PSYCHOLOGICAL TYPE AND COGNITIVE STYLE AS ANTECEDENTS OF COMPUTER ATTITUDE COMPONENTS

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DECLARATION

I hereby declare that this dissertation
is my own, unaided work, and has not
been submitted to any other University,
nor for the purposes of any other degree.

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29 JANUARY 1998

Date

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ABSTRACT

The current research report seeks to investigate the relationship between psychological type/cognitive style, and computer attitude components, namely computer anxiety, computer confidence, and computer liking, in a sample of full-time banking employees. Psychological type is assessed by means of the dichotomous preferences of extraversion-introversion (E-I), thinking-feeling (T-F), and sensing-intuition (S-N), based on Jungian personality theory, and operationalised by the Myers Briggs Type Indicator. The T-F and S-N preferences, being mental processes of *judging* or *perceiving*, may also be interpreted as cognitive styles. Pertinent to the current investigation is the impact that certain demographic variables have on computer attitudes, in terms of their relationship with, and their ability to predict computer attitudes. Research results provide moderate support for the proposed hypotheses. No relationship was found between the extraversion-introversion preference and computer attitudes. People with a sensing preference exhibited more positive attitudes towards computers than people with an intuition preference. People with a thinking preference indicated less computer anxiety and more positive computer attitudes as a whole than their feeling counterparts. No relationship was found between the T-F preference and computer liking or confidence. Age and previous computer experience were found to have the strongest relationships with computer attitudes, suggesting that these two demographics could predict computer attitudes more effectively and conclusively than personality variables. No relationships were found for gender differences and computer attitudes, contrary to previous research.

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CHAPTER 1

The current chapter aims to present, discuss, and evaluate reference works and literature which are central to the field of research under investigation. Areas to be covered include the influx and impact of computers into the modern workplace, and the importance of computer use and adaptation in organisational practice. Following this is a description of computer attitudes, namely computer anxiety, computer confidence, and computer liking, along with an explanation of the psychological basis of attitudes. The concepts of psychological type and cognitive style are then introduced, incorporating the dichotomous preferences of extraversion-introversion, thinking-feeling, and sensing-intuition. Appropriate to the research is the relationship between demographic variables and computer attitudes. This section is discussed in-depth, owing to various interesting, yet often contradictory past research findings. By presenting the history of particular areas to be researched, as well as the origin and development of debates in the area, the researcher aims to show how the concerns of the present research fit into these debates and how the present research will move forward from, or relate to, existing work done on the topic of computer attitudes and psychological type/cognitive style preferences. Incorporated within this section will be a clear and logical discussion of the theoretical framework or body of ideas that will be used to frame the research. Implications of these discussions for the current investigation will then be presented, as well as the rationale for conducting the study. This will be followed by the hypotheses and research questions pertinent to the investigation.

1.1 INTRODUCTION

Since the appearance of the first personal computers in 1981, society has witnessed an explosion in the uses and applications of computers. It has been speculated that, in this short time period, the personal computer has reached the equivalent societal penetration of the telephone in its 75 years of use (Brock & Sulsky, 1994). Computers are widely used in home, educational, and occupational settings (Cohen & Waugh, 1989; Colley, Gale & Harris, 1994). There is no doubt that computers and high technology are here to stay. Companies are automating their operations at an ever-increasing rate with the aim of improving productivity, competitiveness, and profits. The computer, with all its varied uses, has become an integral part of corporate work life (Harrington, McElroy & Morrow, 1990). In particular, the computer has revolutionised the manner in which tasks are carried out in the workplace. Laborious filing systems have been replaced by databases, typewriters are now scarce in deference to the speed and accuracy offered by word processors, and time-consuming mathematical operations have now been reduced to tasks requiring little more than a few seconds to complete (Brock & Sulsky, 1994). These changes have led to an increase in what Card, Moran & Newell (1983) refer to as 'human-computer interaction', which is any process in which "the user and computer engage in a communicative dialogue whose purpose is the accomplishment of some task" (p. 4) (Whitley, 1997). Harrison & Rainer (1992b) refer to employees making hands-on use of computers in their work as end-user computing (EUC). As Fisher (1995) asserts, end-user computing has become increasingly important, owing to the shift over the past 40 years from a focus firstly on the new technology alone, to how the organisation can adapt to the new technology, and ultimately to the realisation that the success of this adaptation lies in the motivation, behaviour, and attitude of the individuals who operate the technology.

With the mass introduction of computers in the workplace, researchers have spent considerable time investigating methods of effectively integrating this technology into the daily routines of employees at all organisational levels (Crable, Brodzinski, Scherer & Jones, 1994). Following from this, there has been increased research interest in examining the affective responses of individuals who use computers in the work environment (Brock & Sulsky, 1994).

Many researchers (Heinssen, Glass & Knight, 1987; Cohen & Waugh, 1989; Davis, 1989; Steier, 1989; Harrington *et al.*, 1990; and Marcoulides, Mayes & Wiseman, 1995) assert that despite the proliferation of computer technology into modern society, and despite computers and information technology having the capacity to improve organisational performance, these gains are often neutralised by the apprehension and unwillingness of employees to use the systems. There is evidence that the actual attitudes towards these machines are not as positive as one would expect, and that the use of computers can be an anxiety-provoking experience for many individuals. Calhoun (1981, in Marcoulides *et al.*, 1995) was one of the first researchers to examine the interaction between computers and human users, and found that the introduction of computers into the work environment caused considerable dissatisfaction among employees. Possible causes of resistance to computer use include personal characteristics, such as age, gender, and educational level, the meanings which individuals ascribe to computers, prior experiences with computers (Gardner, Discenza & Dukes, 1993), negative attitudes toward computers, anxiety toward computer use, limited skill in computer use (Harrison & Rainer, 1992b), and a lack of computer knowledge or a more generalised fear of computers and technology (Harrington *et al.*, 1990). This fear has been variously labelled technostress, computer-phobia, and cyber-phobia, and more recently we speak of the modern day malaise of *computer anxiety* (Henderson, Deane, Barrelle & Mahar, 1995). In addition, researchers have focused on several other attitudes towards computers as a major determinant of using them (Gardner *et al.*, 1993), namely *computer liking* and *computer confidence* (Loyd & Gressard, 1984).

Fear of using computers and negative attitudes toward computers, if they indeed exist among employees in the workplace, are unfortunate because, as Marcoulides (1988) and Ogletree & Williams (1990) maintain, the continuous growth and advancement of computers in the work environment means that familiarity with computers and the ability to use them effectively and competently have become requisite to participation and success in most fields within the occupational sphere. Because of their ability to enhance productivity, computers have become an indispensable component of business practice, and it has become increasingly difficult to avoid daily interaction with computerised technology (Gilroy & Desai, 1986; Henderson *et* *al.*, 1995). In fact, end-user computing skills have become more of a necessary skill than an elective capability for employees (Szajna & Mackay, 1995).

1.2 COMPUTER ATTITUDES

According to Maguire (1985, in Whitley, 1996a, p. 391), an attitude is "a set of evaluative beliefs about an attitude object - which can be a person, thing, or idea - and the positive and negative emotions associated with the attitude object." According to McGuire (1985), in Weiten (1989), attitudes locate objects of thought on dimensions of judgement. *Objects of thought* may be anything, from social issues, groups, institutions, people, or consumer products (such as the computer, in this case), to name a few. *Dimensions of judgement* refer to the various ways in which we might evaluate the objects of our thoughts. Weiten (1989) points out that although attitudes are social judgements, they are not exclusively cognitive in nature. Attitudes are complex mixtures of cognitive, emotional, and behavioural components. The *cognitive component* of an attitude consists of the beliefs we hold about the object. The *affective component* is made up of the emotional feelings stimulated by the object. The *behavioural component* consists of predispositions to act in certain ways toward the object.

Many researchers in the field of information systems development have emphasised the importance of users' attitudes (Zmud, 1979), expectations, satisfaction, emotions, beliefs and values, for the successful implementation of information systems (Henderson, Deane & Ward, 1995). Of particular interest in the present research are psychological characteristics of individual users. Specifically, characteristics of individual users such as attitudes and anxiety regarding computers have been identified as variables related to resistance and commitment (Kay, 1990; Koslowsky, Hoffman & Lazar, 1990). Indeed, as computers have become increasingly common in our educational and occupational settings, one factor in their successful implementation is user acceptance, which may be influenced by the users' attitudes (Koohang, 1989).

Carver (1989) posits that there is conflict and confusion in the computer attitude literature owing to the fact that many researchers treat attitudes toward computers as a unitary construct rather than as a multifaceted construct. Multifaceted constructs are composed of two or more correlated components, each of which could have different relationships to another variable. The variety of computer attitude scales that have been developed and their differing content suggest that computer-related attitudes are indeed multifaceted, including components related to anxiety about using computers, self-confidence in dealing with computers, and positive and negative beliefs about computers (LaLomia & Sidowski, 1993). Based on the extensive research support for Loyd & Gressard's (1984) Computer Attitude Scale, the present research examined three computer attitude components, namely *computer anxiety*, *computer confidence*, and *computer liking*.

1.2.1 Computer Anxiety

Computer anxiety is one possible barrier to the acquisition of computer skills. Many people exhibit fear at the thought of using computers, a condition also known as *cyberphobia* (Dyck & Smither, 1994; Lankford, Bell & Elias, 1994; Reznich, 1996). In a meta-analysis of 81 research reports on computer anxiety, Rosen & Maguire (1990) stated that, on average, 25% of all people "feel less than completely comfortable with computers" (p. 180). It has been estimated that computer anxiety affects up to 30% of the U.S. workforce (Harrington *et al.*, 1990). Rosen & Maguire (1990) add that up to half of all college students, business people and scholars may exhibit computer anxiety at some stage. Educational and employment status does not guard one from the effects of computer anxiety (Lankford *et al.*, 1994). Howard (1984, in Lankford *et al.*, 1994) surveyed 136 business managers and found that nearly one third of the managers reported experiencing computer anxiety.

Cambre & Cook (1985) report that computer anxiety involves an array of emotional reactions including fear, apprehension, hope, and personal threat. The causes for the emotional reactions that make up computer anxiety are probably many. Over the years, various researchers studying computer anxiety have produced several self-report instruments designed to examine the construct, most of which proposed the existence of the factors believed to underlie computer anxiety. Based on these instruments, various definitions of computer anxiety have been proposed. In combining these definitions, computer anxiety may be generally defined as an affective response of fear, apprehension, or anxiousness evoked in individuals when they use computers, or when they consider the possibility of computer utilisation (Simonson, Maurer, Montag-Torardi & Whitaker, 1987; Cambre & Cook, 1987; Igbaria & Parasuraman, 1989; Pilotte & Gable, 1990; Crable *et al.*, 1994; Raub, 1984, in Marcoulides *et al.*, 1995; Anderson, 1996). It may be accompanied by feelings of nervousness, intimidation, hostility, worries about embarrassment, looking foolish, damaging computer equipment, encountering indecipherable error messages, working with a "powerful other", inadequate documentation, losing control, disappointment, and a sense of futility (Banks & Havice, in Lankford *et al.*, 1994; McInerney, McInerney & Sinclair, 1994). Generally, most definitions of computer anxiety focus on the negative emotional reactions to the use or anticipated use of computers, which are perceived as personally threatening to the user (Gardner *et al.*, 1993). The above definition and explanation of the components of computer anxiety is a result of many independently conducted studies, clearly indicating that there is consistency in the hypothesised dimensionality of the construct of computer anxiety (Marcoulides & Wang, 1990).

Research has identified computer anxiety as a significant problem of human performance (Reznich, 1996), and is believed to affect a substantial number of workers and students (Lankford *et al.*, 1994). Computer anxiety can hinder an individual's ability to use a computer effectively, and might reduce the willingness of that individual to spend time in computer related activities (Gardner *et al.*, 1993; Dyck & Smither, 1994). Theoretically, it has been suggested that people with computer anxiety will avoid using computers (Simonson *et al.*, 1987). This phenomenon is explained by operant conditioning, such that anxiety is viewed as a drive that motivates the individual to avoid the stimulus for anxiety. These avoidance patterns remain stable for long periods of time as a result of the reinforcement they receive from their capacity to diminish anxiety (Henderson, Deane & Ward, 1995). Although Rohner & Simonson (1981, in Campbell, 1989) found that computer anxious people tended to avoid using computers, this finding has not been consistently supported (Kernan & Howard, 1990).

1.2.2 Computer Confidence

Computer confidence is defined as confidence in the ability of an individual to learn about or to use computers (Loyd & Gressard, 1984).

1.2.3 Computer Liking

Computer liking may be defined as an individual's enjoyment or liking of computers (Loyd & Gressard, 1984).

Please note that the above two constructs, namely *computer confidence* and *computer liking*, are relatively simply defined. These two constructs were introduced by Loyd & Gressard (1984), and have not been elaborated upon in terms of definition and explanation by any other researchers. *Computer anxiety*, on the other hand, involves more complicated psychological dimensions, and hence has been differently defined, studied, and interpreted by various researchers, as is evident in section 1.2.1.

1.3 MEASUREMENTS USING THE MYERS-BRIGGS TYPE INDICATOR

1.3.1 Psychological Type

Kernan & Howard (1990) maintain that accurately predicting computer-related behaviour and attitudes may require an investigation of different perspectives, one of which could be personality variables. Although Weinberg (1971, in Whitley, 1996a, identified personality as an important individual difference variable in human-computer interaction over 20 years ago, relatively little research has focused on this topic and not much of that research has been theory-driven. Thus, although only a few studies have been performed, they are potentially important because they could provide important information to those who are attempting to reduce computer anxiety (Maurer, 1994).

Psychological type is a theory developed by Carl Jung (1875 - 1961), and subsequently operationalised by the Myers-Briggs Type Indicator, in an attempt to explain the apparently random differences in people's behaviour (Briggs Myers, 1993). The theory enables us to expect specific personality differences in particular people and to cope with the people and the differences in a constructive way (Briggs Myers, 1980; Briggs Myers & McCaulley, 1985). According to Jung's theory, much seemingly chance variation in human behaviour is not due to chance; rather, it is the logical result of the differences in people's mental functioning. These differences concern the way in which people *prefer* to use their minds. The essence of the idea is that when one's mind is active, one is involved in one of two mental activities:

- taking in information, i.e. the process of becoming aware of things, people, occurrences, and ideas - known as *perceiving*; or
- organising and coming to conclusions about the information which has been perceived - known as *judging*.

Jung observed that there are two contrasting ways of perceiving, namely *sensing* and *intuition*, and two contrasting ways of judging, namely *thinking* and *feeling*.

Your Mental Processes

Perceiving — Sensing, Intuition

Judging — Thinking, Feeling

Everyone uses these four mental processes in both the external world (*extraversion*), and the internal world (*introversion*). This results in eight ways of using one's mind. Jung believed that every person has a preference for using one kind of perceiving, and one kind of judging, and is drawn either to the external world or the internal world in exercising these mental processes. The variations in peoples' preferences result in fundamental differences between people, and the subsequent patterns of behaviour stemming from these preferences and the interactions between them allow one to describe aspects of an individual's personality (Jung, 1971; Mason & Mitroff, 1973; Briggs Myers, 1980; 1993: Kirby, 1997). Although these modes of preference are in conflict, neither one is superior or more fundamental than the other (Mason & Mitroff, 1973).

A preference for *sensing* refers to those types of individuals who rely primarily on data received by their senses in order to perceive the objects of the world. Sensing types are thus typified by sensory processes, objective, hard facts, realism, the present moment, acute powers of observation, memory and attention to detail (Mason & Mitroff, 1973; Briggs Myers & McCaulley, 1985), and have the patience for routine, precise work (Henderson & Nutt, 1980). Sensing types are so interested in the actuality around them that they have little attention to spare for ideas coming faintly out of nowhere. On the other hand, people who prefer *intuition* are so engrossed in pursuing the possibilities a situation presents that they seldom look very intently at the actualities (Briggs Myers, 1993). Intuition thus refers to the mode of perceiving objects as possibilities. Whereas sensing perceives objects as they are, in isolation and in detail, intuition perceives objects as they might be and in totality (Mason & Mitroff, 1973), rarely focusing on individual elements in isolation. These people dislike routine and precise work, tend to rely on hunches, and prefer new unstructured problems (Henderson & Nutt, 1980).

They are thus more imaginative, theoretical, abstract, future-oriented, and creative (Briggs Myers & McCaulley, 1985).

Thinking individuals are the types who rely primarily on cognitive processes. Their evaluations tend to run along the lines of abstract true/false judgements and are based on formal systems of reasoning. They are more impersonal in their evaluations, relying on pragmatic, logical analysis to guide their decision-making (Mason & Mitroff, 1973; Henderson & Nutt, 1983; Slocum & Hellriegel, 1983). Thinking people try to mentally remove themselves from a situation to examine it objectively and analyse cause and effect. Their strength lies in figuring out what is wrong with something so that they can apply their problem-solving abilities (Briggs Myers, 1993). Thinking people may develop characteristics associated with analytical ability, objectivity, and criticality (Briggs Myers & McCaulley, 1985). A preference for *feeling* implies the type of individual who relies primarily on affective processes. In making decisions, they consider what is important to them and to other people. They mentally place themselves in a situation and identify with the people involved, and thus make decisions based on person-centred values (Briggs Myers, 1993). Thinking types systematise and attempt to generalise from a logical base to explain their actions; feeling types take moral stands, are interested and concerned with moral judgements, and seek to understand the personalities affected by the decision and the unique characteristics of the decision (Mason & Mitroff, 1973; Henderson & Nutt, 1980; Slocum & Hellriegel, 1983). The classical distinction in psychology between "tough-minded" and "tender-minded" people is concerned with the T-F difference (Briggs Myers & McCaulley, 1985).

People who prefer *extraversion* tend to focus on the outer world of people and external events. They direct their energy and attention outward and receive energy from external events, experiences, and interactions (Briggs Myers, 1993). Their minds are outwardly directed, they are people of action and practical achievement, and they are understandable and accessible (Briggs Myers, 1980). People who prefer *introversion* tend to focus on their own inner world of ideas and experiences. They direct their energy and attention inward and receive energy from their internal thoughts, feelings, and reflections (Briggs Myers, 1993). Their minds are inwardly directed, they are people of ideas and abstract invention, and they are more subtle and impenetrable (Briggs Myers, 1980).

The four dichotomous types in Jung's theory, as operationalised by the Myers Briggs Type Indicator, are summarised in Tabie 1.1.

Table 1.1 A Summary of the MBTI® Preferences

EXTRAVERSION (E)	INTROVERSION (I)
• Attuned to the external environment • Direct their energy outward • Focus on external events, experiences, and interactions • Speak first, reflect later • Sociable and expressive	• Drawn to the inner world of ideas • Direct their energy inward • Focus on internal thoughts, feeling and reflections • Reflect before speaking • Private and contained
SENSING (S)	**INTUITION (N)**
• Take in information through five senses • Focus on what is real and actual • Factual and concrete, notice details • Sequential in observing and remembering • Trust their experience	• Use their "sixth sense" • Focus on possibilities • Abstract and theoretical • Look for patterns and connections • Trust their inspiration
THINKING (T)	**FEELING (F)**
• Look at logical consequences of a choice or action • Examine a situation objectively and analytically • Use cause and effect reasoning • "Tough-minded"	• Make decisions based on person-centred values • Subjective and sympathetic • "Tender-hearted
JUDGING (J)	**PERCEPTION (P)**
• Live in a planned, orderly way • Make decisions, come to closure, and move on • Structured, organised lifestyle	• Live in a flexible, spontaneous way • Feel confined by plans and decisions; prefer to be open to experience and options

<u>Source</u>: Briggs Myers (1993)

Understanding the strengths and weaknesses developed by people with different preferences is one of the great benefits of psychological type and the MBTI®. For the purpose of the present research, knowledge of the effects of preferences in work situations is necessary. Briggs Myers (1993) offers some interesting ideas which will enable the reader to comprehend the preferences being investigated in the current study. These are presented in Table 1.2.

