my job performance	☐	☐	☐	☐	☐
Using e-prescriptions in my job would increase my productivity	☐	☐	☐	☐	☐
Using e-prescriptions would enhance my effectiveness on the job	☐	☐	☐	☐	☐
Using e-prescriptions would make it easier to do my job	☐	☐	☐	☐	☐
I would find e-prescriptions useful in my job	☐	☐	☐	☐	☐
Learning to use e-prescriptions would be easy for me	☐	☐	☐	☐	☐
I would find it easy to get e-prescriptions to do what I want them to do	☐	☐	☐	☐	☐
I would understand how to interact with e-prescriptions	☐	☐	☐	☐	☐
I would find e-prescriptions to be	☐	☐	☐	☐	☐

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
flexible					
It would be easy for me to become skilful at using e-prescriptions	☐	☐	☐	☐	☐
I would find e-prescriptions easy to use	☐	☐	☐	☐	☐

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe e-prescriptions will always meet my expectations	☐	☐	☐	☐	☐
I believe e-prescriptions can be counted on to fulfil their functions well	☐	☐	☐	☐	☐
I believe e-prescriptions will be reliable	☐	☐	☐	☐	☐
I believe e-prescriptions cannot always be trusted	☐	☐	☐		

e-Prescribing questionnaire - Section 1 - page 2 of 5

This section deals with your perceptions of e-prescriptions. Please indicate your level of agreement towards each question by ticking the appropriate box among the options available

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
e-Prescriptions are reasonably priced	☐	☐	☐	☐	☐
e-Prescriptions are good value for money	☐	☐	☐	☐	☐
At the current price, e-prescriptions provide good value	☐	☐	☐	☐	☐
People who influence my behaviour think that I should use e-prescriptions	☐	☐	☐	☐	☐
People who are important to me think that I should use e-prescriptions	☐	☐	☐	☐	☐
People whose opinions I value think I should use e-prescriptions	☐	☐	☐	☐	☐

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I intend to use e-prescriptions, given the opportunity	☐	☐	☐	☐	☐
I predict I would use e-prescriptions, given the opportunity	☐	☐	☐	☐	☐
I plan to use e-prescriptions, given the opportunity	☐	☐	☐	☐	☐

e-Prescribing questionnaire - Section 2 - page 3 of 5

This section deals with your perceptions of people within an organisation. Please indicate your level of agreement towards each question by ticking the appropriate box among the options available

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It's probably a good thing that certain staff are at the top and others are at the bottom	☐	☐	☐	☐	☐
Certain staff should stay in their place	☐	☐	☐	☐	☐
If certain categories of staff stayed in their place, we would have fewer problems	☐	☐	☐	☐	☐
Sometimes other staff must be kept in their place	☐	☐	☐		

e-Scripting Questionnaire - section 3 - page 4 of 5

This section captured demographic data. Please tick whichever boxes are applicable to you.

Please indicate your gender:

- ☐ Female
- ☐ Male

Please indicate your age:

- ☐ Less than 30 years old
- ☐ 30-34

- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-69
- 70 years and older

How did you hear of the e-prescriptions?

- Via someone else who is a medical professional
- Via someone else who is not a medical professional
- Through personal research

Your exposure to e-prescribing systems:

	Yes	No
I am aware of e-prescriptions		
I understand the process of e-prescriptions		
I have been directly exposed to e-prescriptions		
I have begun making use of e-prescriptions		

13.3 Appendix C: Health-Soft Permission Letter

Health-Soft
Innovative Electronic Healthcare Solutions

16 WILL SCARLETT ROAD, ROBINDALE
RANDBURG, JOHANNESBURG, 2195
PO BOX 2670, PINEGOWRIE, 2123
PHONE: +27 11 214 1700
FAX: +27 11 214 1725
WWW.HEALTH-SOFT.CO.ZA

8 June 2012

Commerce, Law and Management / Information Systems
University of the Witwatersrand

To Whom It May Concern:

This letter serves to confirm that Health-Soft grants permission to Mr Michael Jones to conduct a survey with users of our system, e-Scripting. This is subject to his obtaining ethical clearance to conduct research from the Ethics Committee of the University of the Witwatersrand, and abiding to its terms.

We have been informed of the line of research and the nature of the intervention: an anonymous questionnaire.

Sincerely,



Hannes Robberts
For and on behalf of
Health-Soft (Pty) Limited

Health-Soft (Pty) Ltd | Reg No: 2007/004858/07
Directors: E Hofmeyr (Chairman) | WGP Van Zyl (Managing) | AGR Carlston | JT Kruger | CJ Robberts | Q Greyling

13.4 Appendix D: Ethics Clearance

SCHOOL OF
Economic & Business Sciences

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

Division of Information Systems
Private Bag X3, WITS, 2050, South Africa • Telephone: +27 11 717 8160 • Fax: +27 11 717 8139
email: sibongile.chiachia@wits.ac.za

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: CINFO/1021**

PROJECT

Factors supporting the intention to use e-Prescribing Systems: Health Professionals' use of technology in a voluntary setting.

INVESTIGATORS Michael Jones

DEPARTMENT Information Systems

DATE CONSIDERED 11.06.2012

DECISION OF THE ETHICS COMMITTEE Approved Unconditionally

NOTE

Unless otherwise specified this ethics clearance is valid for 1 year and maybe renewed upon application

DATE...11 June 2012 **CHAIRPERSON: Mr. B Mendelowitz**

cc: Supervisor: Mr. Jean-Marie Bancilhon

13.5 Appendix E: Survey Cover Letter





To Dr XYZ

My name is Michael Jones, and I am a Masters student in the Information Systems Division at the University of the Witwatersrand, Johannesburg. I am conducting research into why physicians choose to use e-Prescribing systems. This research is for degree purposes only. The data for the study was kindly supplied by Health-Soft, the providers of e-Scripting, an online e-prescribing tool.

e-Prescribing is the use of computers to enter, modify, review, issue and/or transmit medication prescriptions. This electronic practice may be used in place of the regular written prescription, where instead of a paper form being filled out by the physician, an online form is filled in, and the resultant e-prescription made available to the dispensing pharmacist electronically. Some examples of e-prescribing systems are e-Scripting by Health-Soft and E-Health by T-Systems.

