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'Please do not lean on the computer. It has feelings too.': The relationships transferred by humans to technology.

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“PLEASE DO NOT LEAN ON THE COMPUTER. IT HAS FEELINGS TOO.”: THE RELATIONSHIPS TRANSFERRED BY HUMANS TO TECHNOLOGY.

A thesis submitted in fulfilment of the requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

University of Wollongong

by

Jocelyn R. Harper
BSc. Honours (Psychology).

School of Psychology
2007

Certification

I, Jocelyn Rae Harper, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Psychology, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other institutions.

Jocelyn R. Harper

1st November, 2007.

Please see print copy for (Penna, 2004).

“Please do not lean on the computer. It has feelings too.” A sign on a computer monitor in a work environment. (Penna, 2004).

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Abstract

This thesis explores technology and computer transference. Technology and computer transference refers to the understandings about people and animals projected onto technologies and computers. It describes a 'felt' sense of the object as an 'Other', as a social entity and agent. A methodology for examining transference was developed and trialled during a series of three studies to determine its frequency, nature and influence on the human-computer interaction, and level of technology acceptance and use. Study One trialled and tested the Transference Grid methodology, which was based on the Repertory Grid technique from Personal Construct Psychology. The Transference Grid elements comprised both people and technologies. Study Two extended the research by adding the individual difference measures to examine their influence on transference. These included measures of learning style (Index of Learning Style), occupational style (Self-Direct Search) and personality (NEO-FFI). In Study Two, transference was found to be common, with 90% and 96% transference rates. In Study Three, the measures of individual differences were included with the Technology Acceptance Model (TAM), in order to examine their influence on both transference and technology acceptance. Study Three confirmed that transference was common, with 84% and 94% of constructs being transferred. Analyses were conducted on the two TAM contexts, based on Microsoft Word and Kronos software packages. Comparison of the results of the TAM for Word and Kronos, revealed that individuals with high levels of Extraversion found Word easier to use, but had no influence when using Kronos. Word was also perceived as being more useful than Kronos. Participants' attitudes to Word were more positive than to Kronos; they had more interest in exploring Word. No statistically significant difference between 'low' and 'high' technology transference scorers on the TAM Word or Kronos variables were found, however, there were significant differences in technology transference levels for both computer experience and frequency of use. As well, there was a difference in the level of Extraversion for high transference scorers. In Studies One, Two and Three the Transference Grids were analysed using two-dimensional Multidimensional Scaling. These solutions' results revealed two consistent over-arching (super-construct) dimensions for the various patterns of inter-element clusters. Affect and Effort were interpreted as the two dimensions. Participants' perceptions about the nature of computer transference centred around four sets of themes, based on computers' heightened abilities and orderliness, their dominance, their lack of emotion, and their complexity and subsequent difficulty. Anthropomorphic questions revealed that computers were predominantly attributed masculine characteristics. This thesis found clear evidence for technology and computer transference, although it may occur at low levels of awareness and comfort. Computers were perceived as ambiguous and difficult, offering extended abilities as well as complexity. Affect and Effort were interpreted to be the MDS super-constructs that frame participants' perceptions of the people and technologies in their lives. In view of this result, two further axes were proposed: 'Engagement-Disengagement', and 'Opacity-Transparency'. These results offer an extension to the current models studying the human-technology interaction

INTRODUCTION

Introduction

In the Information Technology (IT) and Information Systems (IS) literature, the human-computer interaction is focused predominantly on technical aspects such as usability and functionality. IT is information technology, “the branch of technology concerned with the dissemination, processing, and storage of information, esp. by means of computers” (Oxford English Dictionary (OED), 2006). IS is defined as a management information system, “a data-processing system designed to supply management and administrative staff with current information about accounts, personnel, etc” (abbreviated *MIS*, OED, 2006). The emphasis on technical aspects has limited understanding of the complexity that the human element brings to the human-computer interaction. This thesis goes towards addressing that gap in understanding, as many studies fail to take account of the complexity of the interaction, due to many of the current models of technology adoption and use being rational and reductionist. The thesis draws on literature from the philosophy of technology, phenomenology and psychology. The human-technology interaction requires a broader exploration than previously investigated.

The most well-received model of computer acceptance is the Technology Acceptance Model (TAM, Davis, 1989) and its variants and extensions. However, the model failed to account for many variables in the interaction, and, over time, additional variables were added (e.g. Venkatesh & Davis, 1996; Venkatesh, 1999; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003) in an attempt to overcome these shortcomings (Legris, Ingham, & Collerette, 2003). Although these extensions better describe the human-computer interaction, these models still offered limited explanation. One of the major limitations with the early model of the TAM was its exclusion of human emotions and emotionality in people's response to technologies. Although later versions of the TAM began to address this limitation (Venkatesh & Speier, 1999; Venkatesh, 2000), this model still left a gap in the conceptualisation of what takes place during, and within, the human-technology interaction. The unexplained poor acceptance and limited use of IS and IT in the work place points to current concepts of the human-computer interactions being inadequate.

The complexity of the relationships between people and technologies is reflected in a small body of literature from diverse backgrounds. The philosophy of the human-technology interaction, and the sensory and mental experience of it, were explored by Ihde (1973, 1983). The blurring of boundaries in the human-technology interaction is a theme common in the works of a number of writers who suggested that the interaction could alter people's perceptions of themselves, their relationships with others, and their capability and power (Barglow, 1994; Coyne, 2001; Ihde, 1973, 1983; Turkle, 1984, 1997). Within the interaction, technologies could be given symbolic and animate meanings that may be emotional and unconscious (Barglow, 1994; Kaufman, 2003; Nass, Moon, Morkes, Kim & Fogg, 1997; Norman, 2004; Schultz, 2000). The interaction between humans and technology may also be such that the templates of relationships are transferred from human-human relationships to human-technology relationships (Lloyd, 1998; Nass et al. 1997; Norman, 2004; Suler, 1998; Turkle, 1984, 1997, 2007; Walker, Harper, Lloyd & Caputi, 2003). Suler (1998) suggested that the form of these relationships was based on the notion of "transference" (Suler, 1998), that is, the transfer of prior relationships into new situations with new agents, both human and technological. Objects that are important to humans can become symbolic and be given emotional involvement (Barglow, 1994; Schultz, 2000). Especially represented are complex technologies such as computers, whose behaviour mimics human behaviour (Suler, 1998; Turkle, 1984; 1997). One of the earliest reports of computer transference occurred in the 1970s with the Eliza computer program, in which people interacted with it as if it were human because it followed a common pattern of conversational interactions (Norman, 2004). Understanding that Eliza was simply a computer program did not insulate people from this effect (Turkle, 1984).

Transference, in the psychological literature, refers to the " 'transferring' of an emotion or affective attitude from one person onto another person or object" (Reber, 1985, p. 785). Previous patterns of thinking or meanings placed on events or actions are transferred to new situations. Therefore, old relationships and patterns of thoughts and responses will structure the ways in which new events are understood, and the meanings placed on them (Kelly, 1955). The notion of transference can be applied to the human-technology interactions because the less rational ways that people interacted with technology, although common and not sufficiently studied, are probably powerful. People talk to their computers and cars; they cajole or swear at them. People may or may not interact in such a way openly, or may protect their self-image of rationality by playfulness, or play-acting, or downgrading the importance they placed on such an irrational responses. However, it seemed clear that responses to technologies are arational (Egan, 1985), and often intensely emotional.

Technology Transference and Use.

Research by Lloyd (1998) and Walker et al. (2003) illustrated some transference relationships which were produced using a method of presenting individuals' interpretations of the world. These interpretations or personal constructs have roots in each individual's history, and are used to make sense of their world. Personal Construct

Psychology (Kelly, 1955) proposed a theoretical framework, and some methodologies, such as the Repertory Grid, “for illuminating the human condition, both individual and collective” (Warren, 1998b, p. 1). The Repertory Grid methodology offers a means of understanding individuals’ experience, their interpretation about their world and predicting their actions (Stewart & Stewart, 1981). Such an understanding may offer valuable insight into the relationships people build with technologies when the human-technology interaction mimics human-human interactions. The understanding offered in human-to-technology transference interactions raises questions about whether the transference relationship is present in the general population, and whether the transference relationship becomes an intrinsic part of the human-technology relationship, and alters its quality (Lloyd, 1998). Further, there is the question of whether the transference relationship may play a part in the acceptance or rejection of technologies and computers.

The use of a constructivist psychology such as Personal Construct Psychology (PCP; Kelly, 1955) is integral to this thesis. The major component of the theory is the use of personal constructs, that is, the way a person views their world. Central to PCP (Kelly, 1955), personal constructs are templates or patterns, and may be cognitions, motives and emotions; intellectually thought through or experientially sensed; integrated into a knowledge structure or fragmented and inconsistent. They may be individual and idiosyncratic, or shared and easily understood among people. There were major advantages of using PCP as a psychology framework. It presents a theoretical framework and methodologies that are integrated, and yet open to change. PCP also adds an optimistic viewpoint about people’s ability to change. Humans have an on-going desire for creative and modified thinking and the re-conceptualisation of themselves and their world (Landfield & Epting, 1987). That world is embedded in technology, and interpretation and self-interpretation within this “technologically textured” (Ihde, 1983, p. 73) context is inevitable (Ihde, 1983). Therefore, PCP presented a method to assess the linkages that people make between technologies and humans, and the relationships they build to support these links.

This thesis also utilised a taxonomy of human values to help structure the constructs found in the human-technology interaction, in order to assess their meaning and commonality. Schwartz’s (1992, 1994) system of human values was taken as a taxonomy by which the constructs could be assessed. This taxonomy has a central place in this thesis, because it gives a systematic assessment of different actions and motivations across different contexts. Values may serve as one important framework from which people assess computer and technology use.

The Importance of Computer and Technology Use.

In this thesis IS and IT usage and adoption are examined, and treated as examples of human-technology interaction. The acceptance of technology is important because of the perceived advantages, from the global to the individual level, gained by the use of technology. The need for its acceptance is driven by many sources, but devolves to resource management, either human, economic (such as productivity, relative competitiveness) or natural (Bandura, 2002). The rate of computer and information technology acceptance has been shown to have large implications for nations (Freeman, 1994).

The Role of People in the Success or Failure of IT Use.

The accelerating rate of technology evolution and the profound changes it is causing in “accelerated pace of human transactions and the growing globalisation of human connectedness” (Bandura, 2002 p. 2) requires on-going adaptation and adaptability from those who use them. Workers are dealing with increased complexity and communication overloading (Weil & Rosen, 1999). Consequently, there are psychological, social and other impacts from the increasing depth and breadth of technology (Bandura, 2002; Mansell, 1994) The extent to which individuals are required to adopt technologies, and the uses to which the technologies are put, are governed by the decisions and choices that societies make. These may conflict with the choices that individuals make, because such choices are based on their belief systems, which provide a personal evaluation and self-regulation framework (Bandura, 2002).