Table 1.2 Effects of Preferences in Work Situations

EXTRAVERSION (E)	INTROVERSION (I)
• Like variety and action • Often impatient with long, slow jobs • Interested in the activities of their work and in how other people do it • .Often act quickly, sometimes without thinking • Develop ideas by discussion • Learn new tasks by talking and doing	• Like quiet for concentration • Don't mind working on one project for a long time uninterruptedly • Interested in the facts/ideas behind their work • Like to think before they act, sometimes without thinking • Learn new tasks by reading and reflecting
SENSING (S)	**INTUITION (N)**
• Like using experience and standard ways to solve problems • Enjoy applying what they have already learned • Seldom make errors of fact • Like to do things with a practical bent • Like to present the details of their work first • Usually proceed step-by-step	• Like solving new,complex problems • Enjoy learning a new skill more than using it • May ignore or overlook facts • Like to do things with an innovative bent • Like to present an overview of their work first • Usually proceed in bursts of energy
THINKING (T)	**FEELING (F)**
• Use logical analysis to reach conclusions • Look at the principles involved in the situation	• Use values to reach conclusions • Look at the underlying values in a situation

Source: Briggs Myers (1993)

1.3.2 Cognitive Style

Since the 1970s, several researchers began to emphasise the importance of cognitive style as a salient variable influencing user attitudes toward computers (Mason & Mitroff, 1973; Benbasat & Taylor, 1978; Zmud, 1979). Today, it is still proposed as a potential influence variable on computer-user skills and attitudes (Harrison & Rainer, 1992a). *Cognitive style* refers to the characteristic processes individuals exhibit in the acquisition, analysis, evaluation, and interpretation of data used in decision-making (Parasuraman & Igbaria, 1990).

The MBTI® preferences of thinking-feeling and sensing-intuition, being mental processes, have been used as a measure of cognitive style by various researchers (e.g. Henderson & Nutt, 1980; Slocum & Hellriegel, 1983; Parasuraman & Igbaria, 1990; and Fisher, 1995). It is important to be aware that whether one terms these four preferences as such, or as *psychological type*, essentially they are interpreted in the same way. Various conceptualisations and definitions of cognitive style exist. Building on the definition proposed by Parasuraman & Igbaria (1990) in the previous paragraph, Zmud (1979) posits that cognitive styles represent characteristic modes of functioning shown by individuals in their perceptive and thinking behaviour. Oborne (1985) asserts that cognitive style refers to the ways in which we treat information within our world. Such individual styles have been shown to be stable over the lifetime of an individual despite external influences. It follows then that the way in which one takes in information (perceiving, either by sensing or intuition), and the way one makes decisions about that information (judging, either by thinking or feeling), are indeed cognitive styles. One should keep in mind the assertion by Zmud (1979) that the cognitive style construct is multi-dimensional, and thus there are various ways of measuring it. The MBTI® is a modern way of doing so. For the purposes of this study, the T-F and S-N dimensions will be referred to interchangeably as both psychological types and cognitive styles, and the I-E dimension as a psychological type.

1.4 THE RELATIONSHIPS BETWEEN PSYCHOLOGICAL TYPE/ COGNITIVE STYLE PREFERENCES AND COMPUTER ATTITUDES[1]

Whitley (1996a) asserts that consideration of Jung's theory suggests that these dimensions should be related to several aspects of human-computer interaction, including aptitude for working with computers, attitudes towards computers, and computer-related behaviours such as computer use and

[1] The findings reported in sections 1.4 and 1.5 are based on student samples, unless otherwise stated.

taking computer-related courses. In reviewing previous research on the relationship between personality factors and human-computer interaction, Pocius (1991) concluded that there was mixed evidence for a relationship between psychological type and computer-related attitudes. However, the studies on which Pocius based this conclusion suffered from a number of methodological flaws, such as small sample sizes and restricted samples. Samples averaged 85 participants, with a maximum of 166. As Cohen (1988) believes, samples of this size provide inadequate statistical power to detect any but the largest relationships between the independent and dependent variables. Secondly, Whitley (1996a) pointed out that that the samples have, for the most part, consisted of students enrolled in college computer programming courses. Thus, the members of the samples have been self-selected for interest in and perhaps aptitude for computer programming, thereby restricting the range of the dependent variables. Because computer professionals show a pattern of psychological type different from that of the general population (Pocius, 1991), self-selection might also have restricted the range of psychological types in these samples. These restrictions of range further attenuate the statistical power of the research (Whitley, 1996a). Despite these shortcomings, the mixed results of these studies deserve mention.

Igbaria & Parasuraman (1989) maintain that insofar as working with computers requires systematic analysis and attention to detail, it appears reasonable to expect that individuals high on thinking and sensing would experience lower computer anxiety and more positive attitudes towards computers than those high on feeling and intuition. In using the MBTI® dimensions as measures of cognitive style, Igbaria & Parasuraman (1989) found that people with a sensing preference reported less computer anxiety and more positive computer attitudes than people with an intuition preference. Contrary to expectations, they found no relationship between the T-F dimension and computer attitudes. However, these authors used a short form (Slocum & Hellriegel, 1983) of the MBTI®, which is unethical. In addition, this short form did not have satisfactory internal reliability. Chu & Spires (1991) found that people with a thinking preference reported less computer anxiety than people with a feeling preference. In contrast to Igbaria & Parasuraman (1989), Chu & Spires (1991) found that people with a sensing preference reported higher computer anxiety than those with an intuitive preference. They further found no relation between the I-E dimension and computer anxiety, a relationship which Igbaria & Parasuraman (1989) did not investigate. In recognising these mixed results, Whitley (1996a) similarly found no relationship between the I-E dimension and computer attitudes, a result which seems to be consistent in prior research, but also found no relationship for the S-N dimension. Consistent with the findings of Chu & Spires (1991), he found that people with a feeling preference reported slightly more computer anxiety than did people with a thinking preference. So, as is evident, results are similar in some aspects, but contrasting in other respects. As Whitley (1996a) suggests, the specific types of computer attitude being measured, and the different scales utilised to measure these attitudes in the different studies, may account for these inconsistent results. It is the aim of the present research to maintain cognisance of these mixed results, and thereby to attempt to clarify the relationship between psychological type and cognitive style, as indicated by an individual's MBTI® preferences, and computer attitudes.

1.5 THE RELATIONSHIPS BETWEEN DEMOGRAPHIC VARIABLES AND COMPUTER ATTITUDES

Mixed results have been found when investigating demographic variables and computer attitudes (Busch, 1995). This section aims to report these mixed findings with regards to various demographic variables, all of which shall be investigated in the current study.

Lack of ***computer experience*** has been taken to be a causal factor in explaining computer anxiety and negative computer attitudes (Maurer, 1994; Charlton & Birkett, 1995). As Marcoulides *et al.* (1995) assert, computer experience is expected to be a significant variable explaining more of the variability in computer anxiety because computer anxiety is produced in part by lack of familiarity. Many researchers have found that subjects who had more computer experience expressed more positive attitudes towards computers in general (e.g. Loyd & Gressard, 1984; Dambrot, Watkins-Malek, Silling, Marshall & Garver, 1985; Gilroy & Desai, 1986; Morrow, Prell & McElroy, 1986; Howard & Smith, 1986; Heinssen *et al.*, 1987; Marcoulides, 1988; Koohang, 1989; Cohen & Waugh, 1989; Kernan & Howard, 1990; Ray & Minch, 1990; Rosen & Maguire, 1990; Woodrow, 1991; Harrison & Rainer, 1992b; Colley *et al.*, 1994; Todman & Monaghan, 1994; McInerney *et al.*, 1994; Crable *et al.*, 1994; Dyck & Smither, 1996; Anderson, 1996). Such consistent results in previous research reinforce the postulation that experience with computers reduces apprehension and uneasiness in computer use. However, Maurer (1994) points out that it is insufficient to question whether computer experience reduces computer anxiety, or whether less computer experience leads to greater computer anxiety. The reason for this is that it seems highly possible that lower computer anxiety would be more a cause of greater computer experience than the other way around. Some researchers are careful to point out that a correlation between previous computer experience and computer anxiety does not demonstrate a cause and effect relationship, but others are not. Overall, Maurer (1994) believes that computer experience has the clearest relationship to computer anxiety than any variable studied. It is likely that they each affect the other.

Using a measure of computer experience that was a composite of range of use and frequency of use of computers, Todman & Lawrensen (1992, in Todman & Monaghan, 1994) found no evidence of a relationship between computer anxiety and computer experience. Furthermore, Todman & Monaghan (1994) report that in studies that obtained measures of computer anxiety before and after the provision of computer experience, the findings do not provide clear support for the view that computer anxiety is related to computer experience. Henderson, Deane & Ward (1995) believe that although many studies report the existence of a relationship between computer anxiety and various other computer attitudes, and computer experience, the strength of these relationships suggests that experience is likely to be a moderate predictor of computer anxiety and that other variables may account for a larger proportion of the variance.

Marcoulides (1988) found that for some individuals, computer anxiety can be present regardless of computer exposure. He is one of the few researchers to report this finding. Furthermore, as Weil, Rosen & Wugalter (1990) and Rosen, Sears & Weil (1993) observe, successive experiences with computers may reinforce feelings of discomfort and intimidation in those who are already anxious. As Weil, Rosen & Sears (1987, in McInerney *et al.*, 1994) state: "during repeated exposure to the computer, the computerphobic is being reconditioned at *increased* levels of anxiety which, in turn, increases discomfort and anxiety" (p. 180). Henderson *et al.*, (1995) found that healthcare employees demonstrated significant positive, yet weak, relationships between experience and computer anxiety, computer confidence, and computer liking. It is interesting to note that non-significant relationships were found between the afore-mentioned variables in banking employees, as this group represented a highly computer experienced group. As Henderson *et al.* (1995, p. 190) state: "If experience is a major factor impacting on computer anxiety, computer confidence, and computer liking, then the banking sample would be expected to display the lowest levels of anxiety, and the highest levels of confidence and liking. One would also expect to observe strong relationships between experience and computer-related anxiety, confidence, and liking, however, this was not the case."

LaLomia & Sidowski (1993) have suggested that "for the future, the novelty of computer technology should dissipate, and as individuals become more comfortable with computers in their environments, the need for assessing computer anxiety should decrease" (p. 262). As Henderson *et al.* (1995) point out, such an assertion is interesting as it seems to suggest that computer anxiety will dissipate with increased exposure to information technology. The results of their study partially support this assertion, but the authors point out that the relationship between computer anxiety and computer experience is neither strong nor simple, and that the relationship between computer experience and the attitudes of anxiety, confidence and liking of computers may not be a simple linear one. It may be that some sort of threshold effect is present such that a positive relationship only holds for those with lower levels of experience, and beyond a certain level of experience a much weaker or negligible relationship exists (Ibid.).

According to Morrow *et al.* (1986) and Leso & Peck (1992), studies have shown that self-assessment of computer knowledge and computer experience explain more of the variance in computer anxiety than do personality correlates. This implies that computer anxiety may be more a function of prior experience, a modifiable condition, than a deeply entrenched personality trait.

Overall, though it is frequently assumed that individuals with more experience of computers will be less anxious about using them, studies of the relationship between computer anxiety and computer experience have produced varied results (Todman & Monaghan, 1994).

As with experience, the relationship between ***age*** and computer attitudes is not straightforward (Cambre & Cook, 1987). Dyck & Smither (1994) found that older adults were less computer anxious, had more positive attitudes towards computers, and had more liking for computers. Older adults also had less computer experience than younger adults. In contrast, however, older subjects indicated less computer confidence than younger subjects. For both younger and older subjects, higher levels of computer experience were associated with lower levels of computer anxiety, and a more positive attitude towards computers. Loyd & Gressard (1984) found that younger subjects had more positive attitudes towards computers than older subjects. Massoud (1991), in using a sample of older adults, reported no age differences in terms of computer attitudes, as did Gilroy & Desai (1986). Woodrow (1991) also reported no age differences, but the mean age of her sample was 23.1 years. Henderson *et al.* (1995) reported non-significant results in an examination of the relationship between age and computer anxiety, liking, and confidence.

These results are congruent with the majority of previous findings, according to Rosen & Maguire (1990).

Although several studies have attempted to examine the relationship between age and computer anxiety and other computer attitudes, the age ranges under consideration in these studies were usually quite limited (Cambre & Cook, 1987; Dyck & Smither, 1994; 1996). The narrow age range is attributable to the fact that the majority of studies used typical, easily accessible student samples. In general, it is those studies which had a wider age range that tended to report an age effect (Cambre & Cook, 1987).

As is evident, research findings regarding the relationship between age and computer attitudes reveal mixed results. Various researchers believe very strongly that older adults would have more positive attitudes towards computers than their younger counterparts, while other researchers believe that the pervasiveness of computers in current society raises important questions regarding the willingness and ability of older adults to adapt to this technology (Jay & Willis, 1992).

Maurer (1994) contends that although research suggests that there is some relationship between age and computer attitudes, the area has not been sufficiently examined to clearly define the relationship. The same holds true for the relationship between computer attitudes and ***gender***.

In the past, most researchers have hypothesised that since computers have traditionally been perceived as belonging to the male domain of mathematics, electronics, and machinery, males are less likely to be computer anxious and are more likely to have more positive attitudes towards computers than females (Dambrot *et al.*, 1985; Wilder, Mackie & Cooper, 1985; Levin & Gordon, 1989; Ogletree & Williams, 1990; Parasuraman & Igbaria, 1990; Colley *et al.*, 1994). In a recent meta-analysis of studies of gender differences in computer-related attitudes and behaviour, Whitley (1997) found that men and boys exhibited greater sex-role stereotyping of computers, higher computer self-efficacy, and more positive affect about computers than did women and girls. He adds that some researchers hypothesise that these differences stem from people being socialised to believe that computers are more appropriate to men and boys than to women and girls (ibid.). One concern which has been widely expressed is that the masculine image of computers, as illustrated in studies of their media portrayal, deters females from benefiting from the advantages offered by the technology and makes them less confident in their use of computers. There is empirical evidence that females have more negative attitudes towards computers than males, are less likely to be attracted to computer courses, and use computers less when given equal access. However, it has been shown that the extent of the sex difference may vary, depending upon how the computer is being used (Colley *et al.*, 1994). Furthermore, as Gutek & Bikson (1985) and Parasuraman & Igbaria (1990) suggest, gender differences reported in previous research (i.e. males having more positive computer attitudes than females) could partly be a function of the lower status organisational positions and roles occupied by women relative to men. However, today this is not necessarily the case.

Chen (1986) reported that men held more positive attitudes of interest and confidence with computers, and had lower anxiety than women. Dyck & Smither (1996) and Colley *et al.* (1994) observed gender differences for attitudes towards computers, with females showing more computer anxiety than males, less computer confidence than males, less computer liking than males and, in total, less positive attitudes towards computers than males. Loyd & Gressard (1984), Koohang (1989), and Henderson *et al.* (1995) found no significant relationships to exist between gender and computer anxiety, confidence, and liking. In terms of the relationship between computer anxiety specifically, and gender, several studies have found lower computer anxiety in males (Gilroy & Desai, 1986; Morrow *et al.*, 1986; Cambre & Cook, 1987; Dukes, Discenza & Couger, 1989; Massoud, 1991), while others have found no gender differences in computer anxiety (Loyd & Gressard, 1984; Heinssen *et al.*, 1987; Parasuraman & Igbaria, 1990; Pope-Davis & Twing, 1990; Rosen & Maguire, 1990; Woodrow, 1991; Anderson, 1996). One needs to be careful of assuming that because men have been found to have more positive attitudes towards computers than women, women therefore have negative attitudes towards computers. As Whitley (1996b) points out from his studies, although men and women differed in their mean scores on several measures of computer-related attitudes, the average scores for both groups fell significantly above the midpoints of each of the scales. That is, both women and men had positive attitudes toward computers, although the average score for men was somewhat higher than that for women.

Chen (1986) points out that certain demographic groups, such as females and black people, are likely to be at an experiential disadvantage. Similarly, Maurer (1994) observes that the contradictory findings in which gender is related to computer attitudes are problematic because males are generally found to have more prior experience with computers, so it becomes more of an experience issue than one of gender. Thus, any research investigating a relationship with gender *must* take prior experience into account.

In sum, Whitley (1996b) maintains that reviews of research on gender differences in computer attitudes have concluded that the results of studies are contradictory or that any differences that exist are very small. As Kay (1992, p. 277) states: "The sheer volume of research examining gender differences in computer-related behaviour is, at first glance, quite intimidating. The morass of conflicting results and conclusions permits confusion to reign ... with the exceptions standing out more than the rules."

Various postulations exist as to the relationship between ***occupational position*** or ***level,*** and computer attitudes, but there have been few explicated findings as such. There is a tendency to believe that higher level employees, particularly those in managerial positions would exhibit more negative attitudes towards computers than employees in the lower ranks or levels. As Parasuraman & Igbaria (1990) maintain, the reluctance of managers to use computers has been found to be due to a pervasive fear of computers or computer anxiety. As Fisher (1995) asserts, the weakly structured nature of many of the tasks performed by senior managers, and the preference of executives for face-to-face, verbal communication, a free-form work style, and a network of personal relationships implies that the value of computer-based tools at senior levels will remain limited. Thus, although there have been many innovations which have led to the rapid growth of end-user computing at the lower levels of the organisation (e.g. the broad availability of computer databases; the growing sophistication of telecommunications; the increasing power, falling cost, and ease of use of hardware; the 'user-friendliness' of software; and the downsizing of organisational structures), whether researchers in the field of management information systems can assume that senior managers will become active direct users of computers as well, is questionable (ibid.).

Limited findings with regards to the relationship between ***education level*** and computer attitudes exist, as most studies have been done on student samples, which represent a limited sample in terms of education. The present study aims to add to research in this domain. What should be noted, however, is that, according to Gist (1987), it appears that increased educational attainment may foster feelings of "self-efficacy", that is, the belief that one can develop the skills necessary to use computers and strengthen confidence in one's ability to master and use them in one's work.

1.6 IMPLICATIONS FOR THE PRESENT STUDY AND RATIONALE

Sufficient justification exists for conducting the present research. Computers and high technology are here to stay. Companies are automating their operations at an ever-increasing rate in order to improve productivity, competitiveness, and profits. The computer has thus become an integral part of work life (Gilroy & Desai, 1986; Harrington *et al.*, 1990;), and attention thus needs to be paid to the human aspect of human-computer interaction, if computer use is to be fully and profitably integrated into the workplace (Marcoulides & Wang, 1990). While often accepting computers as a product of advancement, some individuals express concern about the impact of these machines on their lives (Marcoulides *et al.*, 1995). Fisher (1995) maintains that the shift in focus towards the user produces a change which raises a new set of research issues - those of the behaviour and motivation of the individual. Thus, according to Cohen & Waugh (1989), we need to develop a thorough understanding of what sort of individuals would be prone to suffer from negative computer attitudes, and the psychological effects that computer use has on the user. Being aware of such issues would aid in the development of training programs targeted at increasing the speed of adaptation and willingness to use computers by individuals at work (Hill, Smith & Mann, 1987; Crable, Brodzinski & Scherer, 1991; Webster & Martocchio, 1992; Crable *et al.*, 1994). Crable *et al.* (1994) add that understanding the attitudinal or dispositional antecedent to an encounter with or use of a computer can provide insight into the origins of computer anxiety and negative computer attitudes. The two concepts can then be reduced or eliminated by modifying these antecedents. Maurer (1994) believes that the information relating personality variables to computer anxiety and attitudes is limited. This suggests further need for an investigation involving these variables.

Various researchers, e.g. Igbaria & Parasuraman (1989), Weil *et al.* (1990), Rosen & Maguire (1990), and LaLomia & Sidowski (1993), point out that the prevalence of computer anxiety and negative computer attitudes, particularly among managers, have been extensively documented in popular business and trade journals. However, despite these claims, the severity of negative computer attitudes remains unclear. It has been estimated that computer anxiety affects up to 30% of the U.S. workforce (Henderson *et al.*, 1995), and there is a need to assess whether South African employees are affected by computer anxiety.

Much of the computer anxiety research has focused exclusively on the operationalisation and validation of the anxiety or apprehension constructs and instruments to measure these constructs. Even though the instruments developed measure computer anxiety and may accurately assess an individual's tendency to be willing to use computers, anxiety scores alone provide no information to the respondent or the researcher on the underpinnings of this apprehension. Thus, to fill this void in research, and to add to the few studies that have attempted a similar task, the purpose of the current study is to identify cognitive components and personality dimensions which might influence the development of anxious feelings for or negative attitudes toward computer usage (Crable *et al.*, 1994). Furthermore, according to Maurer (1994), those studies which do examine correlates of computer anxiety do not clearly define why the correlates are important to understanding computer anxiety, or doing something about it. Studies also continue to address questions that have been previously examined, without relating the new information to the old.