As a practitioner, you are invited to take part in this survey: e-Prescribing Questionnaire and you don't need to be a current user of e-prescriptions to do so. Please feel free to forward the survey to anyone else who may be able to add to the study.

Your response is important. There are no right or wrong answers. This survey is both confidential and anonymous. This is ensured by the questionnaire having no responses or retention of information which might identify you. The questionnaire results will be destroyed after the survey is over and the University requirements are met. Your personal participation is completely voluntary and involves no risk, penalty, or loss of benefits to you irrespective of whether or not you participate. You may withdraw from the survey at any stage if you so choose. Choosing to proceed with the survey will imply your willingness and consent in participating in the survey. The survey will close on the 26th of October, 2012.

The survey has three parts. The first part of the questionnaire comprises 29 questions, and the second part comprises 4 questions. Please indicate your level of agreement toward each question by ticking the appropriate box from the options available (strongly disagree through to strongly agree). The third and final part captures demographic data. Please select the options that are applicable to you. The entire survey should take approximately 15 minutes to complete.

Please click on the following link to proceed with the survey: e-Prescribing Questionnaire.

The survey was approved unconditionally by the Faculty of Commerce, Law and Management, University of the Witwatersrand, Protocol Number: *CINFO/1021*.

Thank you in advance for considering participating in the study. If you have any concerns or questions, or if you would wish to obtain a copy of the aggregated results of the survey, please contact me on *084 571-0267*, or at *michael@mrjones.co.za*.

Kind regards,

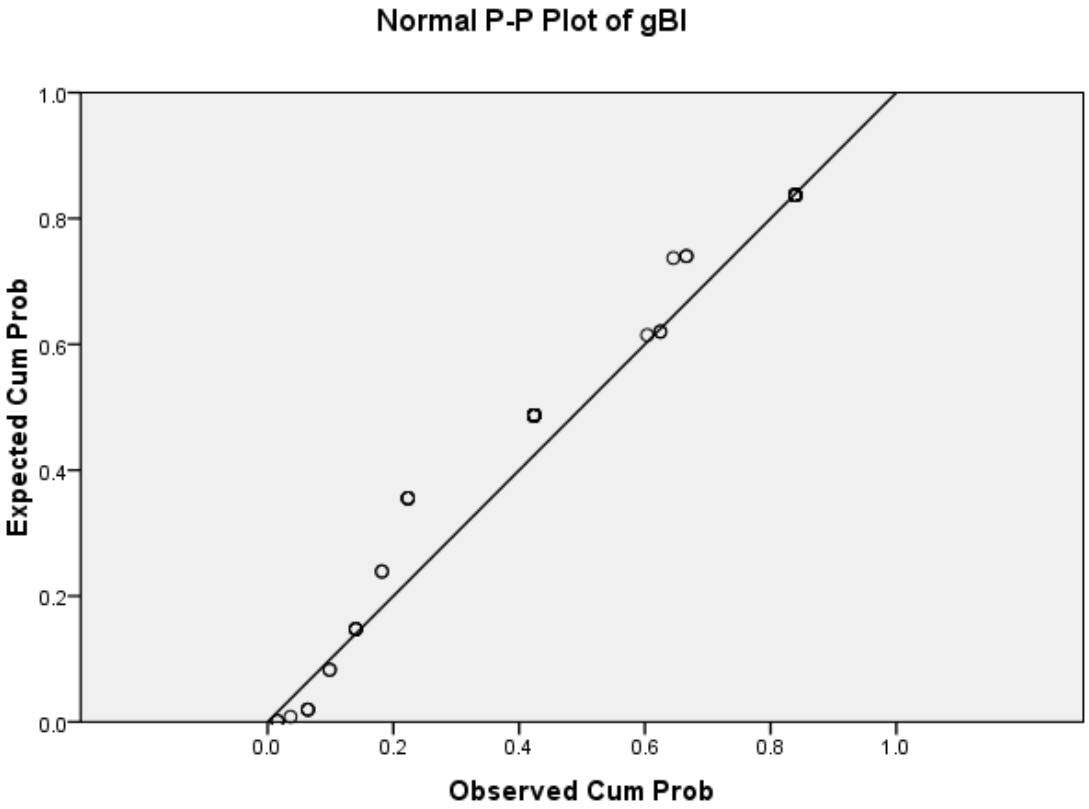
Michael Jones
Masters Student: Division of Information Systems
School of Economic and Business Sciences
University of the Witwatersrand, Johannesburg