The shift toward the use of IS and IT in organisations has produced a context for its mandatory use. This has, in turn, called for re-conceptualising the training of the workforce of the future, from skills acquisition to a framework of knowledge levels that encompasses syntactical to meta-cognition (Sein, Bostrom & Olfman, 1999). Common changes in organisations have included the use of enterprise-wide integrated information systems and technologies architecture (Kovner, Elton & Billings, 2000). These integrated systems have changed computer use from peripheral to core skills, with, for example, the daily use of Personal Digital Assistants (PDAs), integrated PDA mobile phones, mobile laptop computers, voicemail, video-conferencing, intranets and inter-office emails. Integrated systems are critical to data and knowledge management (Kovner et al. 2000). Bandura (2002) describes a pattern of computer use that is an integral part of on-going professional and personal development that requires the effective use of computer and information systems as conduits to rapidly expanding and updated knowledge bases. IT-led changes to the core of the job may have negative or positive outcomes (Ryker & Nath, 1995).

Although the increased productivity and management of resources (either as management of information, more rapid responses to consumer needs, or curtailing costs) has been a primary reason for the implementation of information systems, there are doubts about the realisation of this aim (Tripplett, 1999). There has been a growing dissatisfaction with low IS success rates in organisations (Legris et al. 2003; OASIG, 1996; Standish Group, 1999), and limited acceptance and adoption rates by end-users (Legris et al. 2003), which would reduce the effectiveness of any IS (Agarwal & Prasad, 1999). Governments and industry management voice dissatisfaction globally, because poor adoption is seen as a major impediment to the outcomes available from IT (Freeman, 1994), although improvements and measures of success have varied (Standish Group, 2001).

What factors have led to IS and IT investment failing to come up to expectation? Utopian perspectives during the 1980s fuelled a massive technological investment that was expected to open opportunities for greater wealth, higher standards of living and the reduction of mundane tasks (Garnham, 1994). Many of these implementations did not yield the anticipated benefits, and produced enormous financial costs across Britain, Europe and the United States (Garnham, 1994). In the UK, for example, the government pushed for IS and IT adoption as advised by various government/industry steering committees. Some of the assumptions on which this push was based were about a general and popular desire for consumption of largely public information which had economic importance, and required rational long-range planning (Garnham, 1994). Part of this assumption was utopian, in that there is an inference that being connected with information induces a more satisfying lifestyle “politically, economically, socially, and pragmatically” (Dutton et al. 1987:88 as cited in Garnham, 1994, p. 43). One factor, therefore, may be unrealistic expectations of IS and IT outcomes in organisations.

Escalation of costs continue to be major issues in IT governance. Historically, the costs for IS and IT implementation have been enormous. In Britain, for example, one percent of public sector spending in the National Health Scheme (Poulymenakou & Holmes, 1996; Audit Commission, 1995) and between two to fifteen percent of private sector spending (depending on the industry) has been allocated to IS and IT. UK public sector IT projects for 2003-2004 cost between $15.6 and $23.4 billion (Rohde, 2004a; 2004d). Despite this massive investment, technological and system failures occur (Barnes & Targett, 1999; Beynon-Davies, 1995; Bushell, 2006; Rohde, 2004c, 2004d), although few investments are subject to published assessments (Barnes & Targett, 1999). Most remain secret (Rohde, 2004a), and are not integrated into evidence-based management practices (Kovner et al. 2000). As Martinsons and Chong (1999) suggest, IS success can be elusive. Mixed outcomes lead to uncertainty, rather than clear failures (Barnes & Targett, 1999; Sobol, Alverson & Lei, 1999), which produce complex situations that are hard to assess and re-work and iterate. The UK projects were over-ambitious (Rohde, 2004d). So, a second factor in failed expectations may be that for the large financial investments made, there are mixed outcomes.

Productivity increases have not generally followed from the adoption of technology (e.g. Diewert, Nakamura & Sharpe, 1999). IS and IT have offered the rewards of industrial and global relative economic advantage, for its influence and use (Freeman, 1994). The on-going human quest for the management of resources gave the IT industry, as the bearer of such potential power, a power base and supply of financial resources to fund an on-going quest for the successful IS management. However, a “productivity paradox” (Triplett, 1999, p. 310) had become apparent. The paradox addressed economic concerns through the 1980s and 1990s that productivity increases had not followed from the adoption of technology. The heavy investment in information systems and technology occurred as productivity levels slowed down considerably (Triplett, 1999). The promised productivity has not occurred in spite of many years of cost, innovation pursuit and adoption (Triplett, 1999). More recently, economists have disputed these earlier productivity findings, arguing that different measures of productivity are required as the gains may be, for example, in labour and organisational capital and consumer welfare (Dedrick, Gurbaxani, & Kraemer, 2003). They also found that IS and IT adoption variations occur for different organisations, industries, time lags (Dedrick et al. 2003) and genders (Smith, Morgan & White, 2005).

As an example, the health industry has been especially prone to poor outcomes in IS and IT adoption (Sobol, Alverson & Lei, 1999; Stefl, 2000). Globally, IT has aimed at being cost-effective, accessible, and offering best-practice healthcare for the diverse needs of the population (Ingram, 1999). The acceptance of IS within health has been difficult, because of the rapidity of change, and the clinical concerns as well as ethical IS considerations for the delivery of health (Anon, 2005), and lack of consultation (Rohde, 2004b). Even though the use of enterprise-wide information systems offered improved knowledge and skills, the evolution of professional roles and accountability, more efficient use of teams, along with scientific and technological advances at a higher cost-effectiveness and higher standards of quality (Ingram, 1999), acceptance has been poor. These and other concerns may form conflicts within and between individuals and work groups, and organisations (Cox, 2003). As well, these concerns may form barriers to the widespread acceptance of IS by health workers, especially where the professional values lean away from a technological orientation toward humanitarianism (Herbert & Benbasat, 1994). For example, nurses see their role as carers not computer users.

Because the IT sector is rapidly evolving it continually allows for new methodologies, but these frequently require alteration to organisation patterns (Jayasuriya & Southon, 1996). Undertaking such changes requires “political, managerial, industrial, cultural changes and may require substantial changes in skills, and roles” (Jayasuriya &

Southon, 1996, p.291). The implementation often follows promises of benefits to clinical services, system support for staff, and management information, but without sufficient management understanding of the risks and implications (Jayasuriya & Southon, 1996). Implementations continue to be marred by inadequate staff consultation, inadequate testing, delays and cost over-runs e.g. the UK National Health Service National Programme for IT rose from $11.4 to $55 billion (Rohde, 2004b). In general, the IT system does operate, but much under par of the original expectations and results in a "general feeling of dissatisfaction" (Jayasuriya & Southon, 1996, p. 299). When the rapidity of technology changes compound the disparity between the expected and the achieved system, an early replacement of the system is often called for, and can perpetuate a spiral of disappointment. "There is a great gulf between the enthusiasts, who focus on the system's achievements, and the sceptics, who focus on its problems" (Jayasuriya & Southon, 1996, p. 299). The outcomes are perhaps best described as ambiguous. The high costs of IS development and implementation stem from a need for better outcomes for managed health care. These enterprise-wide systems enable telemedicine capabilities to be shared across health area networks. Such systems offer increased access to diagnostic expertise, results and clinical support systems, as well as clinical audits of treatment plans. They also offer financial management and planning for both governors and consumers of health care (Raghupathi & Tan, 1999). Such systems have been shown to provide better service with improved efficiencies, and in some cases, reduced staffing levels (Raghupathi & Tan, 1999). However, the costs are large, with, for example, $US10 to $US12 billion for USA health care IT expenditure in 1996 alone (Raghupathi & Tan, 1999).

Part of these failures stemmed from the over-emphasis on chasing consumer satisfaction because of "market thinking and economic/industrial considerations" (McQuail, 1987, as cited in Garnham, 1994, p. 49) rather than public interest. Such limitations occur because, regardless of the amounts spent on IS and IT, these resources are made use of by people within their existing strictures (Garnham, 1994). The dynamics of technological change are “constructed and constituted by a matrix of cultural, social, political, economic and technical relationships” (Mansell, 1994, p. 3) as well as psychological. Project development and implementations, therefore, require consultation and transparency with appropriate stakeholders so they have confidence in it (Rohde, 2004b). The identification of “real problems need to be aligned to the reality of the people and the circumstances in which the problem has occurred” (Toomey, 2005). Technology is, therefore, “a social fact” (Garnham, 1994, p. 48) which is political and forms part of a shared world, but one formed from differential access to informational power and distribution by virtue of “workers origins and position, characteristic dispositions, practices and ideologies” (Garnham, 1994, p. 49). The relationship between producers and users of IT is not straightforward, and the process of acceptance, adoption and use is staged, and requires management within the organisation (Gallivan, 2001). As well, individuals’ interactions with technologies are personal and mediated by their existing circumstances, how those circumstances are structured (Garnham, 1994) and their collective efficacy or agency (Bandura, 2002). This, in turn, means that outcomes of technology use (acceptance) remain unpredictable (Rogers, 2003), just as humans are unpredictable (Egan, 1985).

Management of the organisational and individuals’ process of change is crucial, because shifts in roles, work identity, work practices and values are mandated during the negotiation of IS use (Hovenga, Kidd & Cesnick, 1996). Although the aim of IS is enhanced performance, groups and individuals’ performance can be retarded, especially where there has been organisational stress, and competitive disadvantage (Grant, Hall, Wailes & Wright, 2006; Martinson & Chong, 1999; Wilson, 2004). Because the interdependencies between end-users, their tasks, and established social networks are tightly linked, the failure to allow for these human factors, risks IS under-utilisation, misuse and even sabotage (Martinsons & Chong, 1999). Respect for human factors in IT projects is crucial, and users should not be expected to be expert (Toomey, 2005). “A dysfunctional … and convoluted” IS (Horin, 2004, p. 1) allowed children reported to the NSW child protection agency to remain at risk, because workers were unable to extract data to be used quickly. Managers may be initiators of the IT and organisational change process, but they also suffer difficulties during times of change. Managers lack the time and control to manage the IT decision process (Short, 2000), and to deal effectively with such expensive investment decisions (Nutt, 1999) while dealing with many variables and people (Hickey, 2000). They also suffer when the best decisions are marginalised and discarded (Hickey, 2000). Because the management culture has a bias toward action (Nutt, 1999), this promotes short solution-to-implementation action paths. Poor tendering, and rapid implementation processes have occurred in NSW Health which has had a $A300 million, 14-year history of flawed IT management systems (Pollard, 2005). Managers can be vulnerable to a sense of entrapment over ego involvement (Short, 2000), and unable to admit and explore their failures (Oz & Sosik, 2000). This inability has produced a climate that emphasises IT success, and a lack of awareness, recognition and documentation of IT failures (Oz & Sosik, 2000), and poor IT governance (Toomey, 2005).