A relatively exhaustive review of related literature in this domain of interest reveals that all except one or two of the studies are conducted on a student sample, i.e. American undergraduate college students, and generalised to an adult, employed population. This raises concerns about the generalisability of findings to non-student populations (Henderson *et al.*, 1995; Cambre & Cook, 1987). As Marcoulides *et al.* (1995) point out, construct validity established in one group or population does not ensure an equivalent level of construct validity across different populations. Thus, despite the large number of studies conducted on college students, little is known about the attitudes and perceptions of individuals in the workforce (ibid.). Rather, we need to be aware of the comparability of research findings across populations, and the time has come to explore the causes and effects of computer alienation in older adults, and in the workplace in particular (Ray & Minch, 1990; Dyck & Smither, 1996).

An investigation such as the current one has not been carried out in a South African organisational context. The present study thus aims to concentrate entirely on a sample of full-time employed men and women in a prominent South African organisation, so that it may lend itself to explaining organisational concerns regarding computers, training of staff, and selection and recruitment of the correct staff to match job specifications.

A notable methodological problem that is evident in the computer anxiety literature is the lack of consistent personality, cognitive style, and computer attitude measures (Maurer, 1994). Thus, although many research findings have been reported in the current research, these findings reflect the use of different computer attitude and anxiety scales, making it difficult to generalise across studies.

A furtner methodological shortcoming of past research examining the relationship between MBTI® psychological type preferences and computer attitudes is the use of small and restricted samples. This highlights the need for a larger, more varied and general sample to be investigated in terms of these constructs.

Many contradictory and disparate findings exist with regard to the relationship between demographic variables and computer attitudes (Dyck & Smither, 1994). This suggests a need for basic, controlled research in the area of computer attitudes and these variables. Maurer (1994) adds that the entire area of computer anxiety and its correlates has not been sufficiently examined to clearly define the relationships between computer anxiety and demographic variables, in particular age, gender, and past computer experience.

In sum, much of the research in this area is significantly flawed, making it difficult to support any particular claim. Further research with more focus is thus recommended.

1.7 OVERVIEW AND HYPOTHESES

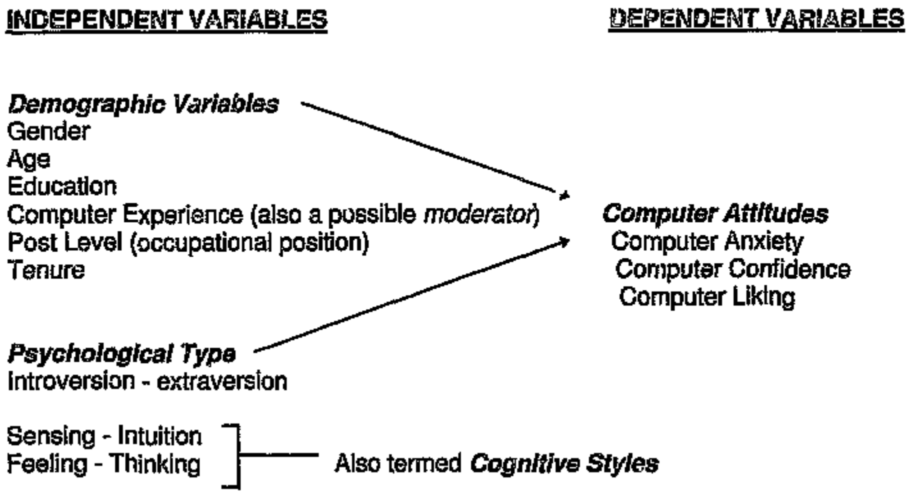
The abundance of previous theoretical and empirical research findings outlined in this review underscore three important issues of ongoing debate:
(1) is there a relationship between an individual's psychological type and cognitive style, as determined by preferences on the Myers Briggs Type Indicator, and his or her computer attitudes, namely computer anxiety, computer confidence, and computer liking?;
(2) is there a relationship between computer attitudes, namely computer anxiety, computer conidence, and computer liking, and various demographic and user-situation variables, namely gender, age, education, tenure, occupational position (post level), and previous computer experience?; and
(3) to what extent does prior computer experience moderate the relationship between psychological type/cognitive style, other demographic variables, and computer attitudes?

The present study investigates the domain of human-computer interaction, with the independent variables being **psychological type** and **cognitive style**, as measured by preferences on the MBTI®, and **demographic variables**, namely age, gender, education, previous computer experience, post level, and tenure. Dependent variables consist of **computer attitude** as a total score, which is composed of **computer anxiety, computer liking**, and **computer confidence.**

The conceptual model guiding this research is presented in Figure 1.7.1. The model is taken from ideas gleaned from Zmud's (1979) model of management information systems (MIS) success, the recommendations of Mason & Mitroff (1973), and various other empirical findings regarding similar relationships in more recent years.

FIGURE 1.7.1

Possible Relationships Among the Dependent and Independent Variables



Based on the model of the relationships being investigated in Figure 1.7.1, as well as on the theory and research already summarised, the following hypotheses with regards to the main study variables are investigated in the present study:

1.7.1 Hypotheses of the Present Study with Respect to Psychological Type/Cognitive Style, and Computer Attitudes

***Hypothesis 1*:**

People with a thinking preference will exhibit less computer anxiety than people with a feeling preference.

***Hypothesis 2*:**

People with a thinking preference will exhibit more computer confidence than people with a feeling preference.

***Hypothesis 3*:**

People with a thinking preference will exhibit greater computer liking than people with a feeling preference.

Hypothesis 4:

People with a thinking preference will exhibit more positive attitudes toward computers than people with a feeling preference.

Hypothesis 5:

People with an introverted preference will exhibit less computer anxiety than people with an extraverted preference.

Hypothesis 6:

People with an introverted preference will exhibit more computer confidence than people with an extraverted preference.

Hypothesis 7:

People with an introverted preference will exhibit greater computer liking than people with an extraverted preference.

Hypothesis 8:

People with an introverted preference will exhibit more positive attitudes toward computers than people with an extraverted preference.

Hypothesis 9:

People with a sensing preference will exhibit less computer anxiety than people with an intuitive preference.

Hypothesis 10:

People with a sensing preference will exhibit more computer confidence than people with an intuitive preference.

Hypothesis 11:

People with a sensing preference will exhibit greater computer liking than people with an intuitive preference.

Hypothesis 12:

People with a sensing preference will exhibit more positive attitudes toward computers than people with an intuitive preference.

1.7.2 Further Analyses with the Demographic Variables

Further statistical analyses will be carried out with regards to the demographic variables, in order to investigate their relationships with the dependent variables (computer attitudes), and to assess the impact of these variables in terms of the above hypothesised relationships. In addition, the extent to which previous computer experience is a predictor of computer attitudes, or whether it moderates the relationships between the independent variables (psychological type, cognitive style, and demographic variables) and the dependent variables (computer attitudes - anxiety, liking, and confidence), will be investigated. Further details of these relationships are presented in Table 2.1 of the Methodology (Chapter 2) and in sections 3.3.1, 3.3.2, 3.3.3, 3.4 and 3.5 of the Results (Chapter 3).

CHAPTER 2

2.1 METHODOLOGY

This aim of this chapter is to thoroughly describe how the entire research process for the present study was carried out. This includes issues such as the sample used in the study, the methods of data gathering, the type of research design, the measuring instruments used to assess the constructs or variables under investigation, justification for the use of the instruments, statistical procedures used in the study to interpret the raw data, as well as an explanation of these statistical procedures.

2.1.1 SAMPLE AND RESEARCH PROCEDURE

Prior to commencing the study and the data collection, the researcher approached the Assistant General Manager of Human Resources of a prominent banking organisation in South Africa, in order to discuss and obtain permission to undertake the data collection within that firm. Various ethical considerations need to be upheld with regards to the administration of the MBTI®, as stipulated by Van Rooyen & Partners in conjunction with Consulting Psychologists Press, Inc. Two of these considerations which pertain particularly to the present study are that copyright laws of the MBTI® may not be violated, and thus users should not reproduce or distribute the published instrument and its materials; the other is that respondents should be informed of the purpose and intended use of results prior to taking the instrument, in a face-to-face setting. Based on such considerations, the following process was carried out: The HR manager provided the researcher with the names of seven Human Resource Consultants in the Gauteng area. The researcher contacted each of the consultants, explained the study to them, and requested that she be provided with names of all branch managers in each of the consultants' service areas. Lists of the names, locations, and telephone numbers of each of the branch managers were faxed to the researcher. The researcher then telephoned each branch manager to inform them of the study, the reasons for requiring a sample from them, to obtain permission to enter the branches, and subsequently to make an appointment to conduct the data collection at a time which would suit all parties involved.

Data collection took place in 25 motor and industrial finance branches, covering areas in the West Rand, East Rand, Northern, and Southern Johannesburg, and Pretoria. The use of different branches in various regions served to increase generalisability and to provide a more representative sample for the current investigation (Cook & Campbell, 1979). Upon arriving at branches, the researcher met each branch manager, who then led the researcher to a suitable room where respondents could sit quietly and concentrate on completing the questionnaires. This room was usually the boardroom, and in the few cases where no boardroom existed, the researcher and respondents used a suitable office. The branch manager had previously informed the potential respondents what time the researcher would be arriving on the day of the data collection, so that respondents were prepared in advance, and had allocated time in their schedules to be of help to the researcher. However, it was still emphasised that responding was voluntary, by both the branch manager and the researcher. Many staff members refused to answer the questionnaires, and excused themselves. Those that volunteered were sincere about responding and being of aid to the researcher.

Once the staff were seated and comfortable, the branch manager introduced the researcher to the staff, reminding them of their reasons for being present, and of his or her appreciation in being of aid to the researcher. The researcher then continued with her thanks and appreciation, further explaining the nature and goals of the research, emphasising the voluntary nature of the research, and assuring the respondents of complete confidentiality and anonymity (no names were required on the biographical questionnaire, and the researcher specified to all respondents not to write their names in the space required on the left hand side of the Form G response sheet). Each respondent received a package consisting of a covering letter from the researcher explaining the objectives of the research, encouraging participation, and reaffirming what she had stated verbally prior to handing out the questionnaires; a short biographical questionnaire; a scale assessing computer attitudes; and a Form G question booklet and answer sheet for the MBTI®. Respondents were assured of no time limit in completing the questionnaires, although most respondents took approximately twenty minutes to half an hour. Whenever possible, subjects were given an MBTI® question booklet and answer sheet in their language preference, i.e. either English or Afrikaans. This provided for more accurate responding to this very important and highly acclaimed instrument.

Ethical considerations stated in the previous paragraph meant that the researcher had to collect data on a face-to-face, individual basis, and furthermore, adherence to copyright laws, and hence cost implications, resulted in the sample size being limited to approximately 200. A maximum of twelve respondents completed the questionnaires at one time or "sitting". This enabled the researcher to have more control over the completion of questionnaires, and to be able to be of assistance and maintain awareness of the respondents, in order to make sure they were completing the questionnaires correctly, and that they adhered to the instruction of omitting their names from the questionnaires. Upon completion of the questionnaires, the respondent(s) would hand the questionnaire to the researcher and would quietly leave the room, so as not to disturb the other respondents. Some people spent up to 40 minutes answering the questionnaires, while others were finished within 15-20 minutes. The amount of respondents obtained from each branch varied, depending on the time of the month, the size of the branch in terms of staff, and the staff available. In terms of race, it is important to note that all respondents obtained were white. The average number of respondents obtained from each branch was eight. The final sample size consisted of 190 cases. Christensen (1985) notes that as the number of subjects within a study increases, the ability of statistical procedures to detect true differences increases. The present sample size (n = 190) was statistically satisfactory for the current study. Demographic details of the sample are presented in Table 2.1.

Table 2.1 Demographic Details of the Sample

DEMOGRAPHIC VARIABLE	FINDINGS
AGE	Min: 20 years Max: 62 years Mean: 32 years *SD*: 8.76 years **Categories** **(years)** ***n*** **%** 10 - 20: 4 2 20 - 30: 100 53 30 - 40: 54 29 40 - 50: 21 11 50 - 70: 9 5
GENDER	Male: 74 (39%) Female: 116 (61%)
LANGUAGE	English: 43 (23%) Afrikaans: 146 (77%)
HIGHEST EDUCATIONAL QUALIFICATION	Std 9 or less: 6% Matric: 65% Diploma: 15% Bachelor's Degree: 9% Postgraduate Degree: 5%
POST LEVEL	A (low level e.g. basic clerks): 1% B (secretaries & admin. clerks): 47% T (more skilled e.g. technical): 36% P (professional e.g. marketers): 9% M (management level): 7% E (executive level): 0%

Table 2.1 continued

DEMOGRAPHIC VARIABLE	FINDINGS
TENURE	Min: 1 month Max: 40 years Mean: 4.4 years *SD*: 4.9 years **Categories** **(years)** ***n*** 0 - 3: 77 3 - 7: 77 7 - 11: 19 11 - 20: 14 20 - 40: 2
COMPUTER USE (HOURS PER WEEK)	Min: 0 hours Max: 160 hours Mean: 19.48 hours *SD*: 19.5 hours **Categories** **(hours)** ***n*** 0 - 9: 85 9 - 27: 31 27 - 44: 53 44 - 62: 16 62 - 160: 1
PREVIOUS COMPUTER EXPERIENCE	**On a rating of 1 - 7** **%** None to very little (1, 2): 12 Less than moderate (3): 25 Moderate (4): 30 More than moderate (5): 21 Very experienced to expert (6, 7): 12

2.1.2 RESEARCH DESIGN

In view of the fact that the present study aims to ascertain the existence of a relationship between the independent variables, namely *psychological type* and *cognitive style*, and the various biographical variables, and the dependent variables, namely *computer attitude*, which incorporates *computer anxiety*, *computer confidence*, and *computer liking*, a cross-sectional, correlational, non-experimental design is necessary. This approach does not allow for causal inferences to be made about the areas of concern, but does allow for associations to be made (Neale & Liebert, 1986). The aim of a cross-sectional study is to measure certain characteristics at a particular moment in time (Christensen, 1985). Therefore, measures were administered to a single sample and no repeat measures were applied.

The research design is classified as non-experimental owing to the fact that *psychological type* and *cognitive style* are not manipulable. Reber (1985) and Kerlinger (1986) describe non-experimental research as the form of enquiry whereby the researcher does not have direct control of the independent variables, either because they are inherently not manipulable, or because their manifestations have already occurred. Consequently, non-experimental research is the most systematic empirical enquiry from which one can make inferences about the relationships between variables, rather than cause-effect relationships (Kerlinger, 1986).

The package consisting of the biographical and computer attitude questionnaires, and Form G of the MBTI®, were together of a self-report, survey nature. Questionnaires of such type have an advantage in that they are easy and convenient to use and distribute, they are economical, and they allow for anonymity (Rosenthal & Rosnow, 1991). Kerlinger (1986) warns that the voluntary nature of survey/questionnaire research can be problematic. However, this was not a problem in the present study, because the administration of the questionnaire packages by the researcher, on such a personalistic, individual basis resulted in all respondents voluntarily accepting to serve as respondents. Furthermore, the data collection method meant that all questionnaires distributed were returned, so there was no chance of questionnaires being distributed and not returned because of factors such as lack of interest, desire, or approval in answering them.

A possible problem in the current research is that of social desirability bias (Rosenthal & Rosnow, 1991), which is defined as "a bias or set to respond to self-evaluative questions in a socially approved manner so as to appear more socially desirable either to oneself or to others" (Reber, 1985, p. 706). Various strategies may be employed in questionnaires to avoid producing a social desirability set, one of which is ensuring confidentiality of results. This tends to encourage subjects to respond truthfully (Rosenthal & Rosnow, 1991). The present research did indeed ensure confidentiality to all respondents, and all questionnaires were thoroughly analysed before entering the data on a statistical package, in order to detect as much as possible negligent or half-hearted answering.

2.2 MEASURING INSTRUMENTS

In accordance with the aims and hypotheses of the current research, five constructs necessitated measurement, namely *psychological type, cognitive style, computer attitude, computer anxiety, computer confidence,* and *computer liking.* These five variables were operationalised by means of scales with sound psychometric properties. Questionnaires were composed of scales to assess these constructs, including a short biographical section at the beginning.

2.2.1 THE BIOGRAPHICAL QUESTIONNAIRE

The biographical section was designed to glean information on the following criteria: age, gender, home language, highest level of education obtained, job title, post level, tenure in one's present job, hours per week spent using a computer, specification as to what one uses the computer for, and due to the absence of a single reliable measure of computer experience, a self-rating scale of previous computer experience was used, with responses ranging from 1 (low experience) to 7 (high experience).

2.2.2 INDEPENDENT VARIABLES

Psychological Type and Cognitive Style

Jungian typology was selected, operationalised by means of the Myers Briggs Type Indicator (Briggs Myers & McCaulley, 1985), in order to determine each respondent's *psychological type* and *cognitive style.*

2.2.2.1 THE MYERS BRIGGS TYPE INDICATOR®

The MBTI® is a self-report questionnaire designed to make Jung's theory of psychological types useful and understandable in everyday life (Briggs Myers, 1993). The MBTI® was published in 1975 by Myers (Pocius, 1991). The indicator is available in six different forms. The current study used Form G, which consists of 126 items, 94 of which are scored, using a template, or mask. The instrument is virtually self-administering, and consists of a forced-choice format, primarily because type theory postulates dichotomies. The forced-choice format is necessary because both poles of a preference are valuable. The aim is to determine which of two valuable or useful behaviours or attitudes is preferred. If each choice were presented separately, both poles could be chosen and one could not know which pole was preferred. The forced-choice format also has the advantage of avoiding the bias of acquiescent and social desirability response sets (Briggs Myers & McCaulley, 1985).

All necessary instructions are provided on the cover of the question booklets and on the response sheets. The items are scored to classify respondents as falling closer to one pole or the other on each of the dimensions of psychological type, i.e. introversion-extraversion (I-E), thinking-feeling (T-F), sensing-intuition (S-N), and judgement-perception (J-P). The person is then classified as either introverted or extraverted, rather than receiving an I-E score. This scoring method is consistent with the theory's focus on categorical psychological types, rather than continuous personality traits (Messick, 1981; Briggs Myers & McCaulley, 1985).

Two kinds of descriptive measures are obtained from the MBTI®. First, each individual receives a score that is indicative of a preference for one of the poles on each index (e.g. thinking or feeling). Second, the four preferences from these indices are combined to form one of 16 possible MBTI® personality types (e.g. INTP). To maintain clarity in this review, an individual's score on a particular index is designated as an individual's preference (e.g. thinking), while the combination of an individual's four preferences, for example, introversion-intuitive-thinking-perceiving, is designated as the individual's psychological type (i.e., INTP) (Briggs Myers & McCaulley, 1985; Pocius, 1991). For the purposes of the current investigation, and in accordance with the hypotheses of the study, the preference scores, excluding the J-P index, will be utilised to ascertain psychological type preferences and cognitive style of the subjects. Frequencies of the 16 type profiles will be reported, but an enormous sample size would be necessary to investigate how type profiles as a whole relate to computer attitudes.

The Jungian typology was selected to assess psychological type and cognitive style, because the validity of Jung's (1923; 1971) dimensions have been demonstrated by hundreds of researchers (Caralyn, 1977; Myers & Myers, 1980), and there continues to be a growing research base which uses the MBTI® to assess psychological type/personality (Mason & Mitroff, 1973; McCrae & Costa, 1989; Pocius, 1991; Whitley, 1996a), and cognitive style (Henderson & Nutt, 1980; Slocum & Hellriegel, 1983; Igbaria & Parasuraman, 1989; Parasuraman & Igbaria, 1990; Chu & Spires, 1991; Fisher, 1995), and because the indicator has been reported to be a reliable self-report inventory that measures dimensions of personality quite similar to those postulated by Jung (1971) (Whitley, 1996a). However, contrasting opinions of the reliability of the MBTI® do indeed exist, and these shall be returned to later in this section.