13.6 Appendix F: Frequency Distribution per Item

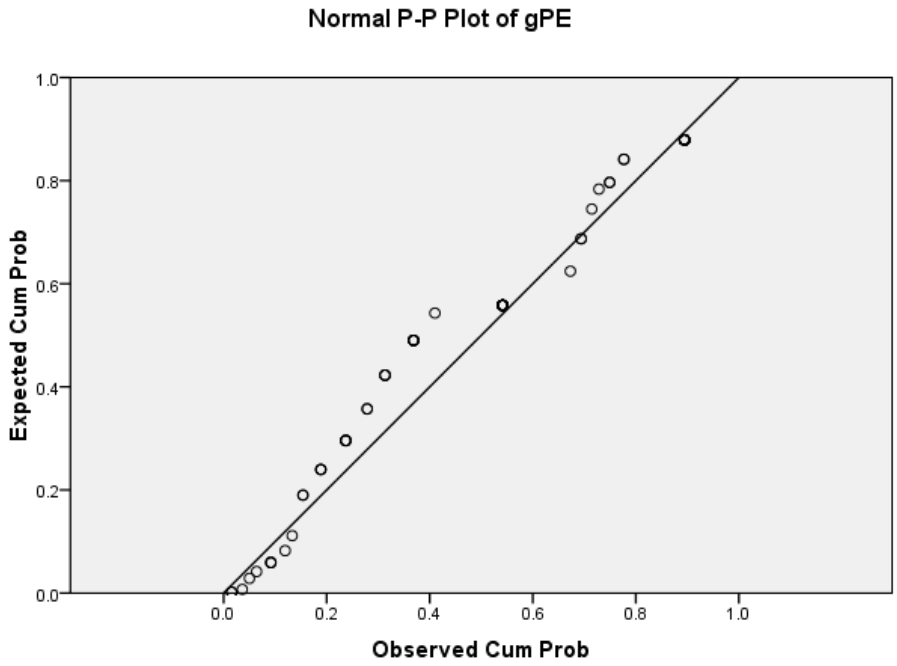
Item	Strongly disagree	Disagree	Neutral	Agree	Strongly Disagree	Total	Missing
Behavioural Intention							
BI1	2	5	7	31	27	72	0
BI2	2	6	6	31	25	70	2
BI3	3	3	9	30	26	71	1
Performance Expectancy							
PE1	2	7	10	33	19	71	1
PE2	3	6	8	34	21	72	0
PE3	3	9	9	31	20	72	0
PE4	3	7	11	30	20	71	1
PE5	3	9	8	29	22	71	1
PE6	3	2	8	36	22	71	1
Effort Expectancy							
EE1	1	4	10	32	25	72	0
EE2	1	4	22	28	17	72	0
EE3	0	1	12	39	20	72	0
EE4	2	5	21	31	13	72	0
EE5	0	2	13	30	25	72	0
EE6	2	6	12	30	20	70	2
Social Influence							
SI1	9	18	23	18	4	72	0
SI2	8	20	24	15	5	72	0
SI3	8	19	26	13	5	71	1
Social Dominance Orientation							
SDO1	3	6	21	34	8	72	0
SDO2	4	18	27	18	5	72	0
SDO3	8	19	23	17	5	72	0
SDO4	8	15	25	20	4	72	0
Price Value							
PV1	2	6	31	24	9	72	0
PV2	2	5	32	24	9	72	0
PV3	2	6	30	23	10	71	1
Trust							
T1	4	17	25	16	9	71	1
T2	2	6	18	32	14	72	0
T3	1	4	14	37	16	72	0
T4	8	25	22	12	5	72	0

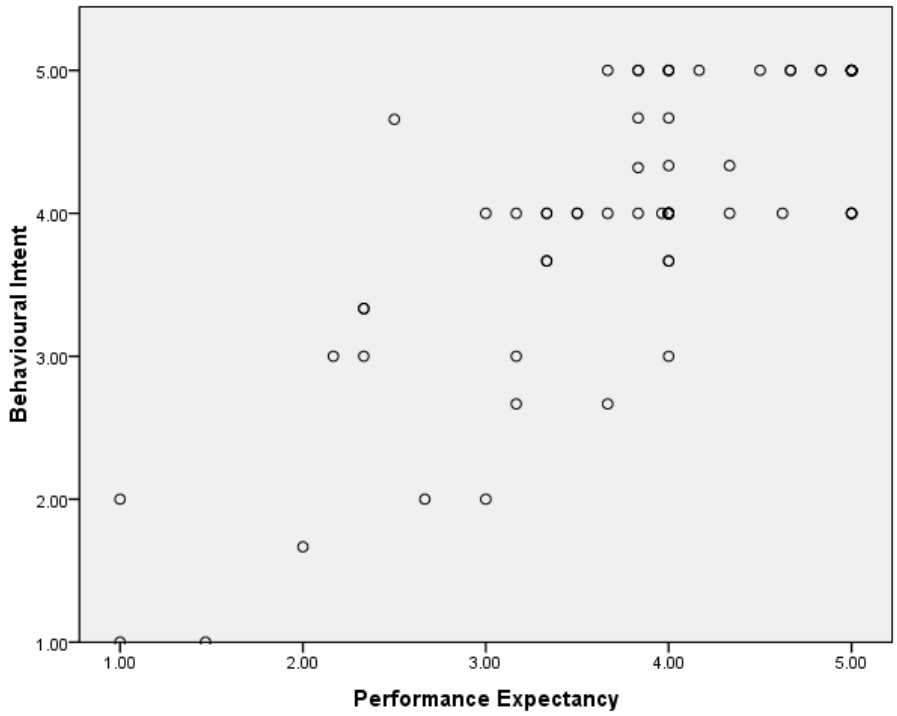
Note – The sample size of 72 is based on rows which had three or less incomplete items, and which conformed to the z-scores test.