Increasing technology innovation and adoption, according to Bandura (2002), requires higher cognitive powers, self-regulation and increasingly complex occupational roles. Government and industry make higher demands by increasing regulation toward higher standards of professional practice. Professionalism demands on-going self-education, with self-regulation abilities in motivation, emotional, social and cognitive functioning (Bandura, 2002). A knowledge-based society requires effective strategies to manage, restructure and re-conceptualise knowledge, and its rapid throughput, short shelf-life and increasing volume. Industry-educational links are facilitated by IS and IT communications, and can create collaboration and synergistic melding of innovation and ideas. Therefore, when poor use of information and communication technologies occurs, systemic relative losses result for organisations, industries and nations (Bandura, 2002).

Thus, the importance of technology use is:

- it has economic consequences for organisations and nations;
- higher levels of use lead to higher demands on individuals; and
- the friction between technology and the individual has psychological consequences.

Individuals respond to the changes due to information technologies in many ways. These responses may include fear of the change and the technology, feeling information overload, and embarrassment about their lack of knowledge and expertise (Martinsons & Chong, 1999). Fear and disempowerment may be amplified when groupware, such as email and co-operative work tools, display to other workers an individual’s low skills and poor relative performance (Martinsons & Chong, 1999). Although training and support should facilitate the use and acceptance of technologies, wide differences in skill levels make such support difficult. Within the workplace environment all this may lead to effects for individuals, including uncertainty, stress and fear, absenteeism, staff turnover, complaints, role changes, re-training, downsizing (Martinsons & Chong, 1999), low morale, reluctance to learn new skills (Hovenga, Kidd & Cesnik, 1996), and fears of job loss (Bitner, Brown & Meuter, 2000). There may be cumulative effects for these difficulties with adjustment being required at multiple levels simultaneously, with "changes in technology, attitudes, organisational structures, policies, consumer expectations" (Feeney, 1996 cited in Hovenga et al. 1996, p. 283). The spill-over effects from highly demanding work situations during organisational upheaval, management of new skills, and assisting others during change, can produce psychological distress (Foley & Powell, 1997). Historically, technology and technology change was fitted around workflows. However, increasingly work practices are being altered to fit with technologies and the improvement in efficiency and effectiveness due to them (Grant et al. 2006; Hovenga et al. 1996).

Complexities can arise from either changes in work practices and workflows or modifications of enterprise-wide software. The former is the implementation of a "vanilla" (Grant et al. 2006, p. 7) version of the software, which occurs when an organisation is required to adapt to the software rather than manage modification of the software. In one case, the advantage of the 'off the shelf' vanilla version was seen as leading to best practice because its implementation and processes are well established. The changes that were required to the software brought about errors and inefficient outcomes. In another case, a more middle path was adopted, so that customisations and modifications enabled more intuitive functionality by end-users. This path was chosen to prevent users becoming frustrated with the system and ceasing to use it, especially when limited training time was the reality. Such modifications led to some inefficiencies and non-functioning system units, but followed from a belief that the organisation's existing business practices had merit over those of the IS. Ultimately, this system was described as having proven to be "no better than the legacy systems" (Grant et al. 2006, p. 10) that it replaced. In Grant et al.'s (2006) third case, rather than implementing a 'vanilla' version, an in-house enterprise system was built to retain flexibility for incorporating those variables seen as important to the client, that is, to remain targeted to the client’s distinctive and multifaceted needs in a competitive environment.

Although the alteration to an enterprise’s operation via technology may create significant improvement for innovation (Thomke, 2001), production and marketing (Freeman, 1994), business management and costing, it may be outside the limits of an individual’s acceptable work practice margins (Hovenga et al. 1996). There is a growing appreciation that people are “the most important element of an information system” (Whitten, Bentley & Barlow, 1989, as cited in Hovenga et al. 1996, 1996, p. 283) and the failure to adequately appreciate this can lead to the failure of IS and IT systems achieving their potential, or their outright failure.

The role of people in the success or failure of IT systems is:

- regardless of whether the use of IS and IT is mandated, if they do not accept and use it, it will partly or fully fail;
- the extent to which they accept it and use it will be a function of their circumstance (cultural, socio-economic, traits and ideologies), and the adequacy of the implementation.

People may use technologies and computers, but the level of the interaction may have remained constrained, non-exploratory and disengaged (Tripplet, 1999). These technologies remain machines, and the human-computer interaction may function at a utility level, but disembodied, unfulfilling, and stripped of the richness of interpersonal relationships. Asking participants to articulate the nature of these two forms of relationships, human-to-human and human-to-computer interactions, and drawing comparisons, was a goal of this thesis. For humans, one of the major on-going tasks in life is to make sense out of their past and present experiences, as well as the anticipation of their future (Kelly, 1955). The current rapidity of the change may be unprecedented in human evolution (Triplett, 1999), and may undermine the knowledge base from which humans understand their world. Dealing with the growing importance and emphasis placed on computers and technologies may require humans to manage a different form of human-machine relationship, because it is one that is mandated, yet transitional. Technology continues to exert an ideological stance for on-going technological solutions to economic, political or power, environmental, and health and spiritual issues (Coyne, 2001). Some social commentators and researchers have noted a recent pervasive sense of loss of social connection (Jones, 2001), identity (Barglow, 1994) and responsibility (Bandura, 2002). A sense of personal and spiritual dislocation, ennui and disconnect has been linked to the uptake of technologies, especially when they have become to be used as reality substitutes, for hedonism, stimulation and affiliation. Taken as a whole, the changes due to technology appear to bring about significant cognitive and emotional loads for workers and managers across many industries.

Research Questions

The research questions formulated for this thesis were exploratory. Study One trials the methodology in relation to transference, to explore the incidence of transference. Research Question 1 examines whether the Transference Grid methodology identifies technology and computer transference. In the second pilot study, Study Two, Research Question 2 examines evidence for, and explores the nature of technology transference and computer transference using different approaches. Also in Study Two Research Question 3 investigates the associations between the measures of individual differences. These measures were learning style and occupational style, and personality. These variations will have implications in areas such as, dealing with new situations and innovations, and perceptions of technologies. With the addition of the individual difference measures, Research Questions 4 examines the relationship between individual differences and technology transference, as well as technology and computer use.

Study Three expands on these questions by using a series of samples of workers in different industries. Research Question 5 continues the examination of evidence for technology transference and computer transference within the context of workers:

- Research Question 5.1: Is there evidence of technology and computer transference within workers?
- Research Question 5.2: How common are technology and computer transference within workers?
- Research Question 5.3: What is the nature of technology and computer transference within a sample of workers?

Research Question 6 again explores the relationships between individual differences, those of learning and occupational style and personality, but within the context of workers. Research Question 7 investigates the nature of individual differences and their influence on technology and computer transference. Research Question 8 seeks to replicate TAM (Symbolic Adoption) (Karahanna & Agarwal, 1999) for workers with different IT contexts. Research Question 9 extends the TAM by including individual differences (personality variables) as external to the TAM variables. It investigates the influence that personality measures have on the TAM internal or core variables. The final Research Question 10 addresses the impact that technology transference may have on technology acceptance and computer use in workers.

The Structure of the Thesis.

Chapter One explores the human-computer interaction literature with regard to computer adoption and acceptance, especially in regard to the social psychology models of the Technology Acceptance Model (Davis, 1989), Theory of Reasoned Action (Fishbein & Ajzen, 1975) and Theory of Planned Behaviour (Ajzen, 1988). These three models are described and criticised as inadequately addressing the full psychological range of experiences invoked in the human-computer interaction. The models have provided a thin, relatively mechanistic description of the relationship built by humans in their interactions with technologies. The Diffusion of Innovation (DoI, Rogers, 2003) literature is another model to explore the key components of novel concepts and objects. This model has had a long history of examining the factors involved in innovation adoption over many contexts. There have recently been developed hybrid models integrating these two major models, the TAM and DoI.

Chapter Two describes the individual difference literature which is used in this thesis to explore the human-technology relationship. Individual differences, including personality (Costa & McCrae, 1992), occupational (Holland, 1985b), learning style (Felder & Soloman, 1999-2006) and human values (Schwartz, 1992, 1994), have implications for technology acceptance and use. These include variation in the evaluation, attitudes and emotions that different work groups have in using technologies. In addition, there are also social and cultural factors involved in technology acceptance.

Chapter Three explains components from the literatures of psychology, sociology and philosophy relevant to human and technology interaction. This chapter is important. It is long and complex. However, it sets out to provide a broader conceptualisation of technology use. A phenomenological framework has provided a richer exploration of the human experience and reflection of changes brought about by the human relationship with technologies. The experience of technology use is concrete and sensory. However, it may also be a means of extending capabilities and understanding, so the technology object may also be a means of reflection and self-reflection. An object may come to hold symbolic power. Computers are less well-defined, and present more ambiguity than other technologies. This chapter describes computers as being seen by people as objects that are both opaque and transparent, and the relationship built by people in responding to technology is not only rational, but may be unconscious.

Chapter Four outlines a constructivist psychology called Personal Construct Theory (Kelly, 1955). This theory focuses on the importance of the ways people go about making sense of their environments and deal with the on-going changes in their environment. In addition, this chapter describes a Repertory Grid methodology, which gives access to individuals' "psychological space" (Borg & Groenen, 2005) or "perceptual maps" (Block & Block, 2005, p. 243). A more specific version of this technique is described. The Transference Grid methodology, a more specific version of this technique, is described. It illustrates how some participants viewed their relationship with the technologies that are incorporated into their lives. Incorporation may occur because the object offers enjoyment, relief, safety, communication and belonging, or simply because it is required.

Chapter Five details the three studies in this research. This chapter describes the methodologies and analysis approaches designed and used to explore the evidence for, and nature of, technology transference. The chapter also describes the modifications built to improve each of the studies.

Chapter Six describes Study One, which was a small study based on 15 student participants. This chapter outlines the original methodology for the Transference Grid and how it was modified from that of the ‘pilot study’ by Lloyd (1998). Case studies are used to illustrate some human-technology relationships, and the sorts of constructs that adequately explain those relationships.

Chapter Seven describes Study Two, which used modifications of the Transference Grid made as a consequence of Study One. Eighteen participants were included in this study. It builds on the use of an additional element, that of ‘self’, which is an important anchor in self-identity. In addition, measures of individual differences were included: the Index of Learning Style (Felder & Soloman, 1999); the Self-Directed Search (Holland, 1985b); and the NEO Five Factor Inventory (Costa & McCrae, 1991).

Chapter Eight describes the Study Three in this thesis. Sixty-nine individuals participated fully in this study. It was for this study that the components of the Technology Acceptance Model (TAM), were added from the IT literature. This was added because exploration of the links between computer and technology acceptance, that is, computer use and computer use intention, may be made with the transference relationship. The use of such a broadly-used and validated model from the IT literature was important, because it was expected to link the way participants viewed the utility of, and their psychological response to, the technologies under examination.

Chapter Nine is a discussion of the findings for all of the studies, with an emphasis on the final study because it was centred on workers. The implications from this set of studies are reported. The limitations of this thesis, and recommendations for future studies based on this exploratory set of studies, are also discussed.

CHAPTER ONE

RESEARCH MODELS USED TO INVESTIGATE INFORMATION TECHNOLOGY USE.