Myers & McCaulley (1985) report that extensive item analyses have been conducted for all forms of the MBTI®, including Form G. Item analyses have proven Form G to be successful in that items do indeed discriminate between the poles of a preference and that items make a useful contribution to only one of the four indices. Throughout the development of the MBTI®, all item analyses were computed separately for males and females. It was discovered that some questions were valid only for one sex. On the T-F scale, it was evident that females had a greater tendency to give certain feeling responses than did males. The difference was due either to the possibility that certain feeling responses were more socially desirable for females than males, or to the effect of social training. Separate weights were assigned to T-F items for each sex. Intercorrelations of continuous scores for various populations show that E-I, S-N, T-F, and J-P tend to be independent of each other, except that S-N and J-P tend to be significantly and positively correlatod. The MBTI® has been shown to have good split-half reliability, and estimates of internal consistency reliabilities for the continuous scores of the four MBTI® scales are acceptable for most adult samples. Practical questions with regards to test-retest reliabilities of the MBTI® revolve around the likelihood that on retest a person will come out the same MBTI type, that is, a person will choose the same pole of all four dichotomous preferences. Overall, test-retest reliabilities of the MBTI® show consistency over time. When subjects report a change in type, it is most likely to occur in only one preference, and in scales where the original preference was low. Finally, because the MBTI® was designed to implement Jung's theory of psychological types, its validity is determined by its ability to demonstrate relationships and outcomes predicted by theory. The instrument has been shown to be valid in this regard (Briggs Myers & McCaulley, 1985).

McCrae & Costa (1989) evaluated the MBTI® from the perspectives of Jung's theory of psychological types, and concluded that Jung's theory is either incorrect or inadequately operationalised by the MBTI®, and cannot provide a sound basis for interpreting it. Personality psychologists have generally been less enthusiastic about using the MBTI®. Theorists complain that the Jungian concepts that are supposed to underlie the MBTI® have been distorted (Comrey, 1983, in McCrae & Costa, 1989), psychometricians are troubled by the conception of psychological types (Mendelsohn, Weiss & Feimer, 1982), and the limited evidence that the MBTI® measures anything other than quasi-normally distributed personality traits (Hicks, 1984). However, despite these concerns, even critical reviewers see promise in the instrument, and its continued popularity, as well as empirical literature to date, suggests that it is effective at some level (McCrae & Costa, 1989).

2.2.3 DEPENDENT VARIABLES

2.2.3.1 COMPUTER ATTITUDES

Computer Anxiety, Computer Confidence and Computer Liking

Owing to the information focus of the present study being that of human-computer interaction, incorporating attitudes towards computers, a measure for gauging an individual's attitudes towards computers is necessary. *Computer attitude* will be assessed using Loyd & Gressard's (1984) Computer Attitude Scale (CAS).

The CAS is a thirty-item four-point Likert scale with three subscales consisting of ten items each, namely *Computer Anxiety* (anxiety or fear of computers), *Computer Confidence* (confidence in one's ability to use or to learn about computers), and *Computer Liking* (liking computers or enjoying working with computers) (Loyd & Gressard, 1984). The items of each subscale are mixed and distributed throughout the instrument. The items presented are positively and negatively worded statements such as "Computers do not scare me at all" and "Working on a computer would make me very nervous". Fifteen of the items are content reversed. In response to the statements, subjects indicate which one of the four ordered responses from strongly disagree to strongly agree most closely represents the extent to which they disagree or agree with the ideas expressed. The responses for the positively worded items are recorded so that strongly disagree = 1; slightly disagree = 2; slightly agree = 3; and strongly agree = 4. Thus, a higher score corresponds to a more positive attitude toward computers, as well as greater confidence and liking, and a lower score corresponds to a more negative attitude and less confidence and liking. However, this scoring strategy has resulted in higher scores on the anxiety subscale corresponding to lower anxiety, and lower scores corresponding to higher anxiety. The 30-item scale takes less than 10 minutes to administer.

The primary criterion for the selection of the research measures in the current study was that they be reliable and valid. Woodrow (1991) suggests that the CAS is perhaps the most extensively used and tested of all computer attitude scales. Loyd & Loyd (1985) reported coefficient alpha scores of .90, .89, and .89 respectively for the anxiety, confidence, and liking subscales. Loyd & Gressard (1984) reported reliabilities for anxiety, confidence, liking, and total attitude scales to be .86, .91, .91, and .95 respectively, Koohang (1989) reported scores to be .93, .91, .93, and .97 respectively, and Busch (1995) reported coefficients to be .88, .89, .89, and .95 respectively. Dyck & Smither (1994) reported alpha reliability coefficients for each subscale as .87, .91, and .91 for anxiety, confidence, and liking respectively. Henderson, Deane & Ward (1995) reported an alpha coefficient for the anxiety subscale as .88.

Intercorrelations between the three subscales are typically in the .67 to .84 range. Reliability coefficients and factor analysis suggest each of the three subscales are sufficiently discrete to be used separately (Loyd & Gressard, 1984), a finding confirmed by Bandalos & Benson (1990). A principal component analysis with a varimax rotation of the items indicated a three component solution, which accounted for 55% of the variance. All three components had eigenvalues greater than 1.00 (Loyd & Gressard, 1984; Loyd & Loyd, 1985). However, despite assertions about the existence of three separate, discrete factors, or subscales, in the CAS, the *factor structure* has been brought into question, owing to the high inter-item correlations, and the high intercorrelations between the subscales. Woodrow (1991) reported that the high intercorrelations among the subscales and the total score indicated that the subscales were accounting for a large amount of common variance.

2.3 STATISTICAL ANALYSIS

Numerous statistical procedures were utilised in the present study in order to interpret the raw data. These are outlined below:

2.3.1 Pearson's Product Moment Correlation Coefficient

This statistical method will be applied to determine the strength of the relationship between the independent variables *psychological type preferences* and *cognitive styles* (introversion-extraversion, thinking-feeling, and sensing-intuition), and the dependent variables, namely *computer attitude*, *computer anxiety*, *computer confidence*, and *computer liking*. Thus, hypotheses 1 - 12 will be analysed using this statistical method.

Correlation is a technique which seeks to determine the direction and degree of linear relationship between two variables (McCall, 1990; Spiegel, 1990). The Pearson product-moment correlation coefficient was developed by Karl Pearson, a foremost figure in modern statistics. It is a number ranging from -1.00 through .00 to +1.00 that reflects the extent of a linear relationship. It is termed a *coefficient* because it is unitless, i.e. it is not expressed in units of measurement - it is just a quantity that varies with the direction and degree of linear relationship (McCall, 1990). A linear relationship is one in which a fixed change in one variable is always associated with a fixed change in the other variable (Rosenthal & Rosnow, 1991). Even though it is not possible to deduce causation when this measure is applied, it is however a suitable method to use in ascertaining the strength of a *relationship* between the variables under consideration, which may range from a perfect positive (+1.00) to a perfect negative one (-1.00), with $r = 0$ representing no linear relationship whatsoever (Neale & Liebert, 1986; Spiegel, 1990; McCall, 1990; Rosenthal & Rosnow, 1991).

When conducting correlational research with the MBTI®, it is useful to treat the dichotomous preference scores as if they are continuous scales. Continuous scores are a linear transformation of preference scores. Thus, four continuous scores can be obtained which correspond to the difference between opposing preferences; these scores have a theoretical neutral point of 100, and are calculated using the following procedure:

- For E, S, T, or J preference scores, the continuous score is 100 minus the numerical portion of the preference score;
- For I, N, F, or P preference scores, the continuous score is 100 plus the numerical portion of the preference score.

S 15 is therefore a continuous SN score of 85, and I 25 is an EI continuous score of 125.

2.3.2 t-Tests

One of the most common uses of the t-test involves testing the difference between the means of two independent groups (Howell, 1992). The present study therefore used this statistical procedure to establish whether there is a difference in the mean score of computer anxiety, computer confidence, computer liking, and total computer attitude scores for each of the independent variables, i.e. E-I, S-N, or T-F psychological types/cognitive styles, as well as gender and the English and Afrikaans language groups.

In order for t-tests to be carried out, certain assumptions and conditions must be met:

1. The subjects in each group must be **randomly** and **independently sampled;**

2. The groups must be **independent;**

3. The population variances must be **homogeneous;**

4. The population distribution must be **normal** in form (McCall. 1990; Rosenthal & Rosnow, 1991).

The present study fulfilled each of the above requirements.

2.3.3 One Way Analysis of Variance

When using t-tests, we test the significance of differences between two independent sampling means. In many situations, there is a need to test the significance of differences between three or more sampling means or, equivalently, to test the null hypothesis that the sample means are all equal. Problems such as this can be solved by using an important technique known as *analysis of variance*, developed by Fisher (Spiegel, 1990; McCall, 1990; Rosenthal & Rosnow, 1991).

Four assumptions must be met before the statistical manipulations necessary for ANOVA may be performed:

1. The subjects in each group are **randomly** and **independently** sampled;

2. The groups of scores being analysed are **independent;**

3. The population variances for the groups are **homogeneous;**

4. The population distribution of scores is **normal** in form (McCall, 1990,).

The present study fulfilled each of the above requirements.

The analysis of variance produces a significant result if the F statistic is significant, which means that the null hypothesis that the treatment means in the population are equal, is rejected. Strictly speaking, this conclusion indicates that at least one of the population means is different from at least one other mean, but we don't know exactly which means are different from which other means (Howell, 1092). In this case, the researcher makes one or at most two comparisons, one of these being *a posteriori* or *post hoc comparisons*. Sometimes all possible pairs of means are to be compared. Typically, this procedure occurs *after* the ANOVA has produced a significant result and the researcher wants to know which means are significantly different from which other means for the entire set of means in the analysis (McCall, 1990; Rosenthal & Rosnow, 1991). One of the oldest methods for making post hoc comparisons is known as **Fisher's Least Significant Difference (LSD)** test (Rosenthal & Rosnow, 1991). The present study made use of the LSD test when ANOVA results were significant.

2.3.4 Multiple Linear Regression

Regression is a statistical technique which uses the association between variables as a method of prediction. It is applied in the present study so that psychological type and cognitive style preferences, as well as the demographic variables (the predictors) can be used to predict the levels of each of the dependent variables (the criterion) (Neale & Liebert, 1986; McCall, 1990).

One of the *simplest* relationships between two variables occurs when high values on one measure are associated with high values on another variable and low values on one are associated with low values on the other. Such a relationship may be represented as a straight line on a graph. A line with a positive slope indicates a positive or direct relationship and a line with a negative slope represents a negative or inverse relationship. The line describing the relationship between two variables is known as the **regression line**. The regression line may be represented by the equation $Y = bX + a$, in which b is the numerical value of the slope and a is the value of the y-intercept (McCall, 1990). In multiple linear regression, on the other hand, we solve the equation $Y = b_0 + b_1X_1 + b_2X_2 + ... + b_pX_p$ where b_0 represents the intercept and b_1, b_2, ... , b_p are the regression coefficients for the predictors X_1, X_2, ... , X_p, respectively (Howell, 1992).

Given the apparent varying degrees by which psychological type and cognitive style preferences, and each of the demographic variables analysed in the present study are believed to explain (predict) the variance in computer attitudes as a whole, computer anxiety, computer confidence, and computer liking, the present research undertook a multiple linear regression analysis, in a *stepwise* fashion, using the backward elimination procedure. This procedure falls under the term *stepwise procedures* because it follows a logical stepwise fashion in order to choose predictor variables for inclusion in the model. In the backward elimination procedure, we begin with a model that includes all of the assumed predictors of a particular criterion. Having computed that model, we examine the tests on the individual regression coefficients, and we remove the variable that contributes the least to the model (assuming that its contribution is not significant). The regression is then re-run without that predictor, again looking for the variable with the smallest contribution, which is removed, and so the process continues, until a model is reached in which all of the remaining predictors are significant and which, as a set, contribute most variation in the dependent variable (Howell, 1992; Crable *et al.*, 1994).

2.3.5 Moderated Multiple Linear Regression

In addition to conducting multiple regression such as that stated above, in order to determine the model containing the significant predictors of the criterion (dependent variables), the present study sought to identify and investigate whether previous computer experience was a *moderator* of the relationships in the regression model.

According to Baron & Kenny (1986, p. 1174), "a moderator is a qualitative (e.g. sex, race, class) or quantitative (e.g. level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable." The essential properties of a moderator variable are summarised in Figure 2.1.

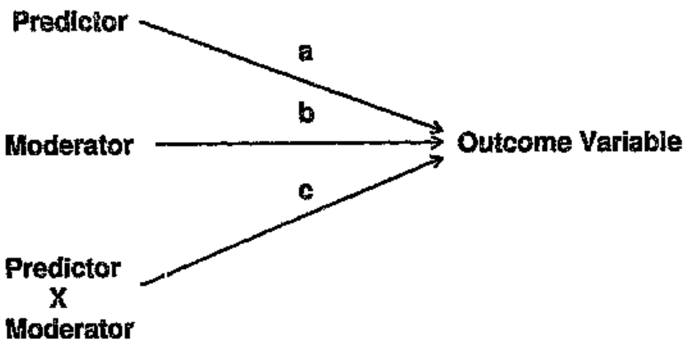


Figure 2.1. Moderator Model

The model diagrammed in Figure 2.1 has three causal paths that feed into the outcome variable of, for example, c mputer anxiety: the impact of the thinking-feeling preference as a predictor (Path *a*), the impact of previous computer experience as a moderator (Path *b*), and the interaction or product cf these two (Path *c*) - also termed the *moderating variable.* The moderator hypothesis is supported if the interaction (Path *c*) is significant. There may also be significant main effects for the predictor and the moderator (Paths *a* and *b*), but these are not directly relevant conceptually to testing the moderator hypothesis (Baron & Kenny, 1986). It is further desirable that the moderator variable (previous computer experience) be uncorrelated with both the predictor and the criterion (the dependent variable) to provide an interpretable interaction term. Also evident from Figure 2.1 is that, unlike the mediator-predictor relation (where the predictor is causally antecedent to the moderator), moderators and predictors are at the same level with regards to their role as causal variables antecedent to the criterion effects (the dependent variable). Thus, moderator variables always function as independent variables. Moderator variables are typically introduced when there is an unexpectedly weak or inconsistent relation between a predictor and a criterion variable (ibid.).

CHAPTER 3

3. RESULTS

Chapter 3 consists of a concise, yet thorough presentation of the statistical procedures and results thereof, which the researcher applied and utilised in order to interpret the raw data and to analyse the hypotheses and research questions outlined in section 1.7 of Chapter 1. Minimal discussion of these statistical findings will take place in this chapter. This is simply a presentation of the results, and further discussion of the findings will take place in the following chapter.

3.1 PRELIMINARY ANALYSES

3.1.1 RELIABILITY RESULTS FOR THE COMPUTER ATTITUDE SCALE AND THE THREE SUBSCALES

The present study yielded adequate Cronbach alpha coefficient results for the computer anxiety subscale, the computer confidence subscale, the computer liking subscale, and the total computer attitude scale. Cronbach's alpha is the estimated correlation of the test with any other test of the same length with similar items (i.e. items from the same item universe). It is believed to be regarded as the most important index of test reliability (Loewenthal, 1996). The criteria of acceptability for reliability coefficients differ. Kline (1993, in Loewenthal, 1996) recommends a minimum of 0.80. The British Psychological Society's Committee on Test Standards suggests that 0.70 is acceptable (Loewenthal, 1996). Reliability results for the Computer Attitude Scale (CAS) used in the current study are presented in Table 3.1.

Table 3.1 Cronbach Alpha Coefficients for the Computer Attitude Scale

SCALE/SUBSCALE	ALPHA (α) COEFFICIENT
Computer Anxiety Subscale	$\alpha = .83$
Computer Confidence Subscale	$\alpha = .85$
Computer Liking Subscale	$\alpha = .85$
Total Computer Attitude Scale	$\alpha = .93$

3.1.2 DESCRIPTIVE STATISTICS FOR MBTI® TYPES AND PREFERENCES

Although type profiles as a whole, based on the sixteen types, are not being analysed in the present study, it is of interest to take note of the frequencies of types in the present sample. The *type table* presents the sixteen types in a logical relationship, and is designed to highlight similarities and differences of the types by their placement (Briggs Myers & McCaulley, 1985). The type table for the present sample is presented in Table 3.2.

TABLE 3.2 MBTI® TYPE TABLE FOR THE PRESENT SAMPLE (N = 190)

ISTJ N = 48 % = 25.26 ■■■■■■■■■■ ■■■■■■■■■■ ■■■■■	ISFJ N = 12 % = 6.32 ■■■■■■	INFJ N = 0 % = 0	INTJ N = 4 % = 2.10 ■■
ISTP N = 6 % = 3.16 ■■■	ISFP N = 2 % = 1.05 ■	INFP N = 1 % = 0.53 ■	INTP N = 1 % = 0.53 ■
ESTP N = 10 % = 5.26 ■■■■■	ESFP N = 5 % = 2.63 ■■■	ENFP N = 6 % = 3.16 ■■■	ENTP N = 12 % = 6.32 ■■■■■■
ESTJ N = 54 % = 28.42 ■■■■■■■■■■ ■■■■■■■■■■ ■■■■■■■■	ESFJ N = 15 % = 7.89 ■■■■■■■■	ENFJ N = 2 % = 1.05 ■	ENTJ N = 12 % = 6.32 ■■■■■■

■ = 1 % of sample

As is evident in Table 3.2, the majority of the sample in the present study fell under two type profiles, namely ISTJ and ESTJ. It is of concern that there is only a small percentage of individuals with *intuition* (N) as a preference in their profile. This concern is also evident in Table 3.3 below, which shows the distribution of the three sets of preferences under consideration in the present investigation. The unequal distribution of preferences should be cautioned when making comparisons in terms of preferences, particularly with the S-N dimension. There is also a very small (22.63) percentage of people with a preference for *feeling* (F).

TABLE 3.3 FREQUENCIES OF MBTI® DICHOTOMOUS PREFERENCES

PREFERENCE	N	% OF TOTAL SAMPLE
THINKING (T)	147	77.37
FEELING (F)	43	22.63
SENSING (S)	152	80
INTUITION (N)	38	20
EXTRAVERSION (E)	116	61.05
INTROVERSION (I)	74	38.95

3.1.3 FACTOR ANALYSIS OF THE COMPUTER ATTITUDE SCALE

In order to confirm the factor structure of the CAS, a confirmatory principle components analysis with varimax raw rotation of the scale was performed on the sample used in the present study. The analysis yielded a three-factor solution, with all three factors having eigenvalues greater than one. All items loading above 0.4 were included. The scree test also indicated that three factors would adequately fit the data. Results of the factor analysis are shown in Table 3.4.

Table 3.4 Factor Loadings for the Computer Attitude Scale

Note: Items are not numbered. The letter in brackets after each item indicates which subscale of the Computer Attitude Scale the item originally stems from.