13.7 Appendix G1: P-Plots – Behavioural Intention

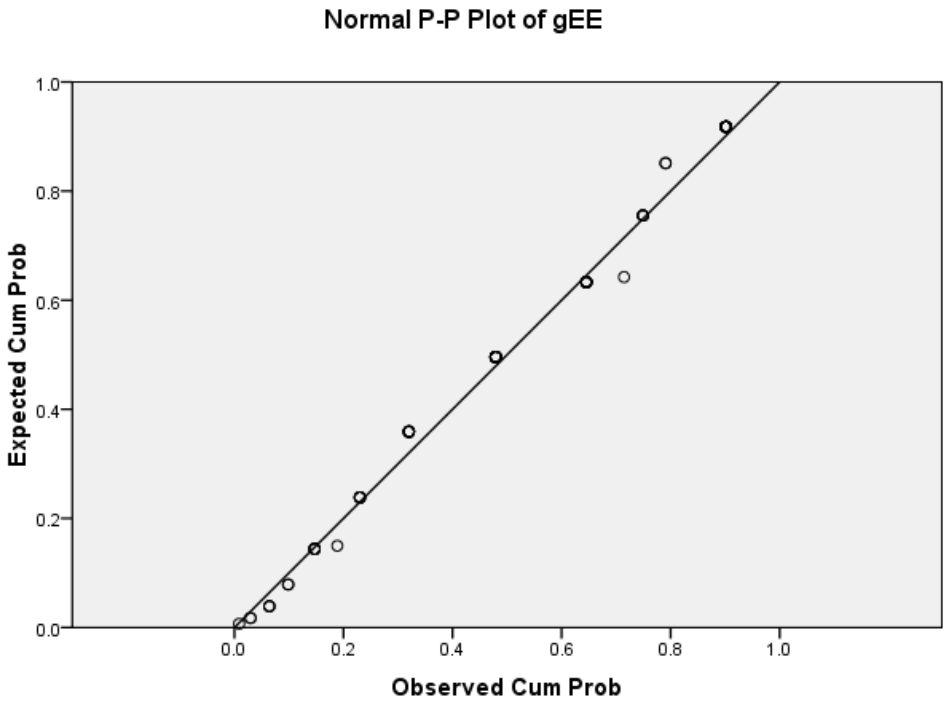


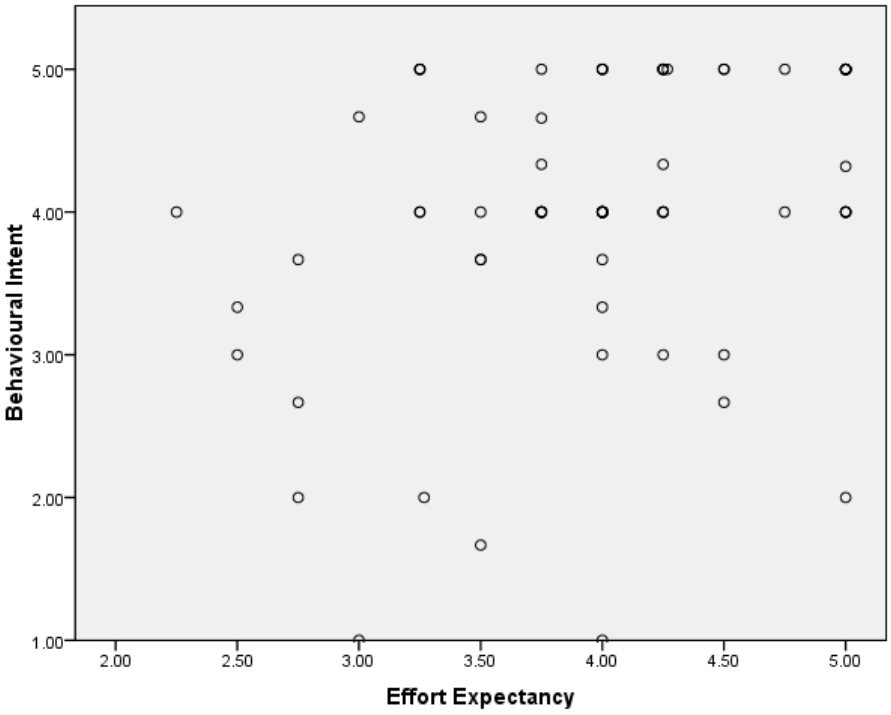
13.8 Appendix G2: P-Plots and Scatterplots – Performance Expectancy



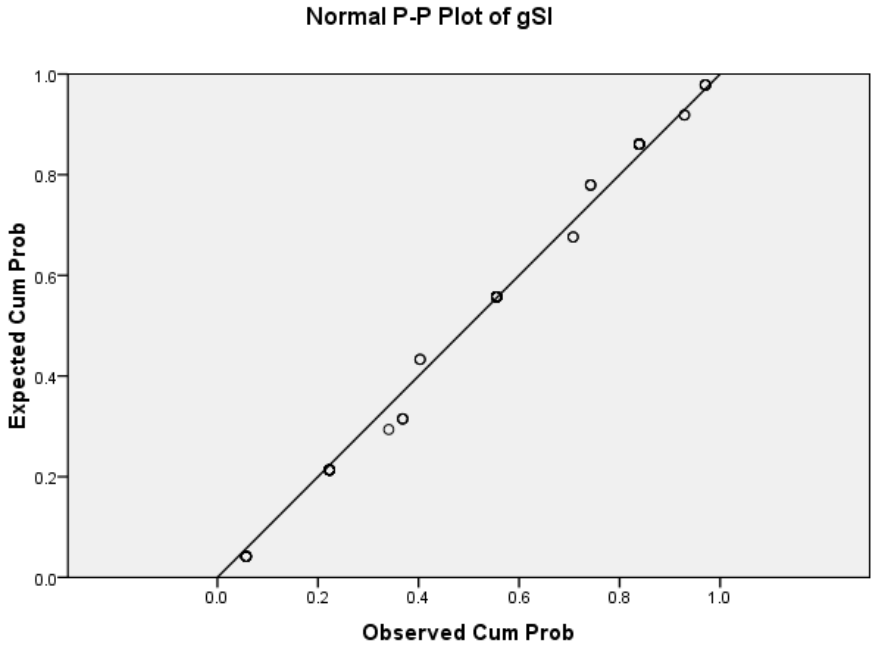


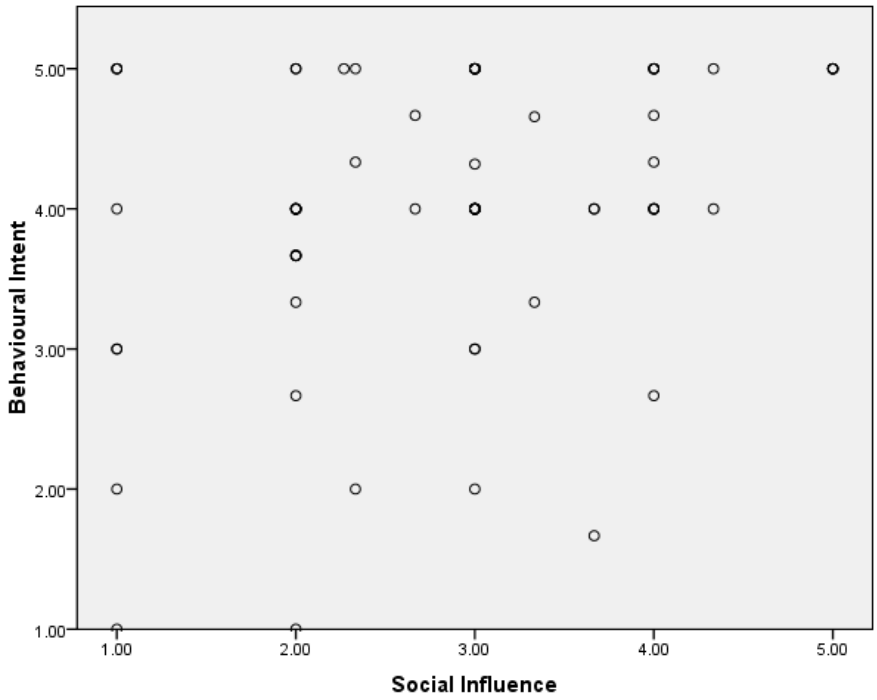
13.9 Appendix G3: P-Plots and Scatterplots – Effort Expectancy