Research Models Used to Investigate Information Technology Use.

Technology is an important element in all facets of people's lives. In an attempt to study how people react to technology, research has been conducted over many decades to facilitate the acceptance and use of information and computer technologies. There are a variety of models that serve different purposes, such as measuring system success, acceptance, adoption and use. The Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), and the Technology Acceptance Model (TAM) have come from a social psychology perspective. The TRA and TPB are general theories that have been applied to many studies of human behaviour, while the TAM was specifically designed to account for the people's use of technology. In this thesis there is a focus on the TAM because it has been an important research model, which has evolved in response to criticisms. However, the literature emerging from such a perspective remains focussed on the usability and functionality of the human-to-technology interaction. As such, it does not address the experiences and interpretations that impact on humans in their interaction with technologies. The Diffusion of Innovation (DoI) model does present a much broader perspective of acceptance and use of technologies. Although IS (information system) and IT (information technology) may not always be innovative, their adoption is an ongoing evolution of increasingly sophisticated technology and use, and therefore novel to users (Hu, Clark & Ma, 2003). The TAM and DoI frameworks come from different backgrounds and have different foci, but both are primarily based on the attributes and adoption of innovation (Gallivan, 2001). Technology acceptance addresses people's use of IS and IT (Davis, 1989). In the workplace, different levels of adoption occur when an organisation engages variously with an IS or IT This engagement occurs first as an adoption decision by management, followed by its deployment, routinisation and assimilation into work practices which varies among different adopter workers. This variation occurs regardless of the mandated use of the IT. Innovation refers to novelty, and the diffusion of innovation refers to the processes undertaken by adopters of innovation. Both the TAM and DoI models have received much research attention, and have evolved over time. The TAM has become a successful model in predicting the use of information systems in the research community, but continues to have limitations, which will be discussed.

1.1 The Technology Acceptance Model

1.1.1 Development of the Model

The Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) come from a social psychology background. The Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) was revised by Ajzen (1988, 1991, 1998) to form the TPB. The TRA posits that a person's behaviour is determined by his or her intention to perform that behaviour (Ajzen & Fishbein, 1980). Intentions are formed from the individual's attitude toward the specific behaviour and their subjective norms, that is, from the individual's beliefs about the behaviour, as well as the social pressure to perform that behaviour (Ajzen & Fishbein, 1980). The TRA model has been shown to predict intentions and behaviours, as well as to pinpoint possible locations and processes for behavioural change (Sheppard, Hartwick & Warshaw, 1988). The theory sets boundaries on its applicability: these limitations apply in contexts where the behaviour is not volitional, where there is a forced choice and the person's intention cannot be completely informed (Sheppard et al. 1988). However, Sheppard et al. (1988) found that in spite of being used outside its boundary conditions, the model's predictive ability was strong. The TRA proposed that two constructs were important influences for intentions, namely, Attitudes and Subjective Norms. In contexts where behaviours were not volitional, Ajzen (1988) modified the model with the addition of a third construct, that of Perceived Behavioural Control. According to Ajzen (2006) “attitude toward a behavior is the degree to which performance of the behavior is positively or negatively valued. … attitude toward a behavior is determined by the total set of accessible behavioural beliefs linking the behavior to various outcomes and other attributes”. *Attitude* is a person’s evaluation of people, physical objects, ideas, actions or behaviours (Bagozzi, Gurhan-Canli & Priester, 2002). Subjective Norm is “the perceived social pressure to engage or not to engage in a behavior. … it is … determined by the total set of accessible normative beliefs concerning the expectations of important referents” (Ajzen, 2006), i.e. it is the pressure to perform an action, or conform to pressure, felt from people whose opinion is valued (Bagozzi et al. 2002). Control beliefs involve the perception of factors to assist or hinder the performance of a behaviour. These beliefs, along with a person’s perception of his or her power to control each factor, determine their Perceived Behavioural Control (Ajzen, 2006). Therefore, each control factor contributes to a person’s aggregated sense of Perceived Behavioural Control, which is a similar construct to self-efficacy according to Conner and Abraham (2001). A person’s belief about the level of difficulty in performing an anticipated behaviour influences his or her intention and subsequent behaviour, as well as directly influencing behaviour (Bagozzi et al. 2002; Ajzen, 2006). Intentions form an important motivation to action (Conner and Abraham (2001). Intention accounted for between 40% and 50% of the variance for behaviours for the TPB in many contexts (Conner & Abraham, 2001). A meta-analysis of studies reported by Armitage and Conner (2001b) showed that the TPB has good predictive power, and Conner and Abraham, (2001) concluded that the model offered good predictability across a number of contexts, although other variables could increase its predictive power. The TRA and TPB models are sufficiently similar to be represented in one diagram (see Figure 1.1).

Please see print copy for Figure 1.1

Figure 1.1. The Theory of Reasoned Action and the Theory of Planned Behaviour (Ajzen, 2006).

Both the TRA and TPB models assume that people are fundamentally rational, that they analyse information that is available to them, and consider the implications of their behaviour. Conner and Abraham (2001) concluded that a valuable extension to the TPB would be to include anticipated emotional reactions, as well as variables of personality, especially that of conscientiousness. The model then may be able to demonstrate the effects of past behaviour on intention and behaviour, especially in regard to how individual differences in thoughts and actions are stable across contexts.

Early IS and IT researchers had focused on end-user satisfaction and explored an array of variables that had been found to contribute to satisfaction, but simplification of the models and factors was required (Legris et al. 2003). Because of the TRA and TPB models' validity across different contexts, research into the adoption and user acceptance of IS and IT since the 1980s has understandably drawn on these models. The TPB (Ajzen, 1988) extended its applicability to include less volitional contexts. The determinants of the behaviour in accepting a technology are seen to spring from beliefs and attitudes within the user (Karahanna, Ahuja, Srite, Galvin, 2002). According to

Morris and Dillon (1997), these models emphasise the person in contrast to the DoI model that focuses on the characteristics of the technology.

The TAM proposed by Davis (1989) was developed in an attempt to explain why users accept or reject information technologies. The aim of the TAM was to build a parsimonious model to explain intention and behaviours toward computer use (Davis, 1989). It also was designed to assist in testing software design for potential problems (Morris & Dillon, 1997). Figure 1.2 shows the Technology Acceptance Model.

Please see print copy for Figure 1.2

Figure 1.2. Technology Acceptance Model by Davis (1989).

In developing the TAM, Davis (1989) replaced the attitudinal determinants in the TRA with Perceived Usefulness (PU) and Perceived Ease of Use (PEU). These constructs along with Attitude (A), Behavioural Intention to Use (BI) and System Use (U) became the five core variables of the model. PEU is the amount of effort perceived by the user required for their use of a system (Venkatesh & Davis 1996; Morris & Dillon, 1997). PU was defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis 1989, p. 320). Different studies have shown different levels of influence of PEU or PU on computer use, (consider, for example, Igbaria, Iivari and Maragahh, 1995; compared with Davis et al’s 1992 study). This difference may be a product of different technologies and different samples. All variables external to these five core TAM variables were mediated by them (Davis, 1989; Agarwal & Prasad, 1999).

After its introduction, the TAM became the dominant model in technology acceptance research (Karahanna et al. 2002). It has shown very good predictive validity, which has in turn shown empirical veracity and consistency throughout many research studies (e.g., Adams, Nelson & Todd, 1992; Davis, 1989; Davis, Bagozzi & Warshaw, 1989; Legris et al. 2003; Taylor & Todd, 1995). Of the studies reviewed in Legris et al's (2003) meta-analysis, the model has shown reasonably consistent associations for the core TAM variables, and consistent significant positive relationship between PU and A, in all but one study. It has strengths, such as its parsimony, easy application and cost-effectiveness (Morris & Dillon, 1997), although its weaknesses are that it has been applied mainly with student samples, and its parsimony was found to limit its explanatory power. Over time, new variables have been added to increase its prediction and explanation. The TAM (Davis, 1989) posits that the end-users' acceptance of an IS is based on beliefs a user holds about a system's ease of use and usefulness.

Venkatesh and Davis (2000), in developing the TAM2, sought to better understand its perceived usefulness, and to extend the TAM to include other main determinants of this construct and usage intensions, and to understand how the effects of these determinants change with experience. The TAM2 added social influence processes (i.e. subjective norm, voluntariness, and image) as well as cognitive instrumental processes (i.e. job relevance, output quality, result demonstrability, and perceived ease of use).

Venkatesh and Davis (2000) found that a system's relevance, together with the status it offers and the social influence of other users, are important antecedents to perceived usefulness. They suggested that with the increase in autonomous networked teams within organisations, and team-based structures and goals, “the nature and role of social influence processes (both within teams and across teams) will need to be elaborated beyond TAM2” (Venkatesh and Davis, 2000, p. 200).

The TAM’s basis on the five core variables constrains the model to psychological processes that are primarily rational. Karahanna (1997) and Karahanna and Agarwal (1999) sought to extend the TAM past the rational constraints. They, and other researchers such as Venkatesh (2000), began to explore how the nature of technology acceptance and use was based in variables that are arational. Approaches to understanding human processes that are rational provide a framework for dealing with people, which allow the design for explicit organisational procedures to assist in managing people and change (Egan, 1985). However, much of the actuality is *arational* (Egan, 1985, p. 50) and doesn’t mirror the rational ideal. Such ‘real’ factors emerge beyond what is planned for (Egan, 1985). Managers may understand that difficulties will occur outside of their models and predictions, and that outcomes may be erratic (Egan, 1985). Although managers may understand the difficulty that arationality provides for individuals and groups, and may build latitude for the unexpected into dynamic human processes, the unpredictability is poorly taken into account (Egan, 1985). Humans fail to comprehend the magnitude of arationality, which “permeate[s] every rational thing we do. We need models for understanding and strategies for dealing with the arational in ourselves, in the systems to which we belong, and in the environment that controls much of our destiny” (Egan, 1985, p. 52). Humans are very complex, emotional, changeable, fragmented and frequently poor at self-understanding (Egan, 1985). Human mental processes are largely unconscious (Ramachandran, 2003), and experience is subjectively felt (Norman, 2004). IS and IT evaluations are also subjective (Ballantine, Bonner, Levy, Martin, Munro & Powell, 1998). Any framework or evaluation that limits itself to a rational basis of human cognitions and actions fails to account for the additional dimensions that are hidden, but spontaneously occur. In short, many unplanned events occur, and many planned events do not (Egan, 1985). In its early stages of development, the TAM was a rational model of technology acceptance that focused on an information system's ease of use, and its usefulness to the user. A step toward explaining the less rational processes was the addition to the TAM of a construct called Symbolic Adoption (Karahanna, 1997; Karahanna & Agarwal, 1999).