KEY: A = Anxiety C = Confidence L = Liking

ITEM	*FACTOR 1*	*FACTOR 2*	*FACTOR 3*
Computers do not scare me at all (A)	.63		
I like working with computers (L)	.58		
Working with computers makes me very nervous (A)	.63		
I'm no good with computers (C)	.58		
Computers make me feel uncomfortable (A)	.54		
I get a sinking feeling when I have to use a computer (A)	.56		
I don't understand how some people can spend so much time working with computers and seem to enjoy it (L)	.57		
Using a computer is very difficult for me (C)	.60		
I do as little work with computers as possible (L)	.53		
Computers make me feel uneasy ,confused (A)	.75		
I don't think I could handle a computer course (C)	.41		
I feel aggressive, hostile towards computers (A)	.59		
I do not feel threatened when others talk about computers (A)		.45	
It wouldn't bother me at all to take computer courses (A)		.58	
I would feel at ease in a computer class (A)		.57	
I think working with computers is enjoyable and stimulating (L)		.71	
I am sure I could do work with computers (C)		.46	
I feel comfortable working with a computer (A)		.55	
When there is a problem with a computer run that I can't immediately solve, I stick with it until I have the answer (L)		.57	
I am sure I could learn a computer language (C)		.65	
Once I start working with a computer, I find it hard to stop (L)		.65	
If a problem is left unsolved in a computer class, I would continue to think about it afterwards (L)		.52	
I could get good grades in computer courses (C)		.66	
I have a lot of self-confidence when it comes to working with computers (C)		.55	
The challenge of solving problems with computers does not appeal to me (L)			.67
Generally I feel okay about trying a new problem on the computer (C)			.49
I don't think I could do advanced computer work (C)			.75
Figuring out computer problems does not appeal to me (L)			.74
I'm not the type to do well with computers (C)			.58
I do not enjoy talking with others about computers (L)			.45

The first factor accounted for 37.8% of the total variance, and included six of the computer anxiety items, three of the computer confidence items, and three of the computer liking items. However, most of the highest loadings dealt with computer anxiety issues. The second factor accounted for 5.8% of the total variance, and included an equal number of items, i.e. four from each of the three subscales. The third factor accounted for 5.3% of the total variance and also included an equal number of items, i.e. three from each of the three subscales. The results of these factor loadings bring the three-factor structure into question. Table 3.5 below illustrates the correlations between the three subscales and the total score. As is evident, all the correlations are significant and extremely high, ranging from - .76 to .94. The subscales could thus be accounting for a large amount of common variance, as postulated by Woodrow (1991), and this could explain the results of the factor analyses. Although not illustrated in table form, the inter-item correlations are also significant. One needs to take care in interpreting the results of the current study, particularly with regards to the computer confidence and computer liking constructs, as these do not seem to be discrete despite the assertions of past research that they indeed are. One can, however, place relative confidence in the computer anxiety construct, and the total computer attitude score.

TABLE 3.5 Pearson Product-Moment Correlation Coefficients for the Three Subscales of the CAS and the CAS Total Score

N = 190	Computer Anxiety	Computer Confidence	Computer Liking	Computer Attitude (Total)
Computer Anxiety	-			
Computer Confidence	- .79*	-		
Computer Liking	- .76*	.83*	-	
Computer Attitude (Total)	- .91*	.94*	.94*	-

* $p < 0.05$

Overall, the CAS has been systematically developed and tested for reliability and validity on a variety of samples, ranging from high school pupils, to university students, to teacher samples (LaLomia & Sidowski, 1993). The scale structure has been shown to be invariant across these samples, and across males and females (Bandalos & Benson, 1990). The scale has been most extensively used to examine correlates of computer attitudes on populations of college students (LaLomia & Sidowski, 1993).

3.2 HYPOTHESES 1 - 12: STATISTICAL PROCEDURES AND RESULTS

3.2.1 Correlational Analyses

Hypotheses 1 - 12 were analysed using two statistical methods. Firstly, pearson product-moment correlation coefficients between the MBTI® continuous scores and the dependent variables computer anxiety, computer confidence, computer liking, and total computer attitude scores were calculated. Results of these correlations are presented in Table 3.6.

TABLE 3.6 Pearson Product-Moment Correlation Coefficients for MBTI® Continuous Scores and Dependent Variables

N = 190	Computer Anxiety	Computer Confidence	Computer Liking	Computer Attitude (Total)
E-I Continuous Score	0.03	- 0.04	0.00	0.01
S-N Continuous Score	- 0.16*	0.21*	0.18*	0.14
T-F Continuous Score	0.15*	- 0.12	- 0.09	- 0.16*

* $p < 0.05$

With regards to the main hypotheses of the study, Table 3.6 reveals some interesting results. People with a thinking preference report lower levels of computer anxiety (r = .15). This is a low correlation, but is nonetheless statistically significant. Hypothesis 1 is thus supported (refer to pages 28 - 29 for the hypotheses). Hypotheses 2 and 3 are partially supported in that people with a thinking preference report higher computer confidence and computer liking (r = - .12 and - .09 respectively), but these correlations are not significant. Hypothesis 4 is supported, in that people with a thinking preference indicate more positive computer attitudes as a whole than do people with a feeling preference (r = - .16). In addition, this result is statistically significant.

People with a sensing preference report greater computer anxiety than do people with an intuition preference (r = - .16), a statistically significant result. This finding is in contrast to Hypothesis 9. People with a sensing preference further report less computer confidence (r = .21) and less computer liking (r = .18) than people with an intuition preference. These are low correlations, but the results are significant, thus resulting in findings in contrast to those proposed in Hypotheses 10 and 11. Furthermore, people with a sensing preference report lower computer attitudes as a whole (r = .14), rather than more positive attitudes, as suggested in Hypothesis 12, although this result is not significant.

Findings with regards to the E-I preference are not significant, thus resulting in the present study not supporting Hypotheses 5, 6, 7, and 8.

3.2.2 t-Tests

The second method used to analyse the main hypotheses of the study employed t-tests. The t-tests are useful in indicating whether people indicated as falling into one of the two preference groups, i.e. extravert or introvert, sensing or intuition, and thinking or feeling, differ in terms of their computer attitudes. Results of the t-tests are presented in Tables 3.7 - 3.9 below.

TABLE 3.7 t-Test Results for Extravert-Introvert Preferences in terms of Computer Attitudes

DEPENDENT VARIABLE	2-tailed t	p-level	Mean (Extraverts) N = 116	Mean (Introverts) N = 74
Computer Anxiety	- 0.30	.763	33.91	34.17
Computer Liking	- 0.63	.529	31.07	31.68
Computer Confidence	- 0.44	.663	32.67	33.06
Computer Attitude (Total)	- 0.90	.369	97.96	100.33

Results reveal that people reporting a preference for extraversion and people reporting a preference for introversion do not differ significantly in terms of their computer attitude scores.

TABLE 3.8 t-Test Results for Sensing-Intuition Preferences in terms of Computer Attitudes

DEPENDENT VARIABLE	2-tailed t	p-level	Mean (Sensing) N = 152	Mean (Intuition) N = 38
Computer Anxiety	- 2.58	.011*	33.49	36.15
Computer Liking	- 2.33	.021*	30.07	33.47
Computer Confidence	- 2.54	.012*	32.28	35.03
Computer Attitude (Total)	- 2.17	.032*	97.50	104.34

* $p < 0.05$

Results indicate a statistically significant difference between people reporting a preference for sensing and people reporting a preference for intuition, in terms of all the computer attitude scores. People with a sensing preference report less liking for computers, less confidence in using computers, less positive attitudes as a whole, and greater computer anxiety (remember: a low score on the computer anxiety scale signifies high anxiety, and a high scores signifies low anxiety), than people with a preference for intuition. These findings are in accordance with those reported in section 3.2.1 above. Once again, Hypotheses 9 - 12 are rejected, but are significant in the opposite direction.

TABLE 3.9 t-Test Results for Thinking-Feeling Preferences in terms of Computer Attitudes

DEPENDENT VARIABLE	2-tailed t	p-level	Mean (Thinking) N = 147	Mean (Feeling) N = 43
Computer Anxiety	2.08	.039*	34.48	32.46
Computer Liking	1.41	.160	31.65	30.05
Computer Confidence	1.50	.136	33.18	31.64
Computer Attitude (Total)	2.09	.038*	100.33	94.11

* $p < 0.05$

Table 3.9 indicates that there is a statistically significant difference between the mean scores for computer anxiety and for the total computer attitude scores, with regards to the thinking-feeling preference. People with a preference for thinking report lower anxiety and more positive computer attitudes as a whole, than do people with a preference for feeling. Thus, hypotheses 1 and 4 are supported. The mean scores for thinking individuals are also slightly higher than those for feeling individuals in terms of computer confidence and computer liking, thus lending partial support to Hypotheses 2 and 3, but these results are not significant.

3.3 FURTHER ANALYSES

3.3.1 CORRELATIONS

TABLE 3.10 Pearson Product-Moment Correlation Coefficients for Continuous Demographic Variables and the Dependent Variables

N = 190	Computer Anxiety	Computer Confidence	Computer Liking	Computer Attitude (Total)
AGE	.24*	- .27*	- .19*	- .26*
HOURS	- .06	.19*	.21*	.15
EDUCATION	- .03	- .08	- .12	- .07
POST LEVEL	.05	- .12	- .15*	- .13
TENURE	.02	- .02	.03	- .01
EXPERIENCE	- .33*	.46*	.41*	.42*

* $p < 0.05$

Table 3.10 reveals some interesting results which could be used to further understand the findings obtained in the current investigation. It is evident that age is significantly positively related to computer anxiety. Thus, the older one is, the more computer anxious one is. Age is furthermore significantly negatively correlated with computer confidence, computer liking, and computer attitude as a whole. Thus, the older one is, the less confidence and liking one is inclined to exhibit, and one's attitudes as a whole towards computers are less positive. These relationships are significant, but they are relatively weak.

The amount of hours one spends per week using a computer is significantly positively, yet weakly related to computer liking and computer confidence. Thus, the longer one spends per week using a computer, the more confident and more prone to liking and enjoying working with computers one is inclined to be.

There is no relationship between the level of education one has obtained, and computer attitudes, as well as between tenure and any of the computer attitudes under investigation.

Post level is inversely related to computer liking, indicating that people of a higher post level may be less inclined to indicate liking and enjoyment of working with computers. However, this correlation is also weak.

Prior experience with computers is inversely related to computer anxiety, suggesting that the more experience one has had, the less one's anxiety, and that less experience will result in people being more anxious. Furthermore, experience is positively related to computer liking and confidence, and to computer attitudes as a whole. This finding is in accordance with the logical underlying hypothesis of the entire study, i.e. that people with more experience in computing would exhibit more positive attitudes towards computers. In addition, all of these four correlation coefficients are significant and fairly strong, compared to all the other continuous demographic variables under consideration in the present study, as is evident in Table 3.10.

3.3.2 t-TESTS

In order to test whether there is a difference in terms of gender (males and females) and in terms of language (English and Afrikaans speakers), with respect to computer attitudes, t-test procedures were computed. These were undertaken for computer attitude as a total score, and in terms of the three subscales of which it is composed, i.e. computer anxiety, computer confidence, and computer liking. Results are reported in Table 3.11 below.

TABLE 3.11 t-Test Procedures of English and Afrikaans Speakers on each Dependent Variable

DEPENDENT VARIABLE	2-tailed t	p-level	Mean (Afrikaans) N = 146	Mean (English) N = 43
Computer Anxiety	0.23	.815	33.94	34.17
Computer Liking	0.33	.738	31.23	31.62
Computer Confidence	0.55	.585	32.65	33.23
Computer Attitude (Total)	- 0.14	.885	98.92	98.47

Results reveal that Afrikaans and English speaking employees do not differ significantly in terms of their scores on computer attitudes.

TABLE 3.12 t-Test Procedures of Male and Female Employees on each Dependent Variable

DEPENDENT VARIABLE	2-tailed t	p-level	Mean (Males) N = 74	Mean (Females) N = 116
Computer Anxiety	0.21	.831	34.11	33.93
Computer Liking	0.20	.838	31.43	31.23
Computer Confidence	0.68	.495	33.18	32.57
Computer Attitude (Total)	- 0.07	.946	98.75	98.93

Results reveal that males and females do not differ significantly in their scores on the four dependent variables under consideration. However, the above result, as well as that revealed in Table 3.11, needs to be cautioned, owing to the fact that the group sizes are relatively unequal. There are many more Afrikaans speaking respondents and females in the sample.

3.3.3 ONE-WAY ANALYSIS OF VARIANCE

One-way ANOVA was conducted in order to determine whether there was a significant difference between the means of more than two groups, in terms of computer attitudes. This statistical procedure was carried out on education, post level, and levels of experience.

3.3.3.1 Levels of Education

1 = less than matric
2 = matric
3 = diploma
4 = university degree
5 = postgraduate degree

TABLE 3.13 Analysis of Variance Results for Computer Attitude Components in terms of Education Level (Mean Scores)

EDUCATION LEVEL	Computer Anxiety	Computer Liking	Computer Confidence	Computer Attitude (Total)
Level 1 (less than matric)	32.5	29.27	32.2	97.22
Level 2 (matric)	33.95	31.98	33.11	99.59
Level 3 (diploma)	35.15	32.88	33.4	101.38
Level 4 (degree)	32.93	25.06	29.94	89.71
Level 5 (postgrad)	34.56	31.56	32.78	98.89
F Ratio	.64	5.44**	1.21	1.34
p	.633	.000	.309	.257

** $p < 0.01$

Table 3.13 indicates that there is no significant difference in mean computer anxiety, computer confidence, and total computer attitude scores between people of different education levels. However, there is a significant difference between the mean scores on computer liking for different education groups. In order to determine exactly where these differences lie, post hoc comparisons were carried out, namely Fisher's Least Significant Difference (LSD) test. Results of the LSD test are shown in Table 3.14.

TABLE 3.14 LSD TEST FOR COMPUTER LIKING
MAIN EFFECT: EDUCATION LEVEL

EDUCATION LEVEL	1 Mean 29.27	2 Mean 31.98	3 Mean 32.89	4 Mean 25.06	5 Mean 31.56
1 - < matric					
2 - matric	.155				
3 - diploma	.097	.490			
4 - degree	.076	.000**	.000**		
5 - postgrad	.400	.837	.569	.010*	

* p < 0.05 ** p < 0.01

Table 3.14 indicates that computer liking scores for people with less than matric are not significantly different from liking scores for people of other education levels. Liking scores for people with matric are not significantly different from liking scores for people with diplomas and postgraduate qualifications, but scores are significantly higher for people with matric than for people with a University degree. People who have a diploma do not differ significantly in their liking scores from people with a postgraduate degree, but they do have higher liking scores than people with a University degree. Finally, people with a University degree have significantly less liking for computers than do people with a postgraduate qualification. These results will be further explained in Chapter 4.

3.3.3.2 Post Levels

A = low level e.g. basic clerks
B = secretaries & admin clerks
T = more skilled e.g. technical
P = professional e.g. marketers
M = management level

TABLE 3.15 Analysis of Variance Results for Computer Attitude Components in terms of Post Level (Mean Scores)

POST LEVEL	Computer Anxiety	Computer Liking	Computer Confidence	Computer Attitude (Total)
A (low level e.g. clerks)	-	24	22	-
B (secretaries & admin)	34.12	32.31	33.52	100.58
T (technical)	34.15	31.09	32.83	98.72
P (professional)	33.73	27.71	31	92.91
M (management)	33	30.29	31.21	94.5
F Ratio	.19	2.19	1.84	1.13
p	.902	.071	.124	.339

Table 3.15 indicates that there is no significant difference in the mean scores in terms of computer anxiety, confidence, liking, and attitude, for people of different post levels.

3.3.3.3 Prior Computer Experience

Levels 1 - 7 (low - high)

TABLE 3.16 Analysis of Variance Results for Computer Attitude Components in terms of Level of Computer Experience (Mean Scores)

COMPUTER EXPERIENCE LEVEL	Computer Anxiety	Computer Liking	Computer Confidence	Computer Attitude (Total)
1	10	10	10	30
2	30.63	26	28.3	88.43
3	31.45	28.45	30.64	90.55
4	31.63	28.43	30.62	90.79
5	35.83	33.04	33.5	102.5
6	35.89	33.74	35.92	106.06
7	35.79	34	36.42	106.21
F Ratio	8.85**	7.77**	9.83**	8.96**
p	.000	.000	.000	.000

** $p < 0.01$

Table 3.16 indicates that there is a significant difference between the mean scores on all of the computer attitude components for people of different levels of computer experience. In order to determine exactly where these differences lie, LSD tests were performed for each computer attitude component. These are presented in Tables 3.17 - 3.20 below.

TABLE 3.17 LSD TEST FOR COMPUTER ANXIETY

MAIN EFFECT: PREVIOUS COMPUTER EXPERIENCE

Computer Experience	1 Mean 10	2 Mean 30.63	3 Mean 31.46	4 Mean 31.63	5 Mean 35.83	6 Mean 35.89	7 Mean 35.79
1							
2	.000**						
3	.000**	.709					
4	.000**	.587	.915				
5	.000**	.005**	.007**	.000**			
6	.000**	.005**	.008**	.000**	.954		
7	.000**	.011*	.016*	.002**	.977	.942	

* $p < 0.05$ ** $p < 0.01$

Table 3.17 indicates that computer anxiety scores for people on level 1 are significantly lower (i.e. they exhibit greater computer anxiety) than anxiety scores for people on all other levels of computer experience. Anxiety scores for people on level 2 are not significantly different from anxiety scores for people on levels 3 and 4. However, scores for people on level 2 are significantly lower (i.e. these people have higher computer anxiety) than scores for people on experience levels 5, 6, and 7. Anxiety scores for people on level 3 are not significantly different from scores for people on level 4, but are significantly less (i.e. computer anxiety is greater) than anxiety scores for people on levels 5, 6, and 7. There is no significant difference between anxiety scores for people on levels 5, 6, and 7.

TABLE 3.18 LSD TEST FOR COMPUTER LIKING
MAIN EFFECT: PREVIOUS COMPUTER EXPERIENCE

Computer Experience	1 Mean 10	2 Mean 26	3 Mean 28.46	4 Mean 28.43	5 Mean 33.04	6 Mean 33.74	7 Mean 34
1							
2	.008**						
3	.002**	.332					
4	.001**	.237	.988				
5	.000**	.001**	.015*	.000**			
6	.000**	.000**	.007**	.000**	.559		
7	.000**	.001*	.009**	.000**	.522	.868	

* $p < 0.05$ ** $p < 0.01$

The results in Table 3.18 indicate that computer liking scores for people on level 1 of computer experience are significantly lower than liking scores for all other levels of experience. Liking scores for people on level 2 are not significantly different from scores for people on levels 3 and 4, but scores on level 2 are significantly lower than scores for people on levels of experience 5, 6, and 7. Liking scores for people on level 3 are not significantly different from scores on level 4, but they are significantly lower than scores for levels 5, 6, and 7. Scores for people on level 4 are significantly lower than scores for people on levels 5, 6, and 7. Scores for people on levels 5, 6, and 7 are not significantly different.

TABLE 3.19 LSD TEST FOR COMPUTER CONFIDENCE
MAIN EFFECT: PREVIOUS COMPUTER EXPERIENCE

Computer Experience	1 Mean 10	2 Mean 28.3	3 Mean 30.64	4 Mean 30.02	5 Mean 33.5	6 Mean 35.92	7 Mean 36.42
1							
2	.001**						
3	.000**	.289					
4	.000**	.329	.718				
5	.000**	.003**	.087	.001**			
6	.000**	.000**	.003**	.000**	.027*		
7	.000**	.000**	.003**	.000**	.031*	.724	

* $p < 0.05$ ** $p < 0.01$

Table 3.19 indicates that computer confidence scores for people on experience level 1 are significantly lower than scores for people of all other levels of experience. Scores on level 2 are not significantly different from scores on levels 3 and 4, but are significantly less than scores on levels 5, 6, and 7. Scores on level 3 are not significantly different from scores on levels 4 and 5, but are significantly less than scores for people on experience levels 6 and 7. Confidence scores for people on level 4 are significantly less than those for people on levels 5, 6, and 7. Scores on level 5 are significantly less than scores on levels 6 and 7. Finally, scores on level 6 are not significantly different from scores on level 7.

TABLE 3.20 LSD TEST FOR COMPUTER ATTITUDE
MAIN EFFECT: PREVIOUS COMPUTER EXPERIENCE

Computer Experience	1 Mean 30	2 Mean 88.43	3 Mean 90.55	4 Mean 90.79	5 Mean 102.5	6 Mean 106.06	7 Mean 106.21
1							
2	.000**						
3	.000**	.754					
4	.000**	.682	.959				
5	.000**	.014*	.012*	.000**			
6	.000**	.003**	.002**	.000**	.258		
7	.000**	.005**	.004**	.000**	.332	.969	

* $p < 0.05$ ** $p < 0.01$

Table 3.20 indicates that people on experience level 1 (very low computer experience) have significantly lower computer attitude scores than do people on all other levels of computer experience. People with experience level 2 do not differ significantly in their computer attitude scores from people on levels 3 and 4, but their scores are significantly lower than those for people on levels 5, 6, and 7. Scores on level 3 do not differ significantly from level 4, but are significantly lower than the scores for levels 5, 6, and 7. Scores on level 4 are significantly less than scores for people on levels 5, 6, and 7. Finally, scores on levels 5, 6, and 7 do not differ significantly from each other.