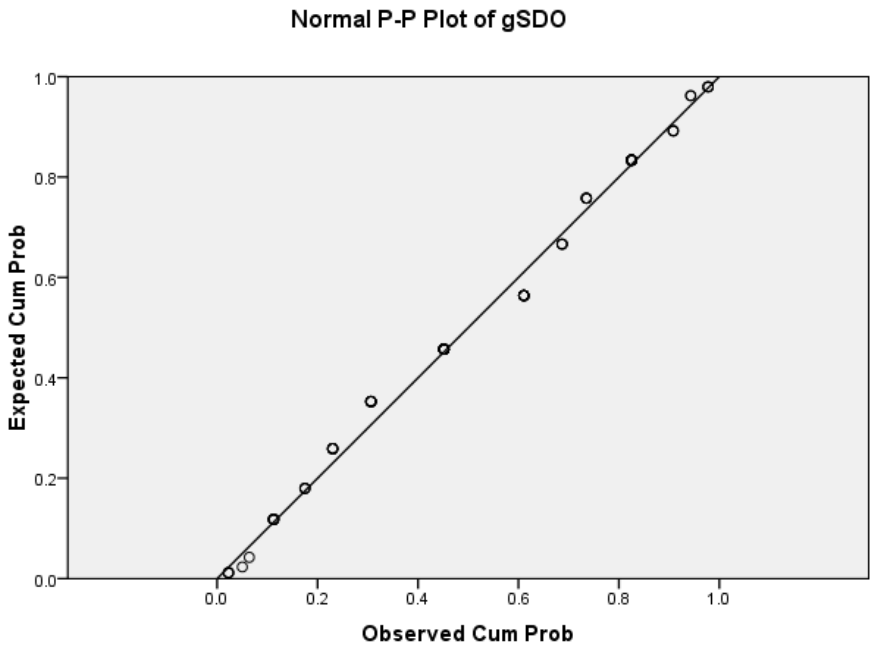


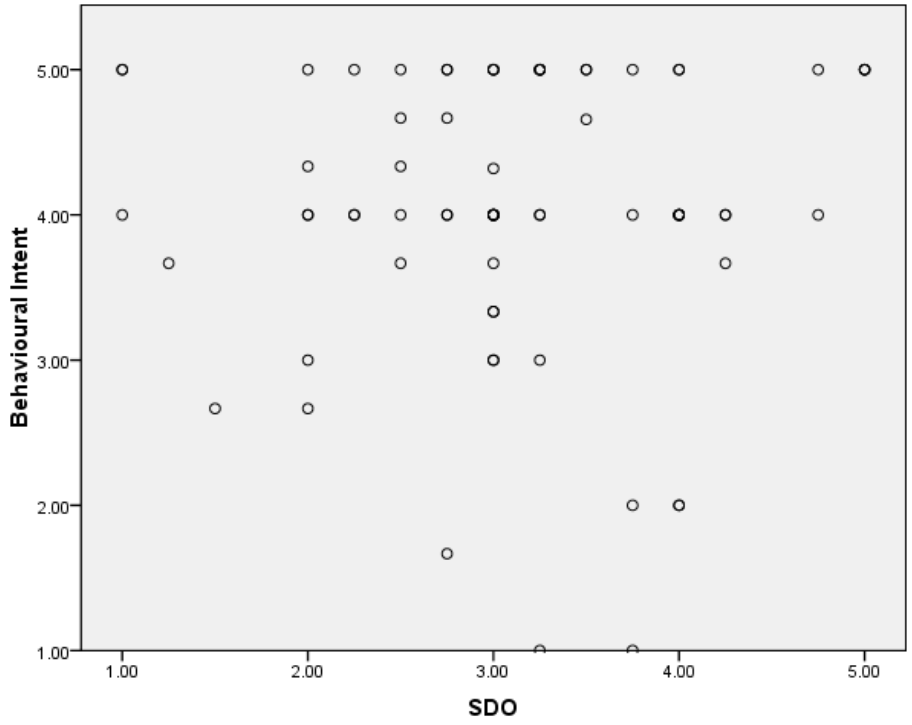
13.10 Appendix G4: P-Plots and Scatterplots – Social Influence