1.1.2 The TAM with Symbolic Adoption

The notion of Symbolic Adoption was first explored in the late 1960s, and has been taken up through the Diffusion of Innovation literature through to current times (Rogers, 2003; Karahanna & Agarwal, 1999). Two studies added Symbolic Adoption as a core variable with the aim of improving the explanatory power of the TAM (Karahanna, 1997; Karahanna & Agarwal, 1999). Research using Symbolic Adoption (SA) lead to the separation of the adoption of an IS or IT into two parts: that of Symbolic Adoption and use adoption, such that SA is distinguishable from attitude (Karahanna, 1997). Symbolic adoption refers to part of the process of adopting any innovation, idea, or position, whether it is material or non-material (Klonglan & Coward, 1970). It is the first part of the process of adoption in which the idea is accepted, and is followed by use adoption whereby the object or practice is accepted (Klonglan & Coward, 1970). Klonglan and Coward, (1970) describe a generalised two-phase model. The first phase is a growing awareness and becoming more informed about an innovation to a point where the innovation is either being symbolically rejected or symbolically adopted (Klonglan & Coward, 1970). Congruence with the individual or group's perceptions and experiences will help the level of engagement with the innovation (Klonglan & Coward, 1970). Symbolic adoption occurs at the beginning of the second phase, and is the point at which a concept is accepted (i.e. either as mental acceptance or the applicability of the innovation idea) and preludes either ‘trial use’ or ‘continued use’ adoption (Klonglan & Coward, 1970). Three levels of Symbolic Adoption may occur: *anticipatory adoption*, an *incomplete adoption*, or *trial* (Klonglan & Coward, 1970). *Incomplete adoption* will lead to *constrained adoption*, while an innovation *trial* may result in either *trial rejection* or *trial acceptance*, which in turn leads to *use adoption*. When *use adoption* has occurred, profitability, or influence on others, or discontinuance, are possible outcomes (Klonglan & Coward, 1970).

IS adoption can be separated into actual adoptive use as distinguished from the acceptance of the idea of the technology. This distinction becomes important when dealing with mandatory use of technologies, because users often exhibit dissonance while using an innovation. Mandatory use may be enforced by implicit or explicit rewards or punishments (Rawstorne, Jayasuriya, & Caputi, 2000). Identification of the variables involved in these discontinuities will assist in predicting resistance to, or lack of acceptance of, mandatory environments. Karahanna (1997) also examined the role of the innovation dissonance, a specific form of cognitive dissonance, in which an individual experiences discomfort as a result of incongruence between their own beliefs and their actions (Rawstorne et al. 2000). Reduction of this discomfort is an important aim for individuals; the means at their disposal are either altering their behaviour or cognitions (Elliot & Devine, 1994 as cited in Rawstorne et al. 2000). When modification of their behaviour is not possible in mandated environments, individuals are more likely to change their attitude, rather than avoiding use of the IS (Rawstorne et al. 2000). Karahanna (1997) points out that Symbolic Adoption is not a requisite precondition for adoption, since symbolic rejection of a technology may have no bearing on an individual’s required use of it. However, this innovation dissonance may be important for the IS industry, where symbolic rejectors are required to use the innovation (Gallivan, 2001; Markus, 1983). One strong response to this situation may be under-utilisation, or even sabotage of the innovation (Leonard-Barton, 1987a, 1987b; Martinsons & Chong, 1999). There are different benefits and costs for different groups and individual users, so expertise and effort, ownership, political and personal motives vary, and have different outcomes (Leonard-Barton, 1987b). Karahanna (1997) concluded that attempts to influence the adopters' attitudes and underlying belief structures, their perceptions of social influence, and removing barriers to adoption, or mandating adoption, are critical to influencing adoption intentions. Some methods for this to occur include strengthening the potential adopter's beliefs about its ease of use, its ability to enhance their effectiveness, or altering their attitude about adopting the innovation (Karahanna, 1997).

Karahanna and Agarwal (1999) extend the concept of voluntariness. Rather than simply being a normally distributed variable, Symbolic Adoption allows an increasingly sophisticated examination of adoption. An individual's voluntary mental acceptance of an innovation will be reflected in the increased sophistication and exploration of the technology(ies) with which they interact. At best, the relationship with the technology is one of engagement and inquiry, involving commitment to the technologies and a considerable period and effort in learning (Karahanna & Agarwal, 1999) and infusion. Thus, the technology would be regarded as having intrinsic value (Karahanna & Agarwal, 1999). Antecedent to attitude and influencing intention (Karahanna & Agarwal, 1999), Symbolic Adoption is redefined as a multi-faceted construct having four dimensions:

“1) *mental acceptance* capturing the extent to which a user views the artefact, in principle, as a good idea;

2) *use commitment*, representing the degree to which one is committed to the use of the technology independent of whether or not it is mandated;

3) *effort worthiness*, or the user’s positive evaluation of the return on resources expended in order to be able to use the technology; and

4) *heightened enthusiasm*, capturing the eagerness with which a user approaches the behaviours associated with technology use” (Karahanna, 1999, p. 7).

What motivates people to symbolically adopt a technology? Motivation is an important component for human actions. Striving to make meanings motivates people to behave in ways that are congruous for them, although they may appear incongruous or idiosyncratic to others. Ryan and Deci (2000) have a long history of research in intrinsic and extrinsic motivation, which Karahanna and Agarwal (1999) argue should be linked with different levels of technology adoption.

Symbolic adoption describes a process that is owned by a person who is internally motivated (Karahanna & Agarwal, 1999). The processes of internally-regulated motivation ranges, with increasing personal importance, from “interest, enjoyment and inherent satisfaction; congruence, awareness, synthesis with self; [to] personal importance and conscious valuing” (Ryan & Deci, 2000, p. 72). Contexts that support peoples’ desire to satisfy human psychological needs foster intrinsic motivation, which in turn leads to increased higher levels of autonomy, and competence and engagement with activities and learning (Ryan & Deci, 2000). Autonomy is one of three primary human psychological needs, along with competence and relatedness; fulfilment of each of these needs offers intrinsic satisfaction and increased general well-being (Ryan &

Deci, 2000). Therefore, intrinsic motivation offers internally-regulated interest, enjoyment, and the satisfaction inherent in humans filling their primary needs for autonomy and competence (Ryan & Deci, 2000). When technologies offer an inherent attraction, the quality of the human-computer engagement may be close and feel intuitive. In comparison, external demands and rewards, such as social approval and pay, will support worker compliance and constrained adoption, but the motivation remains extrinsic (Ryan & Deci, 2000). When humans introject or internalise others' needs and expectations, these external motivators induce behaviours that are compliant at best, but balanced with defiance (Ryan & Deci, 2000). Such external regulation relies on compliance and external rewards, and punishment and non-regulation processes, which, when set in train, result in disengagement or "going through the motions" (Ryan & Deci, 2000, p. 72) behaviours. When acceptance and use is mandated, as in organisational contexts for IS and IT, users' control about IT choice can lead to symbolic rejection and limited or poor use, and even sabotage (Martinsons & Chong, 1999). The costs for individuals bowing to external control are their decreased sense of well-being with lowered positive affect, vitality, general satisfaction, reduced openness to experiences, as well as higher negative affect (Sheldon & Kasser, 1995). Socially, the costs are seen as increased levels of independence, along with alienation, fragmentation and rebelliousness (Deci & Flaste, 1996).

Symbolic adoption only occurs with intrinsic motivation, integrated regulation, and identified regulation (Karahanna & Agarwal, 1999). Integrated regulation describes when a person has integrated the technology with aspects of their own life, and their valued goals (Karahanna & Agarwal, 1999). This would include a positive ideological stance toward the technology, rather than a dystopian stance.

Symbolic adoption is “self-determined adoption resulting from self-determined motivational states” (Karahanna & Agarwal, 1999, p.7). It is a peak motivational state in which an individual or team can act as a “source of inspiration and excitement to others” (Karahanna & Agarwal, 1999, p. 8) in regards to the use of a technology. There is a sense in which these symbolic adopters are able to convert others, users or potential users, to enthusiastic exploratory utilisation (Karahanna & Agarwal, 1999). Such symbolic adopters are committed to using the technology, and they look forward to interacting with it (Karahanna & Agarwal, 1999). Further, they hold the technology in high regard, viewing it as an important concept, and hence see the investment of time and effort in learning its use to be desirable (Karahanna & Agarwal, 1999). This leads into other specific behaviours: engagement with the technology, exploring of new features, and possibly building that into reinvention of the technology (Karahanna & Agarwal, 1999; Rogers, 2003) and its infusion in their knowledge base (Cooper & Zmud, 1990).

Congruence forms a part of the second stage of the process of Symbolic Adoption. An innovation’s *Symbolic Adoption* is more directly influenced by congruity of previous experience with a similar idea. Klonglan and Coward (1970) hypothesised that sociological variables are stronger predictors of Symbolic Adoption, while economic variables are stronger predictors for use adoption. Thus, the use of an innovation is more directly influenced by profitability, or expectations of profitability, than the acceptance of the conceptual notion of it (its Symbolic Adoption). This implies that users of technology must gain ‘profit’ to take up an innovation. Congruence drives Symbolic Adoption, but profitability primarily drives use adoption. Profit can be seen in many forms, for individual workers' individual notions of ‘profit’ may include broadened experience, greater well-being and efficiency, better work flows, reduced vulnerability to litigation, better access to management, increased communication with colleagues, and more bargaining power. For management, ‘profit’ may be seen primarily in economic terms, and thus quite differently to individuals and worker groups.

The notion of congruence is not mentioned but is implicit in Karahanna and Agarwal’s (1999) view of Symbolic Adoption. The description of Symbolic Adoption subsumes individuals’ commitment to, and enjoyment in, using a technology, seeing it as worthy of investment in time and learning effort, actively engaged in exploring and interacting with it. This implies, in the evaluative process, both a mental trial and fit (congruity) when an abstract form of the innovation is applied to a specific context, or event (Beal & Bohlen, 1957 as cited in Karahanna & Agarwal, 1999). This leads later to either mental acceptance or rejection (Karahanna & Agarwal, 1999), most likely in the same direction as some form of their prior experience, either personally or vicariously by people for whom they have some regard. Continuity of meaning is important to adoption, and it relates to the notion of technology clusters where components of the whole technology, although individual in themselves, are perceived as being closely inter-related (Rogers, 2003).

The importance of the separation of Symbolic Adoption from use adoption is that it allows investigation of variables related to both. There can be various instances of incomplete adoption in which there is Symbolic Adoption without use adoption (Klonglan & Coward, 1970). Separation of this symbolic and actual adoption of an innovation allows interrogation of variables of mandatory adoption, where there may be discrepant actual use from a user’s mental acceptance of the idea (Rawstorne et al. 2000).

1.1.3 Research that Extends the TAM

Venkatesh (2000) suggested that although the TAM offers a good basis for human-computer interaction, its antecedents, perceived ease of use (PEU) and perceived usefulness (PU) require further extension and elaboration. Venkatesh, Morris, Davis and Davis (2003) provided a much more elaborated and unified model of user acceptance the Unified Theory of Acceptance and Use of Technology (UTAUT). This model is described more fully as part of combined or hybrid models in Section 1.4. Individual differences in the general perceptions of computer interactions have implications for ongoing information systems use because users' overall perceptions of IS and IT frame the assessments users make of individual systems (Venkatesh, 2000). Information systems have the potential to 'hook' users by using their intrigue and curiosity for complex, unknown and conceptually expansive 'thinking' systems (Coyne, 1999; Agarwal & Karahanna, 2000). Further, manipulation of training processes that offer playfulness may foster intrinsic motivation and reduce the perception of effort in a learning context (Venkatesh, 1999). Weil and Rosen (1995) argued that non-evaluative, playful computer experiences should reduce technology anxiety and phobias. As Venkatesh (2000) states, what is required is change from training that emphasises skills and procedural knowledge toward more generalised computer awareness and system-specific training programs. These programs should build computer self-efficacy and reduce computer anxiety, as well as foster positive general beliefs about new information technologies. This is especially so when there continues to be evidence that individual differences predispose users to different levels of acceptance of technologies (Venkatesh, 2000), depending on the individual difference and technology being studied (Burton-Jones & Hubona, 2005).

Originally the TAM was presented as mediating all the possible external variables antecedent to the Perceived Ease of Use, and Perceived Usefulness construct (Legris et al. 2003). However, other studies have found the need to explore these determinants further (Venkatesh & Speier, 1999; Venkatesh, 2000; Venkatesh & Davis, 2000; Venkatesh, Speier & Morris, 2002; Burton-Jones & Hubona, 2005). Because the TAM presented such a robust model, it has been elaborated, and includes additional variables. A meta-analysis by Legris et al (2003) of studies that employed the TAM, showed that 13 of 22 studies added external variables. These non-core variables included motivation, level of involvement, direct and prior experience, situational and social factors, voluntariness, training and support, implementation issues, gender and educational differences, job relevance and job-task fit and emotional experience (Legris et al 2003). Such studies have shown some counter-intuitive results. Initially it was assumed that training would be related to system use, and that increasing technological experience would ameliorate negative emotions surrounding computer experience. However, training and system use was found to be poorly associated, and that increased computer experience has not resulted in decreased computer anxiety (Henderson, Deane, Barrelle & Mahar, 1995; Karahanna & Straub, 1999; Thomson, Higgins and Howell, 1991; Weil & Rosen, 1995) although Anthoy, Clarke and Anderson (2000) found an inverse relationship with computer anxiety and experience, and a positive relationship between technophobia and Neuroticism, and inverse for technophobia and Openness (Anthony et al. 2000). Computer anxiety holds considerable influence over computer use (Hackbarth, Grover, & Yi, 2003).

Numerous researchers have found links between intrinsic motivation and IT acceptance (e.g., Davis, Bagozzi and Warshaw, 1992; Malone, 1981a; 1981b; Venkatesh & Speier, 1999; Webster & Martocchio 1992). The importance of this finding is that it moves IS design and training away from an emphasis on system useability and functionality, and conceptual and procedural knowledge, toward enjoyment and playfulness. Indeed, emphasising technical usefulness, and the extrinsic rewards it brings, did not alter intentions to use or increase the use of an IT system (Venkatesh, Speier & Morris, 2002). Intrinsic motivation can be aided by “computer playfulness”, and the enjoyment a system offers alters perceived ease of use measures (Venkatesh & Speier, 1999). Users’ perceptions of enjoyment and playfulness with a computer system also facilitate discounting any difficulties in learning the system, and increase their willingness to invest time into an information system or technology (Webster & Martocchio 1992; Venkatesh, Speier & Morris, 2002). This form of intrinsic motivation also enhances perceived usefulness, increased duration, quality and productivity of the task, as well as increased diligence in cognitive processing (e.g., Bagozzi, Gopinath & Nyer, 1999a). Importantly, training that was more play-like enhanced enjoyment (Webster & Martocchio, 1992; Martocchio, 1994), along with environments that provide conceptual and exploratory experiential learning (Compeau & Higgins, 1995; Olfman & Mandviwalla, 1994; Santhanam & Sein, 1994). Therefore, successful initial and enduring acceptance of new technology by end-users within organisations has ongoing implications (Venkatesh, Speier & Morris, 2002). To improve users' efficacy and sophisticated adoption with more advanced software and hardware (Hu et al. 2003), support is needed before and after a critical threshold for acceptance is reached. These users (who were teachers) needed to see the value in the technology’s acceptance (Hu et al. 2003).

In contrast to focusing on training in systems use or playfulness, Karahanna and Straub (1999) suggested that social influence and social presence constructs operated for users, not directly but via perceived usefulness. They cited, in the first instance, the cost of not utilising an email system when it results in being left out of the management loop, and second, the quality of social presence gained via email use when differentiated by personal or business relationships. Therefore, the interactions of humans via computer-mediated communication such as email, bridge the technology, and project a sense of human contact into the relationship, and hence infiltrate the usefulness variable. There is a "sense of human contact with your friends [via email] because you can still sort of picture what they're looking [at] and what they are saying so there's a sense of human contact" (Karahanna & Straub, 1999, p. 246). This contact is a projection, and it changes the quality of the communication exchange. The sense of affiliation and warmth drops away with a business email where the recipients are unknown to each other. Such changes in the perceptions of users can be important in technology use. More critically, since the perception is malleable, these social perceptions of the user may influence their level of engagement, use and adoption (Karahanna & Straub, 1999).

1.1.4 Limitations to the TAM

Although the TAM was conceived as a convenient parsimonious model to explain computer acceptance and usage frequency, supplementary variables were added in order to present a more whole description and explanation. Legris et al (2003) considered that the choice of external variables used to extend the TAM showed "no clear pattern" (Legris et al. 2003, p. 196), implying that there was no theoretically-tied linkage of the additional variables. Another limitation to the TAM is a consistent failure to explain more than 40% of variance across many studies and contexts, both in terms of software and participant groups (Legris et al. 2003). While additions offered more complexity and a more full description of factors involved in IS and IT acceptance, they failed to achieve more explanatory power. In extending the TAM by examining the antecedents of Perceived Ease of Use, and Perceived Usefulness, researchers (e.g. Venkatesh &

Speier, 1999; Venkatesh, 2000; Venkatesh & Davis, 1996; Venkatesh, Speier & Morris, 2002) did not provide a sufficient platform to examine the human component to the human-computer interaction because this conceptualisation of it is still based in technological functionality and useability. As such, it provides only the rational parts of the human-computer interaction, and fails to include much of the depth and complexity in a largely unexplored area of research.

Although the TAM has had a long history of use since its inception in 1989, with evolution of its variables, the meta-analysis by Legris et al. (2003) proposed that the TAM be extended beyond its original form. Some researchers in IT have argued that the model has been limited by its parsimony because it fails to provide insight into the model's antecedents. Although Davis had argued that the model was self-contained and provided sufficient explanation within the model itself, other workers, over the duration of the model's dominance, believed there was paucity of supporting data in the model's explanation, and this was a limitation which needed to be addressed. The addition of more variables was recommended because the TAM's reliability and homogeneity results occurred primarily within student samples (Legris et al. 2003). Testing the TAM in student environments has limitations because they are not real-world environments with complex "structure, roles and responsibilities" (Legris et al. 2003, p. 202). There is also a need to extend the model to achieve beyond its typical 40% to 50% of explained variance results. Legris et al (2003) propose that the TAM be used in work situations, with business process applications, and have an objective measure of use collected rather than the surrogate self-report. Further, they recommend that the TAM be integrated into a broader model which incorporates the social and organisational factors that occur in work environments (Legris et al. 2003).

A question posed by Karahanna and Straub (1999) concerned the origins of perceived ease of use, and perceived usefulness. There was a need to understand how and why users' beliefs about ease of use and usefulness were formed (Karahanna & Straub, 1999). They provided an empirical test for users' perceptions about ease or difficulty, or usefulness of an information system, centring on social aspects of a system, which is the sense of presence of others given by email as well as the social influence for adoption given by supervisors (Karahanna & Straub, 1999). They were surprised when training and support for a system had no bearing on users' perceptions of its ease of use, or usefulness (Karahanna & Straub, 1999). Venkatesh and Davis (2000) and Venkatesh (2000) also determined that there were limitations to the model and examined trait and state factor variables as antecedent to PU and PEU. They found that in voluntary IS environments, up to 60% of variance of computer use was explained by these PU and PEU antecedents. In contrast, in mandated use with a complex integrated system, Mather, Caputi and Jayasuriya (2002) found these antecedents explained only 30% of the variance. The differences in explanatory power of the TAM with different levels of mandated use perhaps raise issues of IS users' ability to self-regulate.

The TAM has five limitations in describing the interaction between humans and technologies such as computers. First, the TAM offers limited explanation, in that, at best, it explains about 40-50% of variance. Second, this level of explained variance dropped to approximately 30% in a mandated context. Third, the parsimony of the model, (which for some research is pared to three variables, and gives it a conciseness), also offers a thin or simplistic understanding of the use or intentions to use technologies. Fourth, there has been a recent exploration of variables outside the model (i.e. external or non-core). In part the addition of these variables stem from a need to pursue more 'holistic' answers as to the motivations for technology acceptance, away from fragmentalist, detailed and positivist solutions. Fifth, the addition of these external variables removes the emphasis on technology acceptance as being rational. The emphasis on moving beyond rationality and perception as the drivers of acceptance shifts an emphasis from technical acceptance and solutions toward some integration with users' meaning of the technology use.

1.2 The Inclusions of More Holistic Experiences in IT Acceptance

A need to extend the investigation of IS and IT adoption beyond the "rational component of IT adoption [that] had emerged within the last ten years" was stated by Karahanna and Straub (1999, p. 237). In addition, the technological rate of change has outstripped the rates of acceptance and use, and variation in these rates by individual users has become a concern within recent IS research (Karahanna & Straub, 1999). There is the beginning of some recognition that rational theories of prediction and explanation were conceptually poor and required upgrading. "User acceptance of information technology in the workplace remains a complex, elusive, yet extremely important phenomenon" (Venkatesh and Davis, 2000. p. 200).

A study by Agarwal and Karahanna (2000) sought to review possible additions to the TAM that were components of the "holistic experiences" (Agarwal and Karahanna, 2000, p. 666) that users experienced in their use of IS. These holistic experiences include "the totality of an individual's experience with new software" (Agarwal & Karahanna, 2000, p. 687) and involve psychological processes of enjoyment and flow, some of which may be independent of the IS. This holistic approach was required because the research models stem from the central notion those individuals' beliefs and perceptions of IS influence their usage behaviour (Agarwal & Karahanna, 2000). Thus the substantial and broad research effort in understanding and managing end-users' reactions to information technology (although covering various theoretical models such as the diffusion of innovation, the TAM, TRA, TPB) have focused on notions of instrumentality and cognitive complexity (Agarwal & Karahanna, 2000). This has meant that these models have concentrated on beliefs as antecedents to behaviours, because of their manipulation through design and technical characteristics or training (Agarwal & Karahanna, 2000). This line of research has led to paucity of the research because there has been an emphasis on the consequences of these beliefs, rather than their antecedents. Agarwal and Karahanna, (2000) proposed a construct they called Cognitive Absorption, as a meld of three distinct literature lines, that of Trait Absorption (Tellegen 1981; Tellegen & Atkinson, 1974); Flow (Csikszentmihalyi 1990; Webster et al 1993) and Cognitive Engagement (Webster & Ho, 1997, references as cited in cited in Agarwal & Karahanna, 2000). Flow is a state in which people are so engrossed in a mental or physical activity that "nothing else seems to matter" (Agarwal & Karahanna, 2000, p. 668) with heightened concentration and sense of control, along with loss of their sense of self-consciousness and time (Agarwal & Karahanna, 2000). The importance of Cognitive Absorption was theorised to be its place as a dynamic and situational antecedent construct to beliefs, and its integration of notions of 'temporal dissociation' (where sense of time is lost), 'focused immersion' (in which the user is totally engaged), 'heightened enjoyment' and pleasure, a sense of 'control', and both sensory and cognitive 'curiosity' (Agarwal & Karahanna, 2000). This construct was thus described as having intrinsic motivation and based in perceived enjoyment, rather than having extrinsic motivation, being instrumental and based in perceived usefulness. It is an integration of the state variables of cognition, affect and behaviour. Along with personal innovativeness, computer playfulness was seen as an effect of trait individual differences. It was suggested that Cognitive Absorption may have effects for users' perceptions of technical characteristics, such as a technology's "absorptive potential" (Agarwal & Karahanna, 2000, p. 688). Further, the construct may be important for infusion, and re-invention and intention to explore, i.e. higher-level constructs in information management. It also focuses away from a utilitarian perspective which has dominated the literature for a considerable time, and has limited the level of research. The construct explores the importance of pleasure in computer-human interaction and trust within an organisation (Agarwal & Karahanna, 2000). It also has implications for training, in that users need for control is emphasised, and given the possibility for cognitive absorption, demonstrated increased ease of use, usefulness and increased diffusion. Finally, it emphasised the need to understand users and their experiential interaction with technologies, and acknowledge that users are neither passive nor captive. These final notions are critical to positive computer interactions because individuals in their use of technologies are engaged to differing extents. Part of the intrigue possible within computer – human interactions are the computers' opportunities to offer an optimal interactive experience with complexity and symbolic systems.

Overall, the bulk of the mainstream IT literature has been based on a relatively narrow range of variables such as utility and effort for users. The emphasis has been toward fine discriminations of difference, loculated constructs that can allow the segmentation of factors into their smaller component parts. For example, IS success was the dependent variable in early studies which later was differentiated into use, user satisfaction, and individual and organisational impacts (Ballantine et al. 1998). Similarly, much of the work has centred on 'use', and more recently 'intention to use' as a surrogate variable because of difficulties in use measurement (Davis, 1989; Hendrickson & Collins, 1996; Legris et al. 2003). One major supposition that the IS adoption models have relied on, is the influence of behavioural intention on actual behaviour (Venkatesh Maruping & Brown, 2006). However, there has been acknowledgment that only a small amount of variance was explained by these models, and that rather than studying technology 'use' as the dominant dependent variable, perhaps a fuller engagement process, such as infusion, should be the desired outcome in users' interaction with computers and technologies. This entails both the notion that there are differences between individuals, and in the intensity of the interaction. Some way toward a fuller description of the computer-human interaction, have been studies that included aspects of the emotions that users bring to bear in the computer-human interaction. Such studies have examined computer anxiety (Heissen, Glass & Knight, 1987), playfulness (Webster & Martocchio, 1992), Symbolic Adoption (Karahanna, 1997, Karahanna & Agarwal, 1999), and, more recently, cognitive absorption (Agarwal & Karahanna, 2000). The chronology of these studies would demonstrate the research process as having seen that negative influences impede successful use or adoption, and more recent studies focusing on positive influences for moods and emotions facilitating successful use or more engaged computer interactivity.

1.2.1 The Role of Emotions and Cognitions in using Information Systems.

Emotions are adaptive (Fridja, 2004), and act as "relevance detectors" (Mellers, 2000, p. 921) that help activate behaviour. Although they may remain unconscious (Forgas, 2000), emotions as well as moods are important in attitudes and decision-making. Therefore, emotions may provide the links between desires and intentions for the commitment required to attain goals. The desires for an outcome shape the sort of behaviours and actions, regardless of the individual's level of awareness of this process (Bagozzi et al. 2002). Desires are a precursor to intentions, because they link an awareness and acceptance of a desire for action with the formation of an intention.

Desires are a motivational state, while intentions involve planning (Bagozzi et al. 2002). This means that the awareness of a desire facilitates a behaviour toward achieving that goal. Goal-setting and striving are the psychological processes and can be seen as having a three-tiered hierarchy in which subordinate, focal and superordinate goals are inter-related (Bagozzi et al. 2002).

The TRA provided the basis of the TAM and its review of computer acceptance. The TPB and TRA are social psychology models of human behaviour and focus on action, rather than goals (Ajzen & Fishbein, 1980; Fishbein & Stasson, 1990 as cited in Perugini & Bagozzi, 2001). A criticism levelled at the TPB is that it fails to provide the impetus that moves an individual to act. While attitudes, SN and PBC give reasons for action, they do not provide the sufficient impetus the way that “intentions become energized … [by] … volitive desires” (Perugini & Bagozzi, 2001, p. 83). In the TPB and TRA, the target behaviour is influenced by attitude which is measured by bi-polar semantic differential items such as “good - bad, harmful - beneficial, rewarding-punishing” (which measure evaluative attitude) and “unpleasant – pleasant” (which measure affect) (Ajzen & Fishbein, 1980, p. 261-262). However, goals are important in decision-making (Bagozzi et al. 2002). Decisions and planning occur around any adoption and acceptance process. This is because part of the level of engagement end-users have with an IS and IT is due to a decision process, to learn and then apply these skills and have an ongoing involvement with the technology interaction. The Symbolic Adoption or rejection of an IS and IT requires a decision path by the end-user, regardless of the level of mandate. An individual’s goals may be different to that of his or her organisation (Garrity & Sanders, 1998). During the course of decision-making, individuals anticipate the emotional positive or negative consequences of achieving their goals before taking their decision.

The discrepancy between the anticipation and achievement of goals provides feedback that is both cognitive and emotional, and both sources are important for ongoing planning (Bagozzi et al. 2002). Since the anticipation of the future is brought to bear in decisions involved in IS and IT use, the addition of emotions into a cognitive model of technology acceptance is important and requires further clarification. Variables such as users' emotions, desires and superordinate goals may offer more improved understanding of IS and IT use.

The next section will examine another well-known and heavily-cited model that investigates the acceptance of innovation. The Diffusion of Innovation (DoI) literature is large, and offers a broader range of factors to be relevant to technology adoption. The DoI also describes the diffusion process as primarily social, and that there is a range of adoption patterns, and user and innovation categories. Its anthropology, sociology or ethnology background has meant that qualitative research methodologies have been used, allowing for data to drive the research and its outcomes, rather than be researcher driven. There are numerous points that are raised within the Diffusion of Innovation literature, pertinent to this thesis.

1.3 The Diffusion of Innovation Model (DoI).

In contrast to the TRA and TPB, the Diffusion of Innovation models come from a sociology background. Diffusion is defined as "the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system" (Rogers, 2003, p. 11). Rates of diffusion for different ideas, practices, and objects have been shown to vary depending on the adopter or innovation characteristics, and the interaction between both (Rogers, 2003). Diffusion is a specific communication focused on a new idea, which always presents uncertainty and unpredictability, and brings about social change and consequences whether it is adopted or rejected (Rogers, 2003). Since diffusion is seen primarily as a social process, understanding of potential adopters and their perceptions, as well as their needs and culture, is required. Shared similarities between those who propose the change and the potential adopters facilitates adoption, because diffusion relies on a social interaction between partners who share some likeness (i.e. are homophilous) (Rogers, 2003). Diffusion requires a client-oriented interaction rather than an innovation orientation (Rogers, 2003). Successful communication is a progressive exchange of two interacting partners who converge in the meanings they give (Rogers, 2003). By working through innovation adoption, individuals reduce their uncertainty about the concept via their subjective evaluations to re-construe its meaning for them using interpersonal networks. This means that adoption is social and subjective.

1.3.1 The Components of DoI

A potential adopter will ask five questions of an innovation: “What is the innovation? How does it work? Why does it work? What are the innovation’s consequences? and What will its advantages and disadvantages be in my situation?” (Rogers, 2003, p. 14). Thus, innovations are subjectively perceived, and individuals seek and process information in order to reduce their uncertainty and lack of knowledge of them (Rogers, 2003). Further, technologies often occur as clusters, so that their diffusion is related (LaRose & Hoag, 1996; Rogers, 2003). These clusters may be related by their functionality or shared infrastructure (LaRose & Hoag, 1996). There are five characteristics of the perception of an innovation that have marked implications for its diffusion rates. The first characteristic is its relative advantage, which is “the degree to which an innovation is perceived as better than the idea it supersedes” (Rogers, 2003, p. 15). This is subjective, and its advantage may be commercial, status, satisfaction or ease. The second characteristic is compatibility “the degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters” (Rogers, 2003, p. 15). Congruency with the mental models that individuals hold supports faster diffusion. Complexity is the third attribute, and is “the degree to which an innovation is perceived as difficult to understand and use” (Rogers, 2003, p. 16). Simple innovations are easier to understand and therefore offer faster diffusion through a social network. Relative advantage and complexity have higher levels of explanation in this model. The fourth characteristic is trialability, which is “the degree to which an innovation may be experimented with on a limited basis” (Rogers, 2003, p. 16). Trials that offer smaller commitment reduce the uncertainty, and therefore “learning by doing”, and improved adoption. The final characteristic is observability, which is the “degree to which the results of an innovation are visible by others” (Rogers, 2003, p. 16). The higher the visibility of its results, the greater is the diffusion of an innovation. Re-invention is the modification that adopters make to an innovation in a process of ownership. Innovations vary in the customising they allow, but flexible innovations enable higher levels of participation and active involvement, and thereby have higher levels of adoption (Rogers, 2003).

The flow of knowledge of an innovation occurs via communication that may be between individuals using interpersonal channels, and mass media such as newspaper, radio, television or Internet (Rogers, 2003). Advocates for an innovation assist in this process (LaRose & Hoag, 1996). Because of the very subjective nature of perceptions, personal networks are those that are most effective for diffusion. For example, the popularity of short message service (SMS) has surprised the makers of mobile phones (Rogers, 2003), because they had not understood the emotional connectedness that SMS offered (Norman, 2004). In particular, shared meanings occur most easily between people who are similar (homophilous), and have the greatest impact for the exchange of knowledge with alteration of attitudes and behaviours (Rogers, 2003). However, some degree of heterophily must exist for an interchange of fresh ideas to occur.

Time is an important variable in the diffusion model, and has three aspects. The diffusion process is staged. The first stage is gaining the knowledge of the innovation, through to when an individual either accepts or rejects the innovation, or subsequently discontinues its use. The second aspect is a time-ordered sequence that compares an individual's adoption rates relative to others (Rogers, 2003). The rate of adoption describes an S-shaped curve of "innovators, early adopters, early majority, late majority and laggards" (Rogers, 2003, p. 22). The third aspect is the time-ordered sequence that compares adoption rates of the innovation based on the numbers who had adopted (Rogers, 2003). Differences in rates of adoptions alter the shape of the S curve, and innovations that are taken up rapidly show a steep curve, in comparison to a "lazy" curve (Rogers, 2003, p. 23) in those that are slow to be adopted. Successful innovations have high levels of adoption.

Rogers (2003) defines a social system as a set of units / individuals who assist in joining a common goal, but which are distinguishable from each other. The members of such a system include individuals and informal and formal groups such as organisations or industries. The nature of the social system can facilitate or restrict the diffusion process, because each system has defined norms of behaviour, nuanced independently of other sets of immediate and national norms, and religious cultures and their values. Each social system has different levels of innovativeness due to each individual's adoption readiness, together with the nature of the social structure (Rogers, 2003). Parts of the health industry, and medicine, are tightly organised, closed, hierarchical (Stefl, 2000) and intolerant of uncertainty (Sanson-Fisher, 2004), which could contribute to their slow uptake of IT and change (Sobol, Alverson & Lei, 1999). Innovators and innovative social systems tolerate high levels of uncertainty (Sanson-Fisher, 2004). They also foster creativity, have flat hierarchies and strong leadership for change (Sanson-Fisher, 2004). Where innovations cross cultural norms or values, they will be resisted, as the innovation requires individuals to behave outside of established and sanctioned behaviour patterns (Rogers, 2003). Further, cultural practices may support ‘best practice’ although the reasons have been lost (Lansing, 1987). Ecologically sound rituals and traditions have been integrated into ancient or religious practices (Lansing, 1989). In Lansing’s (1987) case, Balinese water temples and cosmology acted as effective ecological and agricultural decision practices. In an effort to improve food production, government and foreign expertise ignored the system of fallow periods that had, for centuries, successfully regulated pest levels. Therefore, two intrinsically different institutions may operate and yet be invisible to each other: one, which is based within an instrumental logic, the other a cosmology (Lansing, 1987). When cultural and innovative practices are aligned, the adoption is facilitated, but when opposing, adoption may be resisted. This means that resistance to an innovation may be viewed pejoratively by those favouring the changes, especially when sanctioned by international or government agents (Pellizzoni, 2001). Debate and communication can be stopped by power differentials, and the boundaries made by “alleged lack of competence” (Pellizzoni, 2001, p. 61), professional qualification or skills in argument or language (Pellizzoni, 2001). However, the positioning of such power increases the dependence on experts, technocrats, and “scientific and administrative elites” (Pellizzoni, 2001, p. 64) and knowledge bases become so separated that insights by lay people cannot be absorbed and they are marginalised (Clark & Murdoch, 1997). Individuals high in innovativeness work outside of norms and therefore are given low status, and offer little power in persuading others to adopt. Champions of innovation, those who give opinion leadership and are able to alter attitudes or behaviours, earn this leadership because of their technical competence, social interactivity and conformity to the norms. They have more exposure to external communications, have higher socioeconomic status, and are generally more innovative, but come from within of the social system (Rogers, 2003). Social systems vary in their innovativeness, and may have both opinion leaders who work for and against change, but both are central and influential in the communication network. Change agents work towards modification of the social set but come from outside, and often are heterophilous with the social set they wish to influence. Building a mental bridge by linking an innovation with a well-established knowledge base can improve diffusion (Keller, 2004; Rogers, 2003). This perspective contrasts with seeing the pre-adopter as an “empty vessel” (Rogers, 2003, p.354): a fallacy because no human is without personal and emotional schemas.

The decisions in innovation adoption describe a continuum of authority, through to collective and individual decisions (Rogers, 2003). Authority and collective decisions are made primarily in organisations, such as factories, learning institutions and governments, while consumers make optional and individual decisions (Rogers, 2003). This continuum describes the mandated to voluntary range of adoption practices. Authority decisions (mandated) show the fastest rates of adoption, followed by optional decisions, and the least is collective. However, authority decisions may suffer difficulties from individuals of a system during its implementation (Rogers, 2003) and may have a poor rate of implementation success. It is an individual decision to comply or not with a new social system-sanctioned decision (Rogers, 2003), but compliance is rarely straightforward, and the meanings are altered (Herbert-Cheshire, 2003).

All innovation decisions have social system and individual consequences. They may be desired (functional) or undesired (dysfunctional) (Rogers, 2003); direct and immediate or second order; or anticipated or unanticipated, depending on whether they foreseen and intended (Carter, 1994; Mensch, Bagah, Clark & Binka, 1999; Rogers, 2003). Those favouring an innovation's adoption expect desired, direct and anticipated changes because they have control over the innovation's form or appearance, and to a lesser extent its function. However, this can do little to predict the meanings given to it by individuals, because innovations are always contested within pre-existing power and knowledge bases (Rogers, 2003), and therefore must be negotiated, translated and transformed (Herbert-Cheshire, 2003). Thus, the new meanings are not the same as they were in their old context (Rogers, 2003).

The Diffusion of Innovation has a large research background. It covers a broad range of contexts, and offers integration of diverse patterns of innovation adoption and valuable insights into the characteristics of adopters and the innovations. However, two of the reported limitations to the theory are relevant in this thesis. The first limitation is a systematic bias toward the adoption of innovations (Rogers, 2003). This bias has meant that reasonable reasons for rejecting or limiting innovation use have been poorly researched (Rogers, 2003). Different adopter categories and individuals may hold very discrepant views to the pro-adopter groups. Similar to the notion that history is written by victors, adoption literature has a perspective that adoption should occur (Rogers, 2003). Adoption of an innovation should be examined from its broad context, addressing the practices within which it is embedded and will replace, because rejection may be warranted. There have been few studies of the motivations for and against adoption (Rogers, 2003). The second limitation for the research theory has been its bias in blaming individuals for failures. Rather than implementing socially-structured change for systemic problems, individuals were blamed, as either “resistant to change and/or irrational” (Rogers, 2003, p. 121) or unworthy of consideration (Pellizzoni, 2001).

1.4 Combined or Hybrid Models of Technology Acceptance.

There has been no one satisfactory model in the IS and IT research literature. Although there are many theoretical models, which come from different backgrounds such as Information Systems, sociology and psychology, each explains generally 40% to 50% of the variance in the intention to use technology (Venkatesh, Morris, Davis, & Davis, 2003). The acceptance of technology continues to be a major thrust of research because it is the use and greater acceptance of technology by individuals that will contribute to improved productivity and work outcomes. The goal of improved productivity has driven the enormous expenditure on technology and systems over the last twenty years (Venkatesh et al. 2003). Because of the complexity of choosing between competing models, and their constructs, one study sought to synthesise a unified view of user acceptance to formulate its major components termed the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). This model may be termed an elaboration of the TAM. Usage or intention to use, was maintained as a fundamental dependent variable, rather than others such as task-technology fit (Goodhue, 1995; Goodhue & Thompson, 1995) or implementation success (Leonard-Barton & Deschamps, 1988) or system success (Seddon, 1995, as cited in Ballantine et al. 1998) because intention has been well established as a antecedent of behaviour (Ajzen, 1991 Sheppard, Hartwick, Warshaw, 1988); Taylor & Todd, 1995). Eight constructs taken from eight models were synthesised into one unified model The Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003). The contributing models were the Theory of Reasoned Action (Fishbein & Ajzen, 1975; Sheppard et al. 1988); the Technology Acceptance Model (Davis, 1989); the

Motivational Model (Vallerand, 1997); Theory of Planned Behaviour (Ajzen, 1991); a combined TAM and Theory of Planned Behaviour (Taylor & Todd, 1995a); a Model of PC Utilization (Thompson et al. 1991); the Innovation Diffusion Theory (Rogers, 2003; Moore & Benbasat, 1991) and Social Cognitive Theory (Bandura, 1986; Compeau & Higgins, 1995a). The eight constructs taken from these models include Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions, and the model was satisfactory for voluntary and mandatory contexts (Venkatesh et al. 2003).

Please see print copy for Figure 1.3

Figure 1.3. The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis, & Davis, 2003).

The tests of the model demonstrated that three antecedents of behavioural intention: Performance Expectancy, Effort Expectancy and Social influence, and two antecedents of Use Behaviour: Intention and Facilitating Conditions, were adequate. Gender, Age, Experience and Voluntariness were found to be mediating influences. The new construct, ‘performance expectancy’ was drawn from perceived usefulness, extrinsic motivation, job fit, relative advantage, and expectations of outcome. ‘Effort expectancy’ refers to ease of use and its perceptions, and complexity. ‘Social influence’ incorporates significant others’ opinions, social factors such as subjective cultural, influence of status and personal agreements. Notions of control, facilitating conditions and compatibility are incorporated into the new construct, ‘facilitating conditions’, which includes the support given to using an IS by the organisation, and technical arrangement. Attitude was argued to have been a mix of affect and evaluation, and was not included in the model because it had no direct or interactive influence on intention, in spite of its primary position in the TRA, TPB and TAM (Venkatesh et al. 2003). The model was able to account for 70% of the variance in user intention, which is far in excess of the regular range of about 40% to 50% for the TAM. Although this level of explanation is impressive, the UTAUT still leaves many variables unexamined. This means that a much broader range of behaviours and explanations need to be researched and described.

A more complex hybrid model that further broadens IS model framework is one report by Gallivan (2001). This is a process, or staged model, which has two major critiques of all of the “traditional innovation adoption and diffusion” (Gallivan, 2001, p. 51) models described to date. The shared features of the model sets (TAM and Diffusion of Innovation) include a focus on the perceived attributes of the innovation, that the dependent variable is the user’s intention or actual use or adoption of the innovation, and that the models should describe voluntary adoption practices (Gallivan, 2001). The criticisms are that these models are often mis-applied, because these assumption conditions are frequently not met. These may be because the adoption process described is mandated; the utilisation of the technology requires interdependencies among users, and considerable training, because there is a substantial knowledge burden (Gallivan, 2001). The “assimilation gap” (Gallivan, 2001, p. 58) means that even after a significant lapse of time, the gap between the adoption decision by management (primary adoption) and the implementation (secondary adoption) by users is considerable, especially for innovations with high implementation complexity. Therefore, the model describes the breadth and depth of the innovation’s use within the organisation, and the increasingly involved assimilation during a staged process of initiation to the innovation, its adoption, adaptation, acceptance, routinisation into the work practice, and infusion where it is re-worked and reconceptualised, and integrated into a knowledge base, beyond its original conceptualisation (Cooper & Zmud, 1990). There may be factors that facilitate or impede assimilation, and these may be within in the organisational environment (the context), the innovation itself, an interaction of context and innovation, the individual adopters or generic conditions (Gallivan, 2001). Gallivan (2001) contends that while many antecedents of primary adoption by management have been researched, the secