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Intentions to select an information technology career : a study of South African women

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"Intentions to Select an Information Technology Career: A Study of South African Women"

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ABSTRACT

In South Africa, the importance of computing and information technology (IT) is increasing. Yet, there is an under representation of women IT employees, this may be due to the low percentage of women obtaining IT degrees. South African women are already seriously underrepresented in the IT field and represent an untapped resource. Therefore attention needs to be directed to factors which effect women's intentions to pursue IT careers.

This study drew on two theoretical perspectives, namely the Theory of Planned Behavior, and Social Cognitive Theory to derive a model of how two important factors, computer self-efficacy, and computer anxiety influence women's feelings about the impact of computers on their daily lives and society, as well as their understanding of computers (i.e. computer attitude). The model further depicted the direct effect of computer attitude. Women's computer attitudes were also expected to improve once they have received computer training. Although the main focus of the study was towards women's computer attitude and intention to select an IT career, the study also compared the extent to which gender influences computer self-efficacy, computer anxiety, computer attitude and intention to select an IT career, as well as the relationships that exist between these variables. Hypotheses were thus derived from the model, and uses prior research to argue the validity of the hypotheses. Quantitative data was collected from a sample of 263 first year students from a leading South African University.

Statistical analyses of the data revealed that female students intention to select an IT career consisted of two factors namely, IT career interest and perceived tangible rewards. Pearson correlation and multiple regressions were used to test hypotheses. Results revealed that factors such as computer training, computer self-efficacy, computer anxiety, and positive computer attitude influenced IT career interest and perceived tangible rewards. Amongst female students, computer training, computer self-efficacy and perceived tangible rewards impacted IT career interest. This means that if females received computer training, they were more confident towards computers and aware of IT careers prospects, and thus they would be more likely to select an IT career. The study results also detected gender differences which indicated that females are more computer anxious than males, while males are more computer confident and like computers more than females. In addition females are also less likely to select IT careers than males. These results provide important guidance to educational institutes, the IT industry, IT managers, human resource professionals, and other individuals' interested in career development issues and the gender gap in South African IT.

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DECLARATION

This research report is submitted to the University of the Witwatersrand, Johannesburg in partial fulfillment of the Masters of Commerce (Information Systems) degree. The work presented in this research report is my own unaided work and is, to the best of my knowledge and belief, original, except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or in part, for any degree at this or any other institution.

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Miss P Parsotam

18 July 2010

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CHAPTER 1

INTRODUCTION TO THE PROBLEM OF ATTRACTING WOMEN INTO INFORMATION TECHNOLOGY CAREERS

1.1 Introduction

It has been assumed that "by 2012, 40% of women in the IT workforce will detach from traditional IT career paths and will move aggressively into business, functional and R&D processes" (Harris, Morello and Raskino, 2007). Women influence or control 80% of consumer spending decisions, however men design 90% of information technology (IT) products and services -- a lopsided formula for going out of business (Harris et al., 2007). Gender differences in IT careers appear to be affecting the competitiveness of companies globally (Ahuja, 2002). It is becoming increasingly important to reduce sources of leakage in the IT career paths of women (Ahuja, 2002).

The widening gender gap in IT is further impacting the current labour shortage in the IT industry. In order to mitigate these problems, the participation of women needs to be increased, and so too does the need to engage women in courses of study that will qualify them for IT-related careers (Ramsey and McCorduck, 2005; Ahuja, Robinson, Herring and Ogan, 2004). Subsequently, one needs to understand why women avoid IT careers in order to attract and retain them.

South Africa, although still developing, is the most developed and economically stable country of the African continent. In South Africa, the importance of computing and IT has great impact on the labour market as there is a high demand for skilled IT staff (Pike, Hofer and Erlank, 1993; Kraak, 2005). Yet, there is low participation in these sectors due to the lack of sufficient and necessary knowledge and skills (Bovée, Voogt and Meelissen, 2007). According to SAITIS Baseline Studies (1999) only 27% of IT employees are women. During the last decade, only 31.1% of university degrees in computer science and information technology were awarded to women (Galpin, Sanders, Turner, and Venter, 2003). Therefore serious attention needs to be directed to South African women who are already underrepresented in the IT field and represent an untapped source of potential resources (Galpin et al., 2003).

To date, there has been very little research into women's intentions to select an IT career within South Africa, which would prove useful in improving the widening gender gap in IT.

1.2 Background to the Study

Over the past two decades gender issues in IT have been the source of significant interest to computer and social scholars (Acker and Oakley, 1993; Durndell and Lightbody, 1993; Shashaani, 1994; Mayer-Smith, Pedretti and Woodrow, 2000). Prior research (Bunderson and Christensen, 1995; Reinen and Plomp, 1993; Shashaani, 1997; Shashaani and Khalili, 2001) has indicated the significant under-representation of women in IT and has provided some empirical evidence indicating that IT-related gender differences in attitudes towards computers, and computer experiences exist. In the past decade a large body of research (e.g. Gürer and Camp, 2002; National Science Foundation, 2007) has aimed to examine topics related to reasons for women's persistent under representation in IT areas (Singh, Allen, Scheckler and Darlington, 2007). Yet, that research has very little impact closing or narrowing the gap between men and women in IT careers and most research is not grounded in empirical evidence.

Research has indicated that one critical factor discouraging women from studying IT-related fields is that most students have a narrow understanding of the nature of IT courses and IT professions (Herbert, 2000; Sanders and Galpin, 2007). Students often perceive that computer and IT courses focus on programming skills and that one would need to complete computer science courses, which contains aspects of science, engineering and mathematics (Herbert, 2000). Parents and teachers generally encourage males to enter such technical disciplines which include science, engineering and mathematical courses and females to study the humanities and languages (Teague, 2002; Herbert, 2000). This may lead to female students developing a negative attitude towards their ability to successfully complete computer and/or IT courses, and towards computers and IT careers in general.

Due to a negative attitude towards computers, female students may have other incorrect perceptions towards IT careers such as, limited career opportunities, little interaction with people, and associating IT careers with administrative or secretarial work (Craig 1997; Durndell and Thomson, 1997; Sanders and Galpin, 1994; Clarke and Teague 1996; Symonds 2000; Sanders and Galpin, 2007). These misperceptions and others deter women from studying IT courses. However, the IT industry today consists of many computer-related disciplines, and there is a growing number of IT-related professions that do not require training in computer science, but rather in cognate disciplines such as information science, management information systems, instructional systems technology, and the growing field of informatics; and the importance of these IT-related professions are likely to grow in the future (Ahuja et al., 2004).

The years of inequality between women and men has persisted in the recruitment and retention of women at all levels of IT, from girls' experience in schools, to the initial selection women make as undergraduate majors, to the absence of women in the highest corporate and academic positions (Ramsey and McCorduck, 2005). Alongside these inequalities (gender stereotypes) are findings that women are less confident and are more anxious about using computers (Smith, 1994; Murphy et al., 1989; Maurer, 1994; McIlroy, Bunting, Tierney and Gordon, 2001). Negative attitudes towards computers and IT, further deter them from selecting IT careers. These attitudes need to be changed and women need to engage in courses of study that will qualify them for IT-related careers (Ramsey and McCorduck, 2005; Ahuja et al., 2004).

Prior research is thus suggesting that attention needs to be drawn on factors that affect women's intention to select an IT career such as their attitudes towards computers, confidence of their computer abilities, anxiety towards computer use, and engagement of IT courses. Moreover, exploring differences between women and men in the above issues and their effects on IT career intentions, could also further explain the lack of women IT professionals.

1.3 Statement of the Problem

Women are reluctant to select an IT career due to numerous factors outlined above. In South Africa women have been recognised as an untapped resource. The widening gender gap in IT is impacting the current labour shortage in the IT industry which in turn is impacting the South African economy. As a result South African women have come to play an increasingly important role in the South African economy and its development. However few women have the intention to select IT careers and generally have negative attitudes towards computers. Prior research (e.g. Comber, Colley, Hargreaves and Dorn, 1997; Shashaani, 1994; Volman and van Eck, 2001; Bovée et al., 2007) has indicated that computer attitudes between females and males differ. However there are many contradictory studies with regards to the effects of computer attitudes, confidence (self-efficacy), anxiety, the role of education and training, and IT career perceptions.

Therefore this study proposes to determine whether computer attitude, computer self-efficacy, and computer anxiety, computer training, and career perceptions influence women towards selecting IT careers.

Although the main focus of the study will be towards women's computer attitude and intention to select an IT career, the study will also examine gender differences.

1.4 Aims of the Research

Attention needs to be directed to factors which affect women's computer attitudes as well as their intention to select an IT career. University students select courses based on many reasons, one of them being their career choice. Therefore this study aims to investigate the intention of university students to select an IT career, by analyzing the impact of their computer attitude towards IT as well as other factors, namely computer self-efficacy and computer anxiety which may affect computer attitude.

In order to shed some light on the factors which may influence South African university students computer attitudes and the way in which their computer attitude may influence their intention to select an IT career, this study draws on two theoretical perspectives, namely the Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT) to hypothesise relationships. This study specifically aims to,

1. investigate the extent to which computer training effects computer self-efficacy and computer anxiety
2. investigate the extent to which computer self-efficacy and computer anxiety effects computer attitude
3. investigate the extent to which computer attitude effects a student's intention to select an IT career
4. identify whether there are gender differences with the variables of the study as well as whether there are gender differences with the relationships of the study

1.5 Importance and Contribution of the Study

This study is important to both researchers and practitioners in the IT field. Women are reluctant to select an IT career due to discouraging factors, and without women choosing IT careers, the gender IT profession imbalances will sustain (Bovée et al., 2007). Research (e.g. Comber et al., 1997; Shashaani, 1994; Volman and van Eck, 2001; Bovée et al., 2007) has indicated that computer attitudes between females and males differ. This study seeks to investigate the intention of university students to select an IT career, by analyzing the impact of their computer attitude towards IT, and other factors which may influence their intentions of selecting an IT career. The findings of the study if tested could provide beneficial implications for both researchers and practitioners.

Prior studies have presented frameworks for examining factors effecting computer attitudes of women, although few have chosen to investigate the effect of computer attitude on career choice. Unlike other studies this study will also include the way in which computer training may influence attitude and consequently increase the number of women selecting IT careers. This study could also prove to be a foundation from which future researcher can build on. Organisations need to identify factors discouraging women's capabilities in pursuing an IT career because without doing so the gender gap within the IT industry is indisputably going

to expand to such an extent that retaining current women IT professionals will in turn become an increasing dilemma.

Therefore this study has the potential to minimise the IT gender gap by providing an understanding of the ways in which the computer attitudes and other factors influences women's intention of selecting IT careers.

1.6 Structure and Overview of the Research Report

This research report is structured into 6 chapters, with references and appendices following. The chapter outlines are as follows:

Chapter 1: Introduction to the Problem of Attracting Women into IT Careers
This chapter introduced the research, the background of the study and the nature of the problem being investigated. Lastly the aims and the importance of the study were explained.

Chapter 2: Literature Review of Prior Gender and IT Studies
Reviewed literature will provide a historical perspective of this research. This will highlight the most important contributions made in the field as well as shortcomings of the research. Gaps in the literature are identified in order to derive the purpose of this research. This chapter will also introduce and explain the study's variables, namely factors which influence women towards selecting a career in IT and hypotheses will be developed.

Chapter 3: Research Methodology
This chapter details the research methodology. This is done by presenting the methods of data collection, the questionnaire construction and the analytical and statistical methods which will be used to analyse the data.

Chapter 4: Research Results
This chapter will explain the data screening analyses, describe the characteristics of the respondents, and present the reliability and validity results of the measures. The results and findings from the empirical study will then be statically presented and described.

Chapter 5: Research Interpretation and Discussion
This chapter discusses the results of the study and interprets the results with reference to literature. This is done in order to provide an adequate interpretation of the results for both theory and practice.

Chapter 6: Conclusion

This chapter concludes the report with a summary of the findings. Based on the findings possible recommendations are made and the implications to researchers and practitioners are stated. The limitations of the study as well as suggestions for future research are also presented.

References and Appendices

A reference list of the journal articles and other material that were used to accomplish the research report will be provided. The questionnaire with its cover letter and various data analysis results will be provided in the appendices.

CHAPTER 2

LITERATURE REVIEW OF PRIOR STUDIES

2.1 Introduction

The purpose of this chapter is to describe the current state of female computer attitude and provide a critical review of the existing literature. Firstly, the chapter describes the theoretical background of the study by examining prior literature on computer attitude and contextual factors influencing computer attitude as well as the effect of computer attitude towards selecting an IT career. Secondly, the chapter discusses the contributions and shortcomings of the prior literature in order to provide a direction for the study.

2.2 Prior Literature

Since the 1980s, the issue of encouraging women to select IT careers and appropriate IT courses has been of concern worldwide. Numerous researchers have attempted to investigate and identify reasons as to why women may avoid selecting IT careers (Gürer and Camp, 2002; Adya and Kaiser, 2005). The majority of the research relates to the United States, United Kingdom and Australia. Literature concerning African/South African gender computing studies are still minimal.

According to Teague (2002) and Clarke and Teague (1996), IT careers have been viewed by women working in the field as having characteristics that should make it a popular career choice for girls. IT professionals have described their occupation to be challenging; varied; and providing opportunities to meet people, to travel, and to work at home (Teague, 2002). IT is the use of computers and software to manage information. In some companies, this is referred to as Management Information Systems (MIS) or as Information Systems (IS). IT has been defined as being the study, design, development, implementation support and/or management of any computer based information systems. IT is usually involved in the context of a business and is often used to automate manual tasks as well as improve efficiencies within an organisation.

Career options within IT are vast and can be considered as either technical-orientated, business-orientated or are a blend of both. Technical-orientated IT careers include Software and Hardware Engineers, Network Administrator, Programmers, Database Specialist, Web designers, Game Developers. Business-orientated IT careers, for example are IT/Business consultants, Business Analysts, Project Managers. An IT career maybe any of the above as well as new emerging careers which involve the use, development, or management of IT. However the perception female students have of IT careers are generally inaccurate, and are viewed to be only technical-orientated (Clarke and Teague, 1996). Therefore this prior literature review will examine: misperceptions of IT careers that discourage women from

selecting IT careers; reasons as to why the IT industry needs more women to select IT careers; and reasons as to why women should consider a career in IT.

2.2.1 Misperceptions of IT Careers amongst Women

The literature suggests that many women have inaccurate perceptions of IT careers and lack an understanding of the true nature of IT careers. Research indicates that, women want to pursue a career that would improve the world, and are generally less interested in IT careers, as they perceive IT careers do not (Clarke and Teague, 1996). Many women believe that IT careers involve sitting at a screen all day (Clarke and Teague, 1996), and is either programming or office administration (Craig, 1997). Thus women are more likely to be interested in real-world problem solving, with environments involving human users rather than machines and programming languages per se (Ahuja, 2002).

Another misperception deterring women from pursuing IT careers, at a tertiary education level, is that women who have not studied IT courses in high school believe that they are not adequately qualified to select IT courses at university (Durndell, 1991; Durndell and Lightbody, 1993; Durndell and Thomson, 1997; Teague, 2002). In addition one critical misconception of IT courses which enable one to pursue an IT career that discourages women from studying IT-related fields is that most introductory computer science courses focus on programming skills rather than concepts of computer science.

However literature by researchers such as Teague (2002) and Ahuja et al. (2004) have indicated that the IT industry today consists of many computer-related disciplines. There are a growing number of IT-related careers that do not require training in computer science, but rather in cognate disciplines such as information science, management information systems, instructional systems technology, and the growing field of informatics (Ahuja et al., 2004). The importance of these IT-related professions are likely to grow in the future. Thus women IT professionals do not require distinct training in computer science, but rather in cognate IT disciplines, which offers the potential to correct the pattern of gender inequity traditionally found in computer science (Ahuja et al., 2004).

2.2.2 Women and the IT Industry

Research has indicated that the widening gender gap in IT is further impacting the current labour shortage in the IT industry (Clarke and Teague, 1996; Ahuja, 2002). Gender differences in IT careers still appear to be affecting the competitiveness of companies globally (Ahuja, 2002). The percentage of women in the IT workforce has dropped and is continuing to decline (Harris et al., 2007). Thus it has become more important than ever to reduce sources of leakage in the IT career paths of women (Ahuja, 2002).This also relates specifically to South Africa. Researchers such as Pike, Hofer and Erlank, (1993) and Kraak, (2005) have indicated that there is a growing demand for computer skills in South Africa. A South African study also stated that “it is essential to improve the situation in South Africa

with respect to the number and quality of computer science graduates" (Sanders and Mueller, 1994, p. 33). Research has noted that attention needs to be directed to South African women whom are already seriously underrepresented in the IT field and represent an untapped source of potential resources (Galpin et al, 2003).

As noted above the IT industry today consists of many computer-related disciplines which in turn has created a growing number of IT careers that are considered to be non-traditional IT careers. These non-traditional IT careers may be considered to be either technical-orientated, business-orientated or a blend of both. Therefore there will be greater emphasis on skills previously not recognised as desirable in traditional IT careers, and thus a new range of skills will be needed (Teague, 1998; Teague, 2002). The demand for different skills within IT careers may attract women who previously were not interested as they perceived IT careers to be primarily technical-orientated (Teague, 2002).

Researchers such as Watt (1991), Teague (1998) and Teague (2002) have predicted that IT careers today may require business aptitudes, people-oriented skills, management potentials and the ability to multi-task more than technical ability (Watt 1991, Teague, 2002). Women are believed to be more likely than men to have the types of skills required to help the IT industry become more responsive to society's needs, as users of IT projects generally are understood better by people with personality characteristics found more often in women than men. Women personality characteristics consist of different abilities, attitudes and aptitudes from men. Attracting more women, including women with skills not previously viewed as necessary, into IT careers is likely to also create greater user satisfaction (Teague, 2002).

2.2.3 Women and IT Careers

Prior literature has noted that many women must support themselves and possibly their children, on their own income, for a range of reasons, particularly the high divorce rate and being a single parent (Teague, 2002). In addition most occupations today require one to be computer literate, traditional occupations typically occupied by women, such as secretary and bookkeeper, must now use computers. Many of the traditionally female occupations are experiencing significant changes due to technology influences (Teague, 2002). In order to economically provide for themselves and their families, women need to consider non-traditional areas of employment especially as they are more likely to be displaced in areas where there is overrepresentation in occupations (Jones, 1991, Teague, 2002). IT careers today demand new skills, and do not only have technical-orientation, but also demand the business and people orientations which maybe well suited to the personality characteristics, of those women and men who are not technically orientated.

Prior literature also indicates that the years of inequality between women and men unfortunately still persists in the recruitment and retention of women at all levels of IT: from girls' experience in schools, to the initial selection women make as undergraduate majors, to the absence of women in the highest corporate and academic positions (Ramsey and McCorduck, 2005). Although research has indicated that there is an IT skills shortage, tertiary education institutions find it difficult to attract female students who would want to pursue an IT career. Researchers such as Ramsey and McCorduck (2005) and Ahuja et al. (2004) have noted that in order to mitigate these problems the participation of women needs to be increased, and so too does the need to engage women in courses of study that will qualify them for IT careers.

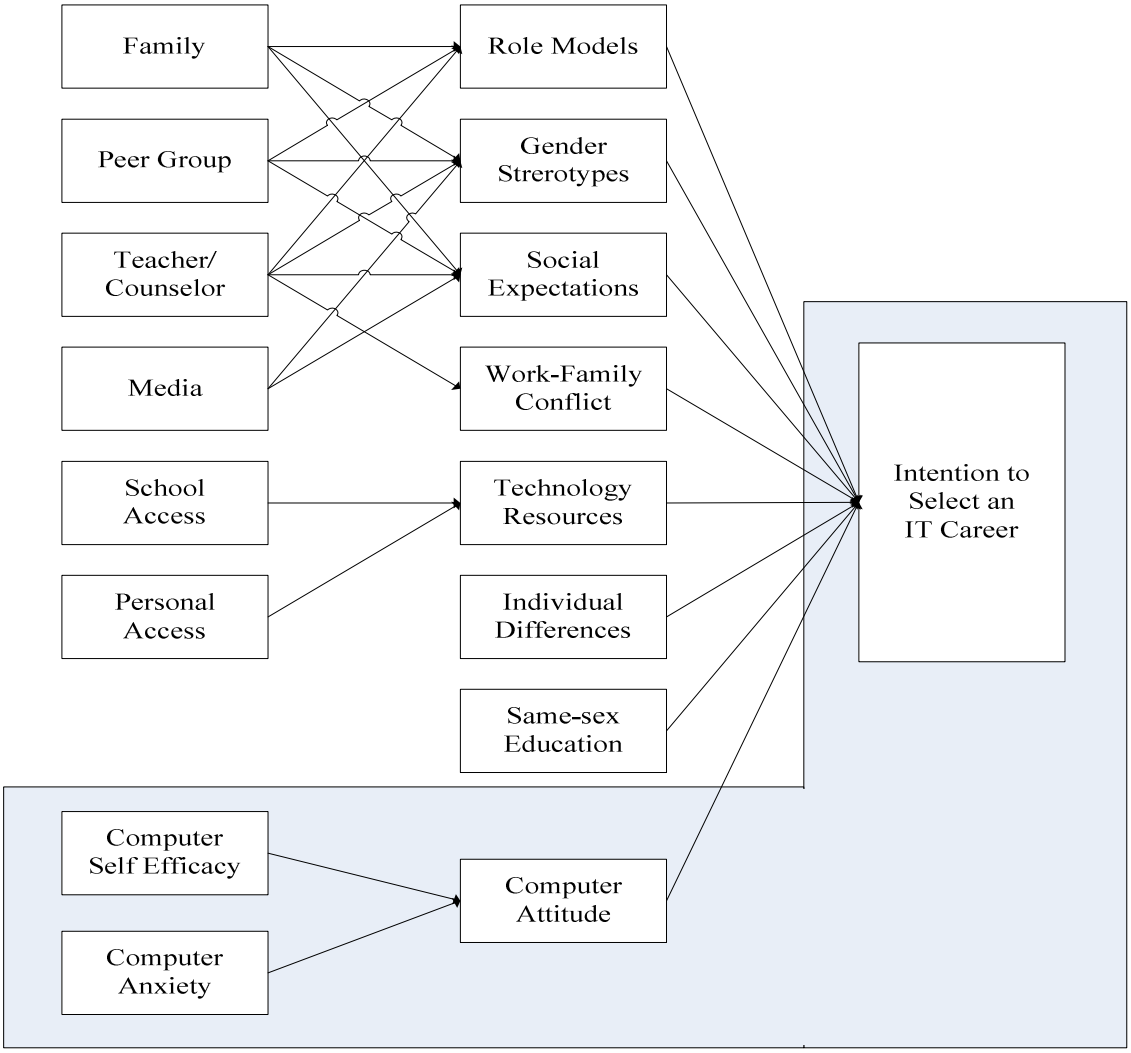
2.2.4 Prior Research on Women's Intention to Select an IT Career

This section identifies various factors which may influence women to select IT careers. It is important to explore factors which may discourage women's interest in selecting an IT career, otherwise the gender gap within the IT industry is indisputably going to expand to such an extent that retaining current women IT professionals will in turn become an increasing dilemma.

Appendix A, Table A.1 presents some of these various factors from a few prior studies, such as societal influences, work-family conflict, mentoring/role-models, and computing environments which may affect an individual's career choice (Gürer and Camp, 2002; Clarke and Teague, 1996; Ahuja, 2002).

The factors identified in prior studies are summarized in Figure 1. Figure 1 graphically depicts various factors influencing women's intentions of selecting an IT career. The least amount of attention has been focused on factors influencing computer attitude as well as the effect of computer attitude towards selecting and IT career (see shaded section of Figure 1). Therefore introducing numerous gaps in our understanding of the ways in which computer attitude may influence women's intentions of selecting an IT career.

Figure 1: Factors influencing Women's Intentions of Selecting an IT Career



(The figure above is adapted from Adya and Kaiser (2005) and Ahuja (2002))

Prior literature suggests that attitudes toward a profession, is a factor that effects an individual's career choice (Gürer and Camp, 2002; Clarke and Teague, 1996; Ahuja, 2002). Researchers (e.g. Comber et al., 1997; Shashaani, 1994; Volman and van Eck, 2001) have also investigated gender differences in computer attitudes, and have indicated that females compared to males show less positive attitudes towards computers. Several researchers (e.g. Durndell, Glissov and Siann, 1995; Moore, 1994; Ordidge, 1997; Shashaani, 1994) have also indicated that gender differences in computer attitudes, are caused by an individual's confidence with computers, and anxiety towards computers. Studies trying to find explanations for gender differences also identified computer experience or computer training as another factor influencing computer attitudes. "Frequency of use and computer training increased levels of computer self-efficacy" (Beas and Salanova, 2006, p.1045). Numerous studies (e.g. Chou, 2001; Decker, 1999; Karsten and Roth, 1998; Torkzadeh, Pflughoeft and Hall, 1999) have studied self-efficacy as a dependent factor, in order to indicate the effectiveness of training.

A study conducted by Torkzadeh et al. (1999) showed that students computer self-efficacy levels increased after computer training, but students showing negative attitude to computers did not increase their computer self-efficacy. Many studies (e.g. Potosky and Bobko, 2001; Hasan and Ali, 2004; Beas and Salanova, 2006; Igbaria and Iivari, 1995) have researched the relationship between computer attitude, computer self-efficacy and computer anxiety, however majority analysed computer anxiety as a dimension on computer self-efficacy, and do not consider gender as a factor. Torkzadeh et al. (1999) found that the impact of computer attitude in computer training is important as an individual's computer attitude influenced the success of computer training. Research also suggests that computer self-efficacy and computer anxiety may be positively influenced by computer training.

Although several studies have investigated the numerous ways in which gender may impact IT and the effect of factors influencing the selection of IT careers. Majority of these studies above fail to investigate the impact of factors influencing computer attitude. These factors, namely computer training, computer self-efficacy, computer anxiety may have an impact on women's computer attitude and in turn may influence their decision of selecting IT career.

2.3 Contributions and Shortcomings of Prior Research

Many researchers have examined computer attitude, however there is disagreement as to whether computer attitude should be examined as a multidimensional concept or a uni-dimensional concept. In addition prior studies have sought to investigate and examine different variations, and/or concepts of computer attitude. Majority of researchers fail to considered computer attitude as a single dimension, and instead they have examined computer attitude as a multidimensional concept including computer self-efficacy and computer anxiety. Therefore it is unclear as to whether computer self-efficacy and computer anxiety directly or indirectly influences computer attitude.

Prior literature has widened the knowledge basis of factors influencing computer attitude and women's intentions to select an IT career. This has been accomplished by investigating the numerous factors with regards to what they are, and how they influence women. However the least amount of attention has been focused on factors influencing computer attitude, and one's intention to select an IT career. Therefore introducing numerous gaps in our understanding of the ways in which computer attitude may influence women's intentions of selecting an IT career. Many studies have identified that computer training courses, computer self-efficacy and computer anxiety could influence computer attitude and thus one's intentions to select an IT career (Maurer, 1994; Levine and Donitsa-Schmidt, 1998; Ropp, 1999; Gaudron and Vignoli, 2002). However these factors need to be examined as independent variables as opposed to dimensions of computer attitude.

Prior literature has contributed to the various factors effecting computer attitudes, and one's intentions to select an IT career, however there are few studies that contribute to ways in which to positively influence women's intentions to select an IT career. In addition few

researchers have attempted to explore women's intentions to select an IT career, yet women have been identified as an untapped source of potential resources which could lessen the demand of IT resources (Galpin et al., 2003). Furthermore inadequate research has been done in order to investigate the growing number of IT-related professions such as management information systems, informatics, education, and business information systems. Literature acknowledging the growing number of IT-related professions such as Ahuja et al. (2004) has indicated that "more studies like this are necessary if we are to meet the demands of the IT workforce and benefit as a society from the contributions of the entire population" (Ahuja, et al., 2004, p. 123).

It is evident that the majority of prior literature investigating factors influencing computer attitude and women's intentions to select an IT career are American, European and Asian in origin. A study conducted by Craig (1997) noted that cross-cultural studies suggest that cultural differences, rather than gender differences, lead to small women enrolments in IT-related courses. Countries such as Singapore, Malaysia and Bulgaria do not report gender difference between female and male attending IT courses and their intentions of selecting IT careers, although the United States, United Kingdom, Australia and New Zealand do report gender differences (Herbert, 2000). Thus one may assume that factors influencing women's intention to select an IT career may also vary from country to country and that South Africa in turn may require research that is more specific to its context.

It is thus evident that while prior literature has made an important contribution to our understanding of factors influencing one's intention to select an IT career, it has also left many gaps in our understanding. In particular, our understanding of factors influencing women's intention to select IT careers.These factors may pose a constraint to women who want to select IT careers. In order to mitigate these factors one needs to understand the extent to which these factors influences women's computer attitude and their intention to select an IT career.

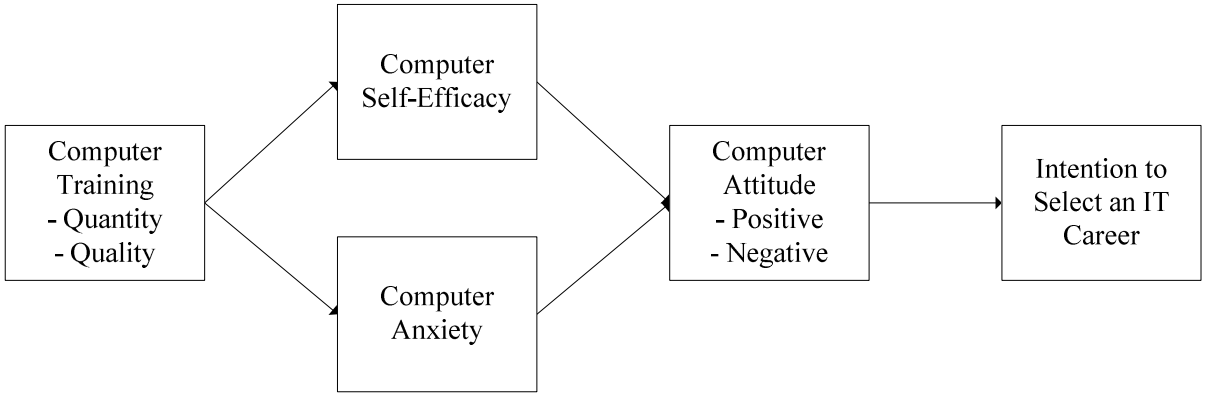
Based on the above review, the following implications for the research have been derived:

1. investigate the extent to which computer training effects computer self-efficacy and computer anxiety
2. investigate the extent to which computer self-efficacy and computer anxiety effects computer attitude
3. investigate the extent to which computer attitude effects a student's intention to select an IT career
4. identify whether there are gender differences with the variables of the study as well as whether there are gender differences with the relationships of the study

2.4 Conceptual Model and Theoretical Background

This study draws on two theoretical perspectives, namely the Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT) to derive a model (Figure 2) of how two important factors, computer self-efficacy, and computer anxiety influence women's feelings about the impact of computers on their daily lives and society, as well as their understanding of computers (computer attitude). The model further depicts the direct effect of computer attitude impacting women's decision of selecting an IT career (intention to select an IT career). Women's computer attitudes are expected to improve once they have received computer training. The arrows in the model represent hypothesized relationships that will be developed and tested in subsequent sections. The theoretical underpinnings of the model are discussed next.

Figure 2: Conceptual Model



SCT based on the work of Bandura (1977), has been extensively applied as a theoretical framework to predict and explain individual behaviour in IT, acceptance and use of information systems, and performance in computer training (Compeau and Higgins, 1995; Hasan and Ali, 2004). The theory proposes that an individual, their environment, and their behaviour are all interrelated. This relationship is referred to as "triadic reciprocality" by Bandura (1977). Research within SCT paradigm has demonstrated that dimensions of SCT have a direct effect on computer learning performance. While this theory has many dimensions, this study is particularly concerned with self-efficacy. Self-efficacy is also an antecedent of TPB, which positively impacts an individual's attitude (Taylor and Todd, 1995). Research (e.g. Harrison and Rainer, 1992; Coffin and MacIntyre, 1999; Rozell and Gardner, 2000) has indicated that low levels of computer self-efficacy generally leads to more negative attitudes toward computers. Negative attitudes towards computers will likely deter students from selecting IT careers.

Literature also depicts high levels of computer anxiety has a negative effect towards computer attitude (Todman and Monaghan, 1994; Torkzadeh et al., 1999; Shaft, Sharfman and Wu; 2004). It has been suggested that computer anxiety causes decreased levels in psychological well-being (Bozionelos, 2001a; Hudiburg; 1990). Computer training which

allows students to interact with computers and presents computer information which may encourage students to change emotional aspects and aspects of their behaviour. Therefore, individuals' that have low levels of computer self-efficacy as well as suffer from high levels of computer anxiety could be helped by computer training in a systematic and gradual way (Saks, 1995; Chou, 2001; Decker, 1999; Karsten and Roth, 1998; Torkzadeh et al., 1999; Bozionelos, 2001b; Wilfong, 2006). The above model was devised in order to examine the role of computer training, the extent to which computer self-efficacy and computer anxiety influence women's computer attitude which in turn impacts their intention of selecting an IT career. Each variable of the model is explained in greater detail below. The hypotheses are then derived from the model, and uses prior research to argue the validity of the hypotheses.

2.5 Intention to Select an IT Career

Research has illustrated the widening gender gap of IT professionals (Camp, 1997; Ahuja, 2002; Besana and Dettori, 2004). Policy makers, corporate managers, and universities have noted that the number of students, particularly of females, preparing for careers in IT are stagnant or declining (Adya and Kaiser, 2005; Wilson, 2002; McInerney et al., 2006). Therefore women need to be urgently encouraged to pursue a career choice in IT. An IT career profession is generally stereotyped to be a male dominated, with little opportunities for women (Bjorkman, Christoff, Palm and Vallin, 1998; Ahuja, 2002; Trauth, 2002; Adya and Kaiser, 2005). These negative perceptions of an IT career decrease the intentions of women to select an IT career (Papastergiou, 2008). Furthermore an undergraduate degree in computer science or IT is assumed to be the traditional path to enter an IT career profession; however it is not the only path (Ballard, Scales and Edwards, 2006). According to Turner, Bernt, and Pecora (2002) "the field of information technology is a roadway with many on-ramps" (p. 16). Most research into the causes of female under representation in IT careers, and ways in which to attract more female students, has concentrated on computer science degree programs. However, there are other degree programs that lead to careers in IT, mainly an Information Systems (IS) degree. An IS degree program tends to put greater emphasis on the application of computer technologies in business (Randall, Price and Reichgelt, 2003). Women are expected to be more attracted to degree programs that place greater emphasis on applications of technology in business (Randall, Price and Reichgelt, 2003). A study conducted by Papastergiou (2008) found that females were motivated towards selecting an IT career based on enhanced employment prospects such as a well paid profession, and job security and stability. Therefore one may assume that IS degree programs may reduce the widening gender gap of IT professionals. Intention to Select an IT Career in this paper refers to an individual's intention of selecting an IT career which may be considered to be either technical-orientated, business-orientated or a blend of both.

2.6 Computer Attitude

An attitude is a set of evaluative beliefs about oneself, other people, and the world around oneself -- which can be either negative or positive (McGuire, 1985). Research on gender differences in attitudes regarding computers are strongly related to confidence in using computers, and negative and positive beliefs about computers (Bovée et al., 2007). Positive attitudes towards one's computer-related abilities should be reflected in greater use of computers, especially recreational use, and enrolment in computer courses (e.g. Igbariaa and Chakrabarti 1990; Whitley, 1997; Durndell and Haag, 2002). Numerous researchers (e.g. Teague, 1997; Gürer and Camp, 2002) have suggested reasons for gender differences in computer attitude. Some researchers (e.g. Liao, 2000; Whitley, 1997; Moore, 1994) have suggested that gender affects an individual's attitude towards computer. A study by Moore (1994) investigated secondary school students attitudes towards computers and found that females were more negative towards computers. She also established that males were more positive towards computers because they used computers more as opposed to females. Research (Johnson, Johnson and Stanne, 1986; Kramer and Lehman, 1990) has also suggested that females are more likely to be negative about the impact of computers on society. A study by Smith and Oosthuizen (2003) also found that female students were more apprehensive about the impact of computers on society. An individual's computer attitude is influenced by their feelings about the impact of computers on their life and society. This paper defines computer attitude as an individual's feelings about the impact (negative or positive) of computers on their daily life and society, as well as their understanding of computers (Heinssen et al., 1987, Nickell and Pinto, 1986).

2.7 Factors influencing Computer Attitude

Prior literature has indicated that computer attitude is affected by various factors. The following section describes three factors in detail namely, computer training, computer self-efficacy and computer anxiety, which are also expected to influence one's intention to select an IT career. The below section discusses prior literature in order to gain a better understanding of the above mentioned factors which influence computer attitude.

2.7.1 Computer Training

Research has indicated that computer training improves computer attitudes (Maurer, 1994; Levine and Donitsa-Schmidt, 1998; Ropp, 1999; Gaudron and Vignoli, 2002). Prior research on computer training has also established that computer training increases computer self-efficacy and that computer self-efficacy is itself an important outcome of a successful computer training process (Loyd and Gressard, 1984a, Potosky and Bobko, 2001). Most computer attitude and training research investigates the direct impact of computer training on computer attitude. Researchers (e.g. Brosnan, 1998; Busch, 1995; Karsten and Roth, 1998; Khorrami-Arani, 2001; Zhang and Espinoza, 1998) indicated that computer training improves one's levels of computer self-efficacy. Most prior research on computer anxiety illustrates

that the level of computer anxiety individual's have, is reduced by computer training (e.g. Torkzadeh and Angulo, 1992; Schuh, 1996; Shashaani, 1997; Bohlin and Hunt, 1995; Chau, 2001; Rovai and Childress, 2002; Tsitouridou and Vryzas, 2003), however there are contradictory findings (e.g. Temple and Gavillet, 1990; Moldafsky and Kwon, 1994 and Smith, Caputi and Rawstorne, 2000). This study aims to examine the indirect impact of computer training on computer attitude by investigating the way in which computer training impacts both computer self-efficacy and computer anxiety. Computer training has the ability to positively influence individuals' computer self-efficacy and positively influence individuals' computer anxiety. Computer training in this paper refers to an individual's experience of an IT course and their perception of the levels of quantity and quality of training received. The IT course should expose respondents to an introductory course which consists of both lecture and computer lab content. The lecture course material should introduce basic theories and principles of IT, cover topics such as data and information, IT components and use, as well as information technologies. Computer lab content should in turn included word processing, spreadsheet, and database applications.

2.7.2 Computer Self-Efficacy

Computer self-efficacy refers to an individual's confidence in their computer-related abilities to use computers in diverse situations (Compeau and Higgins, 1995; Marakas et al., 1998; Hasan and Ali, 2004). Research suggests that individuals' who have high computer self-efficacy are more likely to use IT and to express more positive attitudes toward IT (Thatcher, Loughry, Lim and McKnight, 2007; Igbaria and Iivari, 1995). Individuals' who consider computers too complex and believe that they will never be able to control these computers will prefer to avoid them and are less likely to pursue an IT career (Igbaria and Iivari, 1995). Prior literature (e.g. Harrison and Ranier,1992; Carlson and Grabowski, 1992; Torkzadeh and Koufteros, 1994; Chou, 2001) illustrates that females generally have lower computer self-efficacy than males do whereas other literature (Smith, 1994; Murphy et al., 1989) shows no gender differences and thus is contradictory to whether females generally have lower computer self-efficacy than males do. Computer self-efficacy in this paper is referred to as an individual's confidence in their computer-related abilities.

2.7.3 Computer Anxiety

Computer anxiety has been defined as "the fear or apprehension felt by individuals' when they use computers, or when they consider the possibility of computer utilisation" (Simonson, Maurer, Montag-Toradi, and Whitaker, 1987, p. 238). Prior literature may sometimes consider computer anxiety and negative attitudes towards computers to be interchangeable constructs (Simonson et al., 1987; King et al., 2002). However computer anxiety and negative attitudes towards computers are separate constructs, but they are related (Kernan, and Howard, 1990; Harrison and Rainer, 1992; Whitley, 1997; Schottenbauer et al., 2004; Rosen, Sears and Weil, 1987). Computer attitudes consist of people's feelings about the impact of computers on their daily life and their understanding of computers, whereas computer anxiety

involves more effective response, such as worries, apprehensions and tensions (Heinssen et al., 1987). Researchers (e.g. Maurer, 1994; McIlroy, Bunting, Tierney and Gordon, 2001) have indicated that females have greater computer anxiety than males. However a contradictory study conducted by Brosnan and Lee (1998) found that males were more computer anxious than females. There is much contradiction as to whether females are more computer anxious than males. A study by Todman (2000) found that females are more anxious, and that this issue was increasing through the 1990s, whereas a study by McIlroy et al. (2001) found that computer anxiety difference between females and males to be slightly decreasing but persisting. Computer anxiety in this paper is referred to as an individual's effective response, such as their fears, worries, apprehensions and/or tensions towards the use of computers (Heinssen et al., 1987).

2.8 Research Hypotheses

Based on the illustrated conceptual model and theory outlined above, formal hypotheses can now be stated.

2.8.1 Computer Training, Computer Self-Efficacy and Computer Anxiety

Prior research on computer training has established that both quantity and quality of computer training increases computer self-efficacy and decreases computer anxiety (e.g. Brosnan, 1998; Busch, 1995; Karsten and Roth, 1998; Khorrami-Arani, 2001; Zhang and Espinoza, 1998; Torkzadeh and Angulo, 1992; Schuh, 1996; Shashaani, 1997; Bohlin and Hunt, 1995; Chau, 2001; Rovai and Childress, 2002; Tsitouridou and Vryzas, 2003). Computer training such as IT courses where respondents are exposed to an introductory course that consists of both lecture and computer lab content could positively influence individuals' computer self-efficacy and computer anxiety levels. Computer training may increase one's levels of computer self-efficacy and decrease one's levels of computer anxiety and thus improve women's attitudes towards computers, which in turn may increase women's intentions of selecting IT careers. Therefore the following research hypotheses are stated:

Hypothesis 1a: Quantity of Computer Training will influence women's Computer Attitude by increasing their level of Computer Self-Efficacy

Hypothesis 1b: Quality of Computer Training will influence women's Computer Attitude by increasing their level of Computer Self-Efficacy

Hypothesis 2a: Quantity of Computer training will influence women's Computer Attitude by reducing their level of Computer Anxiety

Hypothesis 2b: Quality of Computer training will influence women's Computer Attitude by reducing their level of Computer Anxiety

2.8.2 Computer Self-Efficacy and Computer Attitude

Computer self-efficacy is associated with behavioral beliefs which influences one's decisions involving computer usage and adoption (e.g. Gist, 1992; Igbaria and Iivari, 1995; Venkatesh, Morris and Ackerman, 2000). Prior studies (e.g. Zhang and Espinoza, 1998; Coffin and MacIntyre, 1999; Rozell and Gardner, 2000; Thatcher et al., 2007; Conrad and Munro, 2008) support that computer self-efficacy has the ability to influence computer attitude, thus individuals' who are more confident are more likely to view computers as a beneficial tool and would have more positive attitudes toward the impact of computers on their daily lives and society. Therefore the following research hypothesis is stated:

Hypothesis 3a: Computer Self-Efficacy will decrease the Negative Computer Attitudes of women

Hypothesis 3b: Computer Self-Efficacy will increase the Positive Computer Attitudes of women

2.8.3 Computer Anxiety and Computer Attitude

Computer anxiety has been described as both a dimension of computer attitude as well as a distinct separate construct (e.g. Henderson, Deane and Ward, 1995; Harrison and Rainer, 1992; Whitley, 1997; Venkatesh et al., 2000). However this study describes computer anxiety as a distinct separate construct of computer attitude. Researchers have indicated that computer anxiety may influence an individual's attitude toward computers (Beckers and Schmidt, 2001; Chou 2001; and Torkzadeh and Angulo, 1992). Prior studies have investigated computer anxiety as a mediator variable between computer self-efficacy and computer attitude (e.g. Compeau and Higgins, 1995; Igbaria and Iivari, 1995; Chou, 2001). However this study is most concerned with the direct effect of computer anxiety on computer attitude. Computer anxious individuals' are more reluctant to use computers, and they generally have negative beliefs about computers (Mahar, Henderson, and Deane, 1997; Rosen and Weil, 1995). Computer anxiety has the ability to influence computer attitude, thus individuals' who are more computer anxious are more likely to view computers as a harmful tool and would have more negative attitudes toward the impact of computers on their daily lives and society. Therefore the following research hypothesis is stated:

Hypothesis 4a: Computer Anxiety will increase the Negative Computer Attitudes of women

Hypothesis 4b: Computer Anxiety will decrease the Positive Computer Attitudes of women

2.8.4 Computer Attitude and Intention to Select an IT Career

Several studies have investigated female students choice of courses and careers. Computer use and skill at computer tasks have been portrayed in our society as more appropriate to men and boys than to women and girls (Whitley, 1997; Gupta and Houtz, 2000). In addition it has been reported that female students have "a very narrow and limited knowledge of the range of computing careers available, and do not see computing as an attractive career choice" (Clarke and Teague, 1996, p.245). This in turn creates a negative attitude towards IT careers and the intention for females to select and IT career. Prior research has also indicated that an individual's attitude influences their decision making and thus their intention to select an IT career maybe influenced by their attitude towards computers (Ballard et al., 2006; Creamer, Burger and Meszaros, 2004; Weinberger, 2004). In addition an individual's computer attitude will most likely influence their intention to select an IT career, therefore women who have a positive attitude towards using computers will in turn be positively influenced towards selecting an IT career. Therefore the following research hypotheses are stated:

Hypothesis 5a: Negative Computer Attitudes will decrease women's Intention to Select an IT Career

Hypothesis 5b: Positive Computer Attitudes will increase women's Intention to Select an IT Career

Hypothesis 6a: Negative and Positive Computer Attitudes mediates the relationship between Computer Self-Efficacy and Intention to Select an IT Career

Hypothesis 6b: Negative and Positive Computer Attitudes mediates the relationship between Computer Anxiety and Intention to Select an IT Career

2.9 Research Questions

Prior research has indicated that gender differences in computer attitudes do exist (Comber et al., 1997; Shashaani, 1994; Volman and van Eck, 2001). Several researchers suggested that these gender differences in computer attitude are caused by computer training, individuals' confidence with computers, and anxiety towards computers (Durndell, Glissov and Siann, 1995; Moore, 1994; Ordidge, 1997; Shashaani, 1994). This study intends to investigate whether there are gender differences in computer attitude, the factors influencing computer attitude and one's intention to select an IT career, as well as the relationships between these factors. Therefore the following research questions are stated:

RQ1: Are there gender differences with the variables of the study?

RQ2: Are there gender differences with the relationships of the study?

2.10 Summary

This chapter has reviewed prior literature on computer attitude. It began by describing the contributions that researchers have made to computer attitude and the factors influencing computer attitude. The chapter then discussed the theoretical background supporting the presented conceptual model. This was followed by unfolding the contributions and shortcomings of prior literature. Finally, the chapter presents the hypotheses of the research which was outlined by the gaps of prior computer attitude literature.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this chapter is to discuss the research methodology of this study. Firstly, the chapter defines the research problem and questions. Secondly, the chapter justifies the research methodology selected. Thirdly, the chapter explains the data measurement approach and the data collection strategy including the development of the questionnaire instrument used to collect the relevant data, the characteristics of the respondents, and the sampling method and sampling frame used for the study. This is then followed by a description of the strategy for testing reliability and validity. Thereafter the data analysis methods which are to be used to test the research model are presented. The limitations of the study are then discussed.

3.2 Research Problem

Based on the shortcomings of the literature review outlined in chapter 2 the following research problem has emerged:

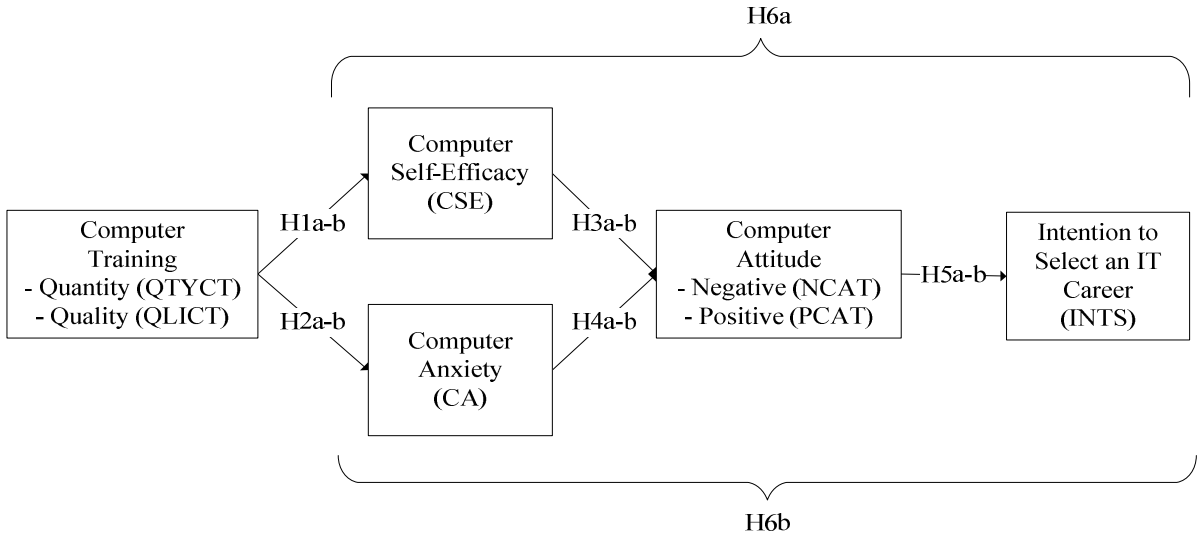
Women are reluctant to select an IT career due to discouraging factors. In South Africa women have been recognised as an untapped resource. However few women have the intention to select IT careers and generally have negative attitudes towards computers.

Therefore the aims of the study are to:

1. investigate the extent to which quantity and quality of computer training effects computer self-efficacy and computer anxiety (Research Hypotheses 1a –b and 2a - b)
2. investigate the extent to which computer self-efficacy and computer anxiety effects negative and positive computer attitude (Research Hypotheses 3a – b and 4a - b)
3. investigate the extent to which negative and positive computer attitude effects a student's intention to select an IT career (Research Hypotheses 5a – b and 6a - b)
4. identify whether there are gender differences with the variables of the study as well as whether there are gender differences with the relationships of the study (Research Question 1 and 2)

(Figure 3, graphically depicts the aims of the study through research hypotheses)

Figure 3: Research Model and Hypotheses



In this study the dependent variable is Intention to Select an IT Career (INTS), and the independent variables are: Quantity of Computer Training (QTYCT), Quality of Computer Training (QLICT), Computer Self-Efficacy (CSE), Computer Anxiety (CA), Negative Computer Attitude (NCAT) and Positive Computer Attitude (PCAT).

Data will also be collected for control variables such as Gender, Age, Ethnicity, Computer Subjects in Matric, Ownership of a Computer, Regular and Ease of Computer Access, Hours per Day of Computer Use, Years of Computer Experience, Majoring Subjects, Registered Course Slots, which may effect the dependent variable.

3.3 Research Methodology

The research methodology to be used for a particular research problem must always take into account the nature of the data to be collected in order to attempt to solve the research problem (Leedy and Ormrod, 2005). This is done by examining the research problem and questions and justifying the appropriate methods of data collection, as well as explaining the questionnaire construction and describing the analytical and statistical methods to be used in order to analyse the data.

This study aims to investigate the intention of female university students to select an IT career. This will be done by analysing the direct and indirect variables impacting on their intention to select an IT career. Therefore a relevant research methodology to be adopted would be a survey methodology. Survey research is defined as surveys which "are conducted to advance scientific knowledge" (Pinsonneault and Kraemer, 1993, p. 77). According to Pinsonneault and Kraemer (1993) survey research has three characteristics namely,

1. "The purpose of the survey is to produce quantitative descriptions of some aspects of the studied population" (p. 77).
2. "Respondents are asked to answer structured and predefined questions" (p. 77).

3. Data is collected from a "fraction of the study population" in such a way that allows generalization of the findings to the population" (p. 78).

This study uses a survey methodology where data is collected using a questionnaire consisting of structured and close-ended questions (the questionnaire development is discussed in detail in the following section). Data is collected from a sample of students from one university in South Africa. This was considered appropriate given limitations around time and cost of data collection. Therefore this study conforms to the three characteristics of survey research methodology.

Pinsonneault and Kraemer (1993) study also defined four conditions to when a survey research methodology is most appropriate namely,

1. The research aims to test hypotheses and answer "questions of interest about phenomena" (p. 78).
2. "Control of the independent and dependent variables is not possible or not desirable" (p. 78).
3. "The phenomena of interest must be studied in their natural setting" (p. 78).
4. "The phenomena of interest occurred in current time or the recent past" (p. 78).

The research hypotheses of this study aims to investigate amongst women university students the impact of influencing factors, namely computer training, computer self-efficacy and computer anxiety on computer attitude as well as the effect of computer attitude towards the intention to select an IT career. Additionally the study aims to identify whether there are any gender differences between computer training, computer self-efficacy, computer anxiety, computer attitude and intention to select an IT career. The independent variable of this study is computer training. Therefore this research study corresponds with all the criteria for the appropriate use of survey research.

In addition survey research is generally used by IS researchers. Premkumar and King (1994) indicated that survey research is also particularly useful for studying a large number of variables using a large sample size and rigorous statistical analysis. According to Hussey and Hussey (1997), and Premkumar and King (1994) this method also provides greater external validity and easier generalization of results as the sample is drawn from a population and studied in order to formulate an inference about a population. This in turn reduces the practical limitations of gathering data on the entire population. Therefore a survey methodology is clearly an appropriate choice to achieve the objectives of this study.

3.4 Measurement and Operationalization of Variables

According to Neuman (1994) two steps, namely conceptualisation and operationalization of variables are necessary at the beginnings of data measurement. Conceptualisation requires each variable to have a conceptual or theoretical definition, which has been accomplished in chapter 2. Operationalization requires the specific operations, measurement instruments or procedures necessary to provide an accurate measurement of the variable to be determined. The variables of this study include gender and the various factors influencing computer attitude either indirectly or directly, namely computer training, computer self-efficacy, and computer anxiety; as well as the effect of computer attitude influencing intention to select an IT career (see Figure 3 above).

3.4.1 Independent Variables

Quantity of Computer Training (QTYCT) and Quality of Computer Training (QLICT)
Computer training refers to an IT course which is perceived by respondents to have appropriate levels of quantity and quality. This variable was operationalized by asking respondents, on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree), to indicate the extent to which they agreed with fourteen statements relating to their perception of the quantity and quality of their computer training. The five items used to measure the quantity of computer training and the nine items of quality of computer training were all adapted from a course evaluation form administrated at the University of the Witwatersrand (see foot note[2]). The actual items used to measure computer training, are provided in Appendix B, Table B.1.

Computer Self-Efficacy (CSE)
Computer self-efficacy was measured by asking respondents, on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree), to indicate the extent to which they agreed with ten statements relating to individuals' confidence in their computer-related abilities (Murphy, Coover and Owen, 1989; Compeau and Higgins, 1995; Marakas et al., 1998; Hasan and Ali, 2004). The ten items used to measure computer self-efficacy were adapted from Murphy, Coover and Owen's (1989) measures of computer self-efficacy. The actual items used to measure computer self-efficacy, together with corresponding literature support, are provided in Appendix B, Table B.2.

[2] These items were adapted from the course evaluation form created by the University of the Witwatersrand Centre for learning, teaching and development (CLTD).

Computer Anxiety (CA)

Computer anxiety in this paper is referred to as an individual's effective response, such as their fears, worries, apprehensions and/or tensions towards the use of computers (Heinssen et al., 1987). This variable was operationalized by asking respondents, on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree), to indicate the extent to which they agreed with twelve statements relating to computer anxiety. The twelve items used to measure computer anxiety were adapted from Heinssen, Glass and Knight's (1987) measure of computer anxiety, and items from Nickell and Pinto's (1986). The actual items used to measure computer anxiety, together with corresponding literature support, are provided in Appendix B, Table B.3.

Negative Computer Attitude (NCAT) and Positive Computer Attitude (PCAT)

Computer attitude is a multidimensional construct and refers to either negative or positive attitudes towards computers. Computer attitude refers to an individual's feelings about the impact (negative or positive) of computers on their daily life and society, as well as their understanding of computers (Heinssen et al., 1987, Nickell and Pinto, 1986). This variable was operationalized by asking respondents, on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree), to indicate the extent to which they agreed with eleven statements reflecting computer attitude. The three items used to measure negative computer attitude and the eight items used to measure positive computer attitude were adapted from Nickell and Pinto's (1986) measure of computer attitude. The actual items used to measure computer attitude, together with corresponding literature support, are provided in Appendix B, Table B.4.

3.4.2 Dependent Variables

Intention to Select an IT Career (INTS)

Intention to select an IT career refers to an individual's desire to pursue an IT career which may be considered to be either technical-orientated, business-orientated or a blend of both. This variable was operationalized by asking respondents, on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree), to indicate the extent to which they agreed with twelve statements relating to an IT career. The twelve items used to measure an individual's intention to select an IT career were adapted from Brinkley and Scholar (2005) survey used to measure high school student's intention to select an IT career. The actual scale items used to measure an individual's intention to select an IT career, together with corresponding literature support, are provided in Appendix B, Table B.5.

3.4.3 Control Variable

Gender
Respondents were required to indicate their gender (male or female).

3.4.4 Demographic Variables

Age
Respondents were required to indicate their age from 3 ranges (16 – 20, 21 – 25, or older than 25).

Ethnicity
Respondents were required to indicate their ethnicity from 6 options (Black, Coloured, White, Indian, Asian, or Other).

Computer Subjects in Matric
Respondents were asked whether they had studied computer subjects in matric. They were required to indicate either “yes” or “no”.

Ownership of a Computer
Respondents were asked whether they owned either a desktop or portable computer. They were required to indicate either “yes” or “no”.

Regular and Ease of Computer Access
Respondents were asked whether they had regular and easy computer access at the university. They were required to indicate either “yes” or “no”.

Hours per Day of Computer Use
Respondents were required to indicate how may hours per day they used computers from 4 options (0 – 1, 2 – 3, 4 – 5, or 6 or more).

Years of Computer Experience
Respondents were required to indicate how many years of computer-related experience they had from 6 options (see Appendix D).

Majoring Subjects
Respondents were required to indicate which university subjects they planned on majoring in (see Appendix D).

Registered Course Slots
Respondents were required to indicate which of three IS classes they were enrolled in.

3.5 Data Collection Strategy

3.5.1 Instrument Construction

Research surveys which are developed using structured questionnaires provide a rich base of numerical data responsive to statistical analysis (Premkumar and King, 1994). Therefore the instrument constructed is a structured questionnaire consisting of closed ended questions. The closed ended questions consisted of mainly 5-point Likert scales ranging from “Strongly Disagree” to “Strongly Agree”. The questionnaire consisted of the operationalized variables previously discussed (see Appendix B, Table B.1 - B.5).

3.5.2 Pre-testing and Pilot testing

Pre-testing

Prior to administration, the questionnaire was pre-tested in order to ensure content validity and completeness. The pre-test was conducted by five senior academics of the University of the Witwatersrand, who are familiar with IS research. Based on their opinions and suggestions only minor changes were required such as rewording and re-ordering of questions, and formatting of the questionnaire.

Pilot-testing

After the modification of the questionnaire based on the pre-test, the questionnaire was then pilot-tested by 26 students taking the IT course at the second year level. The pilot-test was required in order to check whether respondents understood the instructions of the questionnaire, as well as to check the interpretation of questions, and the maximum response time needed. The pilot-test was conducted by administrating the questionnaire in the same manner as the final questionnaire. In addition they were asked to comment and criticise the questionnaire with regards to identifying confusing, redundant, and inappropriate questions. After piloting no changes were made to the instrument. The final questionnaire was three pages in length. A copy of the final questionnaire is presented in Appendix D.

3.5.3 Sampling Frame

It was decided to conduct the study at the University of the Witwatersrand, South Africa. The sampling frame consists of first year Bachelor of Commerce (BComm) students enrolled in the fundamentals of information systems course. This sample was selected in order to determine female students intentions of selecting an IT career. The fundamentals of information systems course is a required/compulsory course for all BComm first year students. Therefore registration of this course does not represent students intentions to select IT careers, since all BComm students regardless of their intentions are registered for this course. Moreover it is assumed that first year students have not yet crystallized their decision about academically majoring in IT. Both female and male students will be targeted in order to collect data to compare gender. Therefore the sample framework will consist of the entire population of all first year BComm university students registered for the foundation information systems course. The sampling frame which is 536 respondents, registered for the fundamentals of information systems course at University of the Witwatersrand, will be potentially targeted, of which 51% are female and 49% are male.

3.5.4 Characteristics of Respondents

All students registered for fundamentals of information systems course at the University of the Witwatersrand, South Africa. Respondents will be mostly first year students or students taking first year course/s. The age ranges of respondents would be between 16 and 25. However all female students of the sample will be considered to be the target audience, whereas male students results will be used for comparison purposes against female students results.

3.5.5 Ethical Considerations and Questionnaire Administration

The approval of the Human Research Ethics Committee is required before any research, associated with the University of the Witwatersrand, which involve humans either as informants or subjects can be conducted. Therefore prior to the administration of the questionnaire an application requesting permission was submitted to the Human Research Ethics Committee. The Human Research Ethics Committee required that the proposal title be amended before the application could be approved. After the amendment of proposal title, permission was obtained from the Human Research Ethics Committee to conduct the research at the beginning of the foundation information system lectures at the University of the Witwatersrand. A copy of the Human Research Ethics Committee clearance certificate is presented in Appendix C.

The final questionnaire was self-administered by hand to the relevant respondents described above. The questionnaire was handed to respondents at the beginning of lecture periods, with permission of the lecturer. Respondents were asked to read the cover letter, and were told that the questionnaire is confidential, does not count academically towards their course, and their participation is voluntary.

The cover letter of the questionnaire explained the aim of the study and was also used to encourage responses. Encouragement of responses was done by pledging to make a donation on behalf of the respondents to Childline Safe House Project, which provides 97 warm loving homes to children who have been abandoned or removed from their own homes in emergency situations. The cover letter also informed the respondents that their response to the survey would contribute to the completion of a master's degree.

According to Bailey (1994) and Easterly-Smith, Thorpe and Lowe (2001), identification may raise an issue of bias and ethical dilemmas. Therefore respondents were also promised confidentiality in the cover letter. Moreover the cover letter also promised anonymity as it also states that no names and student identification numbers would be captured. The questionnaire was administrated throughout one week of lecture periods of all students attending the fundamentals of information systems course. A copy of the cover letter is provided in Appendix D.

3.6 Data Analysis Strategy

3.6.1 Reliability and Validity

Content validity and face validity refers to "the extent to which the content of the items is consistent with the variables conceptual definition, based solely on the researchers judgement" (Hair, Black, Babin, Anderson and Tatham, 2006, p. 771). Content validity ensures that the items selected as indicators represent the pool of items that could be drawn from, in order to measure the variables of interest (Straub, 1989). Face validity ensures that items have meaning to respondents (Straub, 1989). This study has attempted to ensure both content and face validity by having selected the variables from a comprehensive literature review, and establishing item refinement by conducting a pre-test with 5 senior academics in the IS field, and a pilot test with 26 students taking the IT course at the second year level.

Construct validity refers to "the extent to which a set of measured variables actually represents the theoretical latent construct those variables are designed to measure" (Hair et al., 2006, p. 707). To assess construct validity, Principal Component Analysis (PCA) will be used. According to Hair et al. (2006) PCA is an appropriate method to be used to reduce a large number of questionnaire items to a smaller number of composite uni-dimensional variables. This analysis involves combining all items which load highly on a principal component, called a factor, into a composite index score. Therefore composite index scores will be calculated by averaging scores across items that load appropriately onto respective

variables, therefore these composite index scores will represent the uni-dimensional variables of the study. According to Hair et al. (2006) factor loadings between 0.50 and 0.70 are considered practically significant. Therefore the factor loading criteria in this study, will be 0.60 and above for item retention. When items have more than one significant loading, this illustrates that the item represents separate factors as opposed to a distinct factor; this is termed as cross loading (Hair et al., 2006). Items not loading at the criteria level or cross loading on more than one factor will be eliminated.

Convergent validity refers to the degree to which two or more measures of the same concept are correlated. It can be examined through the average variance extracted (AVE) calculation (Hair et al., 2006). The constructs will be empirically similar if the AVE's explained by the construct's items are greater than 0.50, which would indicate that the constructs explain more than 50% of the variance in their observed measures (Hair et al., 2006, p. 777).

Discriminant validity refers to the degree to which two conceptually similar concepts are empirically distinct (Hair et al., 2006). Discriminant validity will be assessed by examining the square root of the construct's AVE and ensuring that AVE's are greater than the correlation between that construct and other constructs in the model (Hulland, 1999; Hair et al., 2006).

Composite or scale reliability refers to the extent to which each construct is represented by the items (Hair et al., 2006). Cronbach alpha tests will be used in order to ensure composite reliability. This will be done prior to the calculation of composite index scores. According to Hair et al. (2006) the loading estimates should be, ideally 0.60 or higher (Hair et al., 2006, p. 137). Therefore in order to demonstrate an acceptable composite reliability for each scale in this study, the cut off level for Cronbach alpha will be 0.60.

3.6.2 Descriptive Analysis of Control Variables

Descriptive statistics will be used to summarise the data and evaluate the demographics representation of the sample.

3.6.3 Testing of Research Hypotheses

The variables of the study, namely quantity and quality of computer training, computer self-efficacy, computer anxiety, negative and positive computer attitude, and intention to select an IT career are interval and will be measured using a 5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree). The following sections describe the data analyses of all research hypotheses.

Four stages will be followed in order to test the following research hypotheses for the female and male sample separately:

- **H1a:** Quantity of Computer Training will influence women's Computer Attitude by increasing their level of Computer Self-Efficacy
- **H1b:** Quality of Computer training will influence women's Computer Attitude by increasing their level of Computer Self-Efficacy
- **H2a:** Quantity of Computer training will influence women's Computer Attitude by reducing their level of Computer Anxiety
- **H2b:** Quality of Computer training will influence women's Computer Attitude by reducing their level of Computer Anxiety
- **H3a:** Computer Self-Efficacy will decrease the Negative Computer Attitudes of women
- **H3b:** Computer Self-Efficacy will increase the Positive Computer Attitudes of women
- **H4a:** Computer Anxiety will increase the Negative Computer Attitudes of women
- **H4b:** Computer Anxiety will decrease the Positive Computer Attitudes of women
- **H5a:** Negative Computer Attitudes will decrease women's Intention to Select an IT Career
- **H5b:** Positive Computer Attitudes will increase women's Intention to Select an IT Career
- **H6a:** Negative and Positive Computer Attitudes mediates the relationship between Computer Self-Efficacy and Intention to Select an IT Career
- **H6b:** Negative and Positive Computer Attitudes mediates the relationship between Computer Anxiety and Intention to Select an IT Career

Stage 1: Testing Hypotheses using Correlation

Hypotheses H1a - H2b will be tested by Pearson's correlation tests. In addition all other hypotheses (H3a - H6b) will also be subjected to Pearson's correlation tests in order to identify the level of significance between dependent variables and independent variables. The correlation between the different variables will be calculated and presented in a correlation matrix.

Stage 2: Testing the Assumptions of Multiple Regression

According to Hair et al. (2006) certain assumptions need to be met in order to validly use multiple regression, namely normality, linearity, homoscedasticity, and multicollinearity.

Normality refers to the degree to which the shape of the distribution of data for a particular variable corresponds to a normal distribution, which is the statistical benchmark (Hair et al., 2006). In order to test for normality, skewness and kurtosis values for each variable will be analysed (Hair et al., 2006). Kurtosis refers to the "peakedness" or "flatness" (height) of the distribution compared with the normal distribution (Hair et al., 2006). Skewness describes the balance of the distribution, and determines whether it is positively or negatively skewed or balanced (Hair et al., 2006). The statistical value will be calculated for both skewness and kurtosis. According to Hair et al. (2006), skewness values within the range of −1 to +1 and

kurtosis values within −3 to +3 indicate an acceptable range for normality. Therefore normality will be tested statically, by analysing calculated skewness and kurtosis values for each variable.

Linearity refers to the "degree to which change in the dependent variable is associated with the independent variable" (Hair et al., 2006, p. 205). Linearity of any relationship between dependent and independent variables is easily examined through scatter plots (Hair et al., 2006). Therefore linearity will be tested graphically, by assessing scatter plots.

Homoscedasticity refers to the "assumption that dependent variable(s) exhibit equal levels of variance across the range of predictor variable(s)" (Hair et al., 2006, p. 83). Variance of the dependent variable, being explained in the dependence relationship, should not be concentrated in only limited range of the independent values thus homoscedasticity is desirable (Hair et al., 2006). The diagnosis of homoscedasticity can be done by residual plots (Hair et al., 2006). Therefore through the examination of histograms and residual plots, violations of homoscedasticity will be detected and reported.

Collinearity is the association (correlation) between two independent variables. Multicollinearity refers to the "correlation among three or more independent variables" (Hair et al., 2006, p. 186). When a regression computation indicates, independent variables that are highly collinear, this poses a problem as it is difficult to identify the unique contribution of each variable in predicting the dependent variable because the highly correlated variables are predicting the same variance in the dependent variable (Hair et al., 2006). Thus if multicollinearity exists one cannot generalise the findings of the research to the wider population (Hair et al., 2006).

In order to determine the level of collinearity between variables (or the amount to which each variable is explained by other independent variables), tolerance and variance inflation factor (VIF) for each independent variable were calculated. According to Hair et al. (2006) tolerance represents the amount of variability of each independent variable that is not explained by other independent variables, a small tolerance value indicates a high level of collinearity between the two variables. Multicollinearity exists when tolerance is below 0.1 and VIF is greater than 10 or on average much greater than 1. In this study a cut-off threshold of 0.1 for tolerance is used, and thus the cut-off for its inverse, VIF, 10 is used (Hair et al., 2006). Therefore tolerance should be close to 1.0 and VIF close to 0.

Stage 3: Testing Hypotheses using Multiple Regression

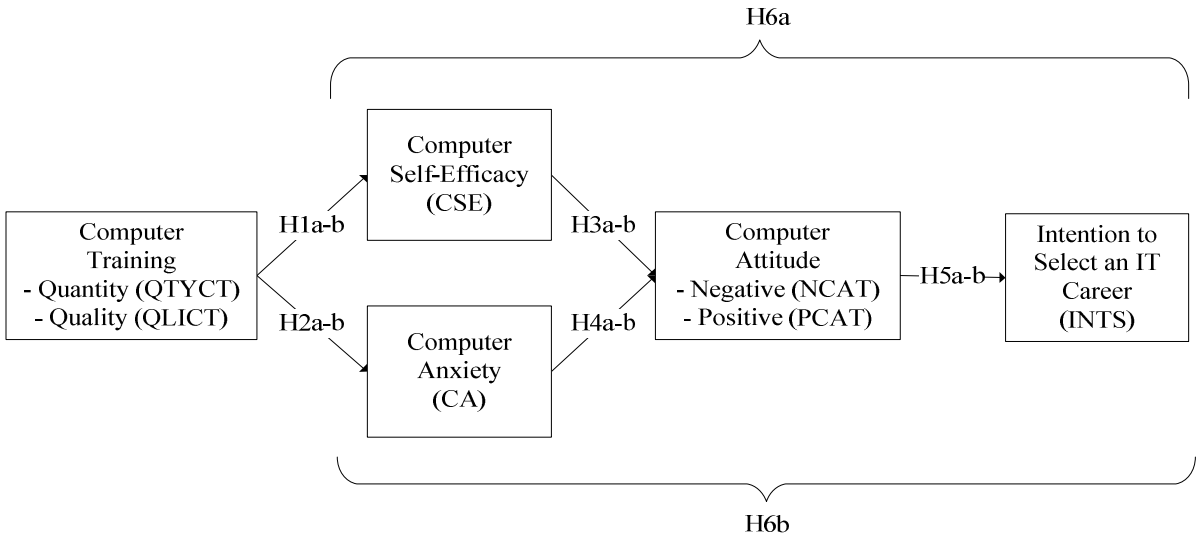
Hypotheses H3a to H6b will be tested by multiple regression equations. Multiple regression analysis will be applied to the data in order to express the relationships between variables mathematically (Hussey and Hussey, 1997). Multiple regression analysis assesses the strength of independent variable in accounting for variance of the dependent variable (Leedy and Ormrod, 2005).

The R^2 value will illustrate the level of variance between the relationships of the independent variables and dependent variables. In this study a R^2 value needs to be statistically significant, a R^2 value greater than 0.1 is preferred to ensure practical significance. Regression paths are also more meaningful if the R^2 value is greater than 0.1 (Hair et al., 2006).

Multiple regression analysis is an appropriate statistical method for determining whether a relationship exists between independent variables and dependent variables. Standardised beta (β) coefficients will be presented as they determine the individual contributions of independent variables towards the prediction or explanation of dependent variables.

Stage 4: Determining the Mediating Effects of Negative and Positive Computer Attitude

According to Baron and Kenny (1986) and Judd and Kenny (1981) the following four steps are recommend to be carried out in order to prove that NCAT/PCAT mediates the relationship between CSE/CA and INTS.



1. Show that CSE/CA is correlated with INTS, where INTS is the dependent variable and CSE/CA is the predictor in the regression equation. This step establishes that there is an effect that may be mediated.
2. Show that CSE/CA is correlated with NCAT/PCAT, where NCAT/PCAT should be the criterion variable in the regression equation, and CSE/CA the predictor. This step treats the mediator as if it were an outcome variable.

3. Show that the mediator affects the outcome variable. INTS should be the criterion variable, and NCAT/PCAT and CSE/CA should be predictors. It is not enough to simply correlate the mediator (NCAT/PCAT) with the outcome (INTS) as the two could both be caused by the variable CSE/CA.
4. Show that the effect of CSE/CA on INTS, controlling for NCAT/PCAT, should be zero.

Correlation analysis and multiple regression analyses will be performed using SPSS software. The correlation coefficients will enable the hypotheses (H1a – H2b) and the results from the multiple regression analyses will enable the hypotheses (H3a - H6b) to be tested.

3.6.4 Testing of Research Questions

An independent samples t-test will be used in order to test the following research question:
RQ1: Are there gender differences with the variables of the study?

This data analysis tests the statistical difference between two sample means for a single dependent variable (Hair et al., 2006). Therefore an independent samples t-test will be able, to test whether females and males differ significantly with respect to each of the study's variables, namely quantity and quality of computer training, computer self-efficacy, computer anxiety, negative and positive computer attitude, and intention to select an IT career. Descriptive statistics (i.e. mean values) will be presented in order to illustrate any gender differences of the variables within the study. The mean value differences and significance values between the female and male samples of each variable will also be calculated in order to illustrate the most influenced variables according to gender.

Correlation analysis and multiple regression analyses will be used in order to test the following research question:
RQ2: Are there gender differences with the relationships of the study?

In order to illustrate any gender differences of the relationships of the study, the correlation analysis and multiple regression analyses as it was done for the female sample will be conducted to the male sample. The hypotheses results of the female sample will then be compared to the results of the male sample, in order to examine whether relationships found to be significant in one sample significantly differs in the other.

3.7 Limitations of the Approach

Due to time, cost, availability of data and various other practical limitations a questionnaire survey research methodology was selected. The limitations of this research methodology include respondents lacking motivation to complete the survey. This will be counteracted by guaranteeing confidentiality and promising a donation on behalf of the respondents' to Chidline, a children's charity, in the cover letter of the survey. This in turn motivates respondents to answer the survey which increases the response rate of the survey.

In addition respondents may not understand the questions of the questionnaire or may inaccurately interpret them, therefore resulting in inaccurate responses. Thus both pre-testing and pilot-testing was conducted in order to reduce the chances of item ambiguity, which is a frequent cause of inaccurate responses.

Another limitation of this study is that the questionnaire survey was administered by hand to the relevant respondents during lectures. Thus implying that only respondents whom attended the lectures were able to respond to the questionnaire. Respondents were instructed to complete the survey only once, thus reducing the risk of duplicate responses.

The sampling frame selected were all BComm first year students registered for the required/compulsory course, fundamentals of information systems course, which may not accurately represent the total population of female South African university students. Therefore preventing the ability to infer about the total population of female South African university students based on the sample. In addition an inadequate number of responses acquired may also prevent inference about the population.

3.8 Summary

This chapter has defined the research hypotheses and justified the research methodology selected. It also explained the data collection strategy by illustrating the operationalization of the studies variables, namely computer attitude computer training, computer self-efficacy, and computer anxiety, and the intention to select an IT career. The chapter also described the testing, namely pre-testing and pilot-testing, used to ensure that the instrument constructed was suitable. The chapter then discussed the targeting respondents, as well as the sampling method and sampling frame used for this study. This was then followed by a description of the reliability and validity strategy to be pursued. Thereafter the data analysis methods which are to be used to answer the research hypotheses and questions were presented. Lastly the limitations of the approach were discussed.

CHAPTER 4

PRESENTATION OF RESULTS

4.1 Introduction

The purpose of this chapter is to present the research findings of this study. Firstly, the chapter explains the data screening, missing value and outlier analysis. Secondly, the chapter describes the characteristics of the respondents. Thirdly, the chapter presents the reliability and validity results of the measures. This is then followed by a presentation of the research findings and lastly a summary of the chapter is provided.

4.2 Data Screening, Missing Value Analysis

A total of 269 completed questionnaires were collected from respondents, which yielded a response rate of 50.19%. Since questionnaire participation was voluntary, the response rate is reasonably high. Of the 269 completed questionnaires six cases were deleted. Three of the six cases were deleted as the respondents failed to complete a number of questions in the questionnaire. The other three cases were deleted as respondents failed to clearly mark their responses in the questionnaire. Therefore, 263 useable responses were received. The female response rate yielded 54.74% while the male response rate yielded 43.13%.

Raw data was then captured electronically into SPSS for analysis, over a period of several days. Each response was individually numbered, in order to easily locate original responses, if necessary. Electronically recorded data of all responses were also double checked. All electronically recorded responses showed no errors due to data capturing. Therefore the data capturing is accepted as sufficiently accurate.

The sample was then split into 2 separate samples namely, females and males. After screening all 263 cases for any missing data, a further 34 cases were identified with one or two missing quantitative and categorical data values, 24 cases had one missing value, and 10 cases had two missing values (see Table 1 presented next). Since no cases with missing data were missing more than two values, it was not necessary to delete the cases from further analysis, and missing value replacement is feasible. Cases missing data values were subjected to Mean Substitution (using female and male sample means as appropriate) however missing demographic data was not replaced (see Table 2 presented next for female sample and Table 3 presented next for male sample).

Table 1: Number of Cases with Missing Values[3]

Gender	Number of Cases with Missing Values	Number of Missing Values in a Case
Female	17	1
Male	7	1
Female	3	2
Male	7	2

Table 2: Strategies for Handling Quantitative Missing Data for Female Sample[4]

Questionnaire Item	Number of Cases Missing Data	Strategy for Handling Missing Data
AGE	1	Demographic unnecessary to replace
COMPMATRIC	1	Demographic unnecessary to replace
OWNCOMP	1	Demographic unnecessary to replace
COMPACCES	1	Demographic unnecessary to replace
SLOT	1	Demographic unnecessary to replace
QTYCT5	1	Mean Substitution (series mean)
QLICT1	1	Mean Substitution (series mean)
QLICT6	2	Mean Substitution (series mean)
CSE6	1	Mean Substitution (series mean)
CSE8	1	Mean Substitution (series mean)
CA2	1	Mean Substitution (series mean)
CA3	1	Mean Substitution (series mean)
CA5	2	Mean Substitution (series mean)
CA10	2	Mean Substitution (series mean)
NCAT2	1	Mean Substitution (series mean)
NCAT3	1	Mean Substitution (series mean)
PCAT2	1	Mean Substitution (series mean)
PCAT3	1	Mean Substitution (series mean)
PCAT6	1	Mean Substitution (series mean)
PCAT7	1	Mean Substitution (series mean)
Total Missing Observations	23	

AGE = Age, Computer Subjects in Matric = COMPMATRIC, Ownership of a Computer = OWNCOMP, Regular and Ease of Computer Access = COMPACCES, Registered Course Slot = Slot, QTYCT = Quantity of Computer Training, QLICT = Quality of Computer Training, CSE = Computer Self-Efficacy, CA = Computer Anxiety, NCAT = Negative Computer Attitude, PCAT = Positive Computer Attitude.

[3] No cases were missing more than 2 items

[4] The Mean Substitution (series mean) analyses was done for both female and male samples separately.

Table 3: Strategies for Handling Quantitative Missing Data for Male Sample

Questionnaire Item	Number of Cases Missing Data	Strategy for Handling Missing Data
OWNCOMP	2	Demographic unnecessary to replace
COMPACCES	2	Demographic unnecessary to replace
HRPERDAY	1	Demographic unnecessary to replace
SLOT	2	Demographic unnecessary to replace
QTYCT1	1	Mean Substitution (series mean)
CSE5	2	Mean Substitution (series mean)
CSE9	1	Mean Substitution (series mean)
CSE10	2	Mean Substitution (series mean)
CA6	1	Mean Substitution (series mean)
CA8	1	Mean Substitution (series mean)
CA10	1	Mean Substitution (series mean)
CA11	1	Mean Substitution (series mean)
NCAT1	1	Mean Substitution (series mean)
NCAT2	1	Mean Substitution (series mean)
ITCAR3	1	Mean Substitution (series mean)
ITCAR4	1	Mean Substitution (series mean)
Total Missing Observations	21	

Ownership of a Computer = OWNCOMP, Regular and Ease of Computer Access = COMPACCES, Hours per Day of Computer Use = HRPERDAY, QTYCT = Quantity of Computer Training, CSE = Computer Self-Efficacy, CA = Computer Anxiety, NCAT = Negative Computer Attitude, ITCAR = IT Career Interest

4.3 Outlier Analysis

Outlier analysis was conducted in order to identify cases with either unusually high or unusually low values. This will allow the detection of respondents that may not be from the same population as the rest of the sample. To test for outliers the questionnaire items measuring each of the variables were standardized. The standardized scores were then scanned to determine if any were greater than ± 3 (i.e. more than 3 standard deviation from the mean, which is a common rule of thumb for detecting extreme values)[5]. This analysis did

[5] A standardized score (z) is computed by subtracting the sample mean (μ) from an individual raw score (x) and then dividing the difference by the sample standard deviation (σ). The standardized score (z) is:

$$z = \frac{(x - \mu)}{\sigma}$$

The z-score represents the relative position of the individual raw score by indicating the number of standard deviations it is from the mean. In a standard normal distribution, the distribution is centered on 0, where 99.7% of all observations should fall between −3 and +3 standard deviations of the mean. Thus a rule of thumb is that any value with a z-score less than −3 or greater than + 3 could be considered a potential outlier (Hair et al., 2006, pp. 222).

not reveal any cases with above ± 3 for any of the scale items. Therefore, there was no concern about the existence of univariate outliers.

4.4 Sample Characteristics

A total of 263 completed responses were valid. Tables 4 - 7 evaluate the demographic representation of the samples general characteristics.

Table 4: Respondents by Gender

Demographic Variable	Female	Male	N = 263	Female Percentages	Male Percentages
Gender	150	113	263	57.03	42.97

Table 5: Respondents by Age and Ethnicity

Demographic Variable	Female	Male	N = 263
Age			
16 – 20	140	96	236
21 - 25	8	17	25
Older than 25	1	0	1
Missing	1	0	1
Ethnicity			
Black	84	71	155
Coloured	8	6	14
White	21	20	41
Indian	28	13	41
Asian	6	3	9
Other	2	1	3

Table 6: Respondents by Computer Ownership, Access, Use and Experience

Demographic Variable	Female	Male	N = 263
Ownership of a Computer			
Yes	113	80	193
No	36	31	67
Missing	1	2	3
Regular and Ease of Computer Access			
Yes	144	109	253
No	5	2	7
Missing	1	2	3
Hours per Day of Computer Use			
0 - 1	51	46	97
2 - 3	81	60	141
4 - 5	14	5	19
6 or more	4	1	5
Missing	0	1	1
Years of Computers Experience			
Less than 6 months	25	10	35
6 months – 1 year	12	6	18
1 - 2 year	15	13	28
2 - 4 year	21	15	36
4 - 6 year	18	15	33
More than 6 years	59	54	113

Table 7: Respondents by Computer Course Interest

Demographic Variable	Female	Male	N = 263
Computer Subjects in Matric			
Yes	30	21	51
No	119	92	211
Missing	1	0	1
Majoring Subjects			
Information Systems	23	18	41
Economics	40	39	79
Accounting Sciences	68	55	123
Auditing Sciences	13	4	17
Marketing	27	13	40
Human Resources	6	5	11
Finance	47	30	77
Management	30	15	45
Law	22	8	30
Mathematical Sciences	2	4	6
Insurance and Risk Management	4	2	6
Psychology	3	3	6
Other**	4	1	5
** The respondents specified "Other" as subjects such as Computer Science and Taxation			
Registered Course Slots**			
C	15	17	32
E	22	28	50
B	112	66	178
Missing	1	2	3
*** The lecture slots indicate which stream the respondents are in. Slot C respondents have chosen to major in IS, slot E are respondents who have chosen to complete the IS course in 6 months, and slot B are respondents who have chosen to complete the IS course over 1 year.			

The demographics indicate that:

- Majority of respondents were female which was adequately representative of the sampling frame.
- Respondents had predominantly 2 years or more computer related experience, indicating that students were generally computer savvy.
- Majority of respondents opted to major in subjects related to Accounting Sciences.
- Only 15.59% of total sample (41 of 263) had an interest in majoring in IS. This figure itself explains why this study is important. One may consider using this variable as a proxy for the dependant variable (Intention to Select an IT Career). Although first year students have not yet crystallized their decision about academically majoring in IT. First year students intentions to select an IT career are better measured using the operationalization of intentions to select an IT career as per the questionnaire as opposed to formal registration of the foundation information system course.

4.5 Approach to Data Analyses

Data analyses were initially only conducted on the female sample, as the aim of the study is to investigate factors which affect women's computer attitudes as well as their intention to select an IT career.

Data analyses of the male sample was then conducted in order to identify whether there are differences between females and males across the variables of interests; and differences in the strength of relationships between the variables in the female / male subsamples. The results for the female sample are presented next, followed by a comparison of female and male samples. Detailed reliability and validity analyses, correlation matrix, and assumptions of multiple regressions for both female and male samples are presented in Appendices E, F and G.

4.6 Reliability and Validity

4.6.1 Principal Components Analysis

Principal components analysis (PCA) was used in order to test the construct validity of the variables by examining their uni-dimensionality. Uni-dimensionality is attained when all items of a variable load onto a single factor (dimension). Alternatively multi-dimensionality is obtained when multiple factors (dimensions) emerge, which will need to be treated as separate variables in the model. The female sample PCA results of all variables, namely computer training, computer self-efficacy, computer anxiety, computer attitude, and intention to select an IT career, are presented next (see Appendix E for detailed female sample PCA results). The male sample PCA results of all variables are presented in Appendix G.

Computer Training

In multiple iterations of PCA five items (QTYCT3, QTYCT5, QLICT1, QLICT2 and QLICT6) were dropped as they either cross-loaded on multiple dimensions or loaded below 0.6. A stable solution then emerged indicating that computer training variable was multi-dimensional consisting of three dimensions. This was detected by the factor analysis which was performed with a Varimax Rotation method. The first dimension consisted of two items (QTYCT1 and QTYCT2) which related to quantity of computer training. This factor was therefore termed "Quantity of Computer Training" (QTYCT). The second dimension consisted of three items (QLICT3, QLICT4 and QLICT5) which related to quality of computer training. This factor was therefore termed "Quality of Computer Training" (QLICT). The third dimension consisted of three items (QLICT7, QLICT8 and QLICT9) which reflected computer training's effectiveness in increasing interest in IT. This factor was therefore termed "Effectiveness of Computer Training" (EFFCT). Appendix E, Table E.1 presents the Varimax Rotation PCA on the computer training variables.

Computer Self-Efficacy

The initial PCA indicated that the computer self-efficacy variable was multi-dimensional. This was detected by the factor analysis which was performed with a Varimax Rotation method. This method indicated that the computer self-efficacy variable comprised of two dimensions. The first dimension consisted of three items (CSE1, CSE2, and CSE3) which related to activities that reflect a beginners level of computer skills. The remaining items reflected higher levels of computer skills. It was decided to focus on the higher levels of computer skills and thus CSE1, CSE2, and CSE3 were dropped. PCA was rerun without these items. Results indicated that the computer self-efficacy variable was uni-dimensional consisting of seven items (CSE4, CSE5, CSE6, CSE7, CSE8, CSE9 and CSE10) that loaded on one factor. This factor was therefore termed "Computer Self-Efficacy" (CSE). Appendix E, Table E.2 presents the Varimax Rotation PCA on the computer self-efficacy variables.

Computer Anxiety

PCA indicated that computer anxiety comprised of two dimensions. The first dimension consisted of four items (CA1, CA2, CA3, and CA5), all these items which were positively phrased and reflected "liking". This factor was therefore termed "Computer Liking". The second dimension consisted of six items (CA6, CA7, CA8, CA9, CA10, and CA11) all these items were negatively phrased. This factor was therefore termed "Computer Anxiety" (CA). One item, namely CA4 was dropped as the loading was below 0.6. This is an important finding of the study as computer liking is detected as a separate variable from computer anxiety. This is consistent with researchers such as Loyd and Gressard (1984b), and who also considered computer anxiety and computer liking to be separate variables. Therefore Computer Liking (CL) in this study refers to the enjoyment of working with computers. Appendix E, Table E.3 presents the Varimax Rotation PCA on the computer anxiety variables.

Computer Attitude

The factor analysis which was performed with a Varimax Rotation method, indicated that computer attitude was multi-dimensional, and comprised of three dimensions. The first dimension consisted of three items (CAT1, CAT2, and CAT3) which related to negative computer attitudes of individuals'. This factor reflected the expected dimension of "Negative Computer Attitude" (NCAT). The second dimension consisted of five items (CAT4, CAT5, CAT6, CAT7, and CAT8) which related to activities that reflect a positive computer attitude. This factor reflected the expected dimension "Positive Computer Attitude" (PCAT). The third dimension consisted of three items (CAT9, CAT10, and CAT11) which had no clear association with either negative or positive computer attitude and therefore was dropped. Appendix E, Table E.4 presents the Varimax Rotation PCA on the computer attitude variables.

Intention to Select an IT Career

PCA indicated that the intention to select an IT career variable was multi-dimensional. This was detected by the factor analysis which was performed with a Varimax Rotation method. This method indicated that the intention to select an IT career variable comprised of three dimensions. The first dimension consisted of six items (INTS1, INTS2, INTS3, INTS4, INTS5, and INTS6) which related to an individual's interest and their desire to pursue an IT career. This factor was therefore termed "IT Career Interest" (ITCAR). The second dimension consisted of three items (INT7, INTS8, and INTS9) which related to perceptions that reflect benefits of an IT career, and financial reward. This factor is termed "Perceived Tangible Rewards" (PTR). The third dimension consisted of two items (INTS10 and INTS12) which related to perceptions that reflect a social aspect of an IT career. This factor was therefore termed "Perceived Social Rewards" (PSR).One item, namely INTS11 was dropped as the factor analysis indicated that the single item cross loaded on multiple factors. Appendix E, Table E.5 presents the Varimax Rotation PCA on the intention to select an IT career variables.

4.6.2 Cronbach Alpha Testing

Cronbach Alpha is used to assess the reliability of the variables. The decided cut off level used for Cronbach Alpha was 0.60 (Hair et al., 2006). Table 8 indicates the Cronbach Alpha values for each variable using items remaining after PCA. All variables, except Quality of Computer Training (QLICT) and Perceived Social Rewards (PSR) were identified by Cronbach Alpha as reliable. PSR yield a Cronbach Alpha value of less than 0.60, and therefore was dropped from further analysis. Although QLICT yield a Cronbach Alpha value of less than 0.60, QLICT Cronbach Alpha value (0.56) was, considered close enough to 0.60, and therefore was retained for further analysis, however caution should be exercised when reviewing results related to this variable.

Table 8 also summarises the number of items per variable (n), the number of cases (N), the Mean and Standard Deviation (Std Dev), Minimum Factor loading (Min Factor Loading), Cronbach Alpha (α), Average Variance Extracted (AVE), and square root of the AVE $(\sqrt{AVE})$.

Examination of the average variance extracted (AVE) for each variable revealed that Quantity of Computer Training (QTYCT), Quality of Computer Training (QLICT), Positive Computer Attitude (PCAT) and Perceived Tangible Rewards (PTR) had AVE's of less than 0.50. The AVE's were, however, considered close enough to 0.5 and were considered acceptable. Thus convergent validity was established.

In order to establish discriminant validity the square root of the variables AVE were calculated and compared to the correlation values. The square root of the variables AVE, were greater than the correlation between that variable and other variables in the model (see Table 8). Therefore discriminant validity was established.

Table 8: Summary of Results per Variable

Variables [a]	n	N	Mean	Std Dev	Min Factor Loading	α [b]	AVE [c]	$\sqrt{AVE}$ [d]
Computer Training								
Quantity of Computer Training (QTYCT)	2	150	3.73	0.71	0.84	0.70	0.36	0.60
Quality of Computer Training (QLICT) [e]	3	150	3.98	0.66	0.65	0.56 [e]	0.38	0.62
Effectiveness of Computer Training (EFFCT)	3	150	3.05	1.05	0.80	0.85	0.55	0.74
Computer Self-Efficacy								
Computer Self-Efficacy (CSE)	7	150	3.18	0.71	0.64	0.83	0.54	0.74
Computer Anxiety								
Computer Liking (CL)	4	150	3.63	0.94	0.79	0.86	0.69	0.83
Computer Anxiety (CA)	6	150	2.10	0.93	0.61	0.86	0.68	0.82
Computer Attitude								
Negative Computer Attitude (NCAT)	5	150	4.24	0.61	0.76	0.85	0.63	0.79
Positive Computer Attitude (PCAT)	3	150	3.23	0.94	0.73	0.68	0.46	0.68
Intention to Select an IT Career								
IT Career Interest (ITCAR)	6	150	2.46	1.05	0.71	0.93	0.76	0.87
Perceived Tangible Rewards (PTR)	3	150	3.53	0.69	0.68	0.64	0.42	0.65
~~Perceived Social Rewards (PSR)~~ [f]	~~2~~	~~150~~	~~3.05~~	~~0.82~~	~~3.02~~	~~0.43~~	~~0.29~~	~~0.54~~

a Item loadings are detailed in Appendix E.

b Cronbach alpha (should be above 0.6), variables which exceed 0.60 cut off level (Hair et al., 2006) or were close enough were considered acceptable, variables below 0.60 cut off level were deleted.

c Average Variance Extracted (AVE) was used to establish convergent validity (should be above 0.50). The formula used for AVE: $AVE = \frac{\Sigma[\lambda i^2]Var(X)}{\Sigma[\lambda i^2]Var(X)+\Sigma[Var(\varepsilon i)]}$ where λi is the loading of xi on X, Var denotes variance, εi is the measurement error of xi, and Σ denotes a sum (Fornell and Larker, 1981).

d Square root AVE was used to establish discriminant validity.

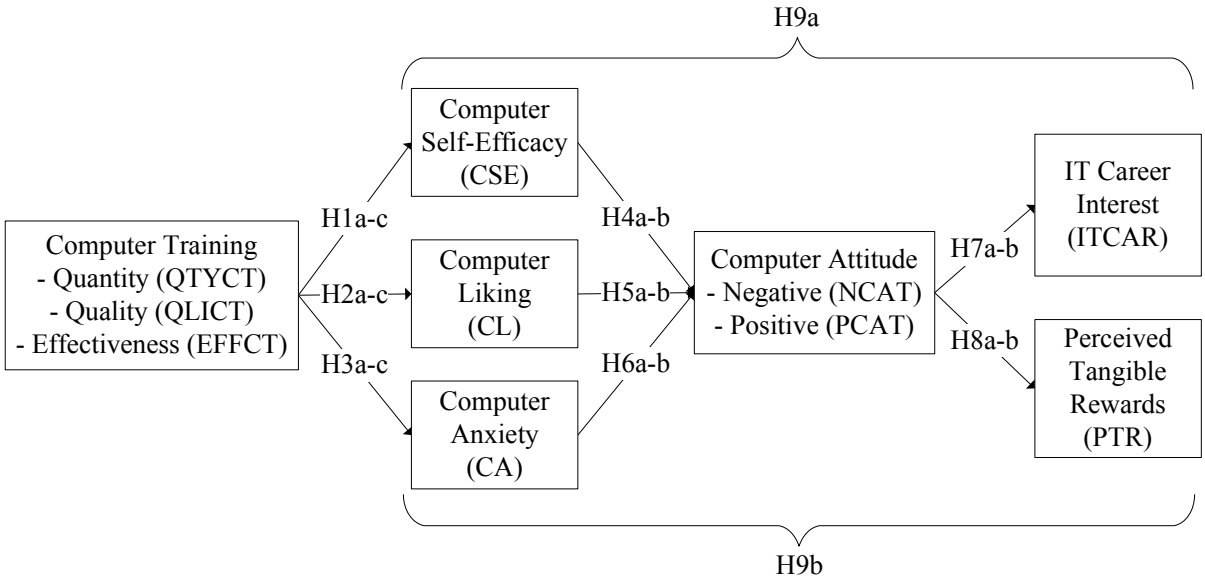
e Caution should be exercised when reviewing results related to this variable.

f Dropped from the model due to poor reliability and validity.

4.7 Revised Research Model and Research Hypotheses

Figure 4 below graphically depicts the revised research model and hypotheses based on the variables that have emerged after the validity and reliability analyses.

Figure 4: Revised Research Model and Research Hypotheses



4.8 Control Variables

Prior to the research hypotheses testing, it was necessary to determine whether any of the demographic variables should be added as controls. The following variables in Table 9 below were tested in order to determine as to whether any relationships with the dependant variables (ITCAR and PTR) exist. Results indicated that only computer subject in matric and hours per day of computer use effected ITCAR, and therefore will be included in the multiple analysis as controls.

Table 9: Demographic Variables as Controls

Control	Test Conducted	ITCAR	PTR
Age	Spearman Correlation	n/s	n/s
Computer Subjects in Matric	Mann-Whitney Test [g]	$p < 0.01$	n/s
Ownership of a Computer	Independent Samples t-test	n/s	n/s
Regular and Ease of Computer Access	Independent Samples t-test	n/s	n/s
Hours per Day of Computer Use	Pearson Correlation	$p < 0.05$	n/s
Years of Computer Experience	Pearson Correlation	n/s	n/s

ITCAR = IT Career Interest; PTR = Perceived Tangible Reward

n/s = Not Significant

[g] Mann-Whitney Test was used because Levene's Test was significant

4.9 Correlation Matrix[6]

Following reliability and validity assessment as presented above, the composite scores of each variable was then calculated as the arithmetic average of the relevant items weighted equally. These composite scores for the variables were used in subsequent analyses. The correlation matrix presented in Table 10 below, shows the correlation coefficients between all the independent and dependant variables. The level of significance of each correlation coefficient is also indicated. For each variable the AVE square roots are presented on the diagonal of the matrix.

Table 10: Correlation Matrix (Square Root AVE on diagonal)

	QTYCT	QLICT	EFFCT	CSE	CL	CA	PCAT	NCAT	ITCAR	PTR
QTYCT	0.60									
QLICT	0.355**	0.62								
EFFCT	0.335*	0.854*	0.74							
CSE	0.267**	0.167*	0.203*	0.74						
CL	0.202*	0.089	0.203*	0.479**	0.83					
CA	-0.139	-0.156	-0.222**	-0.405**	-0.263**	0.83				
NCAT	-0.167*	-0.025	-0.117	-0.068	-0.119	0.259**	0.79			
PCAT	0.089	0.154	0.195*	0.258**	0.151	-0.144	0.018	0.68		
ITCAR	0.104	0.078	0.152	0.498**	0.576**	-0.174*	0.013	0.103	0.87	
PTR	0.246**	0.269**	0.287**	0.190*	0.135	-0.117	0.043	0.237**	0.222**	0.65

QTYCT = Quantity of Computer Training, QLICT = Quality of Computer Training, EFFCT = Effectiveness of Computer Training, CSE = Computer Self-Efficacy, CL = Computer Liking, CA = Computer Anxiety, NCAT = Negative Computer Attitude, PCAT = Positive Computer Attitude, ITCAR = IT Career Interest; PTR = Perceived Tangible Rewards

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

[6] Pearson Product Moment Correlation was used. All variables measured on interval scale and were found to be normally distributed.

4.9.1 Results of Hypotheses H1a – H3c

Hypotheses H1a – H3c were tested with reference to the above correlation matrix (see Table 10 above).

Hypothesis 1a - the influence of Quantity of Computer Training on Computer Self-Efficacy

The correlation between QTYCT and CSE yields a r-value of 0.267 which is significant at $p<0.01$ level (see Table 10 above). H1a is thus supported: QTYCT is associated with and significantly influences CSE. Therefore greater quantity of computer training is associated with higher levels of computer self-efficacy.

Hypothesis 1b – the influence of Quality of Computer Training on Computer Self-Efficacy

The correlation between QLICT and CSE yields a r-value of 0.167 which is significant at $p<0.05$ level (see Table 10 above). H1b is thus supported: QLICT is associated with and significantly influences CSE. Therefore greater quality of computer training is associated with higher levels of computer self-efficacy.

Hypothesis 1c – the influence of Effectiveness of Computer Training on Computer Self-Efficacy

The correlation between EFFCT and CSE yields a r-value of 0.203 which is significant at $p<0.05$ level (see Table 10 above). H1c is thus supported: EFFCT is associated with and significantly influences CSE. Therefore greater effectiveness of computer training is associated with higher levels of computer self-efficacy.

Hypothesis 2a – the influence of Quantity of Computer Training on Computer Liking

The correlation between QTYCT and CL yields a r-value of 0.202 which is significant at $p<0.05$ level (see Table 10 above). H2a is thus supported: QTYCT is associated with and significantly influences CL. Therefore greater quantity of computer training is associated with higher levels of computer liking.

Hypothesis 2b – the influence of Quality of Computer Training on Computer Liking

The correlation between QLICT and CL yields a r-value of 0.089 which is not significant (see Table 10 above). H2b is thus not supported: QLICT is not associated with and does not significantly influences CL. In this study quality of computer training does not relate to ones level of computer liking.

Hypothesis 2c – the influence of Effectiveness of Computer Training on Computer Liking

The correlation between EFFCT and CL yields a r-value of 0.203 which is significant at $p<0.05$ level (see Table 10 above). H2c is thus supported: EFFCT is associated with and significantly influences CL. Therefore greater effectiveness of computer training is associated with higher levels of computer liking.

Hypothesis 3a – the influence of Quantity of Computer Training on Computer Anxiety

The correlation between QTYCT and CA yields a r-value of -0.139 which is not significant (see Table 10 above). H3a is thus not supported: QTYCT has no association with CA but not significant. In this study quantity of computer training does not relate to ones level of computer anxiety.

Hypothesis 3b – the influence of Quality of Computer Training on Computer Anxiety

The correlation between QLICT and CA yields a r-value of -0.156 which is not significant (see Table 10 above). H3b is thus not supported: QLICT is not associated with and does not significantly influences CA. In this study quality of computer training does not relate to ones level of computer anxiety.

Hypothesis 3c – the influence of Effectiveness of Computer Training on Computer Anxiety

The correlation between EFFCT and CA yields a r-value of -0.222 which is significant (see Table 10 above). H3c is thus supported: EFFCT has a significant association with CA. In this study effectiveness of computer training does relate to ones level of computer anxiety.

Hypothesis 4a – 9b were tested through multiple regression, and results are presented next.

4.10 Multiple Regression for Hypotheses H4a to H9b

Before being confident to interpret the multiple regression analyses, certain assumptions were tested, namely normality, linearity, homoscedasticity, and multicollinearity. Appendix F presents results of these multiple regression assumptions.

4.10.1 Results of Hypotheses H4a to H9b

Hypotheses 4a to 9b were tested using multiple regressions analysis. Multiple regressions analysis results are presented in Table 11 below.

Table 11: Standardised Betas of Multiple Regression Analyses

Dependent Variables	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6	Regression 7	Regression 8
	H4a, H5a, H6a	H4b, H5b, H6b			H7a, H8a	H7b, H8b	H9a	H9b
	NCAT	PCAT	ITCAR	PTR	ITCAR	PTR	ITCAR	PTR
Intercept	2.587***	3.617***	-0.871	3.020***	1.543*	2.354***	-0.728	2.138***
COMPMATRIC	-	-	0.082	-	0.174***	-	0.074	-
HRPERDAY	-	-	0.045	-	0.106	-	0.058	-
CSE	0.083	0.225*	0.266**	0.147	-	-	0.273**	0.100
CL	-0.088	0.032	0.465***	0.053	-	-	0.474***	0.051
CA	0.269*	-0.044	0.090	-0.044	-	-	0.064	-0.048
NCAT	-	-	-	-	0.012	0.018	0.079	0.048
PCAT	-	-	-	-	0.068	0.236**	-0.062	0.192*
R^2	0.074	0.069	0.411	0.040	0.058	0.057	0.419	0.079
F	3.910*	3.626*	19.979***	2.041	2.237	4.418*	14.531***	2.476*

COMPMATRIC = Computer Subjects in Matric, HRPERDAY = Hours per Day of Computer Use, CSE = Computer Self-Efficacy, CL = Computer Liking, CA = Computer Anxiety, PCAT = Positive Computer Attitude, NCAT = Negative Computer Attitude, ITCAR = IT Career Interest; PTR = Perceived Tangible Reward

* Multiple regression is significant where $p<0.05$

** Multiple regression is significant where $p<0.01$

*** Multiple regression is significant where $p<0.001$

Hypothesis 4a – the influence of Computer Self-efficacy on Negative Computer Attitude

CSE is not significantly associated with NCAT (beta = 0.083, p = 0.388). H4a is thus not supported: CSE is not associated with and/or does not significantly influences NCAT. Therefore in this study computer self-efficacy did not have the ability to decrease ones level of negative computer attitude.

Hypothesis 4b – the influence of Computer Self-efficacy on Positive Computer Attitude

CSE is significantly associated with PCAT (beta = 0.225, p = 0.021). H4b is thus supported: CSE is associated with and/or significantly influences PCAT. Therefore computer self-efficacy has the ability to increase ones level of positive computer attitude.

Hypothesis 5a – the influence of Computer Liking on Negative Computer Attitude

CL is not significantly associated with NCAT (beta = -0.088, p = 0.338). H5a is thus not supported: CL is not associated with and/or does not significantly influences NCAT. Therefore in this study computer liking did not have the ability to decrease ones level of negative computer attitude.

Hypothesis 5b – the influence of Computer Liking on Positive Computer Attitude

CL is not significantly associated with PCAT (beta = 0.032, p = 0.727). H5b is thus not supported: CL is not associated with and/or does not significantly influences PCAT. Therefore in this study computer liking did not have the ability to increase ones level of positive computer attitude.

Hypothesis 6a – the influence of Computer Anxiety on Negative Computer Attitude

CA is significantly associated with NCAT (beta = 0.269, p = 0.002). H6a is thus supported: CA is associated with and/or significantly influences NCAT. Therefore computer anxiety has the ability to increase ones level of negative computer attitude.

Hypothesis 6b – the influence of Computer Anxiety on Positive Computer Attitude

CA is not significantly associated with PCAT (beta = -0.044, p = 0.616). H6b is thus not supported: CA is not associated with and/or does not significantly influences PCAT. Therefore in this study computer anxiety did not have the ability to decrease ones level of positive computer attitude.

Hypothesis 7a – the influence of Negative Computer Attitude on IT Career Interest

NCAT is not significantly associated with ITCAR (beta = 0.012, p = 0.884). H7a is thus not supported: NCAT is not associated with and/or does not significantly influences ITCAR. Therefore in this study negative computer attitude did not have the ability to decrease ones level of IT career interest.

Hypothesis 7b – the influence of Negative Computer Attitude on Perceived Tangible Rewards

NCAT is not significantly associated with PTR (beta = 0.018, p = 0.825). H7b is thus not supported: NCAT is not associated with and/or does not significantly influences PTR. Therefore negative computer attitude does not have the ability to decrease ones level of perceived tangible rewards.

Hypothesis 8a – the influence of Positive Computer Attitude on IT Career Interest

PCAT is not significantly associated with ITCAR (beta = 0.068, p = 0.416). H8a is thus not supported: PCAT is not associated with and/or does not significantly influences ITCAR. Therefore positive computer attitude does not have the ability to increase ones level of IT career interest.

Hypothesis 8b – the influence of Positive Computer Attitude on Perceived Tangible Rewards

PCAT is significantly associated with PTR (beta = 0.236, p = 0.004). H8b is thus supported: PCAT is associated with and significantly influences PTR. Therefore in this study positive computer attitude has the ability to increase ones level of perceived tangible rewards.

Role of Control Variables

It is important to note that HRPERDAY was not significantly associated with ITCAR. Whereas COMPMATRIC was significantly associated with ITCAR, i.e. individuals' who took computers in matric had higher levels of ITCAR (see regression 5). However when CSE, CL and CA were included in the regression models (see regression 3 and 7) the affect of COMPUMATRIC on ITCAR was not significant. This supports the value of the hypothesized model and the need for explaining the model through complex constructs.

Hypothesis 9a - the mediating effects of Negative Computer Attitude and Positive Computer Attitude between Computer Self-Efficacy, Computer Liking, Computer Anxiety, and IT Career Interest

Hypothesis 9a stated that NCAT and PCAT would mediate the relationship between the independent variable CSE, CL, CA and the dependent variable ITCAR. In order to prove that NCAT and PCAT mediate the relationship between CSE, CL, CA and ITCAR, the three-step mediation approach suggested by Baron and Kenny (1986) was used:

1. Regress Independent Variables (CSE, CL, CA) on Mediators (NCAT and PCAT)
2. Regress Independent Variables (CSE, CL, CA) on Dependent Variable (ITCAR)
3. Regress Mediators (NCAT and PCAT) on Dependent Variable (ITCAR)
4. Regress Independent Variables (CSE, CL, CA) and Mediators (NCAT and PCAT) on Dependent Variable (ITCAR)

Regression 1 and 2 (see Table 11 above) indicated that various variables did not have relationships (i.e. condition 1 had failed in most cases). Regression 3 indicated that there are direct relationships between CSE and CL on ITCAR (see Table 11 above). These direct relationships are additional findings to this study. Regression 5 (H7a and H8a, see Table 11 above) indicated that NCAT and PCAT did not affect ITCAR thus mediation is not supported. Full mediation does not exist, hence H9a was not supported.

Hypothesis 9b - the mediating effects of Negative Computer Attitude and Positive Computer Attitude between Computer Self-Efficacy, Computer Liking, Computer Anxiety, and Perceived Tangible Rewards

The same approach to test Hypothesis 9a was used to test Hypothesis 9b. This hypothesis stated that NCAT and PCAT would mediate the relationship between the independent variable CSE, CL, CA and the dependent variable PTR. Thus Baron and Kenny's (1986) three-step mediation approach was used:

1. Regress Independent Variables (CSE, CL, CA) on Mediators (NCAT and PCAT)
2. Regress Independent Variables (CSE, CL, CA) on Dependent Variable (PTR)
3. Regress Mediators (NCAT and PCAT) on Dependent Variable (PTR)
4. Regress Independent Variables (CSE, CL, CA) and Mediators (NCAT and PCAT) on Dependent Variable (PTR)

Regression 1 and 2 (see Table 11 above) indicated that various variables did not have relationships (i.e. condition 1 had failed in most cases). Regression 4 indicated that there are no direct relationships between CSE, CL and CA on PTR (see Table 11 above). Regression 6 (H7b and H8b, see Table 11 above) indicated that NCAT did not have a significant effect on PTR (H7b), although PCAT did have a significant effect on PTR (H8b), thus mediation is not supported. Although regression 2 indicated that CSE had a significant effect on PCAT (H4b), and regression 6 indicated that PCAT had a significant effect on PTR (H8b). However full mediation does not exist, hence H9b was not supported.

All the hypotheses results have aided in either supporting or rejecting the research hypotheses, Table 12 below presents a summary of results.

Table 12: Summary of Results

Hypothesis	Statement	Result
H1a	QTYCT increases women's CSE level	Supported
H1b	QLICT increases women's CSE level	Supported
H1c	EFFCT increases women's CSE level	Supported
H2a	QTYCT increases women's CL level	Supported
H2b	QLICT increases women's CL level	Rejected
H2c	EFFCT increases women's CL level	Supported
H3a	QTYCT decreases women's CA level	Rejected
H3b	QLICT decreases women's CA level	Rejected
H3c	EFFCT decreases women's CA level	Supported
H4a	CSE decreases women's NCAT level	Rejected
H4b	CSE increases women's PCAT level	Supported
H5a	CL decreases women's NCAT level	Rejected
H5b	CL increases women's PCAT level	Rejected
H6a	CA increases women's NCAT level	Supported
H6b	CA decreases women's PCAT level	Rejected
H7a	NCAT decreases women's ITCAR level	Rejected
H7b	NCAT decreases women's PTR level	Rejected
H8a	PCAT increases women's ITCAR level	Rejected
H8b	PCAT increases women's PTR level	Supported
H9a	NCAT and PCAT Mediates CSE, CL,CA and ITCAR	Rejected
H9b	NCAT and PCAT Mediates CSE, CL,CA and PTR	Rejected

QTYCT = Quantity of Computer Training, QLICT = Quality of Computer Training, EFFCT = Effectiveness of Computer Training, CSE = Computer Self-Efficacy, CL = Computer Liking, CA = Computer Anxiety, NCAT = Negative Computer Attitude, PCAT = Positive Computer Attitude, ITCAR = IT Career Interest; PTR = Perceived Tangible Rewards

4.11 Additional Findings

In addition relationships not originally hypothesized between certain independent and dependent variables were revealed in the correlation analyse (refer to Table 10 above).

Relationship 1a – d: The influence of Quantity of Computer Training on Quality of Computer Training, Effectiveness of Computer Training, Negative Computer Attitude, and Perceived Tangible Rewards (see Table 10 above).

The correlation between QTYCT and QLICT yields a r-value of 0.355 which is significant at $p<0.01$ level (see Table 10 above). In addition the correlation between QTYCT and EFFCT yields a r-value of 0.335 which is significant at $p<0.05$ level (see Table 10 above). The correlation between QTYCT and NCAT yields a r-value of -0.167 which is significant at $p<0.05$ level (see Table 10 above). Furthermore the correlation between QTYCT and PTR yields a r-value of 0.246 and the correlation was significant at $p<0.01$ level (see Table 10 above). Therefore quantity of computer training has the ability to influences ones level of quality of computer training (R1a), effectiveness of computer training (R1b), negative computer attitude (R1c), and perceived tangible rewards (R1d).

Relationship 2a – c: The influence of Quality of Computer Training on Effectiveness of Computer Training, Computer Self-efficacy and Perceived Tangible Rewards (see Table 10 above).

The correlation between QLICT and EFFCT yields a r-value of 0.854 which is significant at $p<0.05$ level (see Table 10 above). In addition the correlation between QLICT and CSE yields a r-value of 0.167 and the correlation was significant at $p<0.05$ level (see Table 10 above). The correlation between QLICT and PTR yields a r-value of 0.269 and the correlation was significant at $p<0.01$ level (see Table 10 above). Therefore quality of computer training has the ability to influence ones level of effectiveness of computer training (R2a), computer self-efficacy (R2b), and perceived tangible rewards (R2c).

Relationship 3a and c: The influence of Effectiveness of Computer Training on Positive Computer Attitude, and Perceived Tangible Rewards (see Table 10 above).

The correlation between EFFCT and PCAT yields a r-value of 0.195 which is significant at $p<0.05$ level (see Table 10 above). The correlation between EFFCT and PTR yields a r-value of 0.287 and the correlation was significant at $p<0.01$ level (see Table 10 above). Therefore effectiveness of computer training has the ability to influence ones level of positive computer attitude (R3a), and perceived tangible rewards (R3c).

Relationship 4a – b: The influence of Computer Self-efficacy on IT Career Interest and Perceived Tangible Rewards (see Table 10 above).

The correlation between CSE and ITCAR yields a r-value of 0.498 which is significant at $p<0.01$ level (see Table 10 above). Furthermore the correlation between CSE and PTR yields a r-value of 0.190 and the correlation was significant at $p<0.05$ level (see Table 10 above). Therefore computer self-efficacy has the ability to influence ones level of IT career interest (R4a), and perceived tangible rewards (R4b).

Relationship 5a – b: The influence of Computer Liking on Computer Self-Efficacy and IT Career Interest (see Table 10 above).

The correlation between CL and CSE yields a r-value of 0.479 which is significant at $p<0.01$ level (see Table 10 above). In addition the correlation between CL and ITCAR yields a r-value of 0.576 and the correlation was significant at $p<0.01$ level (see Table 10 above). Therefore computer liking has the ability to influence ones level of computer self-efficacy (R5a), and IT career interest (R5b).

Relationship 6a – c: The influence of Computer Anxiety on Computer Self-Efficacy, Computer Liking and IT Career Interest (see Table 10 above).

The correlation between CA and CSE yields a r-value of -0.405 which is significant at $p<0.01$ level (see Table 10 above). Moreover the correlation between CA and CL yields a r-value of -0.263 which is significant at $p<0.01$ level (see Table 10 above). The correlation between CA and ITCAR yields a r-value of - 0.174 which is significant at $p<0.05$ level (see Table 10 above). Therefore computer anxiety has the ability to influences ones level of computer self-efficacy (R6a), and computer liking (R6b), and IT career interest (R6c).

Relationship 7 - The influence of Perceived Tangible Rewards on IT Career Interest (see Table 10 above).

The correlation between PTR and ITCAR yields a r-value of 0.222 and the correlation was significant at $p<0.01$ level (see Table 10 above). Therefore perceived tangible rewards has the ability to influence ones level of IT career interest (R7).

4.12 Results of Research Questions RQ1 and RQ2

An independent samples t-test was used to test the following research questions:

RQ1: Are there gender differences with the variables of the study?

RQ2: Are there gender differences with the relationships of the study?

In order to illustrate any gender differences of the variables within the study, mean values, statistical difference (mean differences, and t values) and significance values were calculated. Table 13 presented next presents the mean values of females and males of each variable, and presents the statistical difference (mean differences, and t values) and significance values between the two samples. The mean values, statistical difference (mean differences, and t values) and significance values indicated the following gender differences between the variables;

- Males have a significantly higher level of computer self-efficacy, meaning that males are more confident in their computer-related abilities than females.
- Males have a higher level of computer liking, meaning that males enjoy working with computers more than females do.
- Females have a significantly higher level of computer anxiety, meaning that females are more anxious towards the use of computers than males.
- Males have a higher level of IT career interest, meaning that males are more likely to select IT careers than females.
- All other variables of the study were not significantly different between females and males.

Table 13: Female and Male Mean Values, Statistical Difference and Significance Values

Variables	Gender	Mean	Mean Difference	T Values (t)	Significance (p)
QTYCT	Male	3.9240	0.01727	0.236	0.814
	Female	3.9067			
QLICT	Male	3.8171	-0.05406	-0.680	0.497
	Female	3.8712			
EFFCT	Male	3.9115	-0.09738	-1.251	0.212
	Female	4.0089			
CSE	Male	3.4901	0.30749	3.619	0.000
	Female	3.1826			
CL	Male	3.8916	0.34247	2.733	0.007
	Female	3.5491			
CA	Male	1.8205	-0.27977	-2.573	0.011
	Female	2.1002			
PCAT	Male	3.1772	-0.08227	-1.059	0.291
	Female	3.2298			
NCAT	Male	4.1540	-0.05251	-0.449	0.654
	Female	4.2362			
ITCAR	Male	2.6609	0.19870	1.531	0.127
	Female	2.4622			
PTR	Male	3.9240	-0.04956	-0.586	0.558
	Female	3.9067			

In order to illustrate any gender differences of the relationships of the study, the hypotheses results of females and males were compared using separate female and male samples (see Table 14, p. 62). All male sample results are presented in Appendix G. The comparison of the relationships indicated the following gender differences between the relationships of the study;

- H1a, H1b and H1c: The relationships between quantity, quality and effectiveness of computer training and computer self-efficacy was found in female sample to be statistically significant, but these relationships did not hold in the male sample.
- H2a and H2b: The relationship between quantity of computer training and computer liking was found in female sample to be statistically significant, but did not hold in the male sample. Whereas the relationship between quality of computer training and computer liking was not found in female sample to be significant, but this relationship was statistically significant in the male sample.

- H3a: The relationship between quantity of computer training and computer anxiety was not found in female sample to be significant, but this relationship was statistically significant in the male sample.
- H4a and H4b: The relationship between computer self-efficacy and negative computer was not found in female sample to be significant, but this relationship was statistically significant in the male sample. Whereas the relationship between computer self-efficacy and positive computer attitude was found in female sample to be statistically significant, but this relationship did not hold in the male sample.
- H6a: The relationship between computer anxiety and negative computer attitude was found in female sample to be statistically significant, but this relationship did not hold in the male sample.
- H8b: The relationship between positive computer attitude and perceived tangible rewards was found in female sample to be statistically significant, but this relationship did not hold in the male sample.
- H9a and H9b: Although these relationships were both not supported in the female or male sample, there were differences in the direct effects discovered. In the female sample computer self-efficacy and computer liking had direct effects on IT career interest, but in the male sample only computer liking had direct effects on IT career interest. In addition in the male sample computer liking had direct effects on perceived tangible rewards, but in the female sample there were no direct effects.
- All other relationships of the study were not significantly different between females and males (females and males both supported H2c and H3c, but did not support H3b, H5a, H5b, H6b, H7a, H7b, H8a, H9a and H9b) (see Table 14 presented next).

Table 14: Female and Male Hypotheses Result Differences

Hypothesis	Statement	Female Results	Male Results
H1a	QTYCT increases ones CSE level	Supported	Rejected
H1b	QLICT increases ones CSE level	Supported	Rejected
H1c	EFFCT increases ones CSE level	Supported	Rejected
H2a	QTYCT increases ones CL level	Supported	Rejected
H2b	QLICT increases ones CL level	Rejected	Supported
H2c	EFFCT increases ones CL level	Supported	Supported
H3a	QTYCT decreases ones CA level	Rejected	Supported
H3b	QLICT decreases ones CA level	Rejected	Rejected
H3c	EFFCT decreases ones CA level	Supported	Supported
H4a	CSE decreases ones NCAT level	Rejected	Supported
H4b	CSE increases ones PCAT level	Supported	Rejected
H5a	CL decreases ones NCAT level	Rejected	Rejected
H5b	CL increases ones PCAT level	Rejected	Rejected
H6a	CA increases ones NCAT level	Supported	Rejected
H6b	CA decreases ones PCAT level	Rejected	Rejected
H7a	NCAT decreases ones ITCAR level	Rejected	Rejected
H7b	NCAT decreases ones PTR level	Rejected	Rejected
H8a	PCAT increases ones ITCAR level	Rejected	Rejected
H8b	PCAT increases ones PTR level	Supported	Rejected
H9a	NCAT and PCAT Mediates CSE, CL,CA and ITCAR	Rejected	Rejected
H9b	NCAT and PCAT Mediates CSE, CL,CA and PTR	Rejected	Rejected

4.13 Summary

This chapter analysed the data in order to test the hypotheses. The first step involved determining whether there was any missing data. An appropriate remedy was selected for missing data. Reliability and validity analyses were conducted next. As the data analysis technique involved correlation analysis, multiple regressions, the assumptions of normality, linearity and homoscedasticity were tested, and indicated that there was no cause of concern.

Hypotheses testing were carried out and gender differences were examined next. In addition some unexpected relationships emerged. The next, chapter presents a detail interpretation and discussion of these results.

CHAPTER 5

INTERPRETATION AND DISCUSSION

5.1 Introduction

The purpose of this chapter is to interpret the results of the study. Firstly, the chapter compares the study's results to prior literature, in order to analyse the gaps between the results and theory. The chapter interprets the results obtained for research hypotheses and research questions as presented on pages 53 - 62. Lastly a summary of the chapter is provided.

5.2 Interpretation and Discussion

Since the aim of the study is to investigate factors which affect women's computer attitudes as well as their intention to select an IT career, the interpretation and discussion is focused on findings with regards to female sample. Whereas the male sample is discussed separately at the end of the chapter.

5.2.1 Influences of Computer Training

The findings of this study are consistent with the expectation that computer training improves ones levels of computer self-efficacy (Brosnan, 1998; Busch, 1995; Karsten and Roth, 1998; Khorrami-Arani, 2001; Zhang and Espinoza, 1998) and computer liking (Chau, 2001; Rovai and Childress, 2002; and Tsitouridou and Vryzas, 2003).

This indicates that females whom have low levels of computer self-efficacy can improve their levels of computer self-efficacy by increasing their computer training, as the more exposure to IT course content, the more confident they are about IT. Potosky and Bobko (2001) stated that computer self-efficacy is itself an important outcome of a successful computer training process. Therefore in order to improve females IT confidence educational institutes need to focus on the computer training offered.

A study conducted by Loyd and Gressard (1984a) indicate that the level of one's computer experience or computer training effects the degree to which one likes computers. Thus educational institutes need to not only focus on the computer training content offered, but also structure courses to encourage a fondness of computers, in order to attempt to strengthen the computer liking levels of their students.

Due to the contradictory findings in past research (e.g. Torkzadeh and Angulo, 1992; Schuh, 1996; Shashaani, 1997; Bohlin and Hunt, 1995; Chau, 2001; Rovai and Childress, 2002; Tsitouridou and Vryzas, 2003), it was necessary to empirical test this relationship between computer training and computer anxiety in the South African context. The findings of this study were consistent with Temple and Gavillet (1990), Moldafsky and Kwon (1994) and Smith, Caputi and Rawstorne (2000), which revealed that computer training does not appear to reduce ones computer anxiety. Therefore this finding implies that, other determinants of computer anxiety need to be further researched.

According to researchers such as Maurer (1994), Levine and Donitsa-Schmidt (1998), Ropp (1999), and Gaudron and Vignoli (2002) computer training improves ones level of computer attitude. Therefore another interesting finding was revealed, as this study's results are consistent with the above studies. Another appealing finding was that amongst females' perceived tangible rewards were positively influenced by computer training. However reviewed literature falls short with regards to exploring whether females motivation towards selecting an IT career, based on enhanced employment prospects, are increased due to computer training. Specifically the findings suggest that society and educational institutions need to structure computer training in a way that creates confidence with computers, and excitement, eagerness to use computers, as well as insights into employee prospects. The findings of this study have made progress towards narrowing that lack of understanding.

5.2.2 Influences of Computer Self-Efficacy, Computer Liking and Computer Anxiety

Prior research indicated that ones level of computer attitude is influenced by ones level of computer self-efficacy (Thatcher, Loughry, Lim and McKnight, 2007; and Igbaria and Iivari, 1995), ones level of computer liking (Delcourt and Kinzie, 1993; and Loyd and Gressard, 1984a), and ones computer anxiety (Mahar, Henderson, and Deane, 1997; and Rosen and Weil, 1995).

Consistent with researchers such as Thatcher, Loughry, Lim and McKnight (2007) and Igbaria and Iivari (1995), this study also revealed that individuals' who have high computer self-efficacy are more likely to use IT and to express more *positive* attitudes toward IT. However the regards to *negative* computer attitude, the findings of study were inconsistent with by Igbaria and Iivari (1995) findings that individuals' who have low computer self-efficacy are more likely to avoid computer and to express more *negative* attitudes toward IT. In this study results suggest that females whom have high levels of *negative* computer attitude would not necessarily change their *negative* computer attitude simply by increasing their confidence in their computer-related abilities.

This study also indicated that one's positive computer attitude is not influenced by one's level of computer liking, which was contradictory to the findings of Delcourt and Kinzie (1993), and Loyd and Gressard (1984a). Therefore results indicated that although students may like computers, they may not necessarily change their feelings about the impact of computers on their daily life and society.

The finding of this study were consistent with the findings of Mahar, Henderson, and Deane (1997) and Rosen and Weil (1995) which suggest that the computer anxious individuals' are more reluctant to use computers, and would in turn increase their *negative* computer attitude. However when it comes to *positive* computer attitude, findings did not confirm the view of those researchers above. Results indicated that females who are computer anxious are not necessary less positive towards IT.

Individuals' that have higher levels of *positive* computer attitude are confident in their computer-related abilities, whereas individuals' that have higher levels of *negative* computer attitude, fear the use of computers. Computer self-efficacy therefore affects *positive* computer attitude, whilst computer anxiety affects *negative* computer attitude. Computer liking effects neither negative nor positive computer attitude. Therefore society and educators needs to acknowledge the effects of computer self-efficacy and computer anxiety in order to attempt to improve computer attitudes of female students.

In addition this study also revealed important relationships not originally assumed. These relationships are discussed next. A study conducted by Michie and Nelson (2006) found that computer self-efficacy was the most important factor in selecting an IT career. Prior research (Lent, Brown and Larkin, 1987; Schaefers, Epperson and Nauta, 1997) also found that the strength of career-related self-efficacy expectations influences ones level of persistence in pursuing technical and scientific careers. Thus the finding of this study proved additional empirical support of a direct relationship between computer self-efficacy and IT career interest. Another unforeseen result was revealed as this study's finding indicated that computer self-efficacy has the ability to influences one's perceptions of IT career prospects. This finding is consistent to a study conducted by Papastergiou (2008), and thus provides empirical support for other researchers. The strong role of computer self-efficacy on IT career interest indicates that more research needs to be conducted in order to identify other factors through which computer self-efficacy may influence IT career interest.

Surprisingly results revealed important direct relationships of computer self-efficacy and computer liking. Females who like using computers are likely to be more confident of their computer-related abilities. In addition this study also found that computer liking has the ability to positively influence IT career interest. These results provide additional empirical support for the view of other researchers (e.g. Pamuk and Peker, 2009). Thus contributing to our understanding that computer liking directly and indirectly influences females towards selecting an IT career.

As for additional determinants of computer self-efficacy, and computer liking, the findings of this study also significantly revealed that computer anxiety negatively relates to one's computer self-efficacy (LaGuardia and Labbe, 1993; Henderson, Deane and Ward, 1995; Igbaria, Schiffman and Wieckowski, 1994; Wilfong, 2006) and computer liking (Chu and Spires, 1991; Loyd and Gressard 1984b) and was negatively correlated with IT career interest. In addition results were also consistent with researchers such as, Weil, Rosen and Wugalter (1990) and Todman (2000) who found that IT career choices are constrained by anxieties about computers. This implies that females with relatively high levels of computer anxiety generally experience low levels of computer confidence and computer liking, and are less prone to select an IT career.

Therefore society and educational institutions need to develop ways in which to improve the levels of female computer self-efficacy, computer liking and computer anxiety. This can be done by creating an environment which encourages the use of computers, which in turn may create more familiarity and lessen their fear, and avoidance of computers.

5.2.3 Influences of Negative and Positive Computer Attitude

The findings of this study empirically supports prior research (e.g. Whitely, 1997; Glass and Knight, 1988) which suggested that computer attitude is a multifaceted factor and therefore should be treated as two separate factors, namely negative and positive computer attitude, as an individual can hold both negative and positive computer attitude simultaneously (Shaw, 1984 as cited by Brosnan and Lee, 1998).

The findings of this study were consistent with prior research has indicated that an individual's attitude influences their decision making and thus their intention to select an IT career maybe influenced by their attitude towards computers (Ballard et al., 2006; Creamer, Burger and Meszaros, 2004; Weinberger, 2004, Papastergiou, 2008). This study also found that positive computer attitude influenced perceived tangible rewards. Therefore this finding is consistent with researchers such as Michie and Nelson (2006), and Wright (1997). They found that women's computer attitude influences their perceptions of IT career prospects, such as salary, promotion rates, turnover, and/or career aspirations. Thus the IT industry needs to promote IT career advantageous opportunities in order to encourage females to pursue an IT career.

5.2.4 The Mediating Effects of Negative and Positive Computer Attitude

Interestingly, results revealed that intention to select an IT career reflected as two factors namely, IT career interest and perceived tangible rewards, thus providing empirical support for future research, as reviewed literature falls short with regards to investigating intention to select an IT career as a multifaceted factor.

Prior research indicated that there were mediating effects of negative and positive computer attitude between computer self-efficacy, computer liking, computer anxiety, IT career interest and perceived tangible rewards. However this study found that only the mediating effects of positive computer attitude between computer self-efficacy and perceived tangible rewards, as well as between computer anxiety and perceived tangible rewards are valid.

In addition to the direct and inter-relational relationships discovered and discussed above, it was also discovered that perceived tangible rewards influenced IT career interest. This can be explained with reference to a study conducted by Beyer, Rynes, Perrault, Hay, and Haller (2003) which found that females are less aware of IT career prospects, such as salary, promotion rates, turnover, and/or career aspirations. In addition prior research also found that females are more motivated towards selecting an IT career due to enhanced employment prospects (Papastergiou, 2008). Therefore consistent with the prior research findings, this study's result implies that females' whom are aware of IT career prospects will be more likely to select an IT career. Therefore the IT industry needs to create awareness of IT career prospects which in turn will encourage females to pursue an IT career.

5.2.5 Gender Differences

With regards to the gender differences of the variables and the relationships of the study, this study's findings are once again confirmation that the gender gap is likely to continue to grow. Consistent with researchers such as Ahuja (2002), Teague (2002), Ramsey and McCorduck (2005), Ahuja et al. (2004), and Harris et al. (2007), who have noted that males are more likely to select IT careers than females.

Other variables of the study (i.e. quantity, quality, and effectiveness of computer training, negative computer attitude, positive computer attitude, and perceived tangible rewards) were not significantly different between females and males in this study. However, an important finding is that gender differences with regards to computer self-efficacy, computer liking, computer anxiety and IT career interest were evident. This means that in order to influence females to select an IT career educators needs to focus on ways in which to improve their computer self-efficacy, computer liking, computer anxiety and IT career interest levels.

This study's finding was consistent with studies such as Harrison and Rainer (1992), Carlson and Grabowski (1992), Torkzadeh and Koufteros (1994), Zhang and Espinoza, (1998), Chou (2001), Thatcher et al. (2007) and Conrad and Munro (2008). These researchers illustrate that females generally have lower computer self-efficacy than males. However findings of this study were contradictory compared to other literature (e.g. Smith, 1994; Murphy et al., 1989) which showed that no gender differences exist between females and males computer self-efficacy. As far as males are concerned computer self-efficacy does not have a significant direct effect on IT career interest, as it does in females. This may imply that developing countries need to not only acknowledge that females are less confident than males but attempt to encourage females towards IT so that they will in turn consider selecting IT careers.

A study conducted by Loyd and Gressard (1987) found that females levels of computer liking were not different to males, which is consistent with this study's finding. Literature to date has not agreed on whether there are differences with computer liking across females and males. Studies such as Massoud (1991), and Shashaani (1997) confirmed that males have a higher computer liking level compared to females. Furthermore some studies (Koohang, 1989, and Busch, 1995) found that gender did not significantly influence computer liking and thus there were no differences between females and males computer liking. This study provides empirical evidence consistent with Loyd and Gressard (1987), Massoud (1991), and Shashaani (1997).

Researchers such as Maurer (1994), McIlroy, Bunting, Tierney and Gordon (2001), and Todman (2000) found that females usually have greater computer anxiety than males. Therefore the findings of this study are consistent with the above researchers. The computer anxiety difference between females and males is persisting (McIlroy et al., 2001), thus society and educational institutes should also develop methods in which to improve females effective responses, such as their fears, worries, apprehensions and/or tensions towards the use of computers.

Gender differences between various relationships of the study were also discovered. Computer training contributed to an increase in one's level of computer self-efficacy in females only. This is an important extension of researchers such as Salanova et al. (2000) and Conrad and Munro (2008) who did not considered gender as a factor.

This study specifies that female's positive computer attitudes may be influenced by their level of computer self-efficacy. Unlike the female sample this relationship did not hold in the male sample. However the male sample indicated that computer self-efficacy influences their negative computer attitude, whereas within the female sample this relationship was not supported.

The findings of this study illustrates that gender is a factor that affects the influence of computer anxiety on negative computer attitude, with regards to females but not males. Researchers (Beckers and Schmidt, 2001; Chou 2001; and Torkzadeh and Angulo, 1992) have indicated that computer anxiety may influence an individual's attitude toward computers. However these studies did not consider gender as a factor, therefore the findings of this study is an extension.

This study interestingly illustrated that females would consider an IT career depending on their level of perceived tangible rewards. This study's finding is consistent with studies such as Gürer and Camp (2002), and Ahuja (2002) who agreed that computer attitudes also determines whether or not an IT career may be selected. Therefore with females, positive computer attitude does have a significant direct effect on perceived tangible rewards, whereas with males it does not.

Additionally this study revealed significant additional direct relationships. In the female sample computer self-efficacy and computer liking had direct effects on IT career interest, but in the male sample only computer liking had direct effects on IT career interest. In addition males indicated that computer liking has a significant direct effect on perceived tangible rewards, whereas with females it did not. This implies that females will not consider an IT career if they are not confident, and do not like using computers. In addition this may also imply that females may be less aware of perceived tangible rewards of IT careers compared to males. Thus the IT industry needs to develop better marketing strategies in order to attract more female IT professionals.

All other relationships of the study were not significantly different between females and males. This means that in order to influence females to select an IT career, attention needs to be given to improving the above relationships where there is evidence of females differentiation. Therefore policy makers, corporate managers, and universities need to urgently encourage females to pursue an IT career by creating IT courses which expose students to different IT aspects, improve their confidence in their computer-related abilities, reduce their fears of computers, and create an awareness of the perceived tangible rewards of IT careers. This would in turn encourage females to pursue an IT career and thus minimize the widening gender gap of IT professionals.

5.3 Summary and Conclusion

This chapter relates the findings of this study to prior literature. This research has helped to understand which variables of this study influences females intentions to select IT careers. Firstly the role of computer training, computer self-efficacy, computer liking, computer anxiety, and negative and positive computer attitude in improving IT career interest and perceived tangible rewards both indirectly and directly were presented.

Next this study found that one's intention to select an IT career consisted of two factors namely, IT career interest and perceived tangible rewards, and that perceived tangible rewards influenced IT career interest. The most important finding of the study is that computer self-efficacy, computer anxiety, and positive computer attitude influenced IT career interest within the females. Lastly important differences between females and males were discussed.

The following chapter concludes the study and outlines its contributions.

CHAPTER 6

CONCLUSION

6.1 Introduction

The primary objective of this study was to investigate factors which may influence South African female university students intention of selecting an IT career. Specifically to explore the way in which their computer attitude and other factors, such as computer training, computer self-efficacy, computer liking, computer anxiety, IT career interest and perceived tangible rewards may influence their intention to select an IT career. The study has achieved these objectives. It has contributed to our understanding of the ways in which the computer attitudes and other factors influences women's intention of selecting an IT career and thus contributed to reducing the IT gender gap.

Firstly, the chapter presents a summary of the findings. This is then followed by a presentation of the limitations of the study. Thereafter both the theoretical and practical contributions of the study are discussed. Next, the chapter then presents ideas and implications for future research as educational institution suggestions and IT industry guidelines. Lastly, a conclusion of the chapter is provided.

6.2 Summary of the Study

This study provided an opportunity to:

1. investigate the extent to which quantity, quality and effectiveness of computer training effects computer self-efficacy, computer liking and computer anxiety (Research Hypotheses 1a – 3c)
2. investigate the extent to which computer self-efficacy, computer liking and computer anxiety effects negative and positive computer attitude (Research Hypotheses 4a – 6b)
3. investigate the extent to which negative and positive computer attitude effects a student's intention to select an IT career (Research Hypotheses 7a – 9b)
4. identify whether there are gender differences with the variables of the study as well as whether there are gender differences with the relationships of the study (Research Questions 1 - 2)
5. identify other factors which may influence a student's intention to select an IT career (Additional Relationships 1a - 7)

Prior literature was reviewed and summarized in order to provide a historical perspective of computer attitude and IT gender research. This provided a better understanding of factors influencing computer attitude, and highlighted important contributions and their shortcomings. This research enables some of these gaps in the literature to be addressed. The study used a survey research methodology. A structured questionnaire which consisted of closed ended questions was administered to first year students enrolled in the compulsory fundamentals of information systems course. The survey instrument was constructed by a literature review, pre-testing, and pilot-testing. A total of 263 usable responses were received (150 female, 113 male).

The results of this study indicated that one's intention to select an IT career is best reflected as two factors namely, IT career interest and perceived tangible rewards. The results also revealed which variables influenced females' intentions to select IT careers. Specifically, computer training, computer self-efficacy, computer anxiety, and positive computer attitude influenced IT career interest and perceived tangible rewards. The results of the study also verified underlying gender differences with certain factors influencing one's intention to select an IT career.

It can be concluded that female students were more likely to select an IT career due to the influences of computer training, computer self-efficacy and perceived tangible rewards of an IT career. Whereas male students were more likely to select an IT career due to the influences of computer liking and perceived tangible rewards of an IT career. This suggests that educational institutes need to develop IT courses which expose students to as much IT education as possible. In addition the IT industry needs to perhaps more effectively market IT careers and improve the awareness of IT careers prospects.

6.3 Limitations of the Study

There are various factors which may influence women to select IT careers. However this study attempted to only investigate five factors namely, the effect of computer self-efficacy, computer liking, computer anxiety, and negative and positive computer attitude. It is important to be aware that there are various other factors that were not included in this study. Future research may desire to identify these factors which may discourage women's interest in selecting an IT career, and explore as to whether gender differences exist.

Due to time, cost, availability of data and various other practical limitations questionnaires were administered by hand to respondents at beginning of lecture periods. Thus implying that only respondents that attended lectures when the questionnaire was administered were able to respond to the questionnaire. This method of questionnaire administration is subjected to a lack of interviewer involvement, meaning unclear questions cannot be explained, which in turn can seriously compromise the reliability of the survey (Rea and Parker, 2005). The questionnaire also comprised of a majority of Likert scales. Thus the various selected scale items are subjective to

the different attitudes and beliefs of respondents which are influenced by their experience (Leedy and Ormrod, 2005). The response rate was reasonably high, yet an even larger number of respondents would have improved the generalisability of the study. However, the findings are likely to still be relevant to the understanding of female university students in South Africa.

6.4 Contribution of the Study

This study has resulted in many important contributions to both theory and practice. The following sections will discusses these contributions in detail.

6.4.1 Theoretical Contribution

This study drew on two theoretical perspectives, namely the Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT). These theories were partially supported, as results depicted direct effects of computer attitude impacting women's intention to select an IT career. In addition computer self-efficacy was found to impact positive computer attitude, whereas computer anxiety impacted negative computer attitude. Furthermore computer self-efficacy were significantly influenced by computer training, however computer anxiety was not.

A few prior studies have sought to investigate various factors which may influence women to select IT careers. One contribution of this study is the investigation of the direct and indirect effects which have not been studied. This study originally set out to investigate the effects of factors indirectly influencing one's intention to select an IT career. However the study revealed that computer training, computer self-efficacy, computer anxiety, and positive computer attitude directly influenced IT career interest and perceived tangible rewards. This finding could further theory by proposing an alteration to other theories and further persuading other researchers to explore whether new theories need to be developed which are more specific to females and IT research.

The inclusion of computer training is also a contribution, as it influences positive computer attitude and perceived tangible rewards, thus more research is necessary in order to validate the extent to which computer training could influence females to select IT careers. In addition this study revealed that computer attitude is a multifaceted factor and therefore should be treated as two separate factors, namely negative and positive computer attitude. Another contribution of this study is that it indicated that one's intention to select an IT career is best reflected as two factors namely, IT career interest and perceived tangible rewards.

Furthermore results of this study were then compared to similar prior literature findings. The sample used in these prior studies comprised of either studies which failed to consider gender differentiation or did not consider one's intention to select an IT career as a variable. With regards to gender differences, this study has yet again contributed to theory as this study has revealed the degree to which variables of this study influences females intentions to select IT careers. The findings of this study also indicated several gender differences of the factors and relationships investigated.

6.4.2 Practical Contribution

The practical contributions are presented in the form of educational institution suggestions and IT industry guidelines. This study has numerous realistic executive implications. However due to the broad audience, in terms of the number of educational institutes and the IT industry, that the study's results applies to, the suggestions and guidelines may not apply to all equally. Therefore the executive guidelines are aimed at individuals' whom are responsible for influencing educational institutions and IT careers within industry (eg. managers, human resource professionals, and other individuals' who are interested in career development issues).

Firstly results revealed that computer training is important. Therefore educational institutes need to focus on how computer training content may influence student perceptions about IT careers. This can be accomplished by structuring IT courses which would expose students to both theoretical and practical aspects of computers in business, and by covering many different aspects of IT as a subject matter.

Secondly society and educational institutes needs to acknowledge that females whom have high levels of confidence in their computer-related abilities, express more positive attitudes toward IT. Therefore computer self-efficacy is an essential influencing factor and society and educators need to attempt to strengthen the computer self-efficacy levels of females, by encouraging females to select IT courses which increases their experience of IT and computers.

Thirdly results showed that computer liking is significant. Thus society and educational institutes need to develop ways in which to encourage a fondness of computers, and create higher levels of excitement towards computer usage. This can be achieved by portraying the ways in which computer usage allows one to globally interact with different societies and cultures, as students are attracted to discovering different environments.

Fourthly society and educational institutions need to develop ways in which to reduce computer anxiety by identifying fears and structuring IT courses to address these fears, as computer anxiety deters individuals' from selecting IT careers. In addition the IT industry and educational institutions need to promote the opportunities of IT careers which may in turn reduce individuals' computer anxiety.

Given that positive computer attitude is a noteworthy influencing factor, females need to be made more aware of the ways in which society can benefit from the use of computers. Female students need to be conscious that companies reply on computers, as a fast and efficient means of obtaining information which is used in order to conduct business. This could be done by developing a mentorship programme where female students could possibly shadow female IT professionals in order to better understand the involvement of IT careers.

Finally results found that females are less aware of IT career prospects. Therefore the IT industry needs to change of the way in which females currently view IT-related careers. This insight will in turn aid the IT industry, as to develop better strategies in order to attract more female IT professionals. This can be accomplished by introducing IT careers which cater for flexible working hours, and that could allow one to work from home, which in turn may be more appealing to some females, and thus further persuading females to select IT careers. In addition the IT industry needs to create more awareness about that growing number of IT-related careers, as well as the advantageous prospects of selecting an IT career. Thus by slightly tailoring IT careers to better cater for females and by marketing the advantageous prospects of an IT career, the IT industry could improve the widening gender gap.

6.5 Ideas and Implications for Future Research

Several ideas come to mind for future research from this study. Firstly, this study forms a foundation from which future research can build on. This may be done by exploring different factors which are also likely to influence one's intention to select an IT career. Future research could consider and investigate various other attributes such as, the influences of role models, work-family conflict, and same-sex educational institutes. This research may share light as to how educators could encourage students to select IT courses and in turn IT careers.

Secondly future researchers could investigate multiple dimensions of one's intention to select an IT career such as, perceptions of IT careers, IT professional environments, personality characteristics and the skill set required of IT professionals. This research would aid the IT industry by allowing them to develop strategies which could better market IT careers and therefore encourage students to select IT courses.

Thirdly this study could be repeated in South Africa across other universities, or across different levels of education, namely primary, and secondary levels. Thus in turn would provide richer results which could lead to a deeper understanding of student's intentions to select an IT career within South Africa.

Fourthly a cross-national comparison should be attempted as this will lead to a greater understanding of one's intention to select an IT career as well as increase the knowledge of IT career selection globally.

Fifthly future research can aim to study ways in which to retain current women IT professionals. This would aid IT industries by allowing them to identify key motivators of maintaining IT professionals, and to further promote the benefits of IT careers as well as better accommodating women IT employees. Thus retaining current women IT professionals and encouraging students who are interested in IT careers. This will in turn improve the number of women in IT careers.

Sixthly a qualitative study interviewing females at various levels of education and IT career positions, and/or a longitudinal study could be conducted with female students in order to determine the way in which computer attitude improves or not. Therefore aiding a theory to develop which may contribute to further understanding as to why IT careers may or may not be selected.

Finally exploratory research needs to investigate which factors or attributes would improve students computer self-efficacy and computer liking and reduce their computer anxiety. In addition research needs to explore ways in which to develop studies which focus on influences of computer attitude towards IT careers.

6.6 Conclusion

This study sought to investigate the factors influencing women's intentions of selecting an IT career. Computer attitudes, computer self-efficacy, computer liking, computer anxiety and computer training were examined. The study identified that these factors both directly and indirectly influenced one's intention to select an IT career. Certain gender differences were also revealed. We now have an improved understanding of the drivers influencing women towards selecting IT careers. This will help us bridge the gaps between women and men in the IT industry.

REFERENCES

1. Acker, S. and Oakley, K. (1993). Gender issues in education for science and technology: current situation and prospects for change. *Canadian Journal of Education*, **18**(3), pp. 255-272.
2. Adya, M. and Kaiser, K.M. (2005). Early determinants of women in the IT workforce: A model of girls' career choices. *Information Technology and People*, **18**(3), pp. 230-259.
3. Ahuja, M. (2002), Women in the Information Technology Profession: a Literature Review, Synthesis and Research Agenda, European Journal of Information Systems, **11**(1), pp. 20-34.
4. Ahuja, M., Robinson, J., Herring, S. and Ogan, C. (2004). Exploring Antecedents of Gender Equitable Outcomes in IT Higher Education. *Proceedings of the ACM Special Interest Group on Computer Personnel Research (SIGMIS CPR '04)*, April 22–24, pp. 120-123.
5. Bailey, K.D. (1994). *Methods of social research*. New York: Free Press.
6. Ballard, J., Scales, K. and Edwards, M.A. (2006). Perceptions of Information Technology Careers among Women in Career Development Transition. *Information Technology, Learning, and Performance Journal*, **24**(2), pp. 1-9.
7. Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall.
8. Baron, R.M. and Kenny, D.A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations. *Journal of Personality and Social Psychology*, **51**(6), pp. 1173-1182.
9. Beas, I. and Salanova, M. (2006). Self-efficacy beliefs, computer training and psychological well-being among information and communication technology workers. *Computers in Human Behavior*, **22**(6), pp. 1043-1058.
10. Beckers, J.J. and Schmidt, H.G. (2001). The structure of computer anxiety: a six-factor model. *Computers in Human Behavior*, **17**(1), pp. 35-49.
11. Besana, G. and Dettori, L. (2004). Together is better: strengthening the confidence of women in computer science via a learning community. *Journal for Computing Sciences in Colleges*, **19**(5), pp. 130-139.
12. Beyer, S., Rynes, K., Perrault, J., Hay, K., and Haller, S. (2003). Gender differences in computer science students. *ACM SIGCSE Bulletin*, **35**(1), pp. 49-53.
13. Bjorkman, C., Christoff, I., Palm, F. and Vallin, A. (1998). Exploring the pipeline: towards an understanding of the male dominated computing culture and its influence on women. *ACM SIGCSE Bulletin*, **30**(2), pp. 64-69.
14. Bohlin, R. M., and Hunt, N. P. (1995). Course structure effects on student's computer anxiety. *Journal of Educational Computing Research*, **13**(3), pp. 263-270.
15. Bovée, C., Voogt, J. and Meelissen, M. (2007). Computer attitudes of primary and secondary students in South Africa. *Computers in Human Behavior*, **23**(4), pp. 1762-1776.

16. Bozionelos, N. (2001a). The relationship of instrumental and expressive traits with computer anxiety. *Personality and Individual Differences*, **31**(6), pp. 955-974.
17. Bozionelos, N. (2001b). Computer anxiety: relationship with computer experience and prevalence. *Computers in Human Behavior*, **17**(2), pp. 213-224.
18. Brinkley, T. and Scholar, M. (2005). Women in information technology: examining the role of attitudes, social norms, and behavioral control in information technology career choices. *WSU McNair Journal*, **3**(Fall 2005), pp. 24-40.
19. Brosnan, M. and Lee, W. (1998). A cross-cultural comparison of gender differences in computer attitudes and anxieties: the United Kingdom and Hong Kong. *Computers in Human Behavior*, **14**(4), pp. 559-577.
20. Brosnan, M.J. (1998). The impact of computer anxiety and self-efficacy upon performance. *Journal of Computer Assisted Learning*, **14**(3), pp. 223-234.
21. Bunderson, E. and Christensen, M. (1995). An analysis of problems for female students in university computer science programs. *Journal of Research on Computing in Education*, **28**(1), pp. 1-18.
22. Busch, T. (1995). Gender differences in self-efficacy and attitudes toward computers. *Journal of Educational Computing Research*, **12**(2), pp. 147-158.
23. Camp, T. (1997). The incredible shrinking pipeline. *Communications of the ACM*, **40**(10), pp. 103-110.
24. Carlson, R.D. and Grabowski, B.L (1992). The effects of computer self-efficacy on direction-following behavior in computer assisted instruction. *Journal of Computer Based Instruction*, **19**(1), pp.6-11.
25. Chau, P. (2001). Influence of computer attitudes and self-efficacy on IT usage behavior. *Journal of End User Computing*, **13**(1), pp. 26-34.
26. Chou, H. (2001). Effects of training method and computer anxiety on learning performance and self-efficacy. *Computers in Human Behavior*, **17**(1), pp. 51-60.
27. Chu, P.C. and Spires, E.E. (1991). Validating the computer anxiety rating scale: Effects of cognitive style and computer courses on anxiety. *Computers in Human Behavior*, **7**(1/2), pp.7-21.
28. Clarke, V. and Teague, G. (1996). Characterizations of Computing Careers: Students and Professionals Disagree. *Computers Education*, **26**(4), pp. 241-246.
29. Coffin, R.J. and MacIntyre, P.D., 1999. Motivational influences on computer-related effective states. *Computers in Human Behavior*, **15**(5), pp. 549-569.
30. Cohoon, J. M. and Aspray, W. (2006). *A critical review of the research on women's participation in postsecondary computing education.* In J. M. Cohoon and W. Aspray (Eds.), Women and information technology: Research on underrepresentation. Cambridge, MA: MIT Press.
31. Comber, C., Colley, A., Hargreaves, D. and Dorn, L. (1997). The effects of age gender and computer experience upon computer attitudes. *Educational Research*, **39**(2), pp. 123-134.

32. Compeau, D. and Higgins, C. (1995). Computer Self-Efficacy: Development of a Measure and Initial Test. *MIS Quarterly*, **19**(2), pp. 189-211.
33. Conrad, A.M. and Munro, D. (2008). Relationships between Computer Self-Efficacy, Technology, Attitudes and Anxiety: Development of the Computer Technology Use Scale (CTUS). *Journal of Educational Computing Research*, **39**(1), pp. 51-73.
34. Craig, A. (1997). Women and business computing: where to from here? *Gates*, **4**(1), pp. 13-19.
35. Creamer, E.G., Burger, C.J. and Meszaros, P.S. (2004). Characteristics of high school and college women interested in information technology. *Journal of Women and Minorities in Science and Engineering*, **10**(1), pp. 67-78.
36. Decker, C. (1999). Technical education transfer: perceptions of employee computer technology self-efficacy. *Computers in Human Behavior*, **15**(2), pp. 161-172.
37. Delcourt, M.A.B. and Kinzie, M.B. (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. *Journal of Research and Development in Education*, **27**(1), pp. 35-41.
38. Durndell, A. (1991). The persistence of the gender gap in computing. *Computers and Education*, **16**(4), pp. 283-287.
39. Durndell, A., Glissov, P. and Siann, G. (1995). Gender and computing: Persisting differences. *Educational Research*, **37**(3), pp. 219-228.
40. Durndell, A. and Haag, Z. (2002). Computer self efficacy, computer anxiety, attitudes towards the Internet and reported experience with the Internet, by gender, in an East European sample. *Computers in Human Behavior*, **18**(5), pp. 521-535.
41. Durndell, A. and Lightbody, P. (1993). Gender and computing: change over time. *Computers and Education*, **21**(4), 331-336.
42. Durndell, A. and Thomson, K. (1997). Gender and computing: a decade of change. *Computers and Education*, **28**(1), pp. 1-9.
43. Easterly-Smith, M., Thorpe, R. and Lowe, A. (2001). *Management research: an introduction, 2nd Edition*. London: Sage.
44. Galpin, V., Sanders, I., Turner, H. and Venter, B. (2003). Gender and educational background and their effect on computer self-efficacy and perceptions. Technical Report TR-Wits-CS-2003-0, School of Computer Science, University of the Witwatersrand, 2003.
45. Gaudron, J.P. and Vignoli, E. (2002). Assessing computer anxiety with the interaction model of anxiety: development and validation of the computer anxiety trait subscale, *Computers in Human Behavior*, **18**(3), pp. 315-325.
46. Gist, M.E. (1992). Self-efficacy: a theoretical analysis of its determinants and malleability. *The Academy of Management Review*, **17**(2), pp. 183-211.
47. Glass, C.R. and Knight, L.A. (1988). Cognitive factors in computer anxiety. *Cognitive Therapy and Research*, **12**(4), pp. 351-366.

48. Gürer, D. and Camp, T. (2002). Investigating the Incredible Shrinking Pipeline for Women in Computer Science, Final Report NSF 9812016, 2001. Available online: http://women.acm.org/documents/finalreport.pdf [Last accessed: September 2009].
49. Gupta, U.G. and Houtz, L.E. (2000). High School Students Perceptions of Information Technology Skills and Careers. *Journal of Industrial Technology*, **16**(4), pp. 1-8.
50. Hair, J.F. Jr., Black, W.C., Babin, B., Anderson, R.E., and Tatham, R.L. (2006). *Multivariate Data Analysis, 6th Edition.* New Jersey: Pearson Prentice Hall.
51. Harris, K., Morello, D. and Raskino, M. (2007). Women and Men in IT: Breaking Through Sexual Stereotypes. *Gartner*, Publication Date: 20 March 2007, ID Number: G00146320.
52. Harrison, A.W. and Rainer, R.K. (1992). An examination of the factor structures and concurrent validates for the computer attitude scale, the computer anxiety rating scale, and the computer self-efficacy scale. *Educational and Psychological Measurement*, **52**(3), pp. 735-744.
53. Hasan, B. and Ali, J. (2004). An empirical examination of a model of computer learning performance. *Journal of Computer Information Systems*, **44**(4), pp. 27-33.
54. Heinssen, R.K., Glass, C.R. and Knight, L.A. (1987). Assessing computer anxiety: development and validation of the computer anxiety rating scale. *Computers in Human Behavior*, **3**(1), pp. 49-59.
55. Henderson, R.D., Deane, F.P. and Ward, M. (1995). Occupational differences in computer related anxiety: Implications for the implementation of a computerised patient management information system. *Behaviour and Information Technology*, **14**(1), pp. 23-31.
56. Herbert, T. (2000). Women role models in Computer Science at the University of the Witwatersrand. Masters Research Report, Technical Report TR-Wits-CS-2000-16, Department of Computer Science, University of the Witwatersrand.
57. Hudiburg, R.A. (1990). Relating computer-associated stress to computerphobia, *Psychological Reports*, **67**(1), pp. 311-314.
58. Hulland, J. (1999). Use of Partial Least Square (PLS) in Strategic Management Research: A Review of Four Recent Studies. *Strategic Management Journal*, **20**(2), pp. 910-934.
59. Hussey, J. and Hussey, R. (1997). *Business research: a practical guide for undergraduate and postgraduate students*. London: Macmillan.
60. Igbariaa, M. and Chakrabarti, A. (1990). Computer anxiety and attitudes towards computer use. *Behavior and Information Technology*, **9**(3), pp. 229-241.
61. Igbaria, M. and Iivari, J. (1995). The effects of self-efficacy on computer usage'. *OMEGA International Journal of Management Science*, **23**(6), pp.587-605.
62. Igbaria, M., Schiffman, S.J. and Wieckowski, T.J. (1994). The respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology. *Behaviour and Information Technology*, **13**(6), pp. 349-361.
63. Johnson, R.T., Johnson, D.W., and Stanne, M.B. (1986). Comparison of computer-assisted cooperative, competitive, and individualistic learning. *American Educational Research Journal*, **23**(3), pp. 382-392.

64. Jones, S. (1991). Why do we want to see more women in computing*? In women into computing: selected papers, 1988-1990,* (January 1991), pp. 59-65.
65. Judd, C.M. and Kenny, D.A. (1981) Process Analysis: Estimating Mediation in Evaluation Research. *Evaluation Review,* **5**(5), pp. 602-619.
66. Karsten, R. and Roth, R.M. (1998). Computer self-efficacy: a practical indicator of student computer competency in introductory IS courses. *Informing Science*, **1**(3), pp. 61-68.
67. Kernan, M.C., Howard, G.S. (1990). Computer anxiety and computer attitudes: an investigation of construct and predictive validity issues. *Educational and Psychological Measurement*, **50**(3), 681-690.
68. Khorrami-Arani, O. (2001). Researching computer self-efficacy. *International Education Journal,* **2**(4), pp. 17-25.
69. King , J., Bond, T. and Blandford, S. (2002). An investigation of computer anxiety by gender and grade. *Computers in Human Behavior*, **18**(1), pp. 69-84.
70. Koohang, A.A. (1989). A study of attitudes toward computers: Anxiety, confidence, liking and perception of usefulness. *Journal of Research on Computing in Education*, **22**(2), pp. 137-150.
71. Kraak, A. (2005). Human resources development and the skills crisis in South Africa: the need for a multi-pronged strategy. *Journal of Education and Work*, **18**(1), pp. 57–83.
72. Kramer, P.E. and Lehman, S. (1990). Mismeasuring Women: A Critique of Research on Computer Ability and Avoidance. *Signs: Journal of Women in Culture and Society*, **16**(1), pp. 158-172.
73. LaGuardia, R. and Labbé, E. E. (1993). Self-efficacy and anxiety and their relationship to training and race performance. *Perceptual and Motor Skills*, **77**(1), pp. 27-34
74. Leedy, P.D. and Ormrod, J.E. (2005). *Practical Research: Planning and Design, 8th Edition.* New Jersey: Prentice Hall.
75. Lent, R.W., Brown, S.D. and Larkin, K.C. (1987). Comparison of three theoretically derived variables in predicting career and academic behaviour: self-efficacy, interest congruence, and consequence thinking. *Journal of Counseling Psychology*, **34**(3), pp. 293-298.
76. Levine, T. and Donitsa-Schmidt, S. (1998). 'Computer use, confidence, attitudes, and knowledge: a causal analysis'. *Computers in Human Behavior*, **14**(1), pp. 125-146.
77. Liao, Y. (2000). A meta-analysis of gender differences on attitudes toward computers for studies using Loyd and Gressards' CAS. *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, **2000**(1), pp. 605-611.
78. Loyd, B.H. and Gressard, C. (1984a). The effects of sex, age, and computer experience on computer attitudes. *Association for Educational Data Systems*, **18**(2), pp. 67-77.
79. Loyd, B.H. and Gressard, C. (1984b). Reliability and factorial validity of computer attitude scale. *Educational and Psychological Measurement*, **44**(2), 501-505.

80. Loyd, B.H. and Gressard, C. (1987). Gender and computer experience as factors in the computer attitudes of middle school students. *Journal of Early Adolescence,* **7**(1), pp. 13-19.
81. Mahar, D., Henderson, R. and Deane, F. (1997). The effects of computer anxiety, state anxiety, and computer experience on users' performance of computer based tasks. *Personality and Individual Differences*, **22**(5), pp. 683-692.
82. Marakas, G., Yi, M. and Johnson, R. (1998). The Multilevel and Multifaceted Character of Computer Self-Efficacy: Toward Clarification on the Construct and an Integrative Framework for Research. *Information Systems Research,* **9**(2), pp. 126-163.
83. Massoud, S.L. (1991): Computer Attitudes and Computer Knowledge of Adult Students. *Journal of Educational Computing Research,* **7**(3), pp. 269-291.
84. Maurer, M. (1994). Computer anxiety correlates and what they tell us: a literature review. *Computers in Human Behavior,* **10**(3), pp. 369-376.
85. Mayer-Smith, J., Pedretti, E. and Woodrow, J. (2000). Closing of the gender gap in technology enriched science education: a case study. *Computers and Education*, **35**(1), pp. 51-63.
86. McGuire, W. J. (1985). *Attitudes and attitude change.* In G. Lindzey and E. Aronson (Eds.), The handbook of social psychology (3rd ed., Vol. 2, pp. 233-346). New York: Random House.
87. McIlroy, D., Bunting, B., Tierney, K. and Gordon, M. (2001). The relation of gender and background experience to self reported computing anxiety and cognitions. *Computers in Human Behavior,* **17**(1), pp. 21-33.
88. McInerney, C.R., DiDonato, N.C., Giagnacova, R. and O'Donnell, A.M. (2006). Students Choice of Information Technology Majors and Careers: A Qualitative Study. *Information Technology, Learning, and Performance Journal,* **24**(2), pp. 35-53.
89. Michie, S. and Nelson, D. L. (2006). Barriers women face in information technology careers: Self-efficacy, passion, and gender biases. *Women in Management Review*, **21**(1), pp. 10-27.
90. Moldafsky, N.I. and Kwon, I.W. (1994). Attributes Effecting Computer-Aided Decision Making – A Literature Survey. *Computers in Human Behavior,* **10**(3), pp. 299-323.
91. Moore, C. (1994). Attitudes towards computers: the influence of sex stereotypes, experience, ownership and mathematics. *Unisa Psychologia*, **21**(1), pp. 20-27.
92. Murphy, C.A., Coover, D. and Owen, S.V. (1989). Development and validity of the computer self-efficacy scale. *Education and Psychology Measurement*, **49**(4), pp. 893-899.
93. National Science Foundation, Division of Science Resources Statistics. (2007, February). Women, minorities, and persons with disabilities in science and engineering: 2007 (NSF 07-315). http://www.nsf.gov/statistics/wmpd (Last assessed: September 2009)
94. Neuman, W.L. (1994). *Social Research Methods: Qualitative and Quantitative Approaches*. USA: Allyn and Bacon.

95. Nickell, G.S and Pinto, J.N. (1986).The computer attitude scale. *Computers in Human Behavior*, **2**(4), pp. 301-306.
96. Ordidge, I. (1997). IT's for girls-or is it? *Education and Training*, **39**(1), pp. 30-35.
97. Papastergiou, M. (2008). Are Computer Science and Information Technology still masculine fields? High school students perceptions and career choices. *Computers and Education*, **51**(2), pp. 594-608.
98. Pamuk, S. and Peker, D. (2009). Turkish pre-service science and mathematics teachers' computer related self-efficacies, attitudes, and the relationship between these variables. *Computers and Education*, **53**(2), pp. 454-461.
99. Pike, N., Hofer, A., and Erlank, S. (1993). Effect of gender and occupational aspirations on attitudes towards computers. *South African Journal of Education*, **13**(1), pp. 25-29.
100. Pinsonneault, A. and Kraemer, K.L. (1993). Survey Research Methodology in Management Information Systems: An Assessment. *Journal of Management Information Systems*, **10**(2), pp. 75-105.
101. Potosky, D. and Bobko, P. (2001). A Model for Predicting Computer Experience from Attitudes Toward Computers. *Journal of Business and Psychology*, **15**(3), pp. 391-404.
102. Premkumar, G. and King, W.R. (1994). The evaluation of strategic Information Systems Planning. *Information and Management*, **26**(6), pp. 327-340.
103. Ramsey, N. and McCorduck, P. (2005). Where are the Women in Information Technology? Preliminary Report of Literature Search and Interviews, Prepared for the National Center for Women and Information Technology,. Available online: http://anitaborg.org/files/abi_wherearethewomen.pdf [Last accessed: September 2009].
104. Randall, C., Price, B. and Reichgelt, H. (2003). Women in Computing Programs: Does the Incredible Shrinking Pipeline Apply To All Computing Programs? *ACM SIGCSE Bulletin*, **35**(4), pp. 55-59.
105. Rea, L.M. and Parker, R.A. (2005). *Designing and Conducting Survey Research: A Comprehensive Guide*, 3rd Edition**.** San Francisco: Jossey-Bass.
106. Reinen, I. J. and Plomp, T. (1993). Some gender issues in educational computer use: Results of international comparative survey. *Computers in Education*, **20**(4), pp. 353-365.
107. Ropp, M.M. (1999). Exploring individual characteristics associated with learning to use computers in pre-service teacher preparation. *Journal of Research on Computing in Education*, **31**(4), pp. 402-425.
108. Rosen, L.D. and Weil, M.M. (1995). Computer anxiety: A cross-cultural comparison of university students in ten countries. *Computers in Human Behaviour*, **11**(1), pp. 45-64.
109. Rosen, L.D., Sears, D.C. and Weil, M.M. (1987). Computerphobia. *Behaviour Research Methods, Instruments and Computers*, **19**(2), pp. 167-179.
110. Rovai, A. P. and Childress, M. D. (2002). Explaining and predicting resistance to computer anxiety reduction among teacher education students. *Journal of Research on Technology in Education*, **35**(2), pp. 226-235.

111. Rozell, E.J. and Gardner, W.L. (2000). Cognitive, motivation, and effective processes associated with computer-related performance: a path analysis. *Computer in Human Behavior,* **16**(2), pp.199-222.
112. SAITIS Baseline Studies (1999). SAITIS BASELINE STUDIES: Executive Summary: A Survey of the IT Industry and Related Jobs and Skills in South Africa. Available online: http://www.thedti.gov.za/saitis/studies/jobs_skills/summary.pdf [Last accessed: September 2009].
113. Saks, A. (1995). Longitudinal field investigation of the moderating and mediating effects of self-efficacy on the relationships between training and newcomer adjustment. *Journal of Applied Psychology*, **80**(2), pp. 211-225.
114. Salanova, M., Grau, R., Cifre, E., and Llorens, S. (2000). Computer training, frequency of use and burnout: the moderating role of computer self-efficacy. *Computers in Human Behavior,* **16** (6), pp. 575-590.
115. Sanders, I.D. and Galpin, V. (1994). A survey of attitudes to computing at the University of the Witwatersrand. *Proceedings of the Fifth International Conference on Women, Work and Computerization,* Manchester, United Kingdom, 1994, pp. 108-122.
116. Sanders, I.D. and Galpin, V. (2007). Perceptions of Computer Science at a South African university. *Computers and Education*, **49**(4), pp.1330-1356.
117. Sanders, I.D. and Mueller, C.S.M. (1994). Making Computer Science more accessible to educationally disadvantaged students. *GATES*, **1**(2), pp. 32-41.
118. Schaefers, K.G., Epperson, D.L., and Nauta, M.M. (1997). Women's career development: Can theoretically derived variables predict persistence in engineering majors? *Journal of Counseling Psychology*, **44**(2), pp. 173-183.
119. Schottenbauer, M. A., Rodriguez, B. F., Glass, C. R., and Arnkoff, D. B. (2004). Computers, anxiety, and gender: an analysis of reactions to the Y2K computer problem. *Computers in Human Behavior*, **2**(1), pp. 67-83
120. Schuh, K.L. (1996). The lecture classroom environment and its effects on change in computer anxiety of students taking computer proficiency classes. *Journal of Educational Computing Research*, **15**(3), pp. 241–259.
121. Shaft, T., Sharfman, M. and Wu, W. (2004). Reliability assessment of the Attitude Towards Computers Instrument (ATCI). *Computers in Human Behavior,* **20**(5), pp. 661-689.
122. Shashaani, L. (1994). Socioeconomic status, parents' sex-role stereotypes, and the gender gap in computing. *Journal of Research on Computing in Education,* **26**(4), pp. 433-451.
123. Shashaani, L. (1997). Gender differences in computer attitudes and use among college students. *Journal of Educational Computing Research*, **16**(1), pp. 37-51.
124. Shashaani, L. and Khalili, A. (2001). Gender and computers: similarities and differences in Iranian college students attitudes toward computers. *Computers and Education*, **37**(3-4), pp. 363-375.
125. Shaw, S. (1984). Harris Poll shows public is high on computers. *Mini-Micro Systems,* pp. 55.

126. Simonson, M.R., Maurer, M., Montag-Toradi, M. and Whitaker, M. (1987). Development of a standardized test of computer literacy and a computer anxiety index. *Journal of Educational Computing Research*, **3**(2), pp. 231-247.
127. Singh, K., Allen, K.R., Scheckler, R. and Darlington, L. (2007). Women in Computer-Related Majors: A Critical Synthesis of Research and Theory From 1994 to 2005. *Review of Educational Research*, **77**(4), pp. 500-533.
128. Smith, B., Caputi, P. and Rawstorne, P. (2000). Differentiating computer experience and attitudes toward computers: an empirical investigation. *Computers in Human Behaviour*, **16**(1), pp. 59-81.
129. Smith, J.M. (1994). The effects of education on computer self efficacy. *Journal of Industrial Teacher Education*, **31**(3), pp. 51-65.
130. Smith, E. and Oosthuizen, H. (2003). An investigation of the attitudes of entry-level university students towards computers. *Proceedings of SACLA '03*, Pilanesberg, South Africa.
131. Straub, D.W (1989). Validating Instruments in MIS Research. *MIS Quarterly*, **13**(2), pp. 147-165.
132. Symonds, J. (2000). *Why I.T. doesn't appeal to young women*. In Balka, E., and Smith, R. (Eds.). Women, work and computerization: Charting a course to the future. Boston: Kluwer Academic Publishers.
133. Taylor, S. and Todd, P. (1995). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research*, **6**(2), pp. 144-176.
134. Teague, G.J. (1997). A structured review of reasons for the underrepresentation of women in computing. *ACSE '97: Proceedings of the 2nd Australasian conference on Computer science education*, **2**(July), pp. 91-98.
135. Teague, G.J. (1998). Personality type, career preference and implications for computer science recruitment and teaching. *ACSE '98: Proceedings of the 3rd Australasian conference on Computer science education*, **3**(July 08-10), pp. 155-163.
136. Teague, G.J. (2002). Women in computing: what brings them to it, what keeps them in it? *ACM SIGCSE Bulletin*, **34**(2), pp. 147-158.
137. Temple, L.L. and Gavillet, M. (1990). The development of computer confidence in seniors: An assessment of changes in computer anxiety and computer literacy. *Activities, Adaptation and Aging*, **14**(3), pp. 63-76.
138. Thatcher, J., Loughry, M., Lim, J. and McKnight, H. (2007). Internet anxiety: An empirical study of the effects of personality, beliefs, and social support. *Information and Management*, **44**(4), pp. 353-363.
139. Todman, J. (2000). Gender differences in computer anxiety among university entrants since 1992. *Computers and Education*, **34**(1), pp. 27-35.
140. Todman, J. and Monaghan, E. (1994). Qualitative differences in computer experience, computer anxiety, and students use of computers: A path model. *Computers in Human Behavior*, **10**(4), pp. 529-539.

141. Torkzadeh, G. and Angulo, I. (1992). The Concept and Correlates of Computer Anxiety. *Behaviour and Information Technology*, **11**(2), pp. 99-108.
142. Torkzadeh, G. and Koufteros, X. (1994). Factorial Validity of a Computer Self-Efficacy Scale and the Impact of Computer Training. *Educational and Psychological Measurement*, **54**(3), pp. 813-821.
143. Torkzadeh, R., Pflughoeft, K. and Hall, L. (1999). Computer Self-Efficacy, Training Effectiveness and User Attitudes. An Empirical Study. *Behaviour and Information Technology*, **18**(4), pp. 299-309.
144. Trauth, E. (2002). Odd girl out: an individual differences perspective on women in IT profession. *Information Technology and People*, **15**(2), pp. 98-118.
145. Turner, S. V., Bernt, P.W., and Pecora, N. (2002). Why Women Choose Information Technology Careers:Educational, Social and Familial Influences. Paper presented at the Annual Meeting of the American Educational Research Association. Available online: http://oak.cats.ohiou.edu/~turners/research/women.pdf [Last accessed: September 2009].
146. Tsitouridou, M. and Vryzas, K. (2003). Early childhood teachers' attitudes towards computer and information technology: The case of Greece. *Information Technology in Childhood Education Annual*, **2003**(1), pp. 187-207.
147. Venkatesh, V., Morris, M.G. and Ackerman, P.L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational Behavior and Human Decision Processes*, **83**(1), pp. 33-60.
148. Volman, M. and van Eck, E. (2001). Gender equity and information technology in education: The second decade. *Review of Educational Research*, **71**(4), pp. 613-634.
149. Watt, H.D. (1991). *SWIM: Scottish Women Returners Study Information Technology Management.* In G. Lovegrove and B. Segal (Eds.), Woman into Computing: Selected Papers 1988-1990, London: Springer-Verlag.
150. Weil, M. M., Rosen, L. D., and Wugalter, S. (1990). The etiology of computerphobia. *Computers in Human Behavior*, **6**(4), pp. 361-379.
151. Weinberger, C.J. (2004). Just ask! Why surveyed women did not pursue IT courses or careers. *IEEE Technology and Society Magazine*, **23**(2), pp. 28-35.
152. Whitley, Jr, B.E. (1997). Gender differences in computer-related attitudes and behavior: a meta-analysis. *Computers in Human Behavior*, **13**(1), pp. 1-22.
153. Wilfong, J.D. (2006). Computer anxiety and anger: the impact of computer use, computer experience, and self-efficacy beliefs. *Computers in Human Behavior*, **22**(6), pp. 1001-1011.
154. Wilson, B. C. (2002). A study of factors promoting success in computer science including gender differences. *Computer Science Education*, **12**(1/2), pp. 141-164.
155. Wright, R. (1997). *Women Computer Professionals: Progress and Resistance*. Lewiston, New York: Edwin Mellen Press.
156. Zhang, Y. and Espinoza, S. (1998). Relationships among computer self-efficacy, attitudes toward computers, and desirability of learning computer skills. *Journal of Research on Computing in Education*, **30**(4), pp. 420-438.

APPENDIX A
KEY ISSUES OF PRIOR RESEARCH

Table A.1: Summary of Key Issues of Various Factors influencing Women's Intentions of Selecting an IT Career

Factors influencing Women from Selecting an IT Career	Key Issue	Authors
Family	Parent education	Bouchard and St-Amant (2000); Jackson et al. (1993)
	Technology contact	Breakwell et al. (1988)
	Parents' career choice	Dryler (1998)
	Mother working	Jackson et al. (1993)
	Mother education	Smith (2000)
	Father as influence	Gates (2002); Leslie et al. (1998); Trauth (2002); Turner et al. (2002)
Peers	Mentor alternative	Kram and Isabella (1985)
	Peers dissuade physics	Smith (2000)
	Males encourage math	Brekke (1997)
Media/culture	Physical image	Milkie (1999); Nelson and Paek (2003); Signorielli et al. (1994)
	Women as passive – computer ads	Brownell (1992); Culley (1988); Na (2001)
	Women as passive – TV commercials	Furnham and Mak (1999); Furnham and Voli (1989); Harris and Stobart (1986); McArthur and Resco (1975); Na (2001)
Teacher/counselor	Math as career choice	Dick and Rallis (1991)
	Girls receive less counseling	National Center for Education Statistics (2003)
	Low knowledge about IT	Freeman and Aspray (1999)
	Traditional careers	Gates (2002)
	Discouraged IT	Kane and Frazee (1978); Turner et al. (2002)
	Male professor negative	Turner et al. (2002)
	Male professor positive	Canes and Rosen (1995)
School access	Reason for IT career	Turner et al. (2002)
	No difference in use	Doornekamp (1993); Durndell and Thomson (1997)
	Boys use computers more	Comber et al. (1997); DuBois and Schubert (1986); Huber and Schofield (1998)

Personal access	Workshop attendance positive	National Center for Education Statistics (2002)
	Boys use computers more	Colley et al. (1994); Doornekamp (1993); Durndell et al. (1995); Harris (1999)
	Boys own computers more	Harris (1999)
	Boys in friends' homes	Durndell and Thomson (1997)
	No difference in home use	Habib and Cornford (2002)
	Effects college use	Selwyn (1998)
	Boys wider range of activities	National Center for Education Statistics (2002)
	Girls' e-mail and educational use	National Center for Education Statistics (2002)
	Computer play	Smith (2000); Webster and Martocchio (1992)
	Games for girls	Gorriz and Medina (2000)
	Girls play more online games	Jones (2003)
	No difference in video games	Jones (2003)
Role models	Comprehensive review	Clutterbuck and Ragins (2002)
	Science mentors	National Academy of Sciences (1997)
	Men more mentors	Scandura and Ragins (1993)
	Men mentor women	Trauth et al. (2003)
Gender stereotypes	IT negative/nerdy	Rhode Island Economic Policy Council (2000); Steele (1997); von Hellens et al. (2000)
	Math as filter	Beyer et al. (2002); Beise et al. (2003); Sherman (1982)
	Decision styles – no difference	Harren et al. (1978)
	Women choose social science	Sadker and Sadker (1995)
	Threats/anxiety	Spencer et al. (1999)
	No difference on IT as favorite subject	Francis (2000)
	Parent education	Bouchard and St-Amant (2000)
	Math ability	Jacobs (1991); Volman and van Eck (2001)
	Math as male	Eccles et al. (1990)
	Teachers' perceptions	Culley (1988); Sanders and Stone (1986)
	Male response to women in class	Kane and Frazee (1978)
Social Expectations	Gender computer use differences	Collis (1985); Gefen (2000); Stowers (1995)
Work-family Conflict	Career oriented women create work-family conflict	Duxbury and Mills (1989); Higgins and Duxbury (1992); Barinaga

		(1992)
Individual differences	Feminine/masculine traits	Holland (1997); Lyons (1984); Oakes (1990); Stevens and Macintosh (2003); Trusty et al. (2000)
	Girls enjoy computers less than boys	Reinen and Plomp (1997)
	Women in IT enjoy computing	Trauth (2002); Turner et al. (2002)
	Girls' anxiety with computers	Venkatesh and Morris (2000); Brock and Sulsky (1994); Gattiker and Hlavka (1992)
	Technology perceptions and acceptance	Venkatesh and Brown (2001); Venkatesh and Davis (2000); Venkatesh and Morris (2000)
	Essentialist perspectives	Adam (2002)
	Social construction	Adam et al. (2001)
	Theory of individual differences	Trauth et al. (2004)
Same-sex school	Reinforce stereotypes	Vezeau et al. (2000); Viadero (2001)
	Public school seniors no math difference	Vezeau et al. (2000)
	Minimal pressure from opposite sex	American Association of University Women (1990, 1998a, b); Brutsaert and Van Houtte (2002); Jackson (2002); Watson et al. (2002)
	Intellectual development positive	Danziger (1998); Jones and Clarke (1995)

(The research table is adapted from Adya and Kaiser, (2005) and Ahuja, (2002))

References for Table A.1: Key Issues of Factors Influencing Women from Selecting an IT Career

- Adam, A. (2002). Exploring the gender question in critical information systems. *Journal of Information Technology*, **17**(2), pp. 59-67.
- Adam, A., Howcroft, D. and Richardson, H. (2001). Absent friends? The gender dimension in IS research, in Russo, N.L., Fitzgerald, B. and DeGross, J.I. (Eds), Realigning Research and Practice in IS Development, Kluwer Academic, Boston, MA, pp. 333-52.
- American Association of University Women (1990). Shortchanging Girls, Shortchanging America: Full Data Report, American Association of University Women, Washington, DC.
- American Association of University Women (1998a). Gender Gaps: Where Schools Still Fail Our Children, American Association of University Women, Washington, DC.
- American Association of University Women (1998b). Separated by Sex – A Critical Look at Single-Sex Education for Girls, American Association of University Women, Washington, DC.

- Barinaga M (1992). Profile of a field: neuroscience (the pipeline is leaking). *Science,* **255**, 1366–1367.
- Beise, C., Myers, M., VanBrackle, L. and Chevli-Saroq, N. (2003). An examination of age, race, and sex as predictors of success in the first programming course. *Journal of Informatics Education Research*, **5**(1), pp. 51-64.
- Beyer, S., Rynes, K., Perrault, J., Hay, K. and Haller, S. (2002). Gender differences in computer science students. Association for Computing Machinery SIGCSE Technical Symposium on Computer Science Education, Cincinnati, OH, pp. 49-53.
- Bouchard, P. and St-Amant, J.C. (2000). Gender identities and school success. *Alberta Journal of Educational Research*, **46**(3), pp. 280-284.
- Brekke, S.E. (1997). Physics classes, career choices, and inner-city schools. *The Physics Teacher*, **35**(8), p. 512.
- Brock, D.B. and Sulsky, L.M. (1994). Attitudes towards computers: construct validation and relations to computer use. *Journal of Organizational Behavior*, **15**(1), pp. 17-35.
- Brownell, G. (1992). The representation of females in computer education text for grades K-12. *Journal of Computing in Childhood Education*, **3**(1), pp. 43-54.
- Brutsaert, H. and Van Houtte, M. (2002). Girls' and boys' sense of belonging in single-sex versus co-educational schools. *Research in Education*, **68**, pp. 48-56.
- Canes, B.J. and Rosen, H.S. (1995). Following in her footsteps? Faculty gender composition and women's choices of college majors. *Industrial and Labor Relations Review*, **48**(3), pp. 486-505.
- Collis B (1985). Psychosocial implications of sex differences in attitudes toward computers: results of a survey. *International Journal of Womens' Studies* **8**, pp. 207–213.
- Comber, C., Colley, A.M. and Hargreaves, D.J. (1997).The effects of age, gender and computer experience upon computer attitudes. *Educational Research*, **39**(2), pp. 123-153.
- Clutterbuck, D. and Ragins, B.R. (2002). Mentoring and Diversity: An International Perspective, Butterworth-Heinemann, Oxford.
- Culley, L. (1988). Option choice and careers guidance: gender and computing in secondary schools. *British Journal of Guidance and Counseling*, **16**(1), pp. 73-82.
- Danziger, C. (1998). The trade-offs of a single-sex school: a parent's quandary. *Independent School*, **57**(2), p. 73.
- Dick, T.P. and Rallis, S.F. (1991). Factors and influences on high school students career choices. *Journal for Research in Mathematics Education*, **22**(4), pp. 281-92.
- Doornekamp, B.G. (1993). Students valuation of the use of computers in education. *Computers in Education*, **21**(1/2), pp. 103-13.
- Dryler, H. (1998). Parental role models, gender, and educational choice. *British Journal of Sociology*, **49**(3), pp. 375-474.
- DuBois, P.A. and Schubert, J.G. (1986). Do your school policies provide equal access to computers? Are you sure? *Educational Leadership*, **46**(6), p. 41.
- Durndell, A. and Thomson, K. (1997). Gender and computing: a decade of change? *Computers and Education*, **28**(1), pp. 1-9.
- Duxbury L and Mills S (1989). The electronic briefcase and work– family conflict: an analysis by gender. In *Proceedings of International Conference on Information Systems* (DeGross JI, Henderson JC and Konsynski BR Eds), pp 165–172, ACM Publications, Baltimore, MD.

- Eccles, J., Jacobs, J. and Harold, R. (1990). Gender role stereotypes, expectancy effects, and parents' socialization of gender differences. *Journal of Social Issues*, **46**(2), pp. 183-201.
- Francis, B. (2000). The gendered subjects: students subject preferences and discussions of gender and subject ability. *Oxford Review of Education*, **26**(1), pp. 35-48.
- Freeman, P. and Aspray, W. (1999). The supply of information technology workers in the United States. Computing Research Association, Washington, DC. Available online: www.cra.org/reports/wits/cra.wits.html [Last accessed: May 2008].
- Furnham, A. and Mak, T. (1999). Sex role stereotyping in television commercials: a review and comparison of twelve studies done on five continents. *Sex Roles,* **41**(5/6), pp. 413-37.
- Furnham, A. and Voli, V. (1989). Gender stereotypes in Italian television advertisements. *Journal of Broadcasting and Electronic Media*, **33**(2), pp. 175-261.
- Gates, J. (2002). Women's career influences in traditional and non-traditional fields. Poster presented at the Biennial Meeting of the Society for Research in Adolescence, New Orleans, LA.
- Gattiker, U.E. and Hlavka, A. (1992). Computer attitudes and learning performance: issues for management organization and training. *Journal of Organizational Behavior*, **13**(1), pp. 89-101.
- Gefen D (2000) Gender differences in the perception and adoption of e-mail and computer-mediated communication media: a sociolinguistics approach. In *The Encyclopedia of Library and Information Science* (Kent A and Lancour L, Eds) M Dekker, New York.
- Gorriz, C. and Medina, C. (2000). Engaging girls with computers through software games. *Communications of the ACM*, **43**(1), pp. 42-52.
- Habib, L. and Cornford, T. (2002). Computers in the home: domestication and gender. *Information Technology and People*, **15**(2), pp. 159-234.
- Harren, V.A., Kass, R.A., Tinsley, H.E.A. and Moreland, J.R. (1978). Influence of sex role attitudes and cognitive styles on career decision making. *Journal of Counseling Psychology*, **25**(5), pp. 390-399.
- Harris, S. (1999). Secondary school students use of computers at home. *British Journal of Educational Technology*, **30**(40), pp. 331-341.
- Harris, P.R. and Stobart, J. (1986). Sex role stereotyping in British television advertisements at different times of the day: an extension and refinement of Manstead and McCullough (1981). *British Journal of Social Psychology*, **25**(2), pp. 155-219.
- Higgins CA and Duxbury LE (1992). Work–family conflict: a comparison of dual-career and traditional-career men. *Journal of Organizational Behavior*, **13**, pp. 389–411.
- Holland, J.L. (1997), Making Vocational Choices, Psychological Assessment Resources, Inc., Odessa, FL.
- Huber, B.R. and Schofield, J.W. (1998). Gender and the sociocultural context of computing in Costa Rica. In Bromley, H. and Apple, M.W. (Eds), Education/Technology/Power: Educational Computing as a Social Practice, State University of New York Press, Albany, NY, pp. 103-32.
- Jackson, C. (2002). Can single-sex classes in co-educational schools enhance the learning experiences of girls and/or boys? An exploration of pupils' perceptions. *British Journal of Educational Research*, **28**(1), pp. 37-48.
- Jackson, L.A., Gardner, P.D. and Sullivan, L.A. (1993). Engineering persistence: past, present, and future factors and gender differences. *Higher Education*, **26**, pp. 227-46.

- Jacobs, J.E. (1991). Influence of gender stereotypes on parent and child mathematics attitudes. *Journal of Educational Psychology*, **83**(4), pp. 518-27.
- Jones, S. (2003). Let the games begin: gaming technology and internet among college students. Pew Internet and American Life Project. Available online: www.pewinternet.org/pdfs/PIP_College_Gaming_Reporta.pdf [Last accessed: May 2008].
- Kane, R.D. and Frazee, P. (1978). Occupational Choice: Do Traditional and Non-traditional Women Differ?, report, R.J. Associates, Inc., Arlington, VA.
- Kram, K.E. and Isabella, L.A. (1985). Mentoring alternatives: the role of peer relationships in career development. *Academy of Management Journal*, **28**(1), pp. 110-142.
- Leslie, L.L., McCLure, G.T. and Oaxaca, R.L. (1998). Women and minorities in science and engineering: a life sequence analysis. *The Journal of Higher Education*, **69**(3), pp. 239-76.
- Lyons, M. (1984). The DP psyche. *Datamation*, **30**(9), pp. 103-10.
- Milkie, M.A. (1999). Social comparisons, reflected appraisals, and mass media: the impact of pervasive beauty images on black and white girls' self-concept. *Social Psychology Quarterly*, **62**(2), pp. 190-210.
- McArthur, L.Z. and Resco, B.G. (1975). The portrayal of men and women in American television commercials. *Journal of Social Psychology*, **97**, pp. 209-230.
- Na, M. (2001). The cultural construction of the computer as a masculine technology: an analysis of computer advertisements in Korea. *Asian Journal of Women's Studies*, **7**(3), pp. 93-114.
- National Academy of Sciences (1997). Adviser, Teacher, Role Model, Friend: On Being a Mentor to Students in Science and Engineering, National Academy Press, Washington, DC.
- National Center for Education Statistics (2002), "Digest of Education Statistics, 2002", National Center for Education Statistics, Washington, DC. Available online: http://nces.ed.gov/programs/digest/d02/index.asp [Last accessed: May 2008].
- National Center for Education Statistics (2003), High School Guidance Counseling, Education Public Center (ED Pubs), Jessup, MD. Available online: www.nces.ed.gov/pubsearch/pubsinfo.asp?pubid ¼ 2003015 [Last accessed: May 2008].
- Nelson, M.R. and Paek, H.J. (2003). Exporting the 'fun, fearless female': Cosmopolitan magazine as a case study of a global media brand. Poster presented at the Association for Education in Journalism and Mass Communication Annual Convention, Kansas City, MO.
- Oakes, J. (1990), Lost Talent: The Underparticipation of Women, Minorities, and Disabled Persons in Science, RAND Corporation, Santa Monica, CA.
- Reinen, I.J. and Plomp, T. (1997). Information technology and gender equality: a contradiction in terminis? *Computers and Education*, **28**(2), pp. 65-78.
- Rhode Island Economic Policy Council (2000). What Rhode Island teens think of information technology careers. Available online: www.ripolicy.org/resources/content/FocusGrpTeens.pdf [Last accessed: May 2008].
- Sadker, M. and Sadker, D. (1995), Failing at Fairness: How our Schools Cheat Girls, Touchstone Books, New York, NY.
- Sanders, J.S. and Stone, A. (1986). The Neuter Computer: Computers for Girls and Boys, Neal-Schuman Publishers, New York, NY.
- Scandura, T.A. and Ragins, B.R. (1993). The effects of gender and role orientation on mentorship in male-dominated occupations. *Journal of Vocational Behavior*, **43**(3), pp. 251-317.

- Selwyn, N. (1998). The effect of using a home computer on students educational use of IT. *Computers and Education*, **31**(2), pp. 211-239.
- Sherman, J.A. (1982). Mathematics the critical filter: a look at some residues. *Psychology of Women Quarterly*, **6**(4), pp. 428-473.
- Signorielli, N., McLeod, D. and Healy, E. (1994). Gender stereotypes in MTV commercials: the beat goes on. *Journal of Broadcasting and Electronic Media*, **38**(1), pp. 91-102.
- Smith, L.B. (2000). The socialization of females with regard to a technology-related career: recommendation for change. Meridian: A Middle School Computer Technologies Journal, 3(2). Available online: www.ncsu.edu/meridian/sum2000/career/index.html [Last accessed: May 2008].
- Spencer, S.J., Steele, C.M. and Quinn, D. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology*, **35**(1), pp. 4-28.
- Steele, M. (1997).Using music to increase interest in computers for girls and minorities. *Teaching and Change*, **4**(4), pp. 293-312.
- Stowers GN (1995) Getting behind? Gender differences in computer conferencing. *Public Productivity and Management Review* **19**,143–159.
- Trauth, E. (2002). Odd girl out: an individual differences perspective on women in the IT profession. *Information Technology and People*, **15**(2), pp. 98-118.
- Trauth, E.M., Nielsen, S.H. and von Hellens, L.A. (2003). Explaining the IT gender gap: Australian stories for the new millennium. *Journal of Research and Practice in Information Technology*, **35**(1), pp. 7-20.
- Trauth, E.M., Quesenberry, J.L. and Morgan, A.J. (2004). Understanding the underepresentation of women in IT: toward a theory of individual differences. In Weisband, S. (Ed.), Proceedings of the 2004 ACM SIG MIS CPR Conference, Association for Computing Machinery, Tucson, AZ.
- Trusty, J., Robinson, C.R., Plata, M. and Ng, K. (2000). Effects of gender, socioeconomic status, and early academic performance on postsecondary educational choice. *Journal of Counseling and Development*, **78**(4), pp. 463-536.
- Turner, S.V., Brent, P.W. and Pecora, N. (2002). Why Women Choose Information Technology Careers: Educational, Social, and Familial Influences, Annual Educational Research Association, New Orleans, LA.
- Venkatesh, V. and Brown, S.A. (2001). A longitudinal investigation of personal computers in homes: adoption determinants and emerging challenges. *MIS Quarterly*, **25**(1), pp. 71-102.
- Venkatesh, V. and Davis, F.D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, **46**(2), pp. 186-204.
- Venkatesh, V. and Morris, M.G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, **24**(1), pp. 115-156.
- Vezeau, C., Bouffard, T. and Chouinard, R. (2000). The impact of single-sex versus coeducational school environment on girls' general attitudes, self-perceptions and performance in mathematics. *Journal of Research and Development in Education*, **34**(1), pp. 49-59.
- Viadero, D. (2001), "Study cites flaws in single-sex public schools. Education Week, 20(38). Available online: www.edweek.com/ew/ewstory.cfm?slug ¼ 38gender.H30 [Last accessed: May 2008].

- Volman, M. and van Eck, E. (2001). Gender equity and information technology in education: the second decade. *Review of Educational Research*, **17**(4), pp. 613-648.
- Stevens, C.D. and Macintosh, G. (2003). Personality and attractiveness of activities within sales jobs. *Journal of Personal Selling and Sales Management*, **23**(1), pp. 23-37.
- von Hellens, L.A., Pringle, R., Nielsen, S.H. and Greenhill, A. (2000). People, business, and IT skills: the perspective of women in the IT industry. In Nance, W. (Ed.), Proceedings of the ACM SIGCPR Special Interest Group on Computer Personnel Research, Association for Computing Machinery, Chicago, IL, pp. 152-160.
- Watson, C.M., Quatman, T. and Eder, E. (2002). Career aspirations of adolescent girls: effects of achievement level, grade, and single-sex school environment. *Sex Roles*, **46**(9/10), pp. 323-35.
- Webster, J. and Martocchio, J.J. (1992). Microcomputer playfulness: development of a measure with workplace implications. *MIS Quarterly*, **16**(2), pp. 201-228.

APPENDIX B
MEASUREMENTS OF QUESTIONNAIRE

Table B.1: Measures of Computer Training*

Item	Literature Support	Abbreviation
Quantity		
The course is extensive in its coverage of the subject matter (Information Systems)	Centre for learning, teaching and development (2008)**	QTYCT1
This course covers a lot of IS aspects in the time allocated	As above	QTYCT2
I am being exposed to a lot of different IT aspects (e.g. software, hardware, business)	As above	QTYCT3
I am happy with the level at which the course material is being exposed	As above	QTYCT4
The course is exposing me to a lot of theoretical and practical aspects of computers in business	As above	QTYCT5
Quality		
The theoretical lecture component add to the quality of the course	As above	QLICT1
The practical lab component add to the quality of the course	As above	QLICT2
The computer applications (Word, Access, Excel) exercises are a useful component of the course	As above	QLICT3
The tutorials are set at a high level	As above	QLICT4
Lectures, tutorials, and labs are complementary	As above	QLICT5
My existing knowledge of IT is being challenged in a constructive way	As above	QLICT6
The course stimulates my interest in IT	As above	QLICT7
My interest in IT has increased as a result of the theoretical lecture component	As above	QLICT8
My interest in IT has increased as a result of the practical lab component	As above	QLICT9

* Measured on 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree)

** The literature support was adapted from a course evaluation form administrated at the University of the Witwatersrand. The course evaluation form is produced by selecting items from an item bank for course evaluation.

Table B.2: Measures of Computer Self-Efficacy*

Item	Literature Support	Abbreviation
I feel confident working on a desktop computer	Murphy, Coover and Owen (1989)	CSE1
I feel confident in my ability to use a computer	As above	CSE2
I feel confident adding and deleting information from a database	As above	CSE3
I feel confident understanding terms/words relating to computers	As above	CSE4
I feel confident describing the function of computer hardware (e.g. keyboard, monitor, CPU)	As above	CSE5
I feel confident troubleshooting computer problems	As above	CSE6
I feel confident explaining why a program (software) will or will not run on a given computer	As above	CSE7
I feel confident understanding the three stages of data processing: input, processing, output	As above	CSE8
I feel confident using the computer to organize information	As above	CSE9
I feel confident writing simple business programs for the computer	As above	CSE10

* Measured on 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree)

Table B.3: Measures of Computer Anxiety*

Item	Literature Support	Abbreviation
The challenge of learning about computers is exciting	Heinssen , Glass and Knight (1987)	CA1
I am excited to learn the computer skills required in the workplace	As above	CA2
I look forward to using a computer on my job	As above	CA3
Learning to operate computers is like learning any new skill, the more you practice, the better you become	As above	CA4
If given the opportunity, I would like to learn more about and use computers more	As above	CA5
I hesitate to use a computer for fear of making mistakes that I cannot correct	As above	CA6
I have avoided computers because they are unfamiliar	As above	CA7
I feel intimidated by computers	Nickell and Pinto (1986)	CA8
Computers intimidate me because they seem so complex	As above	CA9
Computers are difficult to understand and frustrating to work with	As above	CA10
It scares me to think that I could cause the computer to destroy a large amount of data by hitting the wrong key	As above	CA11

* Measured on 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree)

Table B.4: Measures of Computer Attitude*

Item	Literature Support	Abbreviation
Soon our lives will be controlled by computers	Nickell and Pinto (1986)	NCAT1
Computers turn people into just another number	As above	NCAT2
Computers are lessening the importance of too many jobs now done by humans	As above	NCAT3
Computers are bringing us into a bright new era	As above	PCAT1
The use of computers is enhancing our standard of living	As above	PCAT2
Life will be easier and faster with computers	As above	PCAT3
Computers are a fast and efficient means of getting information	As above	PCAT4
Computers can help businesses achieve their objectives	As above	PCAT5
Companies rely on computers in order to conduct business	As above	PCAT6
The way in which business is done is changing for the better because of computers	As above	PCAT7
Computers allow us to improve society	As above	PCAT8

* Measured on 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree)

Table B.5: Measures of Intention to Select an IT Career*

Item	Literature Support	Abbreviation
I have a great desire to select an IT career	Brinkley and Scholar, (2005)	INTS1
I would like to pursue an IT career	As above	INTS2
I am interested in choosing an IT career	As above	INTS3
I have the skills and abilities to pursue an IT career	As above	INTS4
An IT career would be personally rewarding	As above	INTS5
An IT career that requires the use of both business and technical skills interests me	As above	INTS6
People with IT careers benefit society	As above	INTS7
If I had an IT career, I could earn a high income	As above	INTS8
If I had an IT career, I could have high job security and stability	As above	INTS9
If I had an IT career, I could have a good balance between work and personal/family activities	As above	INTS10
If I had an IT career, I could have a positive impact on other people	As above	INTS11
If I had an IT career, I could have good social interaction with people at work	As above	INTS12

* Measured on 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree)

APPENDIX C
ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49/1 Parsotam

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER H080721**
PROJECT	Computer attitudes and career choices of South African women: The influence of computer training, computer self efficacy and computer anxiety
INVESTIGATORS	Ms P Parsotam
DEPARTMENT	SEBS
DATE CONSIDERED	11.07.2008
DECISION OF THE COMMITTEE*	Approved Unconditionally ✓

NOTE:

This ethical clearance is valid for 2 years and may be renewed upon application

DATE 22.07.2008 **CHAIRPERSON** .....
(Professor R Thornton)

cc: Supervisor : Mr J Cohen

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

Signature

This ethical clearance is valid for two years from date of approval.

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX D
COVER LETTER AND FINAL QUESTIONNAIRE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Dear Participant

I am currently completing my master research, which aims to investigate the way in which one's computer attitude influences one's decision to pursue an Information Technology (IT) career.

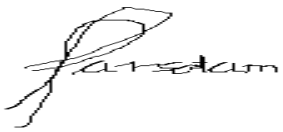
I would like to invite you to complete the survey. The entire questionnaire takes approximately 10-15 minutes to complete and is strictly confidential. No names or students numbers will be captured and therefore the survey is anonymous.

The success of this study depends on your kind cooperation.

Please answer all sections and remember that there are no "right" or "wrong" answers.

Thank you for your willingness to participate in this study on Computer attitudes and IT careers.

Sincerely



Poonam Parsotam (Ms.)

Thank you for your willingness to participate in this study on Computer attitudes and IT careers.

Section 1: Demographic questions - (for statistical purposes only)
(Please place a cross mark (X) in the most appropriate block)

Gender

Male		Female	

Age

16 - 20		21 - 25	
Older than 25 (Please Specify):			

What is your ethnicity?

Black		Coloured	
White		Indian	
Asian		Other (Please Specify):	

	Yes	No
Did you study computer subjects in matric?		
Do you own a desktop computer or portable computer?		
Do you have regular and easy computer access at the University?		

How many hours per day do you spend using a computer either for University work or personal tasks?

0-1		2-3	
4-5		6 or more	

How many years of computer – related experience do you have?

Less than 6 months		6 months - 1 year	
1-2 years		2-4 years	
4-6 years		More than 6 years	

Which subjects do you plan on majoring in?

Information Systems		Economics	
Accounting		Internal Auditing	
Marketing		Human Resources	
Finance		Management	
Other (Please Specify):			

(If you plan on majoring in more than 1 subject, select other subject majors as well)

Which of the following courses are you registered for?

Information Systems IA (C Slot)		Fundamentals of Information Systems (E Slot)		Fundamentals of Information Systems (B Slot)	

Please place a cross mark (X) to indicate the extent to which you agree with each of the following statements:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I feel confident working on a desktop computer					
2. I feel confident in my ability to use a computer					
3. I feel confident adding and deleting information from a database					
4. I feel confident understanding terms/words relating to computers					
5. I feel confident describing the function of computer hardware (e.g. keyboard, monitor, CPU)					
6. I feel confident troubleshooting computer problems					
7. I feel confident explaining why a program (software) will or will not run on a given computer					
8. I feel confident understanding the three stages of data processing: input, processing, output					
9. I feel confident using the computer to organize information					
10. I feel confident writing simple business programs for the computer					
11. The challenge of learning about computers is exciting					
12. I am excited to learn the computer skills required in the workplace					
13. I look forward to using a computer on my job					
14. Learning to operate computers is like learning any new skill, the more you practice, the better you become					
15. If given the opportunity, I would like to learn more about and use computers more					
16. I hesitate to use a computer for fear of making mistakes that I cannot correct					
17. I feel intimidated by computers					
18. I have avoided computers because they are unfamiliar					
19. Computers intimidate me because they seem so complex					
20. Computers are difficult to understand and frustrating to work with					
21. It scares me to think that I could cause the computer to destroy a large amount of data by hitting the wrong key					
22. Soon our lives will be controlled by computers					
23. Computers turn people into just another number					
24. Computers are lessening the importance of too many jobs now done by humans					
25. Computers are bringing us into a bright new era					
26. The use of computers is enhancing our standard of living					
27. Computers allow us to improve society					
28. Life will be easier and faster with computers					
29. Computers are a fast and efficient means of getting information					
30. Computers can help businesses achieve their objectives					
31. Companies rely on computers in order to conduct business					
32. The way in which business is done is changing for the better because of computers					

Please place a cross mark (X) to indicate the extent to which you agree with each of the following statements relating to your Information System (IS) course:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. The course is extensive in its coverage of the subject matter (Information Systems)					
2. This course covers a lot of IS aspects in the time allocated					
3. I am being exposed to a lot of different IT aspects (e.g. software, hardware, business)					
4. I am happy with the level at which the course material is being exposed					
5. The course is exposing me to a lot of theoretical and practical aspects of computers in business					
6. The theoretical lecture component add to the quality of the course					
7. The practical lab component add to the quality of the course					
8. The computer applications (Word, Access, Excel) exercises are a useful component of the course					
9. The tutorials are set at a high level					
10. Lectures, tutorials, and labs are complementary					
11. My existing knowledge of IT is being challenged in a constructive way					
12. The course stimulates my interest in IT					
13. My interest in IT has increased as a result of the theoretical lecture component					
14. My interest in IT has increased as a result of the practical lab component					

A Definition of an IT Career

Information technology (IT) is the use of computers and software to manage information. In some companies, this is referred to as Management Information Systems (MIS) or as Information Systems (IS). IT has been defined as being the study, design, development, implementation support and/or management of any computer based information systems. IT is usually involved in the context of a business and is often used to automate manual tasks as well as improve efficiencies within an organisation. Career options within IT are vast and can be considered as either technical-orientated, business-orientated or are a blend of both. Technical-orientated IT careers include Software and Hardware Engineers, Network Administrator, Programmers, Database Specialist, Web designers, Game Developers. Business-orientated IT careers: for example are IT/Business consultants, Business Analysts, Project Managers. An IT career may be any of the above as well as new emerging careers which involve the use, development, or management of IT.

Please place a cross mark (X) to indicate the extent to which you agree with each of the following statements relating to an IT Career:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I have a great desire to select an IT career					
2. I would like to pursue an IT career					
3. I am interested in choosing an IT career					
4. I have the skills and abilities to pursue an IT career					
5. An IT career would be personally rewarding					
6. An IT career that requires the use of both business and technical skills interests me					
7. People with IT careers benefit society					
8. If I had an IT career, I could earn a high income					
9. If I had an IT career, I could have high job security and stability					
10. If I had an IT career, I could have a good balance between work and personal/family activities					
11. If I had an IT career, I could have a positive impact on other people					
12. If I had an IT career, I could have good social interaction with people at work					

THANK YOU for your time, support and cooperation.
Your contribution towards the successful outcome of this study is invaluable.

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

APPENDIX E
PRINCIPAL COMPONENTS FACTOR ANALYSIS (PCA) RESULTS FOR FEMALE SAMPLE

Table E.1: Computer Training

	Component		
	Quantity of Computer Training	**Quality of Computer Training**	**Effectiveness of Computer Training**
QTYCT1	0.716		
QTYCT2	0.737		
QLICT3		0.754	
QLICT4		0.654	
QLICT5		0.725	
QLICT7			0.900
QLICT8			0.856
QLICT9			0.803

Table E.2: Computer Self-Efficacy

	Components
	Advance Activities
CSE4	0.724
CSE5	0.720
CSE6	0.739
CSE7	0.760
CSE8	0.660
CSE9	0.699
CSE10	0.635

Table E.3: Computer Anxiety

	Components	
	Computer Liking	**Computer Anxiety**
CA1	0.855	
CA2	0.850	
CA3	0.821	
CA5	0.787	
CA6		0.753
CA7		0.835
CA8		0.806
CA9		0.893
CA10		0.680
CA11		0.631

Table E.4: Computer Attitude

	Components	
	Negative	**Positive**
CAT1	0.807	
CAT2	0.802	
CAT3	0.730	
CAT4		0.788
CAT5		0.827
CAT6		0.789
CAT7		0.758
CAT8		0.764

Table E.5: Intention to Select an IT Career

	Components		
	IT Career Interest	**Perceived Tangible Rewards**	**Perceived Social Rewards**
INTS1	0.917		
INTS2	0.918		
INTS3	0.935		
INTS4	0.707		
INTS5	0.798		
INTS6	0.761		
INTS7		0.677	
INTS8		0.819	
INTS9		0.752	
INTS10			0.863
INTS12			0.644

APPENDIX F
TESTING FOR MULTIPLE REGRESSION ASSUMPTIONS FOR FEMALE SAMPLE

Testing for Normality Assumption

In order to test for normality, skewness and kurtosis values of each variable were analysed (Hair et al., 2006). Table F.1 below shows the distributional characteristics. Majority of statistical values were between +/- 1 thus skewness was considered to be acceptable. Kurtosis was also largely acceptable with only hours per day of computer use and positive computer attitude having peaked distributions. Hours per day of computer use, with a mean (1.83), is not surprising given that 75% of students selected 2 to 3 hours. Therefore despite the little variance, hours per day of computer use is considered normal. Positive computer attitude, with a high mean (4.24), is also acceptable as most students indicated that they have good attitudes towards computers. Hence positive computer attitude despite the little variance is also considered normal. Therefore, all variables are normal, such that multiple regression can be performed to test a number of hypotheses.

Table F.1: Skewness, Kurtosis and Normality Tests

Variable Name	Shape Descriptors	
	Skewness	**Kurtosis**
Hours per Day of Computer Use (HRPERDAY)	1.052	2.055
Computer Self-Efficacy (CSE)	-0.142	0.533
Computer Liking (CL)	-0.434	-0.735
Computer Anxiety (CA)	0.774	-0.012
Negative Computer Attitude (NCAT)	-0.228	-0.300
Positive Computer Attitude (PCAT)	-0.845	1.927
IT Career Interest (ITCAR)	0.392	-0.854
Perceived Tangible Rewards (PTR)	-0.357	0.906

Testing for Linearity Assumption

In order to test the assumption of linearity, scatter plots were examined. Figures F.1 – F.16 below illustrate scatter plots for all relationships between dependent and independent variables. The scatter plots indicate little need for concern around the existence of nonlinear or curvilinear relationships. Therefore the assumption of linearity is not violated.

Figure F.1: Scatter plot of NCAT vs. CSE

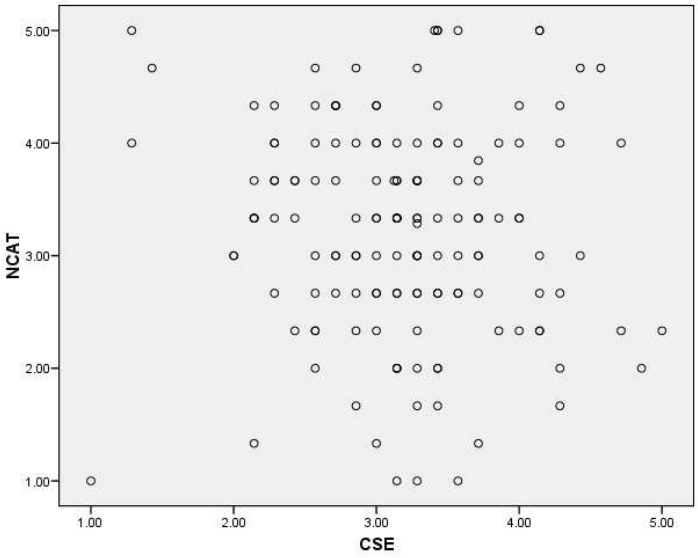


Figure F.2: Scatter plot of NCAT vs. CL

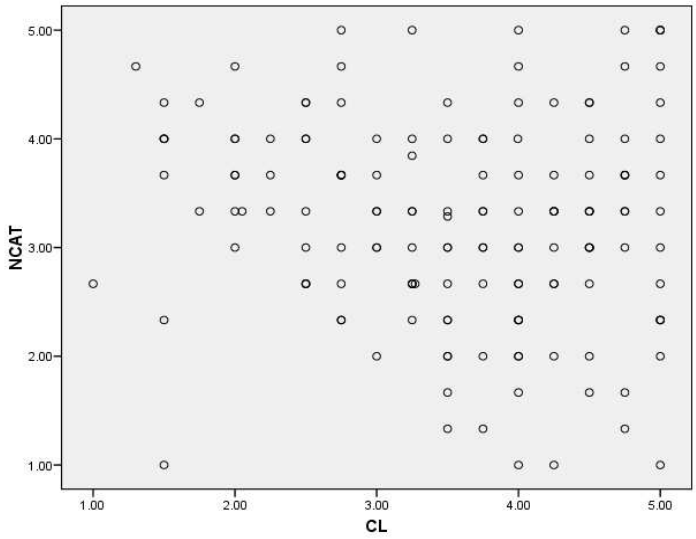


Figure F.3: Scatter plot of NCAT vs. CA

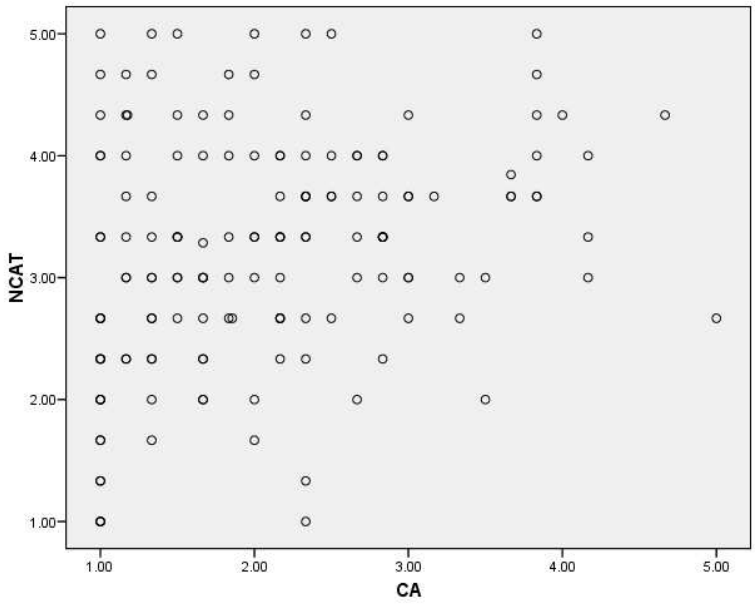


Figure F.4: Scatter plot of PCAT vs. CSE

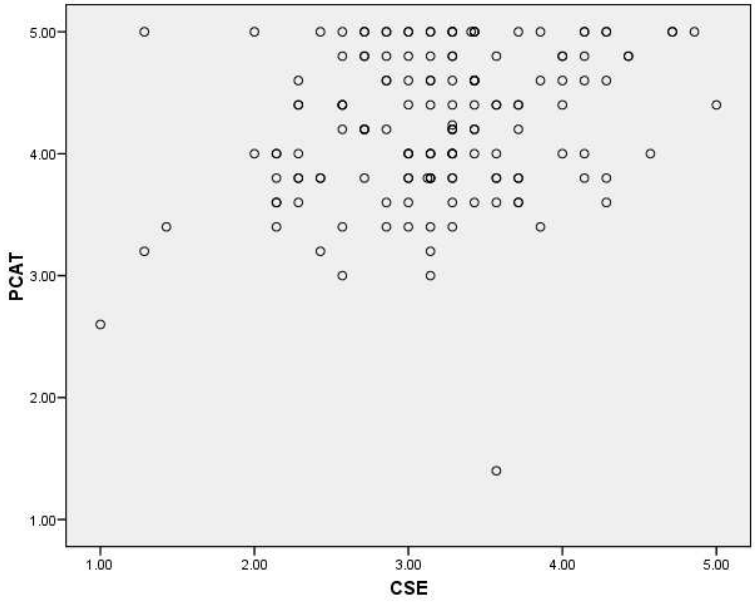


Figure F.5: Scatter plot of PCAT vs. CL

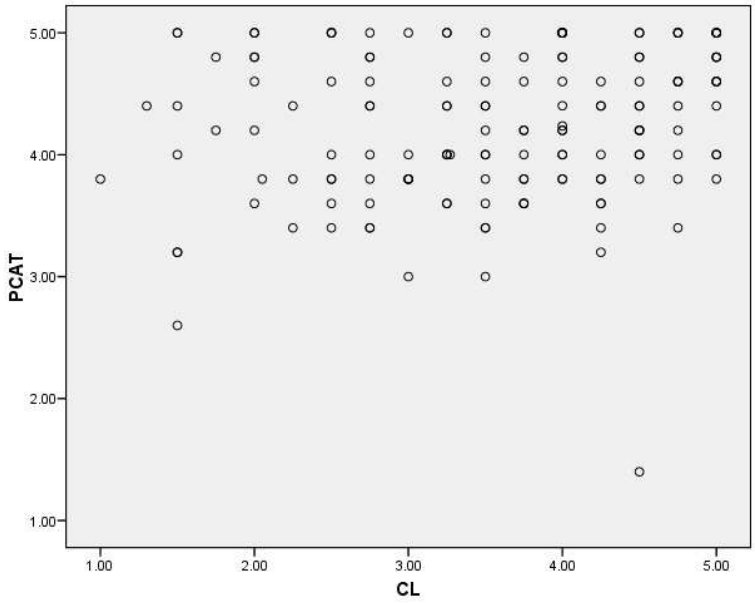


Figure F.6: Scatter plot of PCAT vs. CA

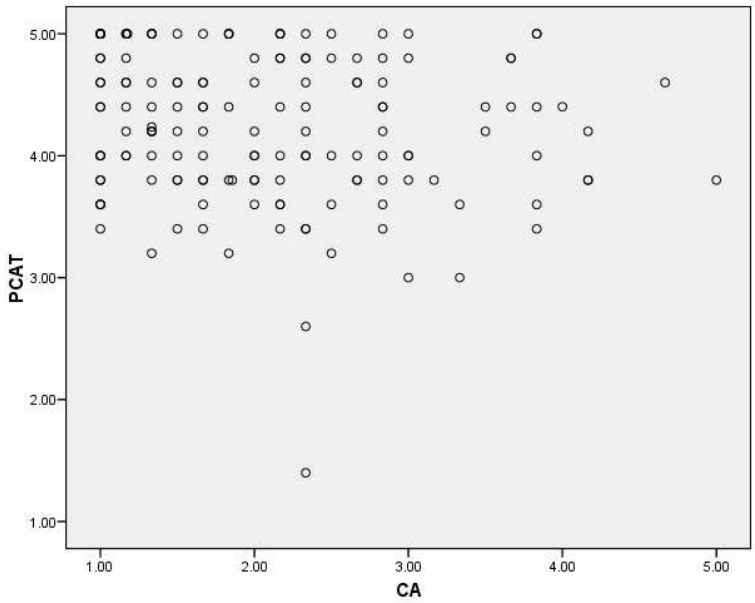


Figure F.7: Scatter plot of ITCAR vs. CSE

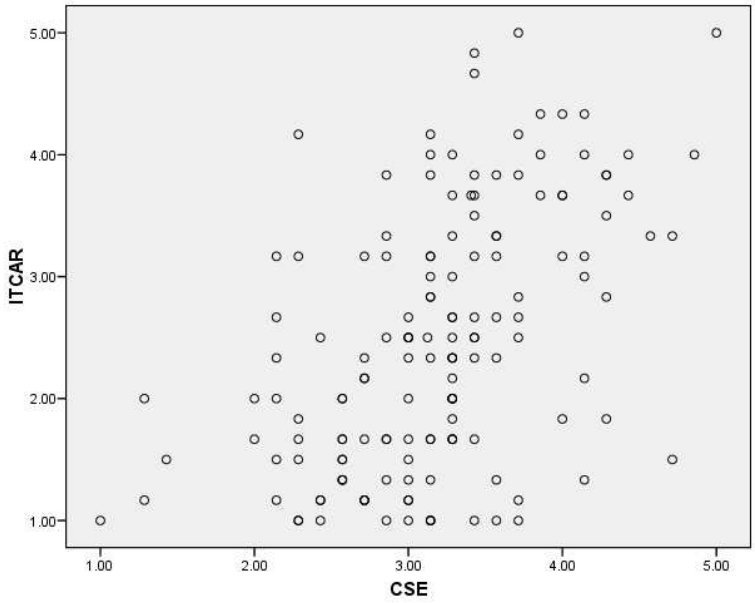


Figure F.8: Scatter plot of ITCAR vs. CL

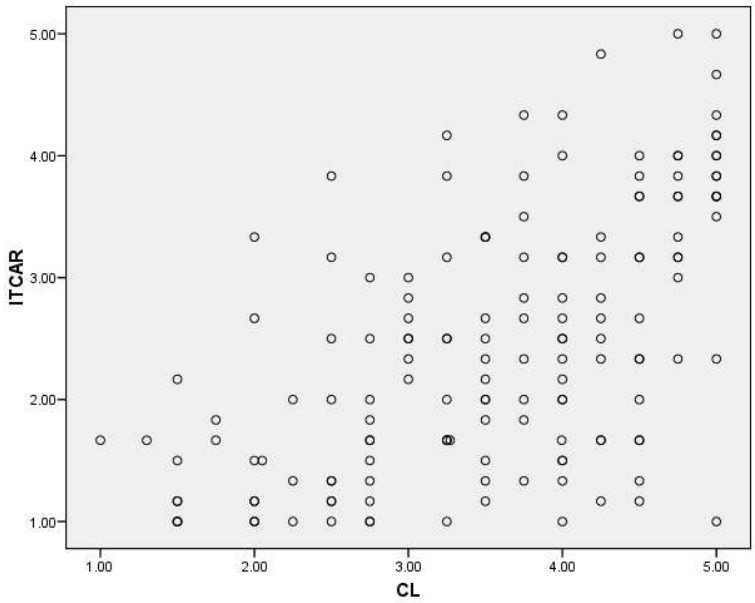


Figure F.9: Scatter plot of ITCAR vs. CA

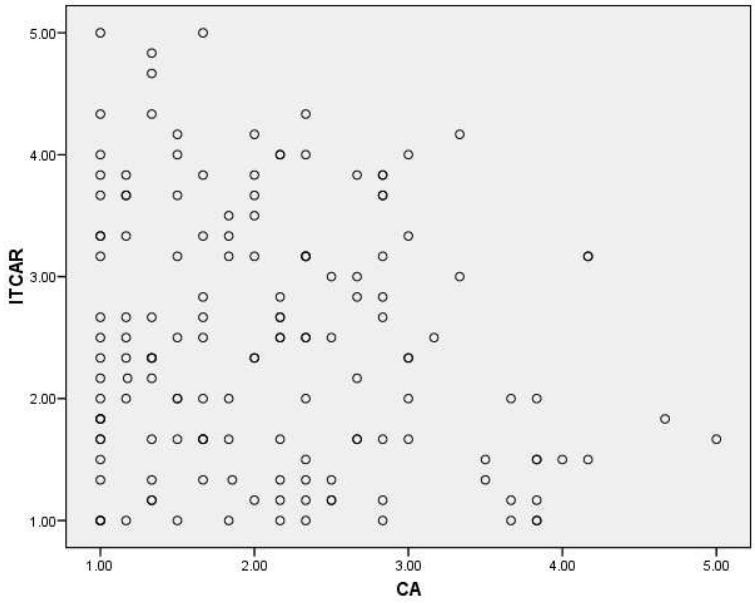


Figure F.10: Scatter plot of PTR vs. CSE

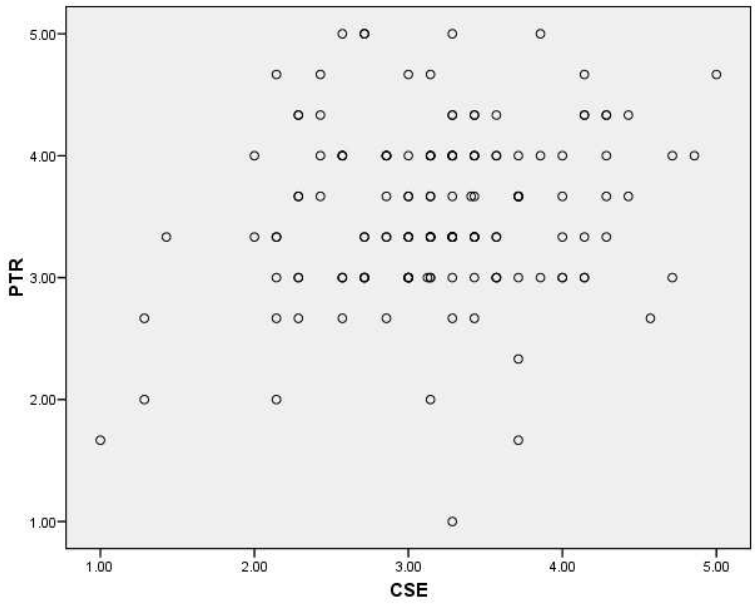


Figure F.11: Scatter plot of PTR vs. CL

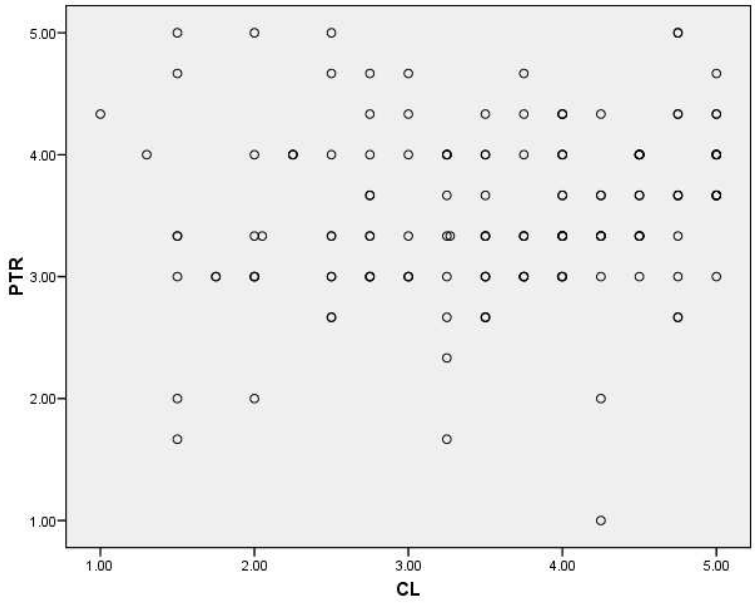


Figure F.12: Scatter plot of PTR vs. CA

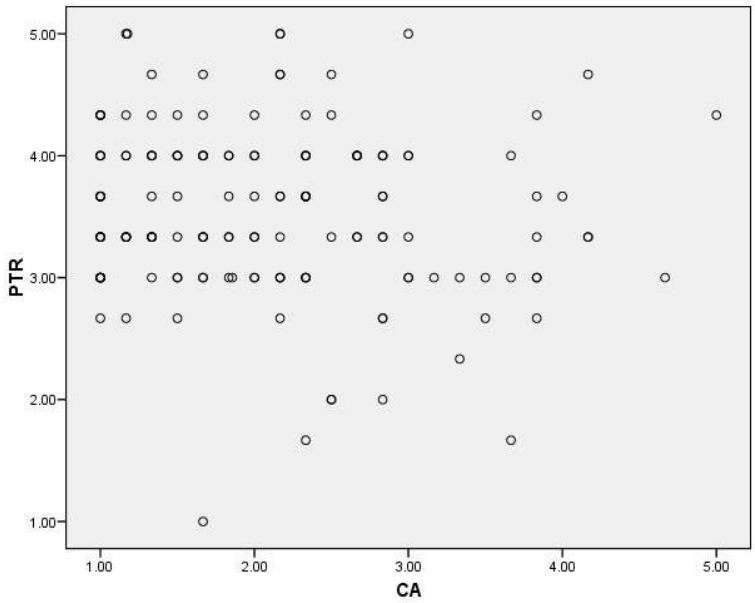


Figure F.13: Scatter plot of ITCAR vs. NCAT

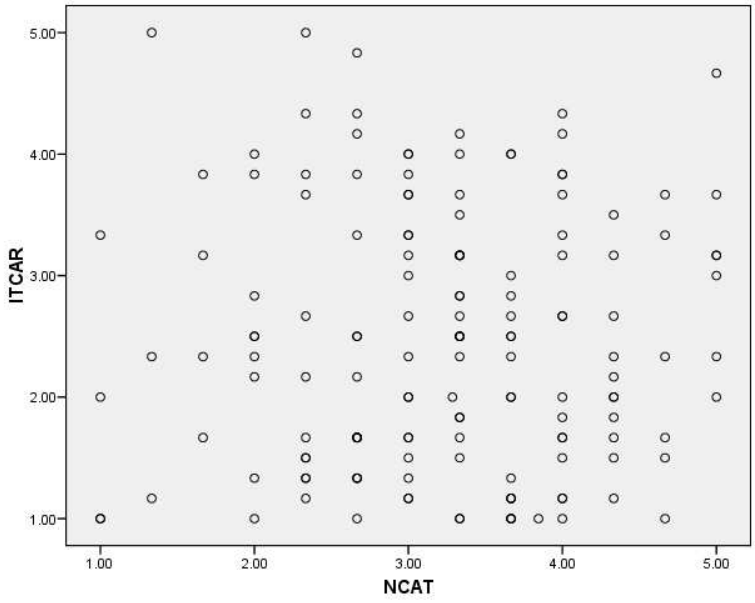


Figure F.14: Scatter plot of ITCAR vs. PCAT

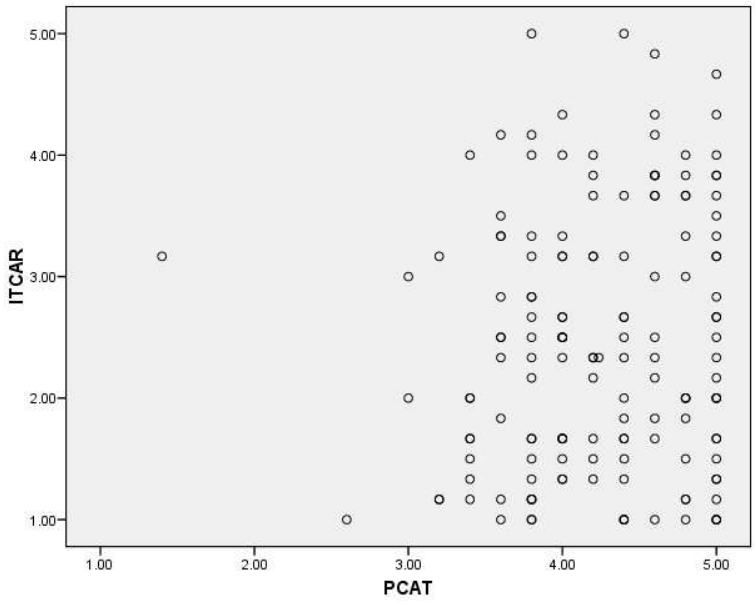


Figure F.15: Scatter plot of PTR vs. NCAT

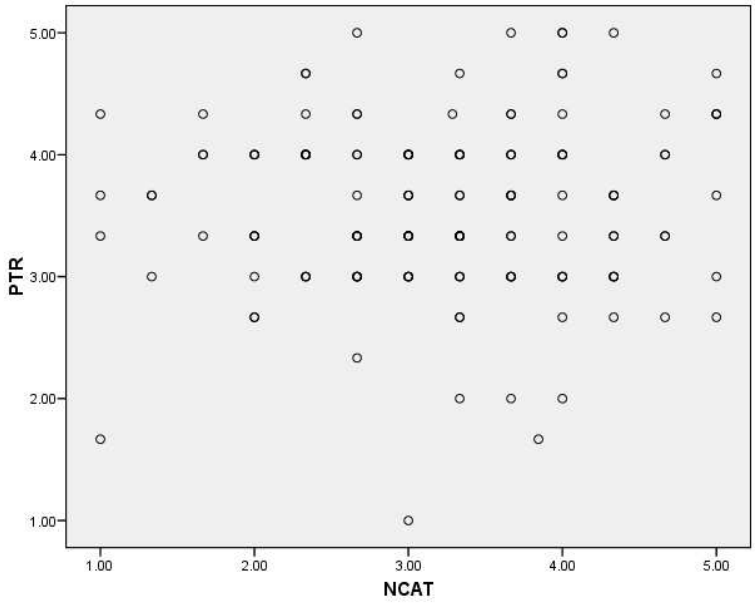
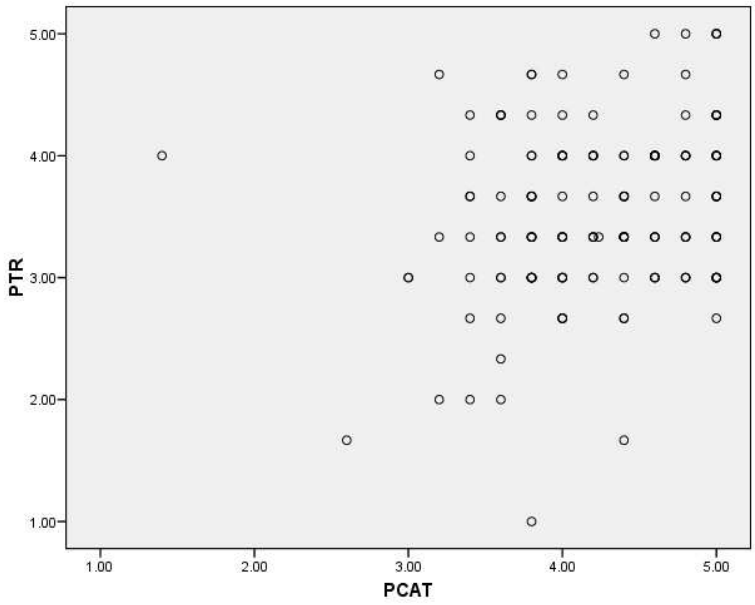


Figure F.16: Scatter plot of PTR vs. PCAT



Testing for Homoscedasticity and Multicollinearity Assumptions

The assumption of homoscedasticity was tested, by plotting residual for all the variables in each multiple regression analysis. Figures F.17 – F.32 presented next plots the standardized predicted values (dependent variables) against the studentized residuals (independent variables) and illustrates the distribution of the residuals in the form of histograms (see Hair et al., 2006, p. 251). The plots and histograms indicate little need for concern around the existence of patterns. Thus all plots can be classified as a null plot, where the residuals fall randomly and exhibit an equal dispersion around zero, with no strong leaning to be greater or less than zero. Therefore, the assumption of homoscedasticity has not been violated.

In order to test for multicollinearity this study used a cut-off threshold of 0.1 for tolerance, and thus the cut-off for its inverse, VIF, 10 is used (Hair et al., 2006). Therefore tolerance should be close to 1.0 and VIF close to 0. Tables F.2 – F.9 presented next shows the tolerance and VIF for each independent variable in each multiple regression analysis. Tables F.2 – F.9 presents results which indicate that there are no concerns over collinearity; and coupled with the correlations results shown in Table 10, there is no reason to be concerned about the effects of collinearity in this regression model. Therefore, the assumption of multicollinearity has not been violated, and all variables met the assumptions of multiple regression. Results of homoscedasticity and multicollinearity testing are presented next under each multiple regression analysis.

Regression 1: CSE, CL and CA on NCAT

Figure F.17: Residual Plot of NCAT vs. CSE, CL and CA

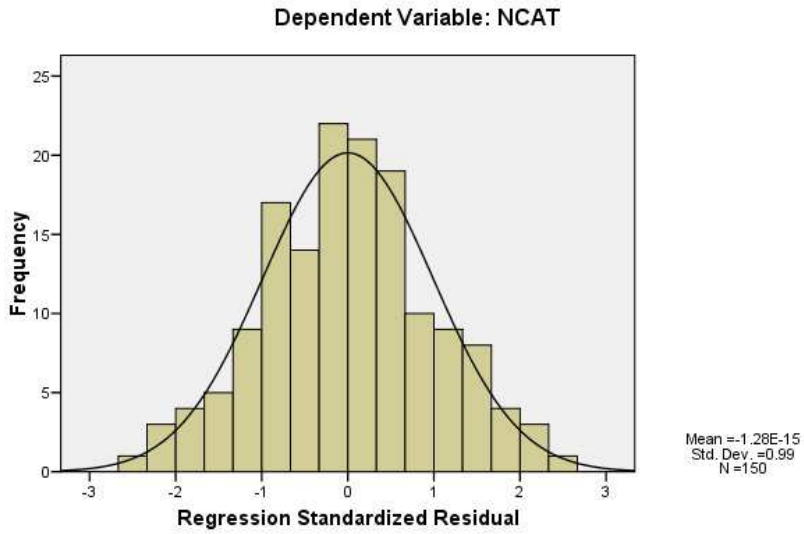


Figure F.18: Histogram of NCAT vs. CSE, CL and CA

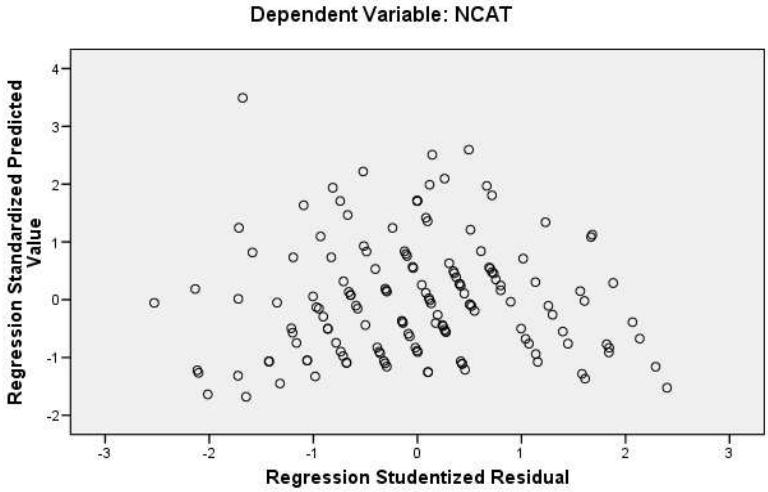


Table F.2: Regression 1: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.687	1.456
Computer Liking (CL)	0.765	1.307
Computer Anxiety (CA)	0.830	1.205

Regression 2: CSE, CL and CA on PCAT

Figure F.19: Residual Plot of PCAT vs. CSE, CL and CA

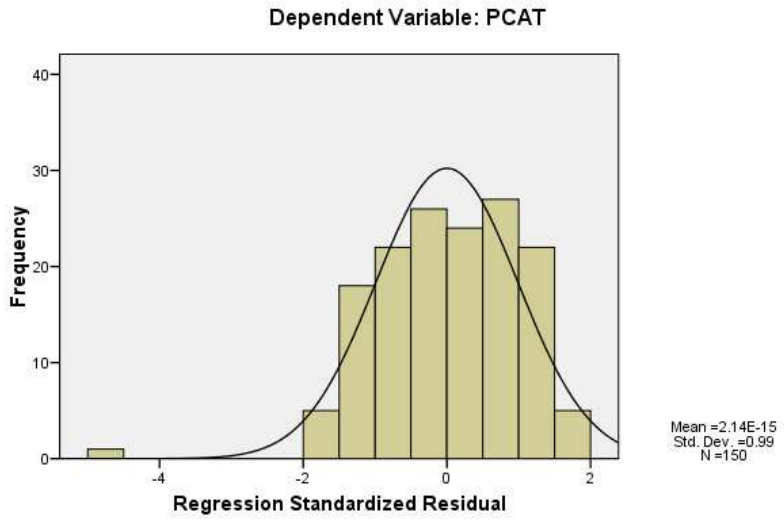


Figure F.20: Histogram of PCAT vs. CSE, CL and CA

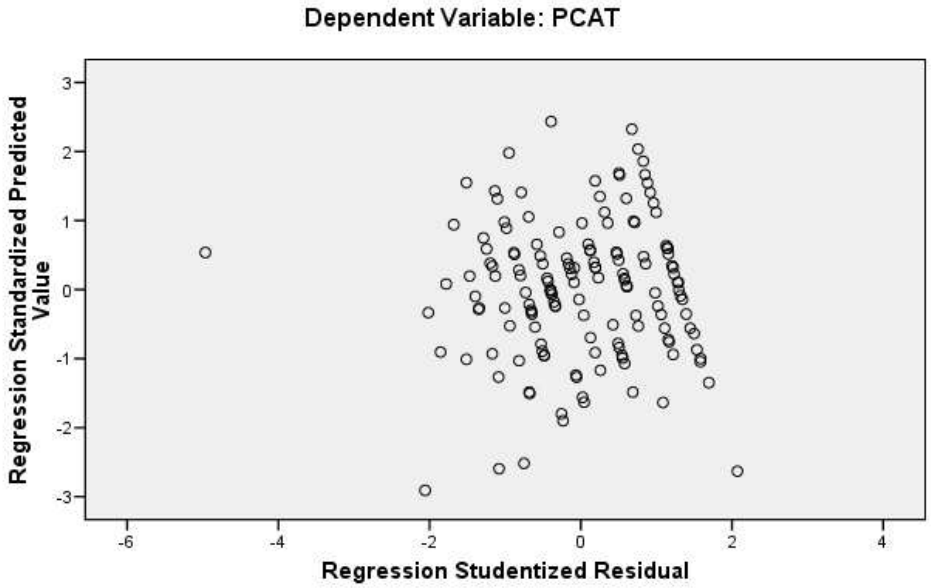


Table F.3: Regression 2: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.687	1.456
Computer Liking (CL)	0.765	1.307
Computer Anxiety (CA)	0.830	1.205

Regression 3: COMPMATRIC, HRPERDAY, CSE, CL and CA on ITCAR

Figure F.21: Residual Plot of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL and CA

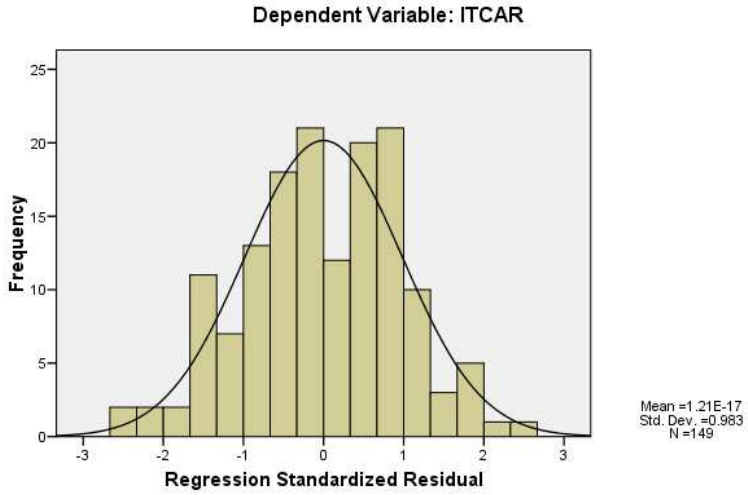


Figure F.22: Histogram of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL and CA

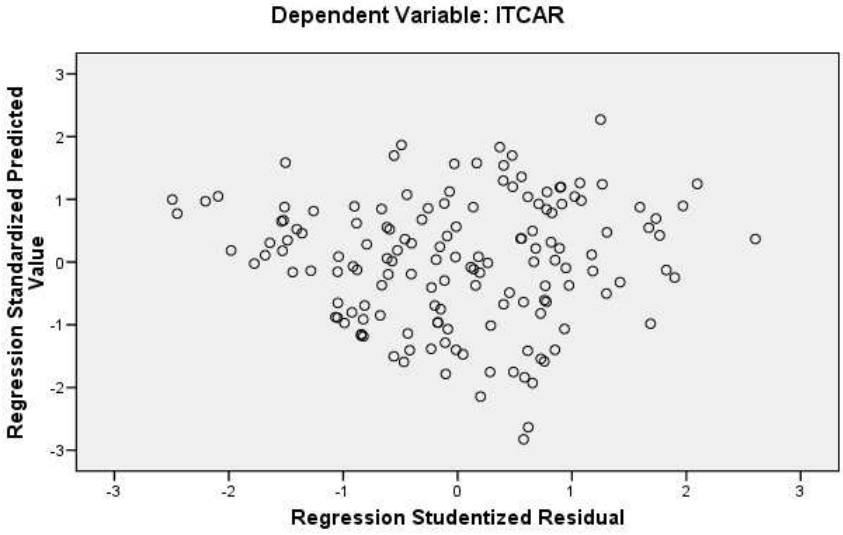


Table F.4: Regression 3: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Subjects in Matric (COMPMATRIC)	0.803	1.245
Hours per Day of Computer Use (HRPERDAY)	0.929	1.077
Computer Self-Efficacy (CSE)	0.610	1.639
Computer Liking (CL)	0.739	1.353
Computer Anxiety (CA)	0.793	1.260

Regression 4: CSE, CL and CA on PTR

Figure F.23: Residual Plot of PTR vs. CSE, CL and CA

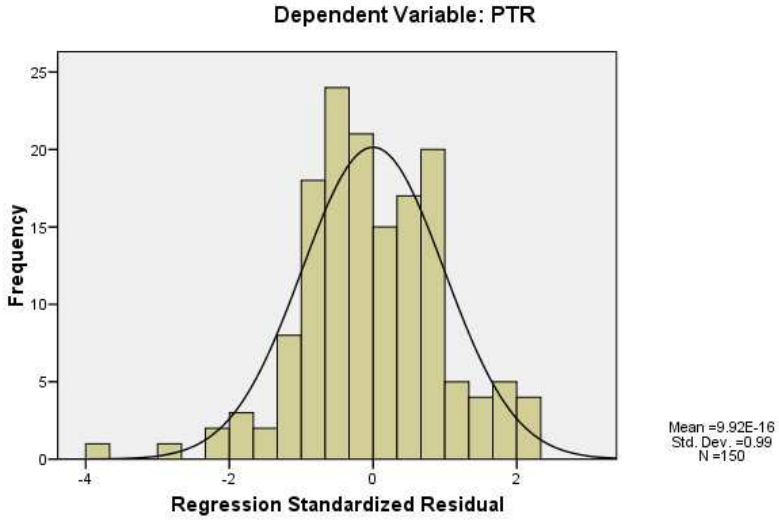


Figure F.24: Histogram of PTR vs. CSE, CL and CA

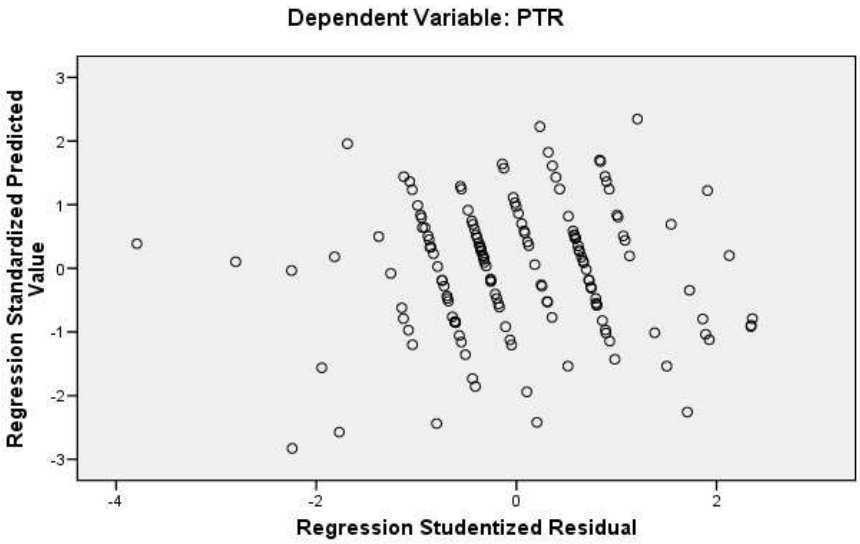


Table F.5: Regression 4: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.687	1.456
Computer Liking (CL)	0.765	1.307
Computer Anxiety (CA)	0.830	1.205

Regression 5: COMPMATRIC, HRPERDAY, NCAT and PCAT on ITCAR

Figure F.25: Residual Plot of ITCAR vs. COMPMATRIC, HRPERDAY, NCAT and PCAT

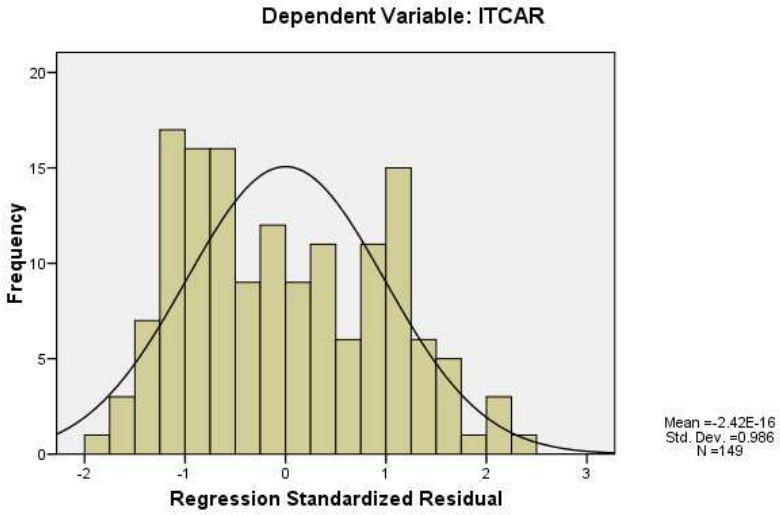


Figure F.26: Histogram of ITCAR vs. COMPMATRIC, HRPERDAY, NCAT and PCAT

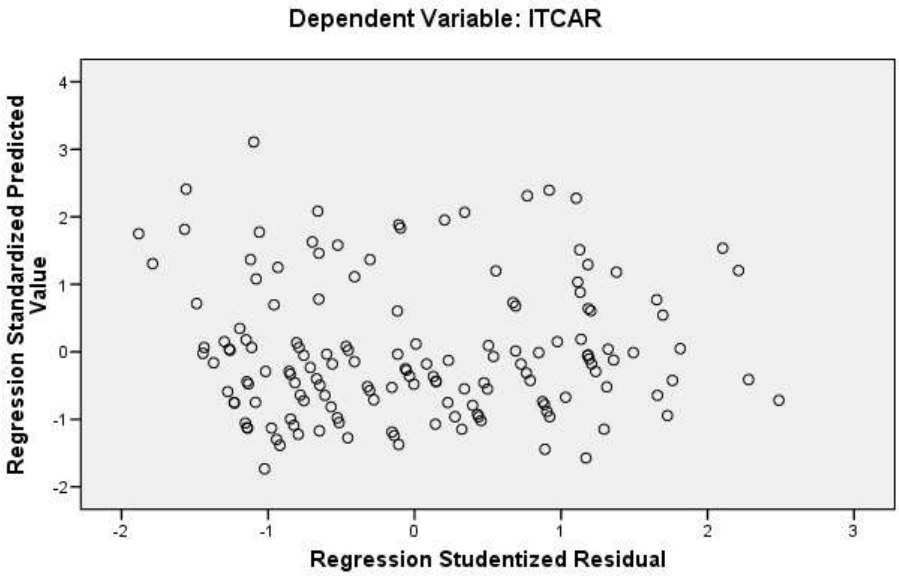


Table F.6: Regression 5: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Subjects in Matric (COMPMATRIC)	0.949	1.054
Hours per Day of Computer Use (HRPERDAY)	0.899	1.112
Negative Computer Attitude (NCAT)	0.987	1.013
Positive Computer Attitude (PCAT)	0.934	1.071

Regression 6: NCAT and PCAT on PTR

Figure F.27: Residual Plot of PTR vs. NCAT and PCAT

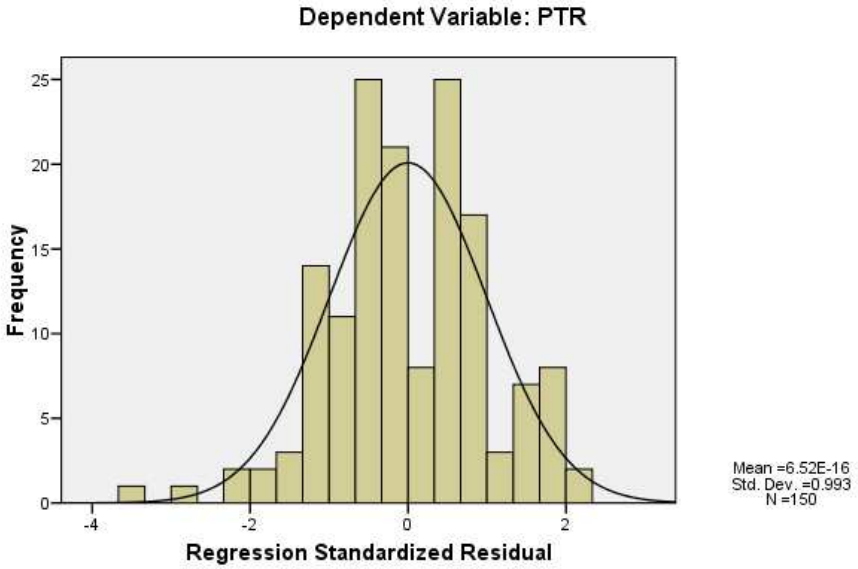


Figure F.28: Histogram of PTR vs. NCAT and PCAT

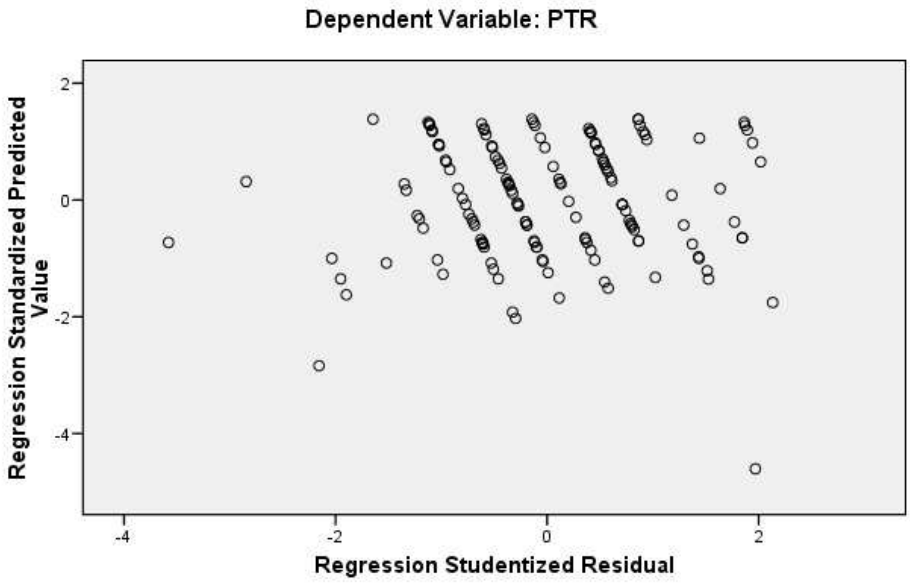


Table F.7: Regression 6: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Negative Computer Attitude (NCAT)	0.988	1.012
Positive Computer Attitude (PCAT)	0.988	1.012

Regression 7: COMPMATRIC, HRPERDAY, CSE, CL, CA, NCAT and PCAT on ITCAR

Figure F.29: Residual Plot of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL, CA NCAT and PCAT

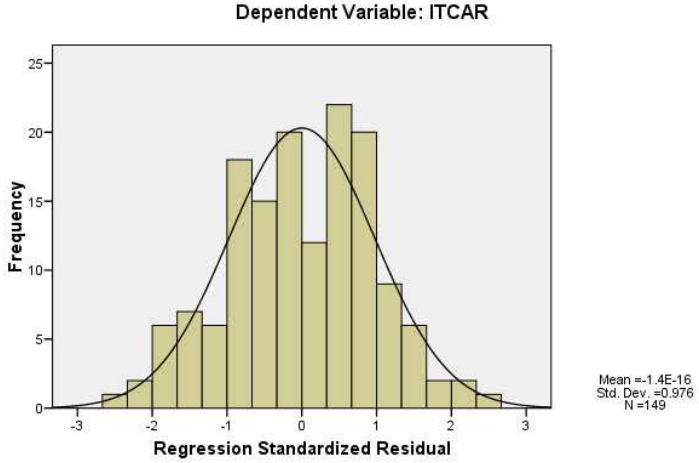


Figure F.30: Histogram of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL, CA NCAT and PCAT

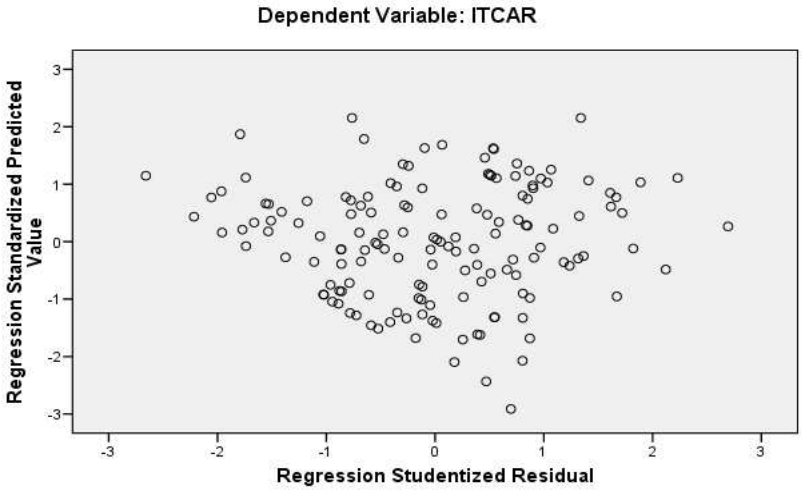


Table F.8: Regression 7: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Subjects in Matric (COMPMATRIC)	0.795	1.258
Hours per Day of Computer Use (HRPERDAY)	0.889	1.125
Computer Self-Efficacy (CSE)	0.594	1.684
Computer Liking (CL)	0.734	1.363
Computer Anxiety (CA)	0.737	1.356
Negative Computer Attitude (NCAT)	0.903	1.108
Positive Computer Attitude (PCAT)	0.870	1.149

Regression 8: CSE, CL, CA, NCAT and PCAT on PTR

Figure F.31: Residual Plot of PTR vs. CSE, CL, CA, NCAT and PCAT

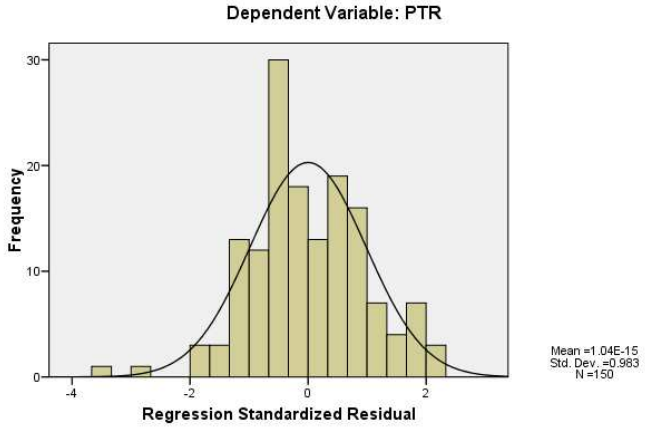


Figure F.32: Histogram of PTR vs. CSE, CL, CA, NCAT and PCAT

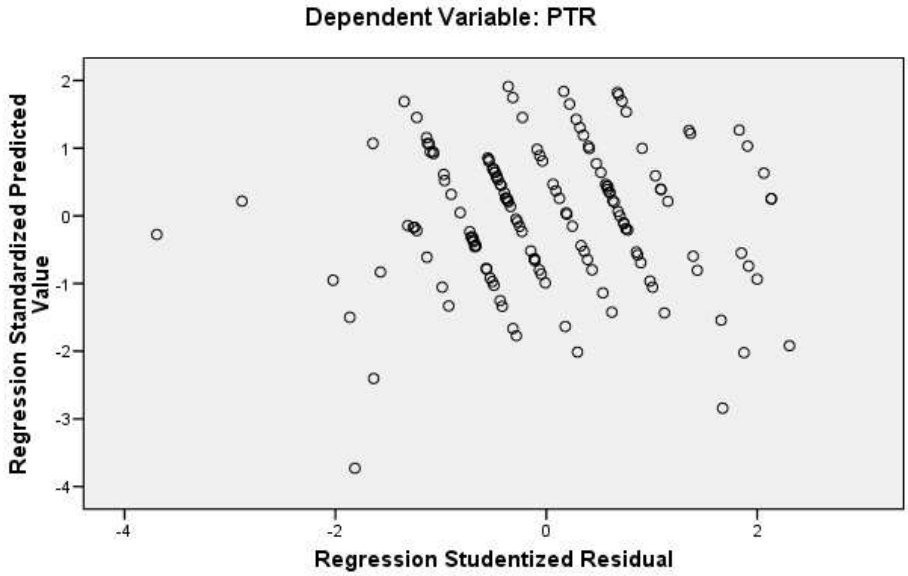


Table F.9: Regression 8: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.661	1.513
Computer Liking (CL)	0.759	1.318
Computer Anxiety (CA)	0.774	1.291
Negative Computer Attitude (NCAT)	0.905	1.105
Positive Computer Attitude (PCAT)	0.910	1.099

APPENDIX G
DATA ANALYSES FOR MALE SAMPLE

The male sample consisted of 113 valid cases. This appendix presents the detailed data analyses on the male sample.

Reliability and Validity

The reliability and validity analyses for the male sample are presented below. The techniques described on page 30 and 31 were used.

Principal Components Factor Analysis (PCA) Results:

Table G.1: Computer Training

	Component		
	Quantity of Computer Training	**Quality of Computer Training**	**Effectiveness of Computer Training**
QTYCT1	0.813		
QTYCT2	0.834		
QLICT3		- 0.672	0.362
QLICT4		0.765	
QLICT5			0.622
QLICT7			0.900
QLICT8			0.856
QLICT9			0.803

As with the female sample, Quantity of Computer Training, a single factor emerged with a Cronbach Alpha score of $\alpha = 0.58$. However unlike the female sample, items loaded differently on the Quality of Computer Training and Effectiveness of Computer Training dimensions. For the female sample Quality of Computer Training (QLICT) consisted of QLICT3, QLICT4 and QLICT5, and Effectiveness of Computer Training (EFFCT) consisted of QLICT7, QLICT8 and QLICT9. However QLICT and EFFCT will still be considered as single factors in order to compare the female and male samples. The male sample Cronbach Alpha score of the single factors for QLICT is $\alpha = 0.184$ and EFFCT is $\alpha = 0.780$.

Table G.2: Computer Self-Efficacy

	Components	
	Intermediate Activities	**Advance Activities**
CSE4	0.733	
CSE5	0.495	0.596
CSE6	0.817	
CSE7	0.787	
CSE8		0.808
CSE9		0.768
CSE10		0.563

Two factors emerged for the male sample. This indicates that male students are able to differentiate between intermediate and advanced computer skills. Whereas in the female sample, Computer Self-efficacy emerged as a single factor. However Computer Self-efficacy will still be considered as a single factor in order to compare the female and male samples, the Cronbach Alpha score of the single factor for the male sample is $\alpha = 0.72$.

Table G.3: Computer Anxiety

	Components	
	Computer Liking	**Computer Anxiety**
CA1	0.799	
CA2	0.799	
CA3	0.801	
CA5	0.855	
CA6		0.692
CA7		0.851
CA8		0.436
CA9		0.881
CA10		0.655
CA11		0.626

As with the female sample, a single factor emerged, for Computer Liking with a Cronbach Alpha score of $\alpha = 0.84$, and for Computer Anxiety with a Cronbach Alpha score of $\alpha = 0.80$.

Table G.4: Computer Attitude

	Components	
	Negative	**Positive**
CAT1	0.733	
CAT2	0.859	
CAT3	0.619	
CAT4		0.710
CAT5		0.826
CAT6		0.812
CAT7		0.740
CAT8		0.562

As with the female sample, a single factor emerged, for Positive Computer Attitude with a Cronbach Alpha score of $\alpha = 0.79$, and for Negative Computer Attitude with a Cronbach Alpha score of $\alpha = 0.59$. The slightly low loading for CAT8 was not enough cause for concern.

Table G.5: Intention to Select an IT Career

	Components	
	IT Career Interest	**Perceived Tangible Rewards**
INTS1	0.875	
INTS2	0.880	
INTS3	0.876	
INTS4	0.518	
INTS5	0.824	
INTS6	0.753	
INTS7	0.546	
INTS8		0.830
INTS9		0.830

As with the female sample, a single factor emerged, for IT Career Interest with a Cronbach Alpha score of $\alpha = 0.80$, and for Perceived Tangible Rewards with a Cronbach Alpha score of $\alpha = 0.65$. Although INTS4 and INTS7 are below 0.6, the items were retained, in addition INTS7 loaded on IT career interest whereas in the female sample it loaded onto Perceived Tangible Rewards in order to compare the female and male samples Perceived Tangible Rewards in the male sample was consider to consist of INTS7, INTS8 and INTS9.

Control Variables

Prior to the research hypotheses testing, it was necessary to determine whether any of the demographic variables should be added as controls. The following variables in Table G.6 were tested in order to determine as to whether any relationships with the dependant variables (ITCAR and PTR) exist. Results indicated that only Computer Subject in Matric effects ITCAR, however Hours per Day of Computer Use will also be included in the multiple analysis as a control, for comparative reasons between females and males.

Table G.6: Demographic Variables as Controls

Control	Test Conducted	ITCAR	PTR
Age	Spearman Correlation	n/s	n/s
Computer Subjects in Matric	Mann-Whitney Test [g]	n/s	n/s
Ownership of a Computer	Independent Samples t-test	n/s	n/s
Regular and Ease of Computer Access	Independent Samples t-test	n/s	n/s
Hours per Day of Computer Use	Pearson Correlation	$p < 0.05$	n/s
Years of Computer Experience	Pearson Correlation	n/s	n/s

ITCAR = IT Career Interest; PTR = Perceived Tangible Reward

n/s = Not Significant

[g] Mann-Whitney Test was used because Levene's Test was significant

Correlation Matrix[7]

Following reliability and validity assessment as presented above, the composite scores of each variable was then calculated as the arithmetic average of the relevant items weighted equally. These composite scores for the variables were used in subsequent analyses. The correlation matrix presented in Table G.7 below, shows the correlation coefficients between all the independent and dependant variables. The level of significance of each correlation coefficient is also indicated. The square root of the variables AVE are presented for each variable on the diagonal of the matrix.

Table G.7: Correlation Matrix

	QTYCT	QLICT	EFFCT	CSE	CL	CA	PCAT	NCAT	ITCAR	PTR
QTYCT	0.58									
QLICT	0.283**	0.60								
EFFCT	0.204*	0.426**	0.74							
CSE	0.171	0.147	0.175	0.72						
CL	0.159	0.274**	0.656**	0.274**	0.81					
CA	-0.215*	-0.164	-0.189*	-0.383**	-0.178*	0.80				
PCAT	-0.011	-0.103	-0.053	0.073	0.158	-0.091	0.77			
NCAT	0.268**	0.025	0.025	-0.287**	0.042	0.159	0.031	0.64		
ITCAR	0.168	0.149	0.521**	0.258**	0.561**	-0.196*	0.137	-0.060	0.89	
PTR	0.102	0.052	0.328**	0.022	0.341**	0.064	0.174	-0.073	0.507**	0.65

QTYCT = Quantity of Computer Training, QLICT = Quality of Computer Training, EFFCT = Effectiveness of Computer Training, CSE = Computer Self-Efficacy, CL = Computer Liking, CA = Computer Anxiety, NCAT = Negative Computer Attitude, PCAT = Positive Computer Attitude, ITCAR = IT Career Interest; PTR = Perceived Tangible Rewards

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

[7] Pearson Product Moment Correlation was used. All variables measured on interval scale and were found to be normally distributed.

Results of Hypotheses H1a – H3c

Hypotheses H1a – H3c were tested with reference to the above correlation matrix (see Table G.7 above).

Hypothesis 1a - the influence of Quantity of Computer Training on Computer Self-Efficacy

The correlation between QTYCT and CSE yields a r-value of 0.171 which is not significant (see Table G.7). H1a is thus not supported: QTYCT is not associated with and does not significantly influence CSE. In this study quantity of computer training does not relate to ones level of computer self-efficacy.

Hypothesis 1b – the influence of Quality of Computer Training on Computer Self-Efficacy

The correlation between QLICT and CSE yields a r-value of 0.147 which is not significant (see Table G.7). H1b is thus not supported: QLICT is not associated with and does not significantly influence CSE. In this study quality of computer training does not relate to ones level of computer self-efficacy.

Hypothesis 1c – the influence of Effectiveness of Computer Training on Computer Self-Efficacy

The correlation between EFFCT and CSE yields a r-value of 0.175 which is not significant (see Table G.7). H1c is thus not supported: EFFCT is not associated with and does not significantly influence CSE. In this study effectiveness of computer training does not relate to ones level of computer self-efficacy.

Hypothesis 2a – the influence of Quantity of Computer Training on Computer Liking

The correlation between QTYCT and CL yields a r-value of 0.159 is not significant (see Table G.7). H2a is thus not supported: QTYCT is not associated with and does not significantly influence CL. In this study quantity of computer training does not relate to ones level of computer liking.

Hypothesis 2b – the influence of Quality of Computer Training on Computer Liking

The correlation between QLICT and CL yields a r-value of 0.274 which is significant at $p<0.01$ level (see Table G.7). H2b is thus supported: QLICT is associated with and significantly influences CL. Therefore greater quality of computer training is associated with higher levels of computer liking.

Hypothesis 2c – the influence of Effectiveness of Computer Training on Computer Liking

The correlation between EFFCT and CL yields a r-value of 0.656 which is significant at $p<0.01$ level (see Table G.7). H2c is thus supported: EFFCT is associated with and significantly influences CL. Therefore greater effectiveness of computer training is associated with higher levels of computer liking.

Hypothesis 3a – the influence of Quantity of Computer Training on Computer Anxiety

The correlation between QTYCT and CA yields a r-value of -0.215 which is significant at $p<0.05$ (see Table G.7). H3a is thus supported: QTYCT has an association with CA and does significantly influence CA. Therefore greater quantity of computer training is associated with lower levels of computer anxiety.

Hypothesis 3b – the influence of Quality of Computer Training on Computer Anxiety

The correlation between QLICT and CA yields a r-value of -0.164 which is not significant (see Table G.7). H3b is thus not supported: QLICT is not associated with and does not significantly influences CA. In this study quality of computer training does not relate to ones level of computer anxiety.

Hypothesis 3c – the influence of Effectiveness of Computer Training on Computer Anxiety

The correlation between EFFCT and CA yields a r-value of -0.189 which is significant at $p<0.05$ level (see Table G.7). H3c is thus supported: EFFCT is associated with and significantly influences CA. Therefore greater effectiveness of computer training is associated with higher levels of computer anxiety.

Hypothesis 4a – 9b were tested through multiple regression, and results are presented next.

Multiple Regression for Hypotheses H4a to H9b

Testing For Multiple Regression Assumptions

Before being confident to interpret the multiple regression analyses, certain assumptions were tested, namely normality, linearity, homoscedasticity, and multicollinearity. Next are the results of these multiple regression assumptions.

Testing for Normality Assumption

In order to test for normality skewness and kurtosis values of each variable were analysed which is recommend by Hair et al. (2006). Majority of statical values were between +/- 1 thus skewness was considered to be acceptable (see Table G.8 below). Kurtosis was also largely acceptable with only quantity of computer training and positive computer attitude having peaked distributions. Hours per day of computer use, with a mean (1.69), is not surprising as given that 75% of students selected 2 to 3 hours. Therefore despite the little variance, hours per day of computer use is considered normal. Positive computer attitude, with a high mean (4.15), is also acceptable as most students indicated that they have good attitudes towards computers. Hence positive computer attitude despite the little variance is also considered normal. Therefore, all variables are normal, such that multiple regression can be performed to test a number of hypotheses.

Table G.8: Skewness, Kurtosis and Normality Tests

Variable Name	Shape Descriptors	
	Skewness	**Kurtosis**
Hours per Day of Computer Use (HRPERDAY)	2.091	9.913
Computer Self-Efficacy (CSE)	0.002	-0.570
Computer Liking (CL)	-0.921	0.280
Computer Anxiety (CA)	1.235	0.916
Negative Computer Attitude (NCAT)	0.022	-0.451
Positive Computer Attitude (PCAT)	-0.976	2.732
IT Career Interest (ITCAR)	0.610	-0.292
Perceived Tangible Rewards (PTR)	-0.346	0.930

Testing for Linearity Assumption

In order to test the assumption of linearity, scatter plots were examined. Figures G.1 – G.16 below illustrate scatter plots for all relationships between dependent and independent variables. The scatter plots indicate little need for concern around the existence of nonlinear or curvilinear relationships. Therefore the assumption of linearity is not violated.

Figure G.1: Scatter plot of NCAT vs. CSE

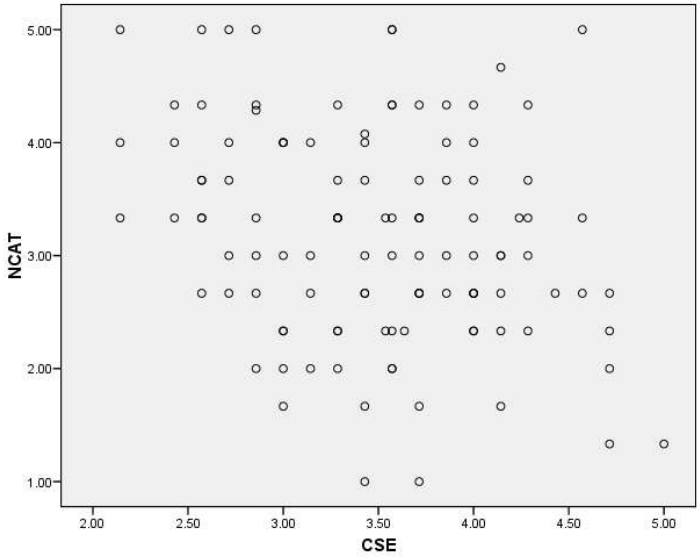


Figure G.2: Scatter plot of NCAT vs. CL

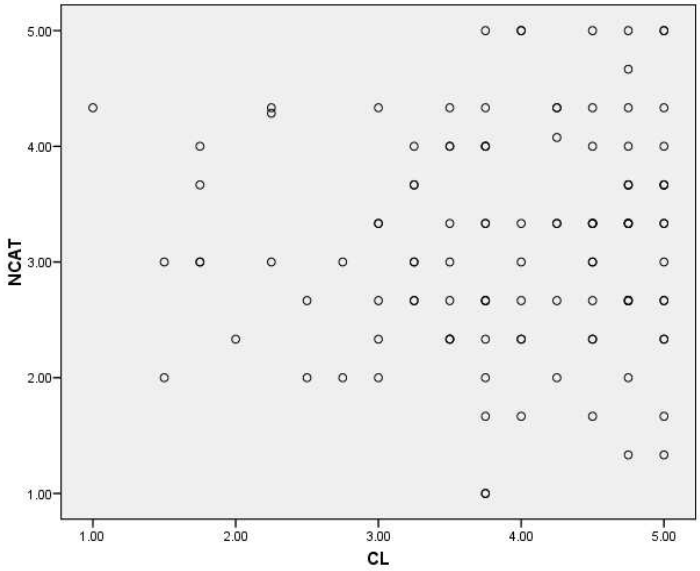


Figure G.3: Scatter plot of NCAT vs. CA

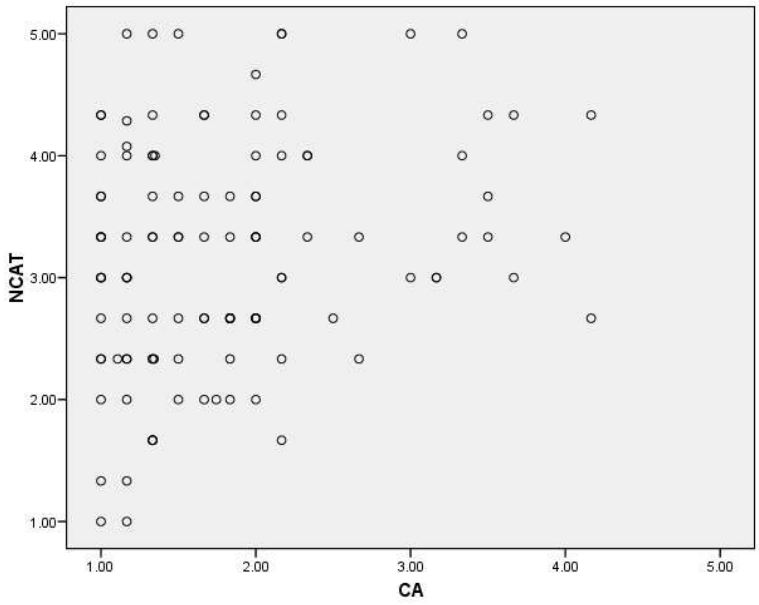


Figure G.4: Scatter plot of PCAT vs. CSE

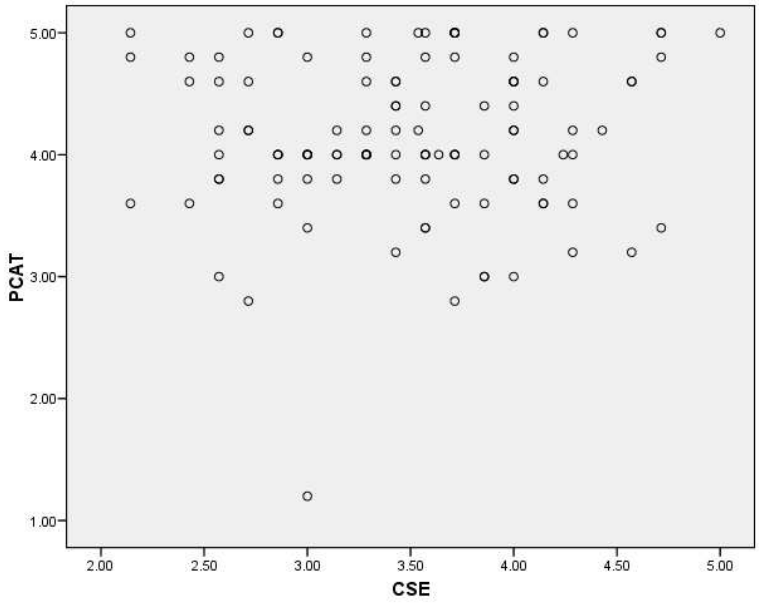


Figure G.5: Scatter plot of PCAT vs. CL

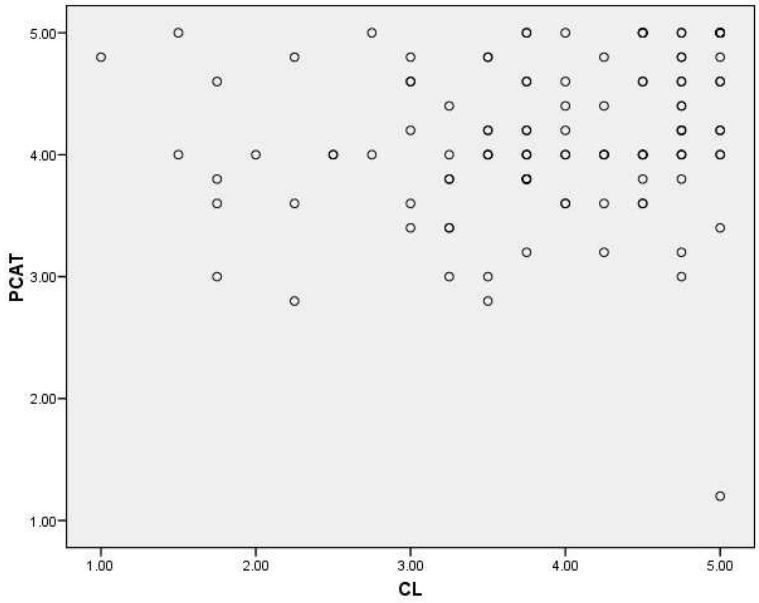


Figure G.6: Scatter plot of PCAT vs. CA

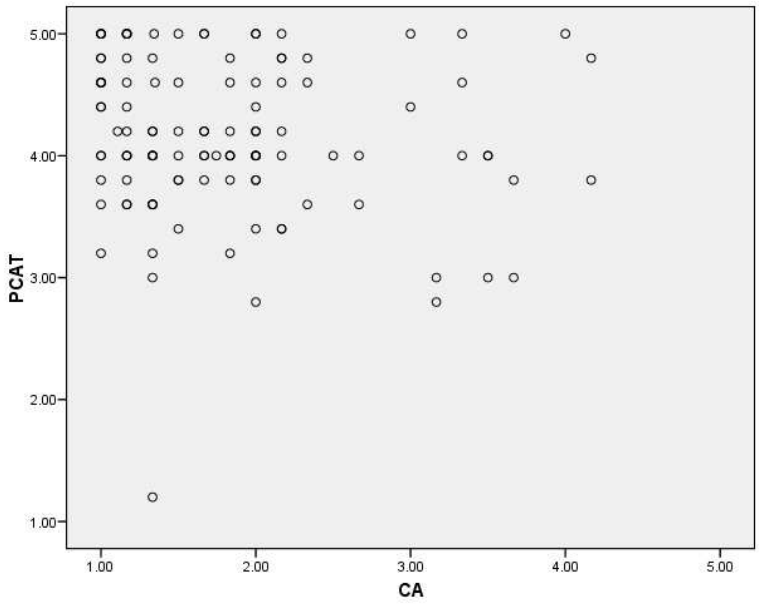


Figure G.7: Scatter plot of ITCAR vs. CSE

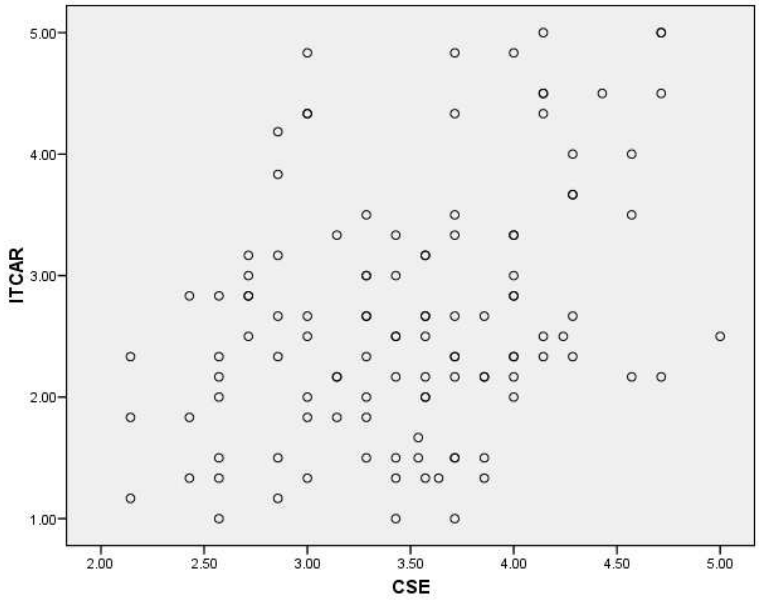


Figure G.8: Scatter plot of ITCAR vs. CL

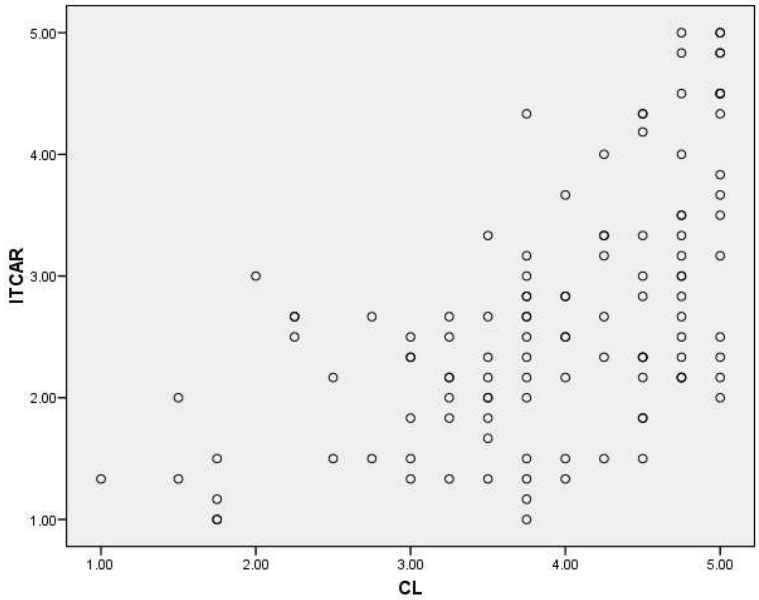


Figure G.9: Scatter plot of ITCAR vs. CA

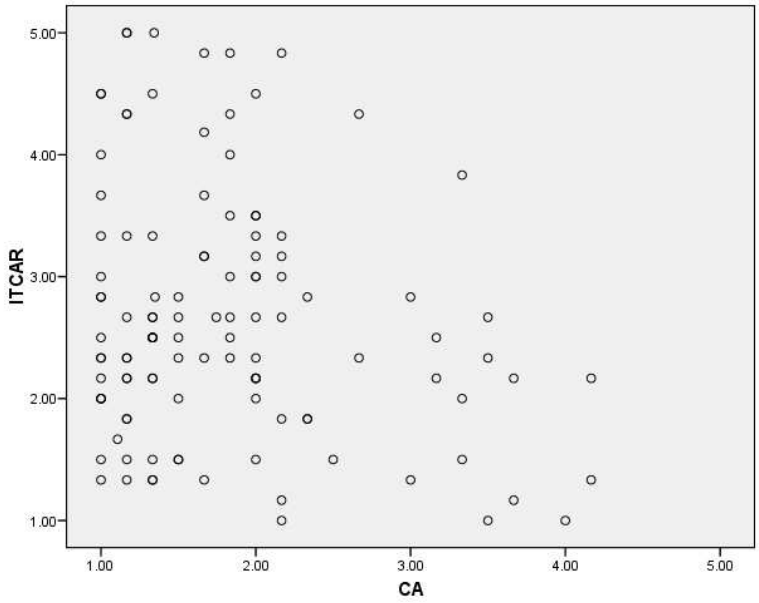


Figure G.10: Scatter plot of PTR vs. CSE

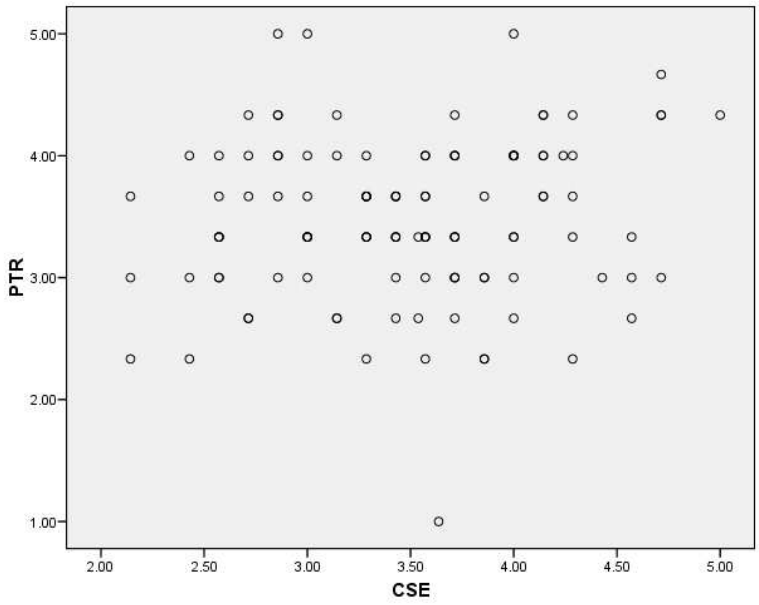


Figure G.11: Scatter plot of PTR vs. CL

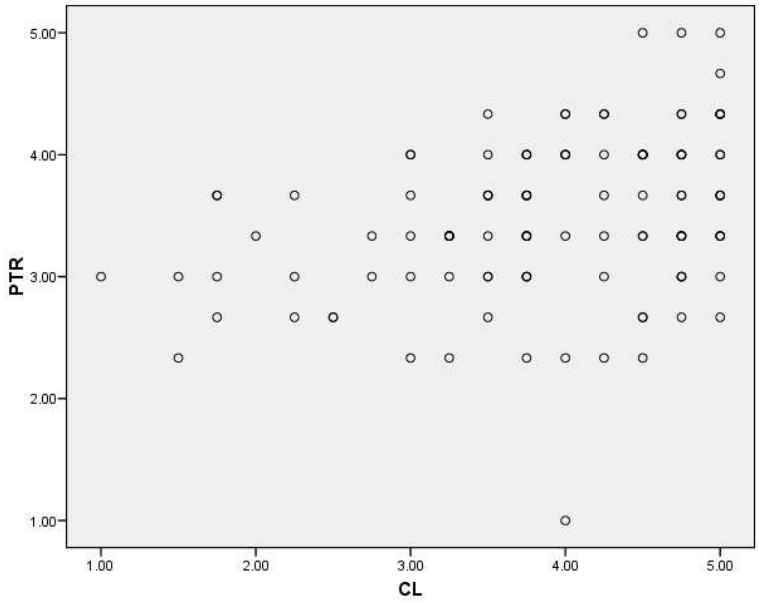


Figure G.12: Scatter plot of PTR vs. CA

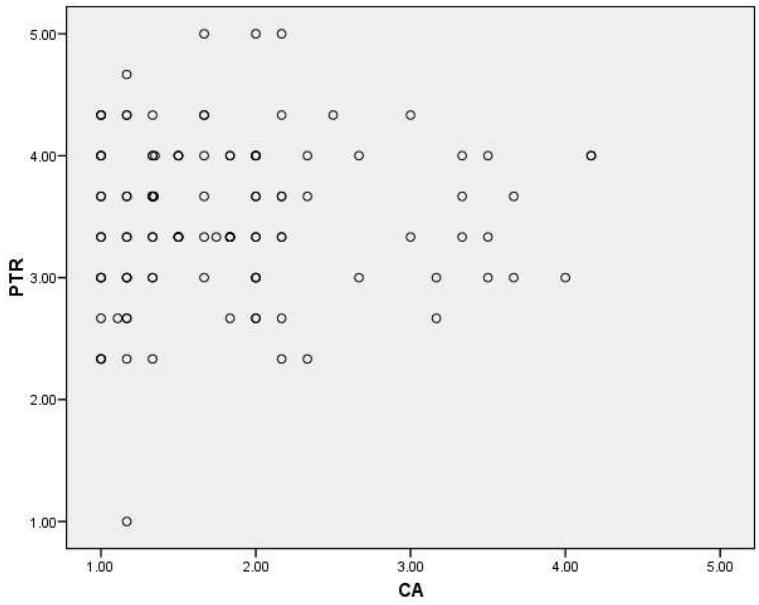


Figure G.13: Scatter plot of ITCAR vs. NCAT

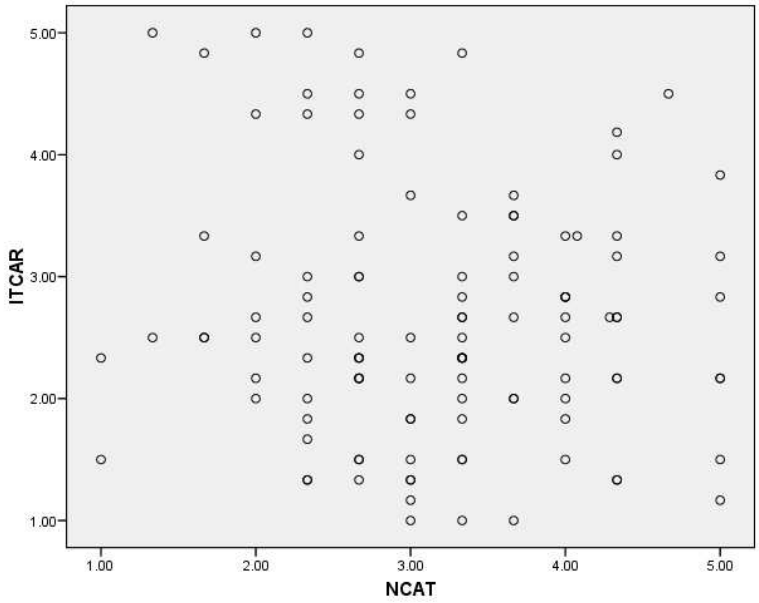


Figure G.14: Scatter plot of ITCAR vs. PCAT

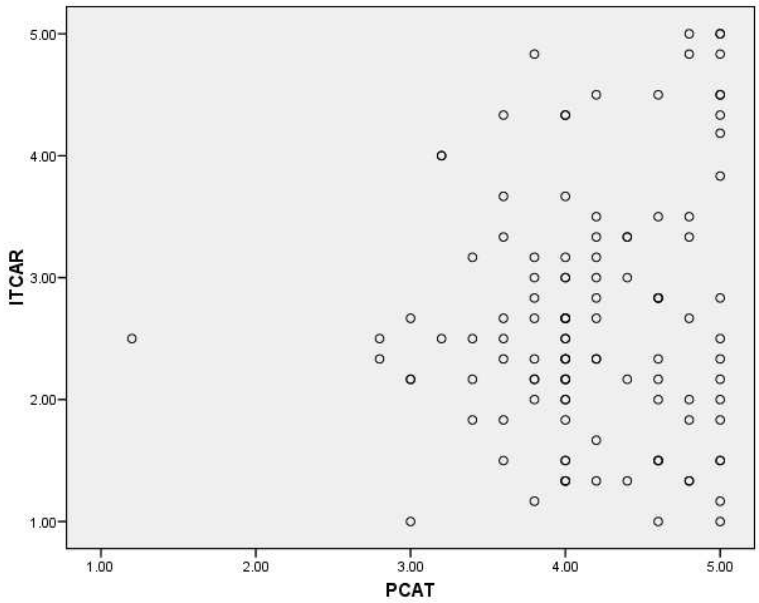


Figure G.15: Scatter plot of PTR vs. NCAT

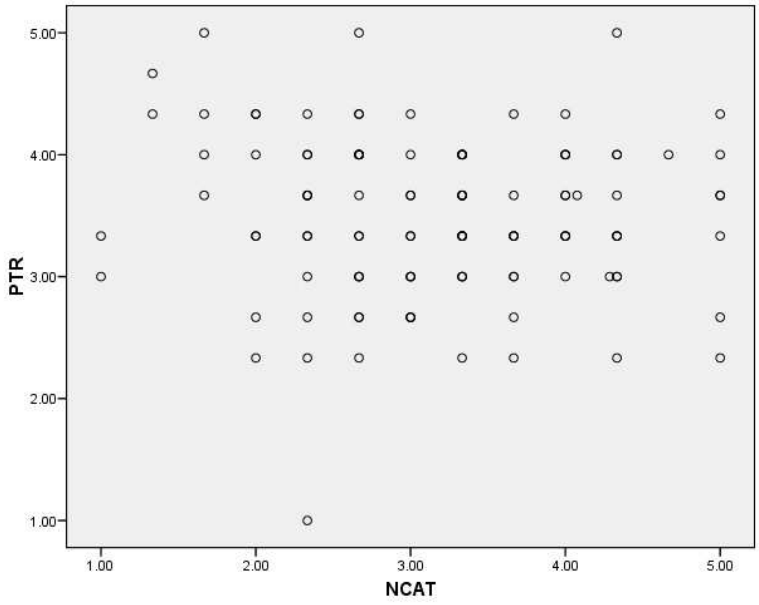
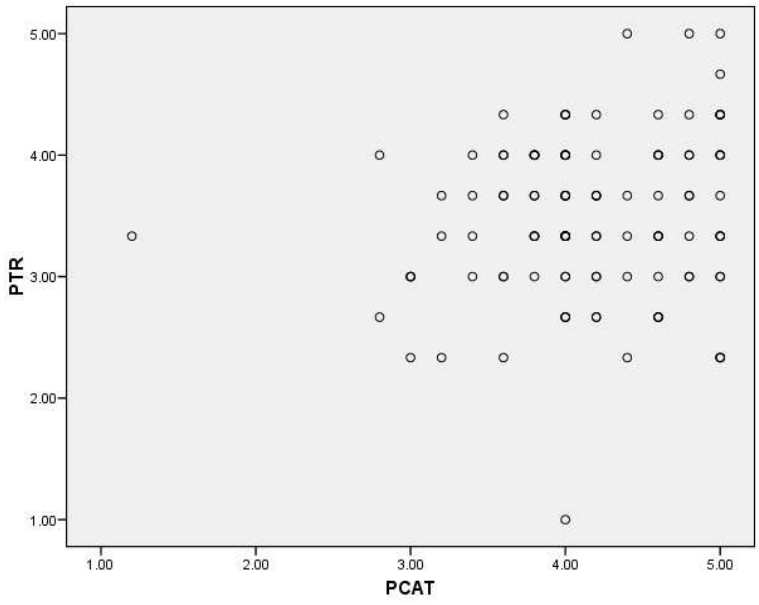


Figure G.16: Scatter plot of PTR vs. PCAT



Testing for Homoscedasticity and Multicollinearity Assumptions

The assumption of homoscedasticity was tested, by plotting residual for all the variables in each multiple regression analysis. Figures G.17 – G.32 presented next plots the standardized predicted values (dependent variables) against the studentized residuals (independent variables) and illustrates the distribution of the residuals in the form of histograms (see Hair et al., 2006, p. 251). The plots and histograms indicate little need for concern around the existence of patterns. Thus all plots can be classified as a null plot, where the residuals fall randomly and exhibit an equal dispersion around zero, with no strong leaning to be greater or less than zero. Therefore, the assumption of homoscedasticity has not been violated.

In order to test for multicollinearity this study used a cut-off threshold of 0.1 for tolerance, and thus the cut-off for its inverse, VIF, 10 is used (Hair et al., 2006). Therefore tolerance should be close to 1.0 and VIF close to 0. Tables G.9 – G.16 presented next shows the tolerance and VIF for each independent variable in each multiple regression analysis. Tables G.9 – G.16 presents results which indicate that there are no concerns over collinearity; and coupled with the correlations results shown in Table G.7, there is no reason to be concerned about the effects of collinearity in this regression model. Therefore, the assumption of multicollinearity has not been violated, and all variables met the assumptions of multiple regression. Results of homoscedasticity and multicollinearity testing are presented next under each multiple regression analysis.

Regression 1: CSE, CL and CA on NCAT

Figure G.17: Residual Plot of NCAT vs. CSE, CL and CA

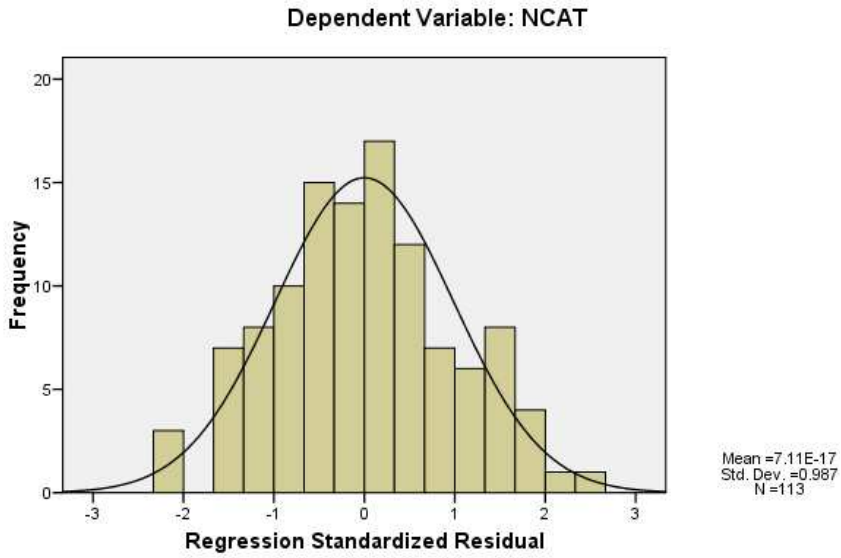


Figure G.18: Histogram of NCAT vs. CSE, CL and CA

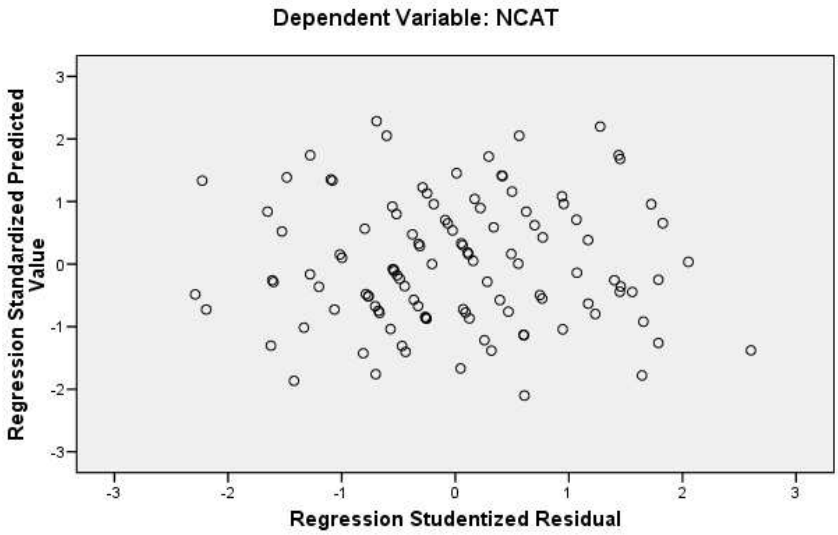


Table G.9: Regression 1: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.808	1.237
Computer Liking (CL)	0.903	1.108
Computer Anxiety (CA)	0.851	1.175

Regression 2: CSE, CL and CA on PCAT

Figure G.19: Residual Plot of PCAT vs. CSE, CL and CA

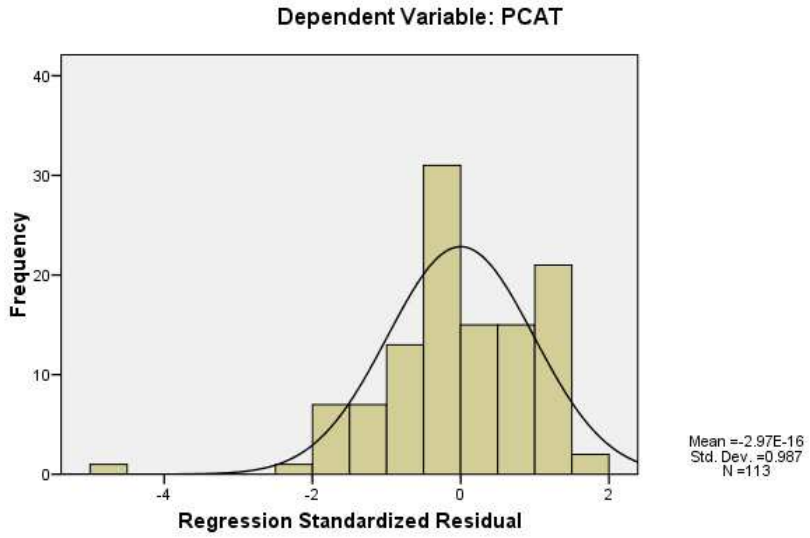


Figure G.20: Histogram of PCAT vs. CSE, CL and CA

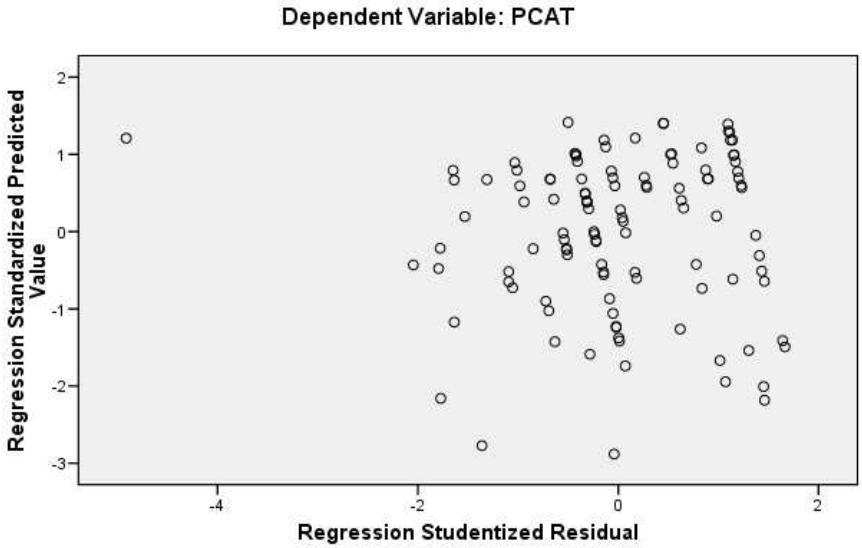


Table G.10: Regression 2: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.808	1.237
Computer Liking (CL)	0.903	1.108
Computer Anxiety (CA)	0.851	1.175

Regression 3: COMPMATRIC, HRPERDAY, CSE, CL and CA on ITCAR

Figure G.21: Residual Plot of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL and CA

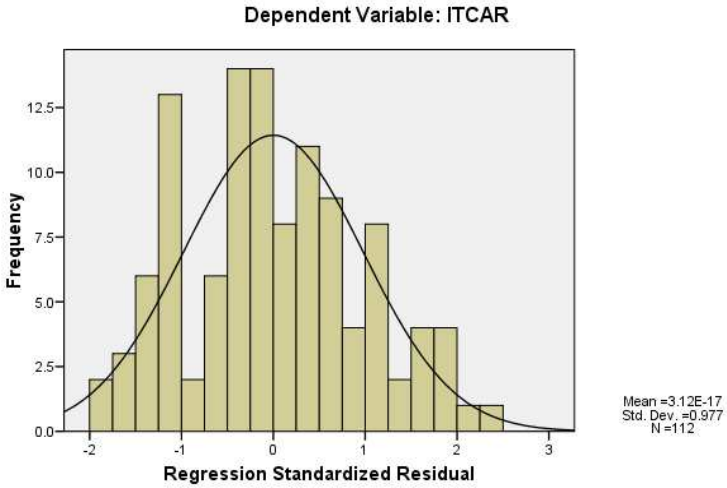


Figure G.22: Histogram of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL and CA

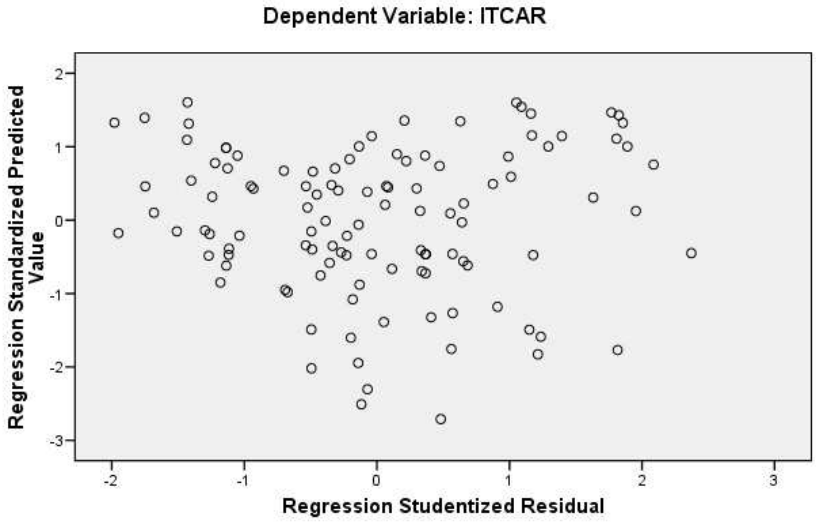


Table G.11: Regression 3: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Subjects in Matric (COMPMATRIC)	0.847	1.181
Hours per Day of Computer Use (HRPERDAY)	0.927	1.079
Computer Self-Efficacy (CSE)	0.677	1.476
Computer Liking (CL)	0.905	1.104
Computer Anxiety (CA)	0.839	1.191

Regression 4: CSE, CL and CA on PTR

Figure G.23: Residual Plot of PTR vs. CSE, CL and CA

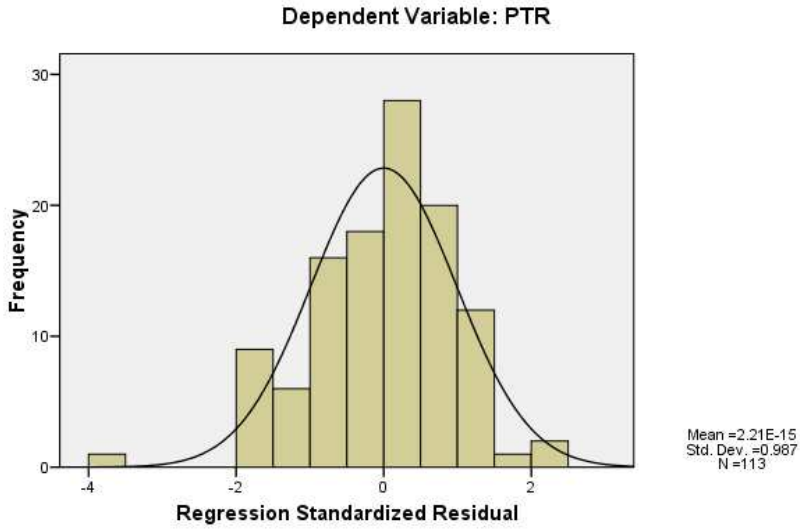


Figure G.24: Histogram of PTR vs. CSE, CL and CA

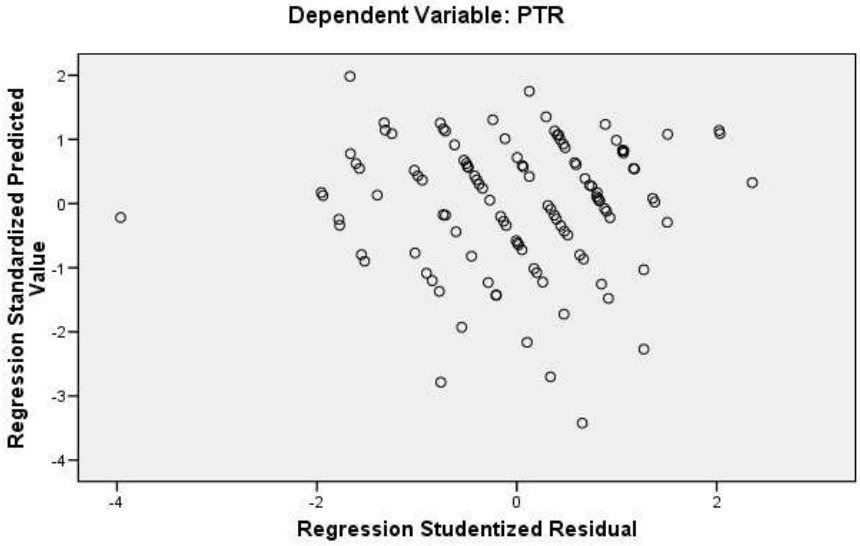


Table G.12: Regression 4: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.808	1.237
Computer Liking (CL)	0.903	1.108
Computer Anxiety (CA)	0.851	1.175

Regression 5: COMPMATRIC, HRPERDAY, NCAT and PCAT on ITCAR

Figure G.25: Residual Plot of ITCAR vs. COMPMATRIC, HRPERDAY, NCAT and PCAT

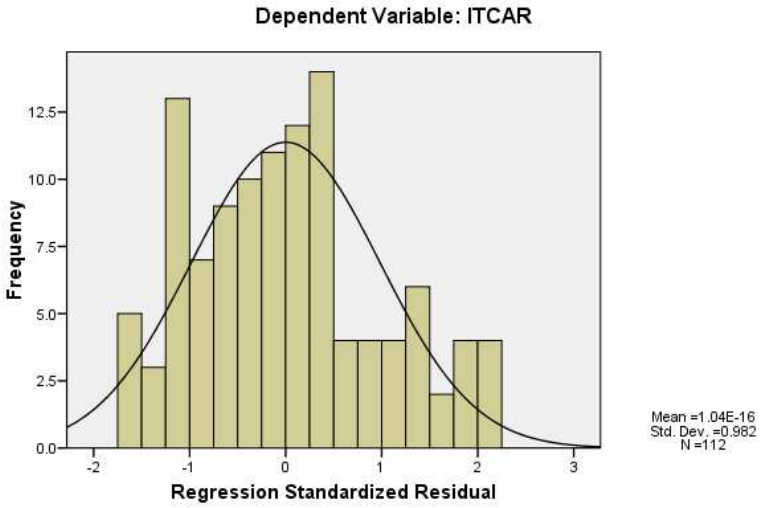


Figure G.26: Histogram of ITCAR vs. COMPMATRIC, HRPERDAY, NCAT and PCAT

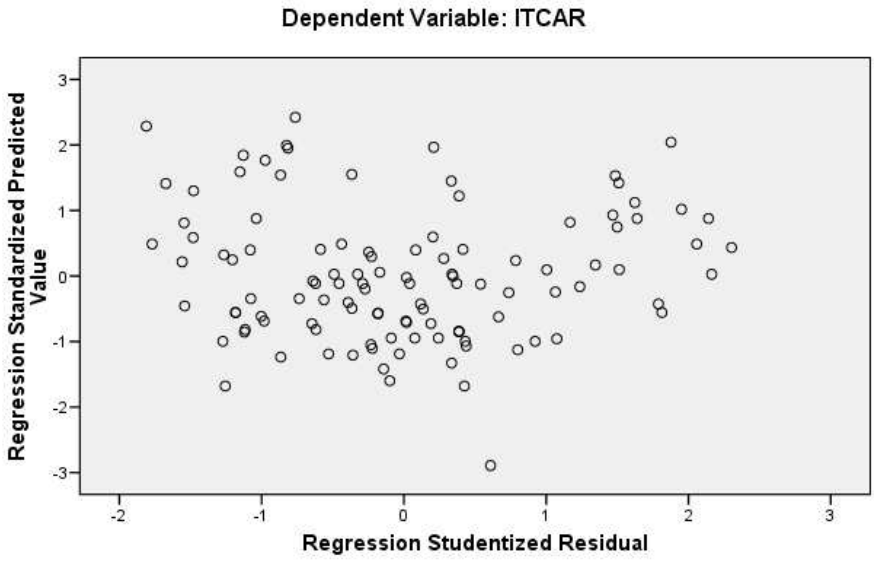


Table G.13: Regression 5: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Subjects in Matric (COMPMATRIC)	0.960	1.042
Hours per Day of Computer Use (HRPERDAY)	0.952	1.050
Negative Computer Attitude (NCAT)	0.966	1.036
Positive Computer Attitude (PCAT)	0.958	1.044

Regression 6: NCAT and PCAT on PTR

Figure G.27: Residual Plot of PTR vs. NCAT and PCAT

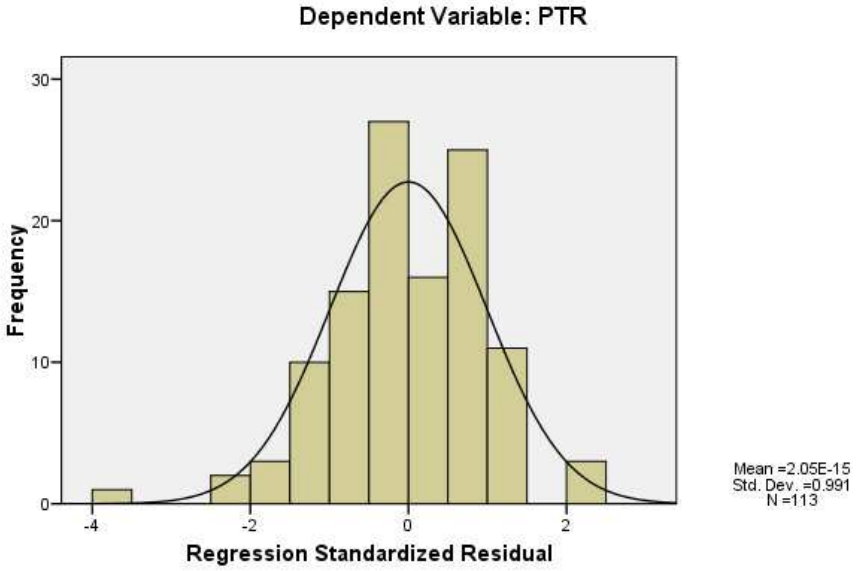


Figure G.28: Histogram of PTR vs. NCAT and PCAT

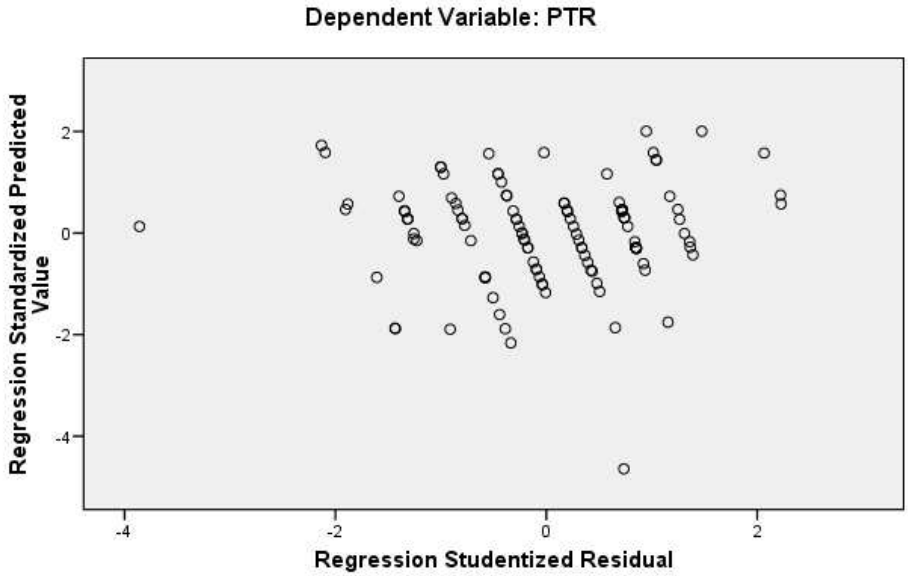


Table G.14: Regression 6: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Negative Computer Attitude (NCAT)	0.998	1.002
Positive Computer Attitude (PCAT)	0.998	1.002

Regression 7: COMPMATRIC, HRPERDAY, CSE, CL, CA, NCAT and PCAT on ITCAR

Figure G.29: Residual Plot of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL, CA NCAT and PCAT

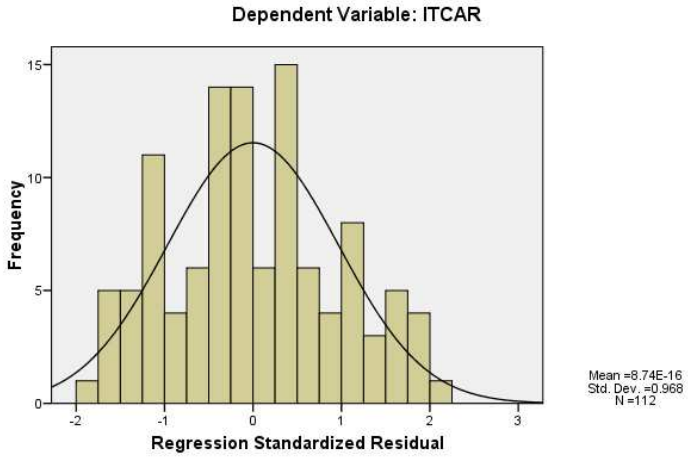


Figure G.30: Histogram of ITCAR vs. COMPMATRIC, HRPERDAY, CSE, CL, CA NCAT and PCAT

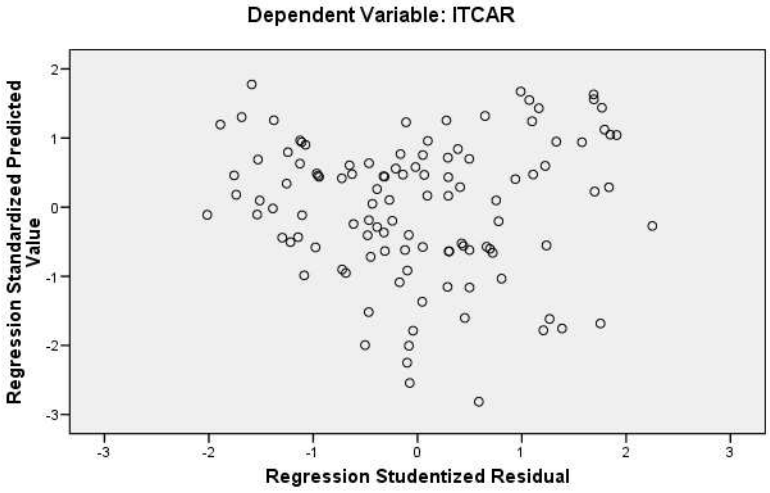


Table G.15: Regression 7: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Subjects in Matric (COMPMATRIC)	0.843	1.186
Hours per Day of Computer Use (HRPERDAY)	0.886	1.129
Computer Self-Efficacy (CSE)	0.639	1.565
Computer Liking (CL)	0.868	1.152
Computer Anxiety (CA)	0.812	1.232
Negative Computer Attitude (NCAT)	0.861	1.162
Positive Computer Attitude (PCAT)	0.933	1.072

Regression 8: CSE, CL, CA, NCAT and PCAT on PTR

Figure G.31: Residual Plot of PTR vs. CSE, CL, CA, NCAT and PCAT

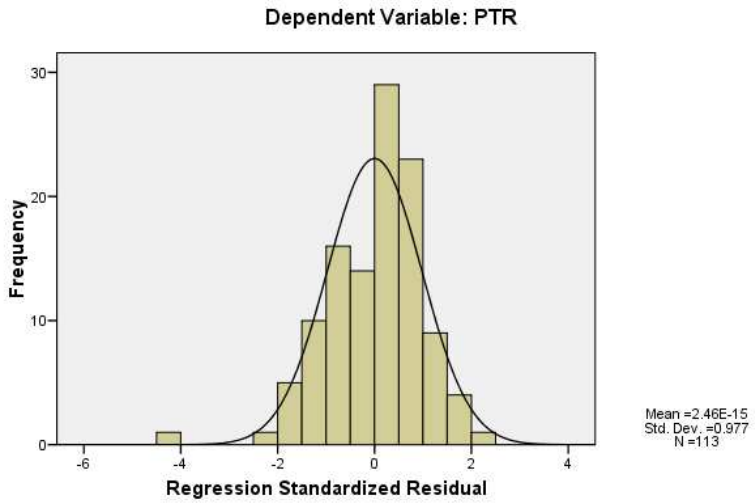


Figure G.32: Histogram of PTR vs. CSE, CL, CA, NCAT and PCAT

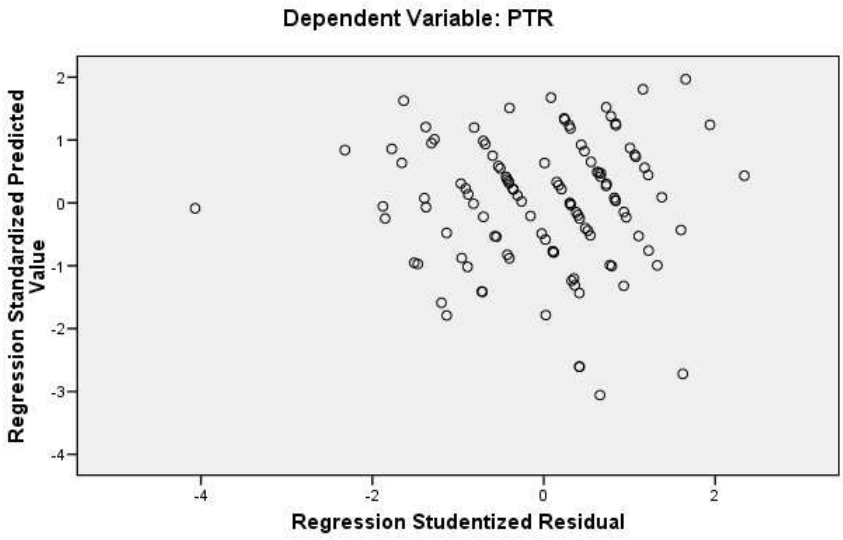


Table G.16: Regression 8: Multicollinearity Test – Tolerance and VIF Values

Variable	Tolerance	VIF
Computer Self-Efficacy (CSE)	0.758	1.320
Computer Liking (CL)	0.865	1.156
Computer Anxiety (CA)	0.822	1.217
Negative Computer Attitude (NCAT)	0.873	1.145
Positive Computer Attitude (PCAT)	0.965	1.036

4.9.1 Results of Hypotheses H4a to H9b

Hypotheses 4a to 9b were tested using multiple regressions analysis. Multiple regressions analysis results are presented in Table G.17 below.

Table G.17: Standardised Betas of Multiple Regression Analyses

Dependent Variables	Regression 1 H4a, H5a, H6a NCAT	Regression 2 H4b, H5b, H6b PCAT	Regression 3 ITCAR	Regression 4 PTR	Regression 5 H7a, H8a ITCAR	Regression 6 H7b, H8b PTR	Regression 7 H9a ITCAR	Regression 8 H9b PTR
Intercept	3.562***	3.933***	-0.440	2.006***	1.951	2.898***	-0.234	1.751**
COMPMATRIC	-	-	0.025	-	0.117	-	0.020	-
HRPERDAY	-	-	0.062	-	0.128	-	0.067	-
CSE	-0.269**	-0.002	0.167	0.072	-	-	0.146	0.037
CL	0.166	0.138	0.503***	0.362***	-	-	0.514***	0.363***
CA	0.166	-0.089	-0.043	0.170	-	-	-0.029	0.205**
NCAT	-	-	-	-	-0.087	-0.075	-0.078	-0.130
PCAT	-	-	-	-	0.092	0.177	0.014	0.144
R^2	0.127	0.031	0.367	0.146	0.056	0.036	0.372	0.179
F	5.128**	1.180	12.296***	6.231**	1.591	2.035	8.819***	4.669**

COMPMATRIC = Computer Subjects in Matric, HRPERDAY = Hours per Day of Computer Use, CSE = Computer Self-Efficacy, CL = Computer Liking, CA = Computer Anxiety, PCAT = Positive Computer Attitude, NCAT = Negative Computer Attitude, ITCAR = IT Career Interest; PTR = Perceived Tangible Reward

* Multiple regression is significant where p<0.05

** Multiple regression is significant where p<0.01

*** Multiple regression is significant where p<0.001

Hypothesis 4a – the influence of Computer Self-efficacy on Negative Computer Attitude

CSE is significantly associated with NCAT (beta = -0.269, p = 0.008) in the male sample. H4a is thus supported: CSE is associated with and/or does significantly influences NCAT. Therefore in this study, computer self-efficacy does have the ability to decrease ones level of negative computer attitude.

Hypothesis 4b – the influence of Computer Self-efficacy on Positive Computer Attitude

CSE is not significantly associated with PCAT (beta = -0.002, p = 0.986) in the male sample. H4b is thus not supported: CSE is also not associated with and/or significantly influences PCAT. Therefore computer self-efficacy in this study did not have the ability to increase ones level of positive computer attitude.

Hypothesis 5a – the influence of Computer Liking on Negative Computer Attitude

CL is not significantly associated with NCAT (beta = 0.166, p = 0.081) in the male sample. H5a is thus not supported: CL is not associated with and/or does not significantly influences NCAT. Therefore in this study computer liking did not have the ability to decrease ones level of negative computer attitude.

Hypothesis 5b – the influence of Computer Liking on Positive Computer Attitude

CL is not significantly associated with PCAT (beta = 0.138, p = 0.168) in the male sample. H5b is thus not supported: CL is not associated with and/or does not significantly influences PCAT. Therefore in this study computer liking did not have the ability to increase ones level of positive computer attitude.

Hypothesis 6a – the influence of Computer Anxiety on Negative Computer Attitude

CA is not significantly associated with NCAT (beta = 0.166, p = 0.090) in the male sample. H6a is thus not supported: CA is not associated with and/or does not significantly influences NCAT. Therefore computer anxiety in this study does not have the ability to increase ones level of negative computer attitude.

Hypothesis 6b – the influence of Computer Anxiety on Positive Computer Attitude

CA is not significantly associated with PCAT (beta = -0.089, p = 0.386) in the male sample. H6b is thus not supported: CA is not associated with and/or does not significantly influences PCAT. Therefore in this study computer anxiety did not have the ability to decrease ones level of positive computer attitude.

Hypothesis 7a – the influence of Negative Computer Attitude on IT Career Interest

NCAT is not significantly associated with ITCAR (beta = -0.087, p = 0.364) in the male sample. H7a is thus not supported: NCAT is not associated with and/or does not significantly influences IT Career Interest. Therefore in this study negative computer attitude did not have the ability to decrease ones level of IT career interest.

Hypothesis 7b – the influence of Negative Computer Attitude on Perceived Tangible Rewards

NCAT is not significantly associated with PTR (beta = -0.075, p = 0.428). H7b is thus not supported: NCAT is not associated with and/or does not significantly influences PTR. Therefore negative computer attitude does not have the ability to decrease ones level of perceived tangible rewards.

Hypothesis 8a – the influence of Positive Computer Attitude on IT Career Interest

PCAT is not significantly associated with ITCAR (beta = 0.092, p = 0.340) in the male sample. H8a is thus not supported: PCAT is not associated with and/or does not significantly influences ITCAR. Therefore positive computer attitude does not have the ability to increase ones level of IT career interest.

Hypothesis 8b – the influence of Positive Computer Attitude on Perceived Tangible Rewards

PCAT is not significantly associated with PTR (beta = 0.177, p = 0.062) in the male sample. H8b is thus not supported: PCAT is not associated with and significantly influences PTR. Therefore in this study positive computer attitude does not have the ability to increase ones level of perceived tangible rewards.

Role of Control Variables

It is important to note that HRPERDAY and COMPMATRIC were not significantly associated with ITCAR.

Hypothesis 9a - the mediating effects of Negative Computer Attitude and Positive Computer Attitude between Computer Self-Efficacy, Computer Liking, Computer Anxiety, and IT Career

Hypothesis 9a stated that NCAT and PCAT would mediate the relationship between the independent variable CSE, CL, CA and the dependent variable ITCAR. In order to prove that NCAT and PCAT mediates the relationship between CSE, CL, CA and ITCAR, the three-step mediation approach suggested by Baron and Kenny (1986) was used:

1. Regress Independent Variables (CSE, CL, CA) on Mediators (NCAT and PCAT)
2. Regress Independent Variables (CSE, CL, CA) on Dependent Variable (ITCAR)
3. Regress Mediators (NCAT and PCAT) on Dependent Variable (ITCAR)
4. Regress Independent Variables (CSE, CL, CA) and Mediators (NCAT and PCAT) on Dependent Variable (ITCAR)

Regression 1 and 2 (see Table G.17 above) indicated that various variables did not have relationships (i.e. condition 1 had failed in most cases). Regression 3 indicated that there is a direct relationship between CL on ITCAR (see Table G.17 above). This direct relationship is an additional finding to this study. Regression 5 (H7a and H8a, see Table G.17) indicated that NCAT and PCAT did not significantly effect ITCAR thus mediation is not supported. Full mediation does not exist, hence H9a was not supported in the male sample.

Hypothesis 9b - the mediating effects of Negative Computer Attitude and Positive Computer Attitude between Computer Self-Efficacy, Computer Liking, Computer Anxiety, and Perceived Tangible Rewards

The same approach to test Hypothesis 9a was used to test Hypothesis 9b. This hypothesis stated that NCAT and PCAT would mediate the relationship between the independent variable CSE, CL, CA and the dependent variable PTR. Thus Baron and Kenny's (1986) three-step mediation approach was used:

1. Regress Independent Variables (CSE, CL, CA) on Mediators (NCAT and PCAT)
2. Regress Independent Variables (CSE, CL, CA) on Dependent Variable (PTR)
3. Regress Mediators (NCAT and PCAT) on Dependent Variable (PTR)
4. Regress Independent Variables (CSE, CL, CA) and Mediators (NCAT and PCAT) on Dependent Variable (PTR)

Regression 1 and 2 (see Table G.10 above) indicated that various variables did not have relationships (i.e. condition 1 had failed in most cases). Regression 4 indicated that there is a direct relationship between CL on ITCAR (see Table G.17 above). This direct relationship is an additional finding to this study. Regression 6 (H7b and H8b, see Table G.17 above) indicated that NCAT and PCAT did not significantly effect PTR thus mediation is not supported. Full mediation does not exist, hence H9b was not supported in the male sample.

All the hypotheses results have aided in either supporting or rejecting the research hypotheses, Table G.18 below presents a summary of results.

Table G.18: Summary of Results (Male Sample, n = 113)

Hypothesis	Statement	Result
H1a	QTYCT increases men's CSE level	Rejected
H1b	QLICT increases men's CSE level	Rejected
H1c	EFFCT increases men's CSE level	Rejected
H2a	QTYCT increases men's CL level	Rejected
H2b	QLICT increases men's CL level	Supported
H2c	EFFCT increases men's CL level	Supported
H3a	QTYCT decreases men's CA level	Supported
H3b	QLICT decreases men's CA level	Rejected
H3c	EFFCT decreases men's CA level	Supported
H4a	CSE decreases men's NCAT level	Supported
H4b	CSE increases men's PCAT level	Rejected
H5a	CL decreases men's NCAT level	Rejected
H5b	CL increases men's PCAT level	Rejected
H6a	CA increases men's NCAT level	Rejected
H6b	CA decreases men's PCAT level	Rejected
H7a	NCAT decreases men's ITCAR level	Rejected
H7b	NCAT decreases men's PTR level	Rejected
H8a	PCAT increases men's ITCAR level	Rejected
H8b	PCAT increases men's PTR level	Rejected
H9a	NCAT and PCAT Mediates CSE, CL,CA and ITCAR	Rejected
H9b	NCAT and PCAT Mediates CSE, CL,CA and PTR	Rejected