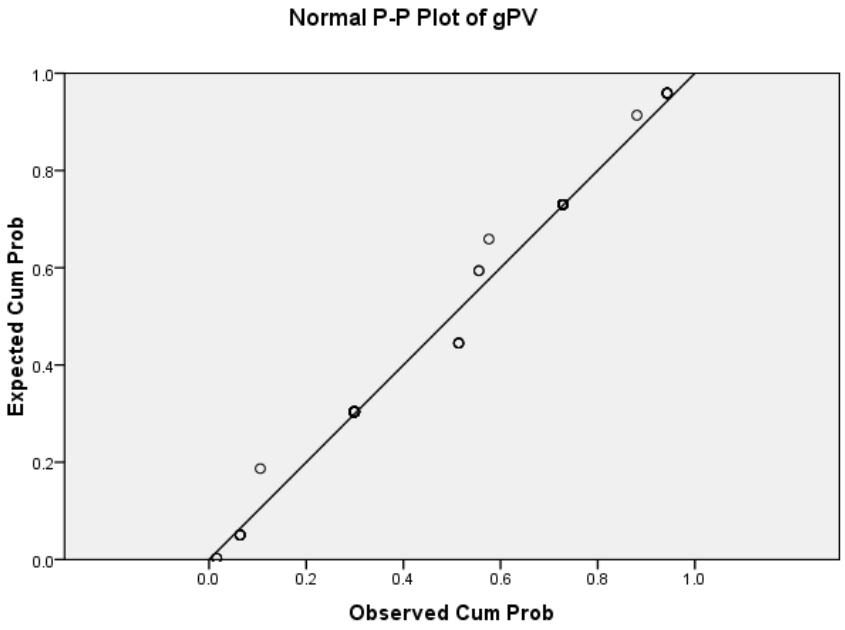


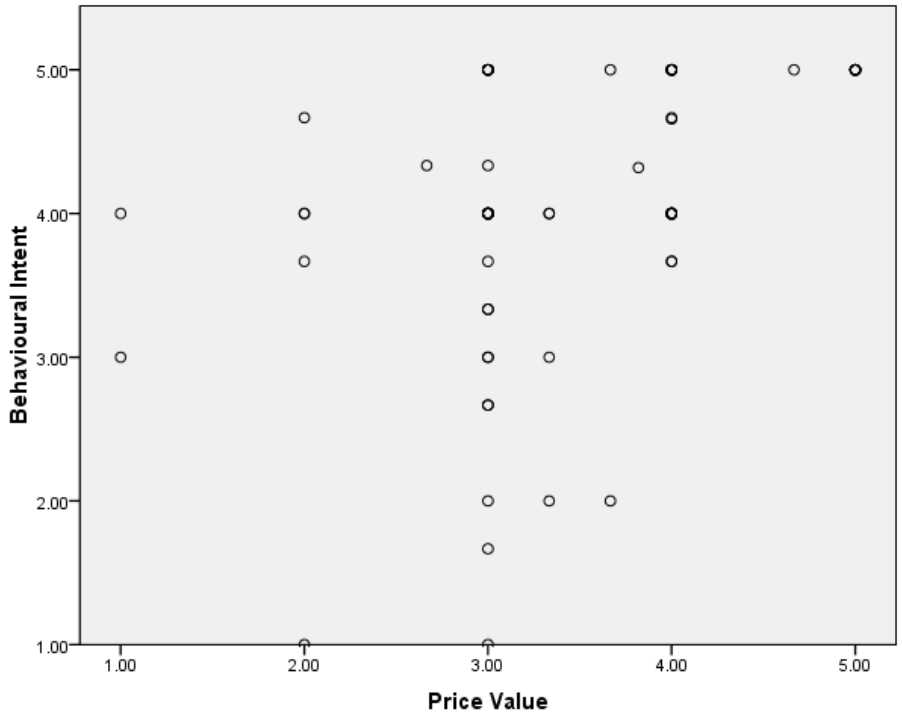
13.11 Appendix G5: P-Plots and Scatterplots – Social Dominance Orientation



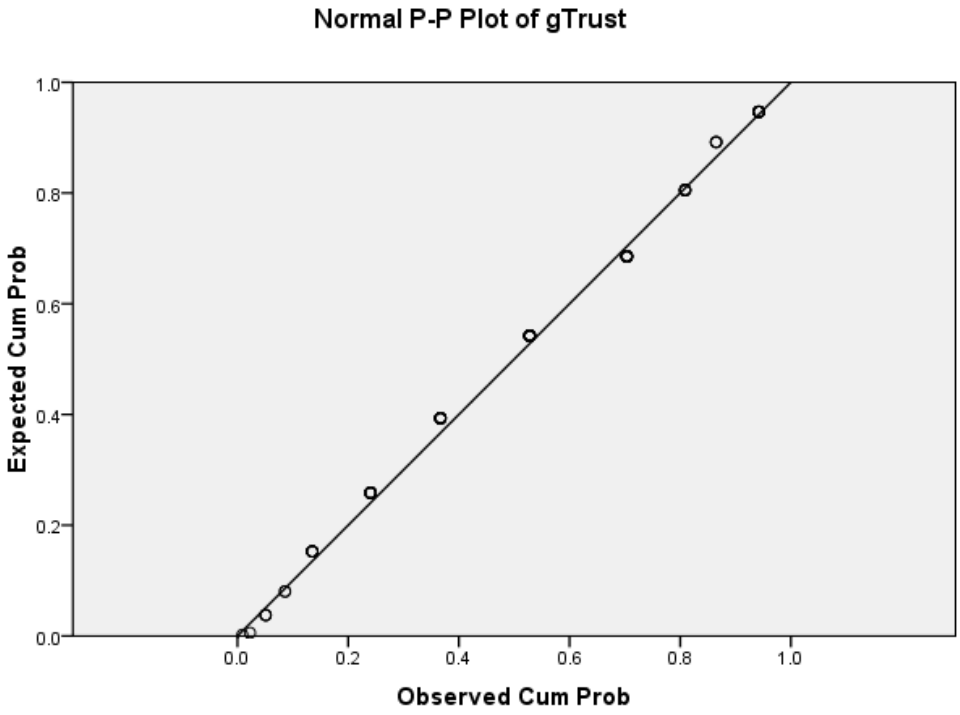


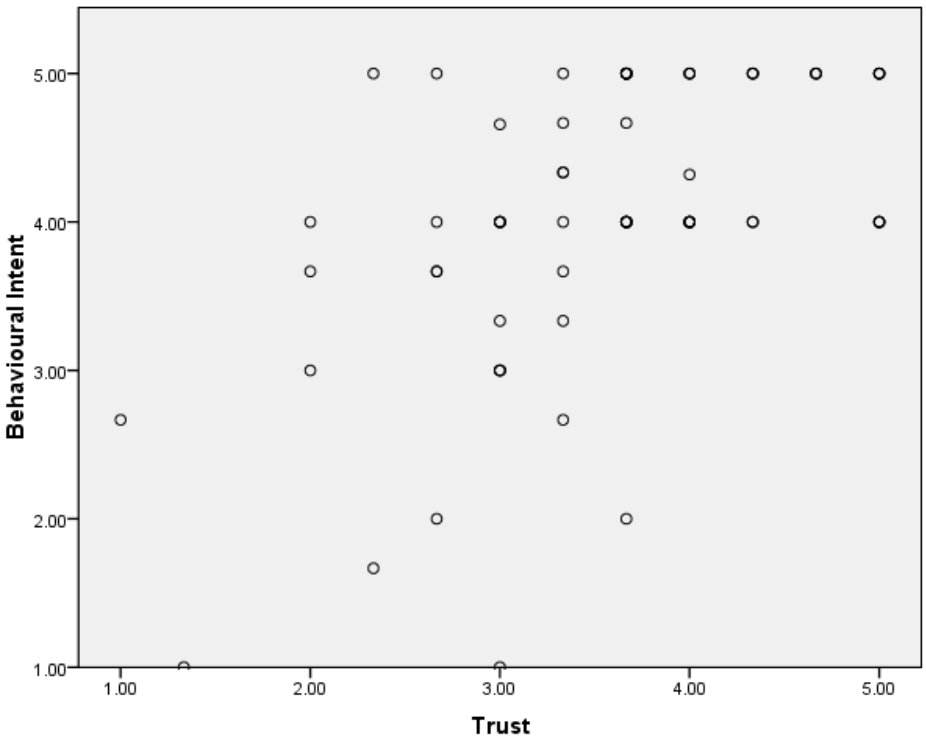
13.12 Appendix G6: P-Plots and Scatterplots – Price Value



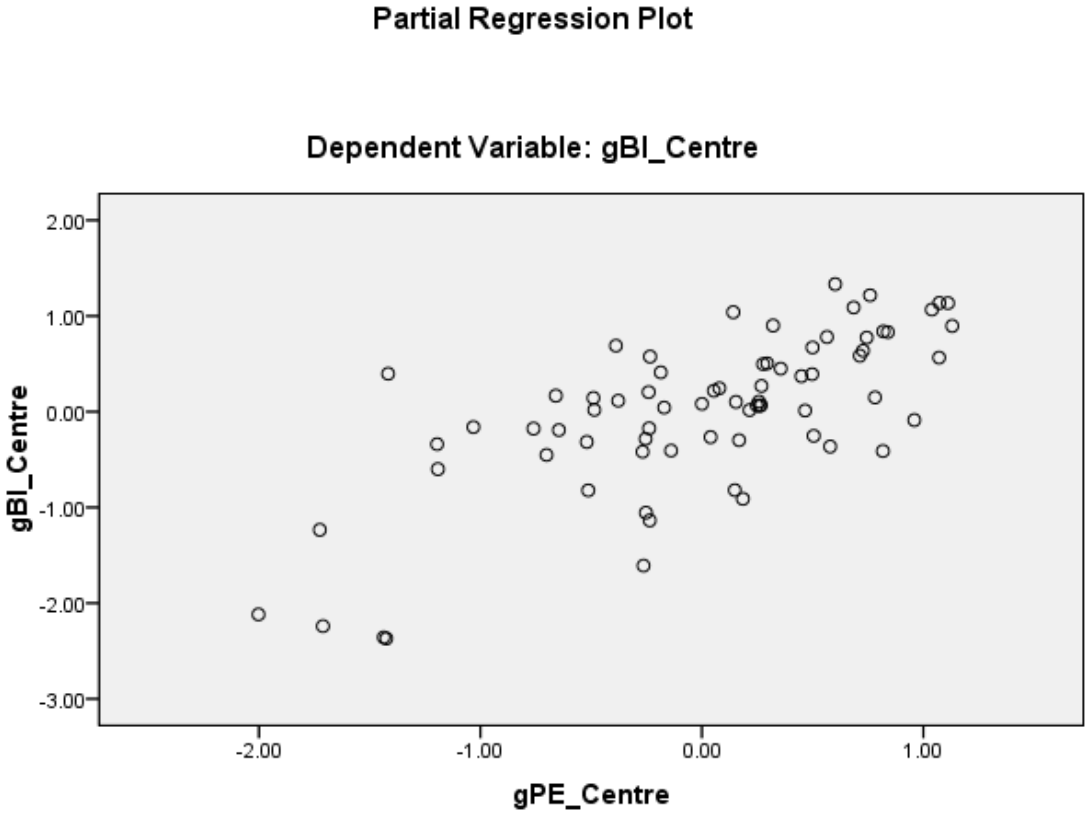


13.13 Appendix G7: P-Plots and Scatterplots – Trust

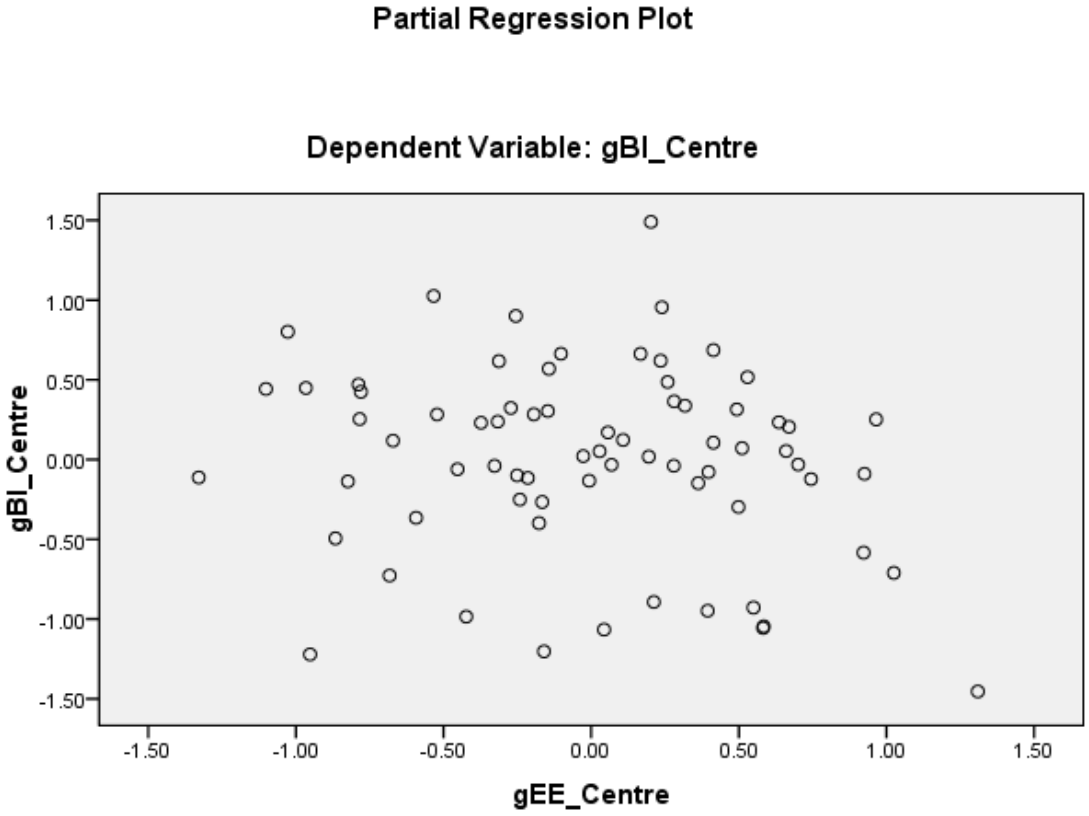




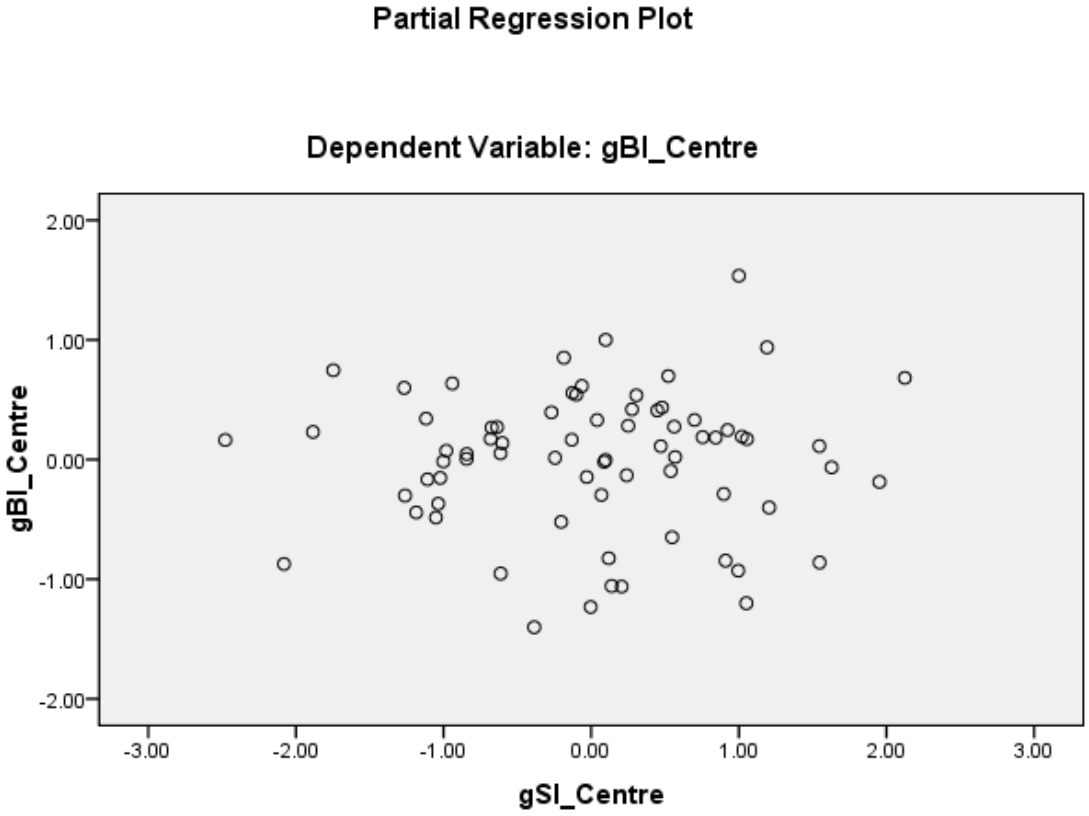
13.14 Appendix H1: Partial Regression Plot – Performance Expectancy



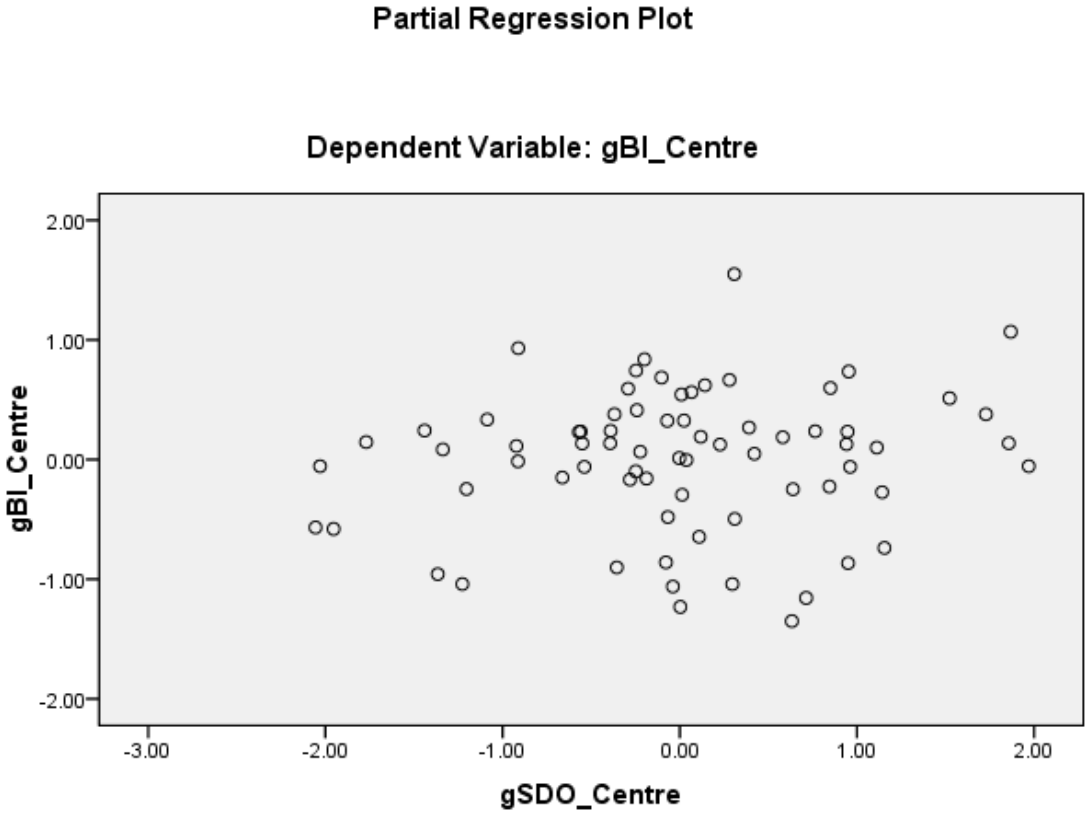
13.15 Appendix H2: Partial Regression Plot – Effort Expectancy



13.16 Appendix H3: Partial Regression Plot – Social Influence



13.17 Appendix H4: Partial Regression Plot – Social Dominance Orientation



13.18 Appendix H5: Partial Regression Plot – Price Value