3.4 BACKWARD STEPWISE REGRESSION

Up until this point we have investigated the degree of relationships between the independent variables, namely psychological type, cognitive style, and demographic data, and the dependent variables, namely computer anxiety, computer confidence, computer liking, and total computer attitudes. We can obtain a better idea of these relationships by conducting multiple regression in order to be able to predict such computer attitude variables on the basis of psychological type/cognitive style preferences, and demographic variables. Thus, we use the association between variables as a method of prediction (Neale & Liebert, 1986). When using multiple regression techniques to analyse the data, all variables are entered simultaneously into the analysis; thus the effects of all other variables are controlled when assessing the effect of each input variable (Lambert, 1991). One can therefore emphasise the contribution of each set of predictors on the dependent variables (Greenberger & O'Neil, 1993). Furthermore, given the apparent varying degrees by which psychological type preferences/cognitive styles and demographic data are believed to explain (predict) the variance in computer anxiety, computer confidence, computer liking, and computer attitudes as a whole, the present research undertook a stepwise regression analysis, using the backward elimination procedure. Variables originally entered into the regression equation were age, gender, language, education, post level, tenure, hours per week spent using a computer, previous computer experience, and the E-I, S-N, and T-F continuous scores. Significant findings are presented below:

TABLE 3.21 MULTIPLE REGRESSION
Model and Summary Statistics for Computer Attitude

VARIABLE	R^2	β	t	F
Intercept			15.349	
Age		- .1886**	- 2.859	
Experience		.3612**	5.471	
Thinking-Feeling		- .1317*	- 2.010	
	.20			15.905**

* $p < 0.05$ ** $p < 0.01$

In the above and following multiple regression results, the strength of the model is determined by examining R^2. The beta coefficients were examined to determine the relative importance of the variables in the model. With respect to computer attitude as a whole, as shown in Table 3.21, a three variable solution was obtained from the analysis. Variables included in the model were age, experience, and thinking-feeling. R^2 was .20, indicating that the model accounted for 20% of the variation in computer attitude as a whole.

TABLE 3.22 MULTIPLE REGRESSION
Model and Summary Statistics for Computer Anxiety

VARIABLE	R^2	β	t	F
Intercept			12.635	
Age		- .1866*	- 2.775	
Experience		.2849**	4.229	
Thinking-Feeling		- .1529*	- 2.275	
Sensing-Intuition		.1501*	2.234	
	.18			9.989**

* $p < 0.05$ ** $p < 0.01$

It is evident in Table 3.22 that together, age, experience, thinking-feeling, and sensing-intuition explain 18% of the variance in computer anxiety.

TABLE 3.23 MULTIPLE REGRESSION
Model and Summary Statistics for Computer Confidence

VARIABLE	R^2	ß	t	F
Intercept			11.389	
Age		- .1931**	- 3.070	
Experience		.4204**	6.684	
Sensing-Intuition		.1859**	2.978	
	.28			23.701**

* p < 0.05 ** p 0.01

Table 3.23 indicates that age, experience, and sensing-intuition together explain 28% of the variation in the dependent variable, computer confidence.

TABLE 3.24 MULTIPLE REGRESSION
Model and Summary Statistics for Computer Liking

VARIABLE	R^2	ß	t	F
Intercept			9.796	
Age		- .1611*	- 2.481	
Experience		.3428**	5.236	
Sensing-Intuition		.1704**	2.671	
University educ		- .2139**	- 3.262	
	.25			15.479**

* p < 0.05 ** p < 0.01

Table 3.24 indicates that together, age, experience, university education, and sensing-intuition explain 25% of the total variance in com[illegible]r liking.

3.5 MODERATED MULTIPLE LINEAR REGRESSION

As reported in Tables 3.21 - 3.24 in the previous section, certain variables emerged as significant predictors in the regression model. The aim in this section is to determine whether previous computer experience moderates the relationships between the significant predictors and the criterion (dependent variables).

3.5.1 Moderated Multiple Linear Regression with Computer Attitude as the DV

In Table 3.21 the model exists such that:

Computer Attitude = $\beta_0 + \beta_1 Age + \beta_2 Exp + \beta_3 T\text{-}F$. The moderating variable is the product of experience and the independent variable. When carrying out the regression, the independent variables are made up of the independent variable, experience, and the moderating variable. Therefore:

DV = Computer Attitude

IV = Experience, T-F, Experience * T-F

TABLE 3.25 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between the T-F preference and computer attitude.

VARIABLE	R^2	ß	t	F	p
Intercept			7.76		.000
Experience		.35	1.3		.182
Exp * T-F		.04	.14		.888
T-F		-.15	-.82		.414
	.17			12.63	

There are no significant findings in Table 3.25. Thus, experience does not moderate the relationship between the T-F preference and computer attitude.

Table 2.21 also includes age as a predictor. In this case:
DV = Computer Attitude
IV = Experience, Age, Experience * Age

TABLE 3.26 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between age and computer attitude.

VARIABLE	R^2	ß	t	F	p
Intercept			10.33		.000
Experience		.01	.033		.974
Exp * Age		.44	.1.65		.101
Age		- .46*	- 2. 57		.011
	.20			15.37	

* $p < 0.05$

Table 3.26 indicates that age is not strongly influenced by the moderating variable, and that the direct effect of age on computer attitude is much stronger than that of computer experience.

3.5.2 Moderated Multiple Linear Regression with Computer Anxiety as the DV

In Table 2.22 the following regression model exists:
Computer Anxiety = $\beta_0 + \beta_1$Age + β_2Exp + β_3T-F + β_4S-N.
DV = Computer Anxiety
IV = Experience, T-F, Experience * T-F

TABLE 3.27 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between the T-F preference and computer anxiety.

VARIABLE	R^2	ß	t	F	p
Intercept			8.23		.000
Experience		.11	.40		.687
Exp * T-F		.25	.79		.427
T-F		- .27	- 1.4		.154
	.12			8.70	

There are no significant findings in Table 3.27. Thus, experience does not moderate the relationship between the T-F preference and computer anxiety.

DV = Computer Anxiety
IV = Experience, Age, Experience * Age

TABLE 3.28 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between age and computer anxiety.

VARIABLE	R^2	ß	t	F	p
Intercept			11.08		.000
Experience		- .28	- 1.21		.227
Exp * Age		- .71**	2.60		.009
Age		- .63**	- 3.44		.001
	.17			12.47	

** $p < 0.01$

Table 3.28 indicates that the independent variable (age) and the product varable (moderating variable) are significant. This suggests that experience moderates the relationship between age and computer anxiety.

DV = Computer Anxiety
IV = Experience, S-N, Experience * S-N

TABLE 3.29 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between the S-N preference and computer anxiety.

VARIABLE	R^2	β	t	F	p
Intercept			6.56		.000
Experience		.22	.82		.414
Exp * S-N		.12	.35		.726
S-N		.07	. 33		.739
	.12			6.65	

There are no significant findings in Table 3.29.

3.5.3 Moderated Multiple Linear Regression with Computer Confidence as the DV

In Table 2.23 the following regression model exists:
Computer Confidence = $\beta_0 + \beta_1$Age + β_2Exp + β_3S-N.
DV = Computer Confidence
IV = Experience, S-N, Experience * S-N

TABLE 3.30 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between the S-N preference and computer confidence.

VARIABLE	R^2	ß	t	F	p
Intercept			4.32		.000
Experience		.64*	2.51		.013
Exp * S-N		-.25	-.78		.434
S-N		.33	1.73		.084
	.24			19.84	

* $p < 0.05$

Table 3.30 indicates that the moderator (experience) is significant. This suggests that experience is more of a main effect in the present model, rather than a moderator.

DV = Computer Confidence
IV = Experience, Age, Experience * Age

TABLE 3.31 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between age and computer confidence.

VARIABLE	R^2	ß	t	F	p
Intercept			9.09		.000
Experience		.11	.49		.618
Exp * Age		.38	1.49		.136
Age		-.44*	-2.53		.012
	.25			20.78	

* $p < 0.05$

Table 3.31 indicates that age is significant, suggesting that this variable is not strongly influenced by the moderating variable.

3.5.4 Moderated Multiple Linear Regression with Computer Liking as the DV

In Table 2.24 the following regression model exists:

Computer Liking = $\beta_0 + \beta_1 Age + \beta_2 Exp + \beta_3 S\text{-}N + \beta_4 Educ$.

DV = Computer Liking

IV = Experience, S-N, Experience * S-N

TABLE 3.32 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between the S-N preference and computer liking.

VARIABLE	R^2	ß	t	F	p
Intercept			4.13		.000
Experience		.43	1.65		.101
Exp * S-N		- .04	- .12		.902
S-N		.18	.93		.353
	.19			14.69	

There are no significant findings in Table 3.32.

DV = Computer Liking

IV = Experience, Age, Experience * Age

TABLE 3.33 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between age and computer liking.

VARIABLE	R^2	ß	t	F	p
Intercept			6.99		.000
Experience		.20	.89		.375
Exp * Age		.23	.84		.401
Age		- .27	- 1.51		.132
	.19			14.15	

No significant findings are reported in Table 3.33.

DV = Computer Liking

IV = Experience, University Education, Experience * Educ

TABLE 3.34 Moderated Multiple Linear Regression Results. Testing whether Experience moderates the relationship between education and computer liking.

VARIABLE	R^2	ß	t	F	p
Intercept			18.65		.000
Experience		.35**	4.95		.000
Exp * Educ		.23	1.17		.243
Educ		- .39*	- 2.01		.046
	.20			15.71	

* $p < 0.05$ ** $p < 0.01$

Table 3.34 indicates that the independent variable (university education) and the moderator (experience) are significant, suggesting that education is not strongly influenced by the moderating variable, and that experience may be more of a main effect than a moderator.

In sum, previous computer experience is not found to be a moderator of any of the relationships deduced in the regression models, except between age and computer anxiety, as illustrated in Table 3.28.

CHAPTER 4

4.1 DISCUSSION

Owing to the mass introduction of computers in the workplace, researchers have begun to pay considerable attention to ways in which such technology can be effectively integrated into the daily routines of employees at all levels within the organisation (Crable *et al.*, 1994). It has been observed that while computers and information technology may indeed have the capacity to improve organisational performance, these gains are often neutralised due to employees' apprehension and unwillingness to use these systems in their work (Davis, 1989; Steier, 1989). Computer attitudes are thus pertinent and of extreme importance to researchers and to any individuals in the workplace who are concerned with integrating computers and computer use into the organisation in a positive fashion for both the employee and the organisation as a whole. However, as Crable *et al.* (1994) assert, computer attitude scores alone provide no information to the researcher on the underpinnings of this apprehension. The present study thus aims to fill this void by identifying whether psychological type preferences and cognitive styles, as well as various demographic variables, function as antecedents of, and have a relationship with, computer attitude components, namely computer anxiety, computer liking, and computer confidence.

This section of the research report aims to discuss the findings of the present study, as presented in Chapter 3, and to relate and explain these findings in relation to previous literature on the topic, as reported in Chapter 1. The results will then be coherently summarised after which the limitations of the present investigation will be pointed out, along with various suggestions for future research related to the current topic. This will be followed by a section on the theoretical and practical implications of the study.

Three important issues of ongoing debate were mentioned in section 1.7 of Chapter 1, thus formulating the research questions for the current study. These are reviewed below.

(1) is there a relationship between an individual's psychological type and cognitive style, as determined by preferences on the Myers Briggs Type Indicator, and his or her computer attitudes, namely computer anxiety, computer confidence, and computer liking?;
This research question incorporates hypotheses 1 - 12 (see section 1.7.1, p. 28 - 29).
(2) is there a relationship between computer attitudes, namely computer anxiety, computer liking, and computer confidence, and various demographic and user-situation variables, namely gender, age, education, tenure, occupational position (post level), and previous computer experience?; and
(3) to what extent does prior computer experience moderate the relationship between psychological type/cognitive style, other demographic variables, and computer attitudes?

4.1.1 THE RELATIONSHIP BETWEEN PSYCHOLOGICAL TYPE/COGNITIVE STYLE AND COMPUTER ATTITUDES

The current investigation extends previous enquiries into human-computer interaction by focusing on the relationship between psychological type preferences/cognitive styles, and computer attitudes, as outlined in section 1.7.1. The results of the correlations in section 3.2.1 (see Table 3.6, p. 55) indicate that there is no significant difference between people with a preference for extraversion and people with a preference for introversion, in terms of computer anxiety, computer liking, computer confidence, or computer attitude as a whole. The present study therefore fails to support Hypotheses 5, 6, 7, and 8. In order to further analyse Hypotheses 1 - 12, t-tests were used to determine whether individuals indicated as falling into one of the two preference groups, i.e. extravert or introvert, sensing or intuition, and thinking or feeling, differ in terms of their computer attitudes. These results are presented in section 3.2.2. Table 3.7 (p. 57) indicates that there is no significant difference between people with a preference for extraversion and those with a preference for introversion, in terms of computer anxiety, computer liking, computer confidence, and computer attitude scores as a whole. This finding is in accordance with the results of the correlational analyses in Table 3.6, which also failed to support Hypotheses 5, 6, 7, and 8. There has been limited prior research with regards to the I-E preference and computer attitudes. However, those that did investigate this area reported similar results. Both Chu & Spires (1991) and Whitley (1996a) reported no relation whatsoever between the I-E dimension and computer anxiety, despite the contention by the author of the present study that introverts, being more inwardly drawn, thought-focused, reflective and private (Briggs Myers, 1993) would be expected to exhibit more positive computer attitudes, and less anxiety in particular towards computer use, than their extraverted counterparts.

Table 3.6 indicates that people with a sensing preference report greater computer anxiety than do people with an intuition preference ($r = -.16$). This finding is in contrast to the hypothesised relationship between the S-N preference and computer anxiety, as stated in Hypothesis 9. However, although this is a statistically significant result ($p < .05$), the correlation is extremely small. With respect to computer liking and computer confidence, people with a sensing preference report less computer liking ($r = .18$) and less computer confidence ($r = .21$). Once again, these correlations are weak, but the results are significant at the .05 significance level, thus resulting in findings in contrast to those stated in Hypotheses 10 and 11. Furthermore, people with a sensing preference report less positive computer attitude scores as a whole ($r = .14$), than do people with a preference for intuition. This result is also in contrast to Hypothesis 12. However, this result is not statistically significant, and thus it is not taken as a legitimate finding.

In Table 3.8 (p. 57), t-test results indicate that there is a statistically significant difference between people reporting a preference for sensing and people reporting a preference for intuition, in terms of all the computer attitude scores. People with a preference for sensing indicate greater computer anxiety, lower computer liking, and lower computer confidence, than do people with a preference for intuition. These t-test results are in accordance with the correlation results reported above. It was stated that although significant, the correlations are weak. It can be seen in Table 3.8 that although sensing and intuition individuals differ significantly in terms of their computer anxiety, liking, and confidence scores, if one takes a close look at the means for the two groups, in columns 4 and 5, it is evident that the differences in the mean scores between the two groups are not that large. With respect to whether sensing and intuition individuals differ significantly in terms of their computer attitude scores as a whole, Table 3.8 indicates that individuals with a sensing preference report lower overall scores than do those with a preference for intuition. The difference between the mean scores for the two groups is large enough to place more confidence in this result, although one should keep in mind that the correlation result with regards to the S-N preference and computer attitude as a whole, was not significant. Overall, it can be concluded that Hypotheses 9 - 12 are rejected, but are significant in the opposite direction.

Igbaria & Parasuraman (1989) hypothesised that, owing to computer use requiring attention to detail and systematic analysis, individuals preferring sensing would be expected to indicate lower computer anxiety and more positive computer attitudes as a whole than those with a preference for feeling. It was this assertion which served as the basis for formulating Hypotheses 9 - 12 of the current study, owing to the fact that Igbaria & Parasuraman (1989) found support for their contention. However, later researchers, such as Chu & Spires (1991) found that people with a sensing preference reported greater computer anxiety than those with an intuition preference, a finding in accordance with that of the present study. Whitley (1996a) found no relationship at all for the S-N dimension and computer attitudes. All of these findings, as well as the findings in the present research, add confusion to this relationship, making it difficult to support and place faith in one particular research claim. Of particular importance to discern are the sample sizes in the three afore-mentioned studies, because this would give us an idea of the effect size of the findings. Igbaria & Parasuraman (1989) made their deduction from 166 managers, 94 of whom were part-time students enrolled in an MBA program, Chu & Spires (1991) deduced their result from a sample of 132 first-year MBA students, and Whitley (1996a) came to his conclusion by using 233 male and 238 female introductory psychology students, aged 18 - 24 years. The sample sizes of Igbaria & Parasuraman (1989) and Chu & Spires (1991) are satisfactory, but slightly small to make a conclusive deduction, and although Whitley (1996a) utilises a larger sample, his findings are limited because they cannot be generalised to a working population, owing to the study being done on first year students of a young age, with no working experience. A further explanation and clarification of these mixed findings and how to view them is possible if various concerns and shortcomings with regards to the S-N dimension in the present study are mentioned.

Firstly, it is evident in Table 3.2 (p. 51), the MBTI® Type Table, that the majority of participants (53.68%) fall into two type profiles, namely ISTJ and ESTJ. There is thus a very small percentage of individuals in the sample with *intuition* (N) as a preference in their profile. Unequal group sizes are further evident in Table 3.3 (p. 52) where it can be seen that only 20% of the total sample have a preference for intuition, while 80% of respondents have a preference for sensing. The sample is thus biased towards more sensing-oriented individuals. This could possibly explain the negation of Hypotheses 9 - 12. We cannot place confidence in results when there is an insufficient quantity of respondents representing the intuition preference. As Christensen (1985) points out, as the number of subjects increases, so the ability of statistical procedures to detect true differences increases. Results with regards to the S-N preference and computer attitudes should thus be interpreted with caution.

With respect to the thinking-feeling (T-F) preference, Table 3.6 shows that people with a preference for thinking report lower levels of computer anxiety (r = .15) than do people with a feeling preference - a finding which supports Hypothesis 1. However, despite being statistically significant, the correlation is weak and should be interpreted with caution. Hypotheses 2 and 3 stated that people with a preference for thinking would exhibit more confidence and more liking towards computers than people with a preference for feeling. Although it appears that these hypotheses are supported, due to the correlations (r = -.12 for computer confidence, and r = -.09 for computer liking), the results are not significant. Thus hypotheses 2 and 3 are not supported. Hypothesis 4 is supported, in that people with a thinking preference indicate more positive computer attitudes as a whole than do people with a feeling preference (r = -.16) - a statistically significant result.

The t-test results in Table 3.9 (p. 58) indicate that, as with the correlation results mentioned above, Hypotheses 1 and 4 are supported. There is a statistically significant difference between the mean scores for computer anxiety and for the total computer attitude scores, with regards to the T-F preference. More specifically, people with a preference for thinking report lower computer anxiety and more positive computer attitudes as a whole, than do people with a preference for feeling. This finding is in line with that suggested by Igbaria & Parasuraman (1989), who postulated that inasmuch as computer work requires systematic analysis, logical reasoning, and attention to detail, individuals high on thinking would be expected to experience lower computer anxiety and more positive attitudes overall towards computers than those high on feeling. However, despite this assertion, these authors found no relationship between the T-F dimension and computer attitudes - a finding which possibly owed itself to the unethical use of a shortened form of the MBTI®. Nevertheless, a later study by Chu & Spires (1991) found the same result as the present study, adding confirmation to the fact that individuals with a thinking preference would indeed exhibit more positive computer attitudes and less computer anxiety than people with a feeling preference. However, Whitley (1996a) interestingly states that it is important that the finding that people with a feeling preference report higher levels of computer anxiety than people with a thinking preference is ambiguous. People with a feeling preference are more generally sensitive to emotions than are people with a thinking preference, so their higher levels of anxiety may not reflect their attitudes towards computers so much as their more intense experience of all forms of affect. That is, people with a thinking preference might be equally anxious, but might not experience the anxiety as intensely as people with a feeling preference.

The mean scores for thinking individuals are also slightly higher than those for feeling individuals in terms of computer liking and confidence, thus lending partial support to Hypotheses 2 and 3, but these results are not significant - a result similar to that deduced from the correlation analyses. Although the results with regards to the T-F preference and computer attitudes are more in line with the proposed hypotheses of the current study, one should also view these results with caution, in the same way as the S-N results, as mentioned in the previous paragraph. Table 3.3 indicates that 77.37% of respondents had a preference for thinking, while a meagre 22.63% had a preference for feeling. Furthermore, results of the factor analysis, presented in section 3.1.3, and illustrated in Table 3.4 (p. 53), as well as the correlation results between the three subscales and the total score, as shown in Table 3.5, indicate that the computer confidence and computer liking constructs do not seem to be discrete, despite the contentions of past research that they indeed are. Nevertheless, the computer anxiety and the total computer attitude scores can be viewed and results therewith interpreted with greater confidence.

The results of the current research suggest that there is mixed evidence for a relationship between psychological type and computer-related attitudes, a conclusion concordant to that proposed by Pocius (1991). Pocius further pointed out that the studies on which he based this conclusion were methodologically flawed, particularly in terms of small and restricted samples. In the present study, this limitation exists not with the overall sample size, which is sufficient, but could be larger, but with the individual frequencies of psychological type preferences (ibid.). When only 20% of the sample shows intuition as a preference, and only 22.63% have a preference for feeling, then the results need to be cautioned due to inadequate statistical power to detect relationships between the independent and dependent variables (Cohen, 1988).

4.1.2 THE RELATIONSHIP BETWEEN DEMOGRAPHIC VARIABLES AND COMPUTER ATTITUDES

According to Busch (1995), results indicating the relationships between various demographic variables and computer attitudes are varied. The present study sought to investigate biographical data because they are believed to play an important part in terms of having a close relationship with, and in being able to predict the variance in computer attitudes, maybe even more so than psychological type preferences and cognitive styles. Various statistical procedures were carried out with regards to these variables, revealing some interesting findings for the current research.

Section 3.3.1 consists of correlation analyses performed on the continuous biographical variables, namely age, amount of hours per week spent using a computer, level of education, occupational position (post level), tenure on the job, and previous computer experience. These results are presented in Table 3.10 (p. 59).

The current research found ***age*** to be significantly positively related to computer anxiety (r = .24), suggesting that the older one is, the more computer anxious one is inclined to be. Age is also significantly negatively correlated with computer confidence (r = -.27), computer liking (r = -.19), and computer attitude as a whole (r = -.26). Thus, as one gets older, one is inclined to exhibit less liking towards computers, be less confident working with computers, and one's attitudes as a whole towards computers begin to decline. These correlations may be significant, but they are relatively weak, and thus one should caution placing too much confidence in these results. However, if we accept these results as being plausible, viewing them in the light of previous findings provides interesting food for thought. Similarly to the present study, Loyd & Gressard (1984) also found that younger subjects had more positive attitudes towards computers (i.e. less anxiety, more confidence, and more liking for computers) than older subjects. As Jay & Willis (1992) point out, the pervasiveness of computers in contemporary society, characterised by continual improvements and upgrading, brings into question whether older adults would be able to willingly adapt to this new technology more effectively than their younger counterparts, who are newer to the field, bringing with them a more open frame of mind and attitude. On the other hand, there are researchers such as Dyck & Smither (1994), who reported results indicating the opposite, i.e. that older adults had more positive attitudes overall, were less anxious, and had more liking and confidence towards computers than younger adults. Researchers such as Massoud (1991), Gilroy & Desai (1986), Woodrow (1991), and Henderson *et al.* (1995) reported no age differences in terms of computer attitudes. However, the age ranges under consideration in these studies were usually quite limited, owing to the majority of the studies being performed on student samples, as Cambre & Cook (1987), and Dyck & Smither (1994; 1996) pointed out. The present study, on the other hand, drew its sample from a more representative, adult, working population, with ages of respondents ranging from [illegible] - 62 years, with an average age of 32 years (see Table 2.1), thus providing a better spread of ages from which to draw conclusions.

The relationship between age and computer attitudes may be better understood, if we look at the relationship between ***previous computer experience*** and computer attitudes, because very often, older people have had more experience with computers, although this is not always the case today, with many young adults gaining untold experience in computers (more than any business manager could ever hope to accomplish) in a short space of time. Table 3.10 indicates that prior experience with computers is significantly inversely related to computer anxiety (r = -.33), and significantly positively related to computer confidence (r = .46), computer liking (r = .41) and computer attitude as a whole (r = .42). Such results suggest that the more computer experience one has had, the less computer anxious one is inclined to be, and that if one has had very little experience with computers, one is prone to computer anxiety. In addition, the more experience in computers one has had, the more confident one would be, the more one would be inclined to enjoy working with computers, and the more positive one's overall attitudes towards computers would be. These findings are in accordance with the logical underlying hypothesis of the current study, i.e. that people with more computer experience would have more positive attitudes towards computers than people who rate themselves as having very little computer experience. Furthermore, these correlations are all fairly strong in comparison to the other correlations presented in Table 3.10. A look at Table 2.1 reveals that there is a good spread of individuals representing the different levels of computer experience, forming a normal curve. The majority of respondents (30%) have moderate experience, with slightly fewer having marginally less experience (25%) and marginally more experience (21%), and a lot fewer having very little (12%), or rating themselves as experts (12%).

Further analyses involving previous computer experience and computer attitudes were carried out, by means of one-way analysis of variance. Table 3.16 (p. 65) indicates that there is a significant difference between the mean scores on all of the computer attitude components and the overall computer attitude score, for people of different experience levels. LSD tests were then conducted to look more closely at these differences. Table 3.17 indicates that people with extremely little computer experience (level 1) exhibit very much more computer anxiety than people on all other levels of experience. People on levels 2, 3, and 4 (little to moderate experience) exhibit significantly higher anxiety than do people on levels 5, 6, and 7 (moderate to very experienced, to expert). Table 3.18 shows that people with very little experience (level 1) have significantly less liking for computers than people on all other levels of experience, particularly those on levels 5, 6, and 7. Computer liking scores for people on levels 2, 3, and 4 are significantly lower than liking scores for people on levels 5, 6, and 7. Similar results are evident in Table 3.19, where people on level 1 show significantly less confidence in computer use than people of all other levels of computer experience, particularly those on levels 5, 6, and 7. People on levels 5, 6, and 7 (more than moderate, to very experienced) show more confidence towards computer use than people of little to moderate experience. Table 3.20 indicates once again that people on experience level 1 (very little computer experience) have significantly lower computer attitude scores as a whole than people on all other levels of computer experience. People on levels 2, 3, and 4 are significantly lower than scores for people on levels 5, 6, and 7. Overall, it can be concluded that people of lower levels of previous computer experience are more computer anxious, have much less liking for computers and computer use, are more confident with computers, and overall have a more positive attitude towards computers than their more experienced counterparts.

Computer experience is the most pertinent and most-researched demographic variable in research investigating computer anxiety and negative computer attitudes. It has been demonstrated to have the clearest relationship to computer attitudes, and in particular to computer anxiety, than any variable studied (Maurer, 1994). Like the present study, the majority of researchers have found that subjects who had more computer experience expressed more positive attitudes towards computers in general (e.g. Loyd &

Gressard, 1984; Dambrot *et al.*, 1985; Gilroy & Desai, 1986; Morrow *et al.*, 1986; Howard & Smith, 1986; Heinssen *et al.*, 1987; Marcoulides, 1988; Koohang, 1989; Cohen & Waugh, 1989; Kernan & Howard, 1990; Ray & Minch, 1990; Rosen & Maguire, 1990; Woodrow, 1991; Harrison & Rainer, 1992b; Colley *et al.*, 1994; Todman & Monaghan, 1994; McInerney *et al.*, 1994; Crable *et al.*, 1994; Dyck & Smither, 1996; Anderson, 1996). These consistent results, as well as the result of the present study, confirm that experience with computers does indeed reduce anxiety, apprehension and uneasiness. One must be very careful of deducing a cause and effect relationship from these results, something which Maurer (1994) notes that researchers are prone to do.

The amount of ***hours per week*** one spends using a computer is significantly positively, yet weakly related to computer liking and computer confidence. Thus, we can deduce that the longer one spends per week using a computer, the more confident one would be and the more one would enjoy working with computers. This is a logical deduction. However, one should exercise caution in making this logical deduction, because correlation does not suggest cause-and-effect. The directionality of the correlations is not specified in this result. It could just as well be possible that the more confident one is and the more one enjoys working with computers, the greater amount of hours per week one would be inclined to spend using a computer. Based on the two above-mentioned significant correlations, one would also expect hours per week to be significantly negatively related to computer anxiety and to be significantly positively related to computer attitudes as a whole. However, although the correlation results are in the correct direction, the results are not significant.

The present study found no relationship whatsoever between ***tenure*** and computer attitudes. Furthermore, there is no relationship between the ***level of education*** one has obtained, and one's attitudes towards computers, as shown in Table 3.10. One-way ANOVA results indicated in Table 3.13 also show that there is no significant difference in the mean scores for computer anxiety, computer confidence, and total computer attitude, in terms of different levels of education. However, there is a significant difference between the mean scores for computer liking for different education levels. Results of the LSD test (see Table 3.14, p. 63) show that these differences are most significant between people on a matric level and people with a University degree, i.e. scores for people with matric are significantly higher than scores for people with a degree. Thus, matric people exhibit more liking towards computers than do people with a degree qualification. People with an education level as high as a diploma also have significantly higher liking scores than people with a degree, as do people with a postgraduate qualification. These results could possibly be explained by the fact that people with only a matric or a diploma (which, in the case of the present study, usually involved a secretarial diploma of some sort), would be more likely to find themselves in secretarial, administrative jobs where computer use is more likely. People with a University degree, on the other hand, are not as likely to select such jobs, and therefore would not be as exposed to computer use. In the case of people with a postgraduate qualification, the fact that they exhibit more liking for computers and computer use could be due to the fact that owing to their high qualification, they are inclined to work more with computers and be involved with higher level business operations which involve computer use. Nevertheless, the results of this ANOVA and LSD test ought to be cautioned, owing to the small percentage of respondents having a diploma, a degree, and a postgraduate qualification. These unequal group sizes limit the results and the explanations thereof.

The present study is therefore limited in being able to make any further contribution to the already limited research findings with regards to education level and computer attitudes, despite the fact that an adult, working sample, rather than a limited student sample, was used in the study. The lack of finding in the present study could, as mentioned previously, be due to the fact that there is an inadequate spread of education levels in the sample. Table 2.1 reveals that the majority (65%) of the sample had only a matric and no further qualification, and there were very few people with a higher qualification such as a degree.

Post level was found to be significantly inversely related to computer liking, suggesting that people of a higher post level (i.e. in a higher occupational position) would be less inclined to enjoy working with computers. However, this correlation is very weak ($r = -.15$). ANOVA results in Table 3.15 further indicate that there is no significant difference for people of different post levels in terms of all three of the computer attitude components and the computer attitude score as a whole. Nevertheless, the correlation finding, however weak, is in line with previous literature and postulations on the topic. As Parasuraman & Igbaria (1990) believe, higher level employees, such as those in managerial positions, would be less likely to be enthusiastic about computer use and have more negative attitudes towards computers than those in lower levels. Fisher (1995) asserts that this tendency could be due to the fact that many managers perform more weakly structured tasks, and spend more time on the job engaging in verbal communication, a free-from work style, and delegating tasks and responsibilities which involve computer use, to other employees. The present research is limited in that there is an inadequate spread of individuals over different post levels, as shown in Table 2.1. The majority of the sample (83%) fall under post levels B and T (lower to middle occupational levels), while only a small percentage (16%) are in professional or management levels (P and M), with nobody in the executive level (E).

With respect to ***language***, t-test results in Table 3.11 indicate that there is no significant difference between English and Afrikaans speaking respondents in terms of their computer attitudes. Furthermore, Table 3.12 indicates that no ***gender*** differences were found with respect to computer attitudes. However, both these findings are limited in that there unequal sample sizes from which to make true deductions, i.e. there are more females than males, and there are more Afrikaans speaking respondents than English speaking, as shown in Table 2.1. Maurer (1994) pointed out that the relationship between gender and computer attitudes has not been sufficiently examined to clearly define the relationship. Although many researchers (Dambrot *et al.*, 1985; Wilder *et al.*, 1985; Levin & Gordon, 1989; Ogletree & Williams, 1990; Parasuraman & Igbaria, 1990; and Colley *et al.*, 1994) believe or have found that males would be less likely to be computer anxious and would be inclined to have more positive attitudes overall towards computers, this does not appear to be the case in the present investigation.

4.1.3 THE EXTENT TO WHICH PSYCHOLOGICAL TYPE/COGNITIVE STYLE AND THE DEMOGRAPHIC VARIABLES PREDICT COMPUTER ATTITUDES

Up until this point, the present study has investigated the relationships between the independent variables, namely psychological type, cognitive style, and demographic data, and the dependent variables, namely computer anxiety, computer liking, computer confidence, and computer attitude as a whole. The study has analysed variables on an individual basis. However, in order to gain a better picture of how the independent variables have a combined effect, if they indeed do, on the dependent variables, and thus to deduce cause and effect relationships between the independent (predictor) variables and the dependent (criterion) variables, it is necessary to look at the results of the multiple linear regression in Section 3.4. Table 3.21 (p. 71) indicates that with respect to computer attitude as a whole, a three variable solution was obtained. Predictors included in the model were age, experience, and thinking-feeling, which together accounted for 20% of the variation in computer attitude. In Table 3.22 it is evident that together age, experience, thinking-feeling, and sensing-intuition accounted for 18% of the variance in computer anxiety. Table 3.23 shows that age, experience, and sensing-intuition together explain 28% of the variance in computer confidence, and finally, Table 3.24 indicates that age, experience, sensing-intuition, and University education together account for 25% of the variance in computer liking. These regression results reveal some convincing findings, with age and experience being consistent predictors of computer attitudes. The values of R^2 range from 18% to 28%, which is a large proportion of the variance explained. However, this still leaves approximately 70% of the variance in computer attitudes unexplained, and could thus be attributable to other factors which the present study does not consider. The F values indicate that the complete regression model in each case is highly significant, and the outcomes of the t-tests indicate that each parameter included in the regression model is significant. Thus the null hypothesis that all the predictor variables we found (i.e. age, experience, and T-F in the case of computer attitude as a whole; age, experience, T-F, and S-N for computer anxiety; age, experience, and S-N for computer confidence; and age, experience, S-N, and University education for computer liking) do *not* tell us anything about computer attitudes, is rejected.

The results of the regressions support the correlation and t-test results mentioned previously that there is no relationship between the I-E preference and computer attitudes, and that people with a preference for extraversion and people with a preference for introversion do not differ in terms of their computer attitudes. Furthermore, the results also support the significant, but weak correlations between the S-N preference and computer attitudes. Thinking-feeling was found to be a significant predictor, and hence included in the regression model, of computer attitude as a whole, and of computer anxiety, but not for computer liking, and computer confidence. This finding is in accordance with the results of the correlations and t-tests mentioned in section 4.1.1, i.e. that people with a preference for thinking report lower computer anxiety and more positive computer attitudes than people with a preference for feeling, but that there is no relationship between the T-F preference and computer confidence or computer liking. Age and experience were found to be significantly correlated with all three computer attitude components, and with computer attitude as a whole. It makes sense then that these two demographic variables were included in the regression model, thus confirming that they obviously do, to an extent, predict computer attitudes.

Henderson *et al.* (1995) believe that despite the many studies reporting a relationship between previous computer experience and computer anxiety, the strength of these relationships suggests that experience is likely to be only a moderate predictor of computer anxiety, and that other variables may account for a larger proportion of the variance. However, the present study found that the correlations between experience and computer attitudes were medium to high, as is evident in Table 3.10, suggesting that perhaps experience is not just a moderate predictor of computer anxiety and other computer attitudes, but has more bearing than one is inclined to believe. Results of the multiple regression analyses mentioned in the previous paragraph confirm this assertion.

Morrow *et al.* (1986) and Leso & Peck (1992) point out that studies have shown that self-assessment of computer knowledge and computer experience (similar to that used in the present study), may explain more of the variance in computer anxiety than do personality correlates. This implies that computer anxiety may be more a function of prior computer experience than a deeply entrenched personality trait. Perhaps this is indeed the case, as the current investigation has found previous computer experience to have the strongest relationship with all the computer attitude components, and with computer attitude as a whole, out of all the variables used in the study. Regression results evident in Tables 3.21 - 3.24 further indicate that experience is the most important predictor variable out of all the variables included in the model.

4.1.4 DOES PREVIOUS COMPUTER EXPERIENCE MODERATE THE RELATIONSHIP BETWEEN PSYCHOLOGICAL TYPE/COGNITIVE STYLE AND COMPUTER ATTITUDES?

An issue of particular interest in the current study is whether previous computer experience predicts computer attitudes, or whether it actually *moderates* the relationship between psychological type/cognitive style, and computer attitudes. Findings thus far lead the researcher to a relatively confident opinion that experience is indeed a significant predictor of computer anxiety, computer liking, computer confidence, and computer attitude as a whole, and that experience has a fairly strong relationship with these computer attitudes. In order to determine whether experience is a moderator of the relationship between psychological type/cognitive style, and computer attitudes, moderated multiple regression was conducted. Findings are, however, limited in this regard. Table 3.25 (p. 74) shows that experience does not moderate the relationship between the thinking-feeling preference and computer attitude. Table 3.26 indicates that experience does not moderate the relationship between age and computer attitude, and that age has a stronger direct effect on computer attitude than does computer experience. With respect to computer anxiety, Table 3.27 shows that experience does not moderate the relationship between the T-F preference and computer anxiety. Table 3.28 shows that experience moderates the relationship between age and computer anxiety. Table 3.29 reveals no significant results, suggesting that experience does not moderate the relationship between the S-N preference and computer anxiety. With respect to computer confidence, Table 3.30 indicates that experience functions more as a main effect in the model, than as a moderator between the S-N preference and computer confidence. Table 3.31 points out that age has a stronger direct effect on computer confidence than does computer experience. Results with regards to computer liking indicate that experience does not moderate the relationship between the S-N preference and experience, as shown in Table 3.32, and between age and experience, as shown in Table 3.33. It is evident in Table 3.34 that experience is more of a main effect than a moderator between education and computer liking. In sum, previous computer experience was found to moderate the relationship only between age and computer anxiety. The above-mentioned findings are new to the field of research, which makes it impossible to compare them with previous research. One needs to be careful of *multicollinearity*, when interpreting these moderated multiple linear regression results. Multicollinearity is the term used to refer to the instance when variables are highly correlated. According to Baron & Kenny (1986), it is desirable for the moderator variable (experience) to be uncorrelated with both the predictor (age) and the criterion/dependent variable (computer anxiety), in order to provide a clearly interpretable interaction term. The present research found experience to be uncorrelated with age, but significantly correlated with computer anxiety (see Table 3.10, p. 59). Thus, although experience is found to moderate the relationship between age and computer anxiety, this may not be the case because experience is too highly correlated with computer anxiety to be considered a moderator. Rather, it is more conclusively a predictor, as the results reported in Section 4.1.3 indicate.

4.1.5 SUMMARY OF RESULTS

Overall, the results of the current study suggest that there is mixed evidence for a relationship between psychological type/cognitive style, and computer attitudes (computer anxiety, computer confidence and computer liking). Results need to be interpreted with caution. However, certain findings are more conclusive than others. These are reviewed below.

With respect to the principal hypotheses of the study, based on the research question: Is there a relationship between psychological type/cognitive style, and computer attitudes?, the present investigation found no evidence for a relationship between the extravert-introvert preference, and any of the computer attitudes. Hypotheses 5, 6, 7, and 8, which proposed that introverts would exhibit less computer anxiety, more confidence, more liking, and more positive computer attitudes overall than extraverts, were rejected. The present study thus confirms that whether one shows a preference for extraversion or for introversion, has no bearing whatsoever on whether one would be inclined to be computer anxious or have negative attitudes towards computers.

Results with the sensing-intuition preference, whether we refer to it as a psychological type or a cognitive style variable, were all significant, but in complete contrast to the hypothesised relationships between the preferences and computer attitudes, as listed in Hypotheses 9 - 12. In sum, instead of the hypothesised relationships, such that people with a sensing preference would exhibit more positive attitudes towards computers than people with a preference for intuition, the current study found that people preferring sensing indicated more negative attitudes towards computers.

The study found that people with a thinking preference exhibited less computer anxiety and more positive attitudes towards computers overall, than people with a feeling preference - a finding which supported Hypotheses 1 and 4. Chu & Spires (1991) also found this result in their study, adding confirmation to the assumption that thinking individuals, being more systematic, logical, objective, and analytical, would have more positive attitudes than their feeling counterparts. No significant relationships were found, however, between the T-F dimension and the other two computer attitudes under investigation, namely computer confidence, and computer liking.

The current investigation found the relationships between the various biographical variables and computer attitudes to be varied. Nevertheless, it was found that demographic data could have a closer relationship with computer attitudes and be able to explain more of the variance in computer attitudes, than psychological type/cognitive style variables.

Age was found to be positively related to computer anxiety, negatively related to computer confidence, computer liking, and computer attitude as a whole, suggesting that the older one is, the more anxious one is inclined to be, the less confident one would be in using computers, the less liking and enjoyment one would have for computer work, and the more negative attitude overall one would have towards computers and computer use. Previous computer experience appeared to have the strongest relationship with computer attitudes, after age. The study found that people with little previous experience in computers were prone to computer anxiety, showed less confidence and liking towards computers, and more negative attitudes towards computers overall, reinforcing the conclusion that experience with computers reduces apprehension and uneasiness. Results indicated that the more hours per week one spent using a computer, the more computer confidence, liking, and enjoyment of working with computers one would be inclined to exhibit. No relationships were found between tenure on the job and computer attitudes, and between level of education and computer attitudes, except for in the case of computer liking, where people who had a matric or a diploma showed more liking for computers than people with a higher qualification such as a degree or a postgraduate qualification. It was found that people in a higher occupational position were less likely to enjoy working with computers. No gender or language differences were found with regards to computer attitudes. The finding with regards to gender is interesting, since many studies have found significant results in this domain, with males reporting more positive attitudes overall than females. Furthermore, most prior research (cf. Charlton & Birkett, 1995) asserts that females are likely to be at an experiential disadvantage, thus explaining their more negative attitudes towards computers. Despite the present study finding significant results with regards to experience and computer attitudes, no gender differences were found, and on top of this, there were more females in the sample from which to draw the conclusion with regards to experience.

Contrary to the assertion of the current investigation that computer experience could possibly moderate the relationship between psychological type/cognitive style and computer attitudes, this was not found to be the case. Only one significant result in this regard emerged, that being that previous computer experience was found to possibly moderate the relationship between age and computer anxiety.

4.2 LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Several limitations to the current research require acknowledgement. This section aims to outline these limitations, and to subsequently make various suggestions for future research in this domain.

The present study revealed each of the subscales of the Computer Attitude Scale, as well as the overall measure of computer attitude, to have adequate internal reliability, based on the alpha coefficient results. However, factor analysis results indicated that the computer confidence and computer liking constructs did not seem to be discrete. Nevertheless, the computer anxiety subscale, and the computer attitude scale as a whole were more reliable and valid measures. The computer anxiety subscale is thus a good measure of computer anxiety for adults and can be used in future research, while the computer confidence and computer liking subscales deserve further attention and validation with regards to more adult samples (the CAS has been primarily used for student samples) before results with regards to these two constructs can be stated with confidence.

The researcher of this study believes that although the computer anxiety subscale of the CAS appears to be a valid and reliable measure of computer anxiety, one needs to keep an open mind to the fact that computer anxiety is multidimensional, as Howard (1983, in Harrington *et al.*, 1990) points out. Therefore, one reason for the mixed results appearing in the literature, and which the present research adds to, may be that the underlying dimensions of computer anxiety have not been clearly explicated. Although the present research has attempted to overcome this issue by reporting mostly results using the Computer Attitude Scale by Loyd & Gressard (1984), we must acknowledge that there are several instruments designed to measure computer anxiety, most of which proposed different factors believed to underlie the construct, and the results of which were also mentioned in the literature review of the present research. The mixed results could therefore indicate that there is some inconsistency in the hypothesised dimensionality of the construct of computer anxiety. As an example, Howard (1983, in Harrington *et al.*, 1990) speaks of two dimensions of anxiety: duration (temporary versus permanent) and intensity (normal or neurotic). As Harrington *et al.* (1990) maintain, research is needed to determine what form of anxiety best approximates. This is an important issue from a training perspective. If computer anxiety is a normal type of anxiety, then simple exposure to computers may be all that is required to make an individual more adept at computer use. If computer anxiety is found to be a more permanent, neurotic condition, the appropriate selection and placement procedures would be needed to avoid exposing highly computer anxious people to computers in their work. A qualitative analysis of individual differences in type and degree of computer anxiety might be a valuable direction for future research, because it would be possible to detect normal or neurotic conditions of computer anxiety, something which the computer anxiety subscale of the CAS fails to consider. Future research therefore needs to be more specific about the type, nature, and extent of computer anxiety being considered, as this is a necessary prerequisite for determining whether and/or how computer anxiety can be alleviated, and performance at work therefore maximised.

The study is biased towards more sensing- and thinking-oriented individuals. Future research with a broader range of both sensing and intuition, and thinking and feeling participants might result in a more conclusive cognitive style/computer attitude relationship.

A valid conclusion that can be drawn from the existing body of literature, as well as from the current investigation, is that previous experience with computers does seem to be a positive force in reducing computer anxiety, but questions about that experience remain. The present study used a self-rating measure of computer experience, owing to the fact that previous research efforts at assessing computer experience are varied. Furthermore, the field of computers and computer use is so varied that it is difficult to produce one single measure of computer experience, because one person may be highly experienced in certain aspects of computers, but ignorant in other aspects, which a scale could be assessing, and then appear totally inexperienced. What does emerge from the present research, therefore, is that future research investigating effects of providing computer experience must pay greater attention to the *qualitative nature of the experience provided.*

Future research would do well to specify more clearly the domain of computer use being investigated, and how psychological type/cognitive style, and computer attitudes come into play in that particular area, rather than the broad perspective of computer use and computer experience adopted in the present study.

A replication of the current study, using a more comprehensive coverage of personality variables, other than psychological type, as well as using various other individual difference variables other than the ones studied, which could possibly be more relevant to attitudes about computers, and using a larger sample of subjects from a more heterogeneous working population would increase the generalisability of the findings to a larger population of South African employees. Although the study has overcome some of the shortcomings of past research by using a sample of individuals from a working population, rather than a student sample, future studies should attempt to analyse employees from more than one organisation in order to make results more generalisable. Furthermore, although the present study had an acceptable sample size (although as mentioned above, it could have been larger), it is unclear whether there was any response bias in the sample.

A further limitation with regards to the nature of the sample is the fact that all respondents volunteered to complete the questionnaire packages. It is thus possible that these volunteers had more positive attitudes at the beginning of the study than one would expect to find in a random sample of subjects. One needs to be careful of the "good subject effect", whereby subjects attempt to give the researcher what they presumably want to find, as well as social desirability bias, whereby respondents attempt to present themselves in a more favourable light to the experimenter (Rosenthal & Rosnow, 1991). Thus, perhaps some subjects answered falsely on the MBTI®, as well as tried to deny that they had little computer experience, or that they had negative attitudes towards computers.

The study could also be limited by mono-method bias, i.e. the use of the MBTI® *to measure both psychological type and cognitive style.* Future studies could do well to use an alternative measure of cognitive style, as well as the MBTI®, and then compare the results using the two measures of cognitive style. Furthermore, many other scales to assess computer attitudes exist, particularly when it comes to computer anxiety. Having found significant results in the present study with regards to computer anxiety correlates and antecedents, the researcher believes that one would be inclined to wonder whether other computer anxiety scales would produce similar results. Future research could therefore utilise an additional scale to measure computer anxiety, such as the Computer Anxiety Rating Scale (CARS) by Heinssen *et al.* (1987), and then compare whether similar results are indeed found.

The cross-sectional nature of the research limits the results. Future studies of a longitudinal nature, or those investigating pre- and post-test measures of computer anxiety before and after computer training programmes would provide more valuable results.

4.3 IMPLICATIONS OF THE STUDY

According to Prentice & Miller (1992) and Whitley (1997), when the results of research are statistically significant, but small, the question arises as to their practical and theoretical significance, that is, are the effects found large enough to have practical and theoretical importance? Although the present research may to a small extent fall short in this domain, issues of practical and theoretical significance may still be suggested by the research.

4.3.1 Practical Implications

Understanding the attitudinal or dispositional antecedent to an encounter with or use of a computer can provide insight into the origins of computer anxiety, and other computer-related attitudes. Computer anxiety can then be reduced by modifying these antecedents (Crable *et al.*, 1994; Anderson, 1996), particularly in the case of demographic variables, such as experience with computers, which can be increased through training and increased exposure towards computers while at work. The present research is therefore useful in that it provides some information to managers on the extent of computer anxiety and negative computer attitudes, what sort of staff would be likely to suffer from these constraints, and this then aids in developing strategies in the workplace which can be used to help alleviate or eliminate computer anxiety and other negative attitudes towards computers. Charlton & Birkett (1995) believe that knowledge of employees displaying symptoms of computer anxiety and negative computer attitudes is important since such individuals may be at a vocational disadvantage.

The current study found rather conclusively that previous computer experience has a significant, moderate inverse relationship with computer attitude, and that experience explains more of the variance in computer attitudes than psychological type/cognitive style. Therefore, in terms of training, and selection and recruitment of staff, it would be wise to test individuals' previous computer experience beforehand, particularly if they are applying for a job which requires computer skills which are so necessary that a lack of proficiency in these skills could lead to complete failure of task demands and the job as a whole.

Knowledge of personality traits, such as psychological type preferences and type profiles, as measured in the current study by the MBTI®, and how they relate to computer anxiety is potentially important, because such knowledge can give important information to those who are attempting to reduce computer anxiety. As Maurer (1994) asserts, knowing more about the correlation of computer anxiety to various personality variables is the first step in answering the question of what computer anxiety reduction techniques will work best for what kind of personality. The present research suggests that whether one has a preference for extraversion or introversion makes no difference to whether one would be prone to suffer from negative computer attitudes or not. People with a sensing preference were found to exhibit more positive attitudes towards computers than people with a preference for intuition. Thus, perhaps more focus could be placed on individuals who have a preference for intuition when designing and planning training programmes which are aimed at decreasing computer anxiety and negative attitudes towards computers. A similar suggestion is applicable with individuals who have a preference for feeling, rather than thinking.

In addition to training employees in the domain of computer use, individuals need to be made aware, in a non-threatening manner, of the value of computing in their day-to-day lives, that computers are tools - to be used for their effectiveness in making jobs easier in many respects, not machines to replace or control workers. Training programs would therefore aid in increasing the speed of adaption and willingness to use computers by individuals (Webster & Martocchio, 1992; Crable *et al.*, 1994). Research into the types of computer training for employees that best prevent initial anxiety from escalating, perhaps by focusing on building confidence and a sense of personal control in a non-threatening learning environment, individualised if necessary, is needed. According to Henderson *et al.* (1995), there is potential for the development of computerised adaptive screening and training programmes which can simultaneously reduce anxiety about computers. The added advantage of a computer-assisted intervention to reduce computer anxiety, is that it simultaneously provides exposure to the computer.

Overall, the implications of the findings of this study are that the successful integration of computers into the work environment calls for increased sensitivity to individual differences in personality and educational preparation, namely psychological type preferences (thinking-feeling, and sensing-intuition), and demographic variables (age and previous computer experience), that might have an impact on their receptivity to an potential use of computers as aids to decision-making and office functions. Overall, this would promote improved user-system fit.

4.3.2 Theoretical Implications

The relationship between psychological type/cognitive style and computer attitudes is inconsistent, and mixed results exist, as the present study has shown. This assertion is in accordance with that suggested by Poclus (1991). It cannot be stated conclusively that whether one has a preference for sensing or intuition, or thinking or feeling, has bearing on one's subsequent computer attitudes. Nevertheless, certain interesting significant results were found in terms of the relationships between psychological type/cognitive style and computer attitudes, which indeed merit discussion and consideration. This pertains particularly to the finding that the extraversion-introversion preference has no bearing whatsoever on computer anxiety, confidence, and liking, which provides support for Whitley's (1996a) belief that it is not worthwhile investigating this MBTI® type preference. In addition, the present study found sensing people to exhibit more positive computer attitudes than their intuition counterparts, a finding which negates the hypotheses of the present study, and which adds to the confusion in this area which so many researchers (e.g. Igbaria & Parasuraman, 1989; Chu & Spires, 1991; and Whitley 1996a) talk about in their articles. Regression results of the current study also found that although the S-N preference was incorporated in the model in terms of being predictive of computer anxiety, confidence, and liking, along with other variables, only a minimal proportion of variance was explained, suggesting that other factors exist which predict computer attitudes, which the present study fails to consider.

With respect to the T-F preference, the present study found that thinking individuals would be more inclined to have more positive computer attitudes overall, and less computer anxiety than their feeling counterparts. However, the study also found that the computer anxiety construct and the total computer attitude construct were the most discrete constructs, based on the factor analysis findings reported in Table 3.4 (p. 53). Therefore, considerable confidence can be placed in these results, and we can conclude that whether one has a preference for thinking or for feeling could potentially affect one's computer attitudes. This is the most conclusive finding in the present research in terms of investigating whether people of a certain personality type would be more likely to exhibit negative computer attitudes or not. However, an important theoretical implication of the present research is that there is little evidence to suggest that personality type or one's cognitive style explain or predict computer attitudes. Future research investigating other measures of personality would be beneficial to this domain of interest.

Of particular interest in the current research in terms of theoretical implications and suggestions is the finding that computer experience and age have a stronger relationship with, and explain more of the variance in, computer attitudes (anxiety, liking, and confidence) than do personality dimensions, which are deduced from an individual's psychological type preference score on the MBTI®. This leads the researcher to one adventurous presumption, and that is that perhaps deducing whether one is inclined to suffer from negative computer attitudes is far less complicated than researchers are inclined to believe - perhaps age and experience are all that makes one computer anxious. Such a presumption leads one to assume that even the most computer anxious person can get rid of his or her anxiety, simply by having increased exposure to computers, or by patiently getting older, which in itself brings more experience and exposure if one constantly works with computers and moves with the times. Indeed, perhaps this can be achieved irrespective of one's personality. Age and "good ol' experience" is all it possibly takes.

4.4 CONCLUSION

Computers and new technology are flooding organisations today, resulting in constant improvements and advancements. Although the wonder of computers continues to amaze, and they have proven their usefulness in being of benefit to organisations in terms of improving productivity, competitiveness, and profits, there is no denying that without capable, confident, non-anxious users, these machines are relatively fruitless. The ability of employees in the workplace today (particularly in the South African workplace, where constant attempts are being made to match up to first-world specifications and performance, and where productivity and performance are of paramount importance in terms of local and global competitiveness) to use a computer effectively, at maximum potential, and with a positive attitude, and for all employees at all organisational levels to be capable of adapting to the constant improvements and advancements in computer technology, cannot be stated with enough conviction.

With this in mind it is of interest to organisations and employees alike to be aware of what types of individuals would be prone to exhibit negative computer attitudes. This research investigation has comprehensively sought to examine the relationships between psychological type/cognitive style and computer attitudes, and between relevant demographic variables and computer attitudes. In conclusion, the results of the current study provide limited support for evidence of a relationship between psychological type/cognitive style, and computer attitudes. Nevertheless, the findings of this research help fill gaps in our knowledge as to the links between these variables, and many issues and misconceptions in past research have been clarified in the present research. Despite this contention, and despite the conclusive findings with regards to the relationships between previous computer experience, age, and computer attitudes, the findings of this research should be considered tentative. This is one of the first studies of this type to be conducted on an adult working sample, and further research is obligatory before conclusive predications with regards to computer attitudes can be made.

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APPENDIX

1922 1997

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Private Bag 3, WITS 2050, South Africa • Telegrams 'Uniwits' • Fax (011) 716-8030 • Telephone (011) 716-1111

Dear Sir / Madam

This questionnaire forms part of a research project I am conducting as part of my Masters Degree in Industrial Psychology at the University of the Witwatersrand. The permission and support of ABSA has been obtained to approach you as a respondent, and it would be greatly appreciated if you would participate in this research.

The aim of the study is to investigate the relationships between one's psychological type preferences, as measured by the Myers Briggs Type Indicator, and computer attitudes. Please assist me by completing the attached questionnaires. Your name is not required on the questionnaires, and the information to be used in the research will remain completely anonymous and confidential, and cannot be used by your employer to your disadvantage. There are no right or wrong answers, and it is important to express your true feelings in your answers. Feedback will be given to the organisation of which you are a part, in the form of trends, and you are welcome to have access to the feedback.

Completion of Sections 1 and 2, and the Myers Briggs Type Indicator, should take no longer than 20 minutes of your time. It is important that you answer all of the questions. In adhering to ethical considerations, it is essential that responding to the questionnaires takes place under my personal supervision.

Thankyou for agreeing to participate in the study. Your time and effort is greatly appreciated.

Yours sincerely

BFuller

Miss Beverly Fuller
Masters Student in Industrial Psychology

PRIVATE AND CONFIDENTIAL

RESEARCH QUESTIONNAIRE

UNIVERSITY OF THE WITWATERSRAND

DEPARTMENT OF PSYCHOLOGY

INSTRUCTIONS:

Please complete the following questions as carefully and as accurately as possible.

All information will remain strictly confidential.

SECTION A

BIOGRAPHICAL INFORMATION

Date of birth Y Y M M D D

Gender MALE FEMALE

Home language: ____________

Highest level of education attained:

Std 9 or less	Matric	Diploma	Bachelor's Degree	Postgraduate Degree

Other (please specify): ____________

What is your job title? ____________

What is your post level? A B T P M E

How long have you been in your present job? [ ] years [ ] months

On average, how many hours per week do you spend using a computer at work?

__________ hours

What do you use the computer for? Please cross as many boxes as appropriate.

Word Processing	Spreadsheet	Statistical Analysis
Games	Graphics Packages	Company Software
E-Mail	Programming Language	Web Browser

Overall, how would you rate your experience with computers?
Please cross one box.

None ⟷ Expert

1	2	3	4	5	6	7

SECTION B

COMPUTER ATTITUDE SCALE

Please answer the following by putting a cross mark (X) in the appropriate column.

	STRONGLY DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	STRONGLY AGREE
1. Computers do not scare me at all				
2. I like working with computers				
3. Working with computers makes me very nervous				
4. I do not feel threatened when others talk about computers				
5. It wouldn't bother me at all to take computer courses				
6. I'm no good with computers				
7. The challenge of solving problems with computers does not appeal to me				
8. Computers make me feel uncomfortable				
9. Generally I feel okay about trying a new problem on the computer				
10. I would feel at ease in a computer class				
11. I think working with computers is enjoyable and stimulating				

	STRONGLY DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	STRONGLY AGREE
12. I don't think I would do advanced computer work				
13. Figuring out computer problems does not appeal to me				
14. I get a sinking feeling when I have to use a computer				
15. I am sure I could do work with computers				
16. I feel comfortable working with a computer				
17. When there is a problem with a computer run that I can't immediately solve, I stick with it until I have the answer				
18. I'm not the type to do well with computers				
19. I don't understand how some people can spend so much time working with computers and seem to enjoy it				
20. I am sure I could learn a computer language				
21. Once I start working with a computer, I find it hard to stop				
22. Using a computer is very difficult for me				
23. I do as little work with computers as possible				
24. Computers make me feel uneasy and confused				
25. If a problem is left unsolved in a computer class, I would continue to think about it afterward				
26. I could get good grades in computer courses				
27. I do not enjoy talking with others about computers				
28. I do not think I could handle a computer course				
29. I have a lot of self-confidence when it comes to working with computers				
30. I feel aggressive and hostile towards computers				

SECTION C

THE MYERS BRIGGS TYPE INDICATOR

Please turn over to find an answer sheet in either English or Afrikaans for the MBTI®. A question booklet will be given to you by the researcher. Please return the question booklet together with your completed answer sheets to the researcher when you have finished. Thankyou for your co-operation.

Author: Fuller, Beverly Dawn.
Name of thesis: Psychological type and cognitive style as antecedents of computer attitude components.

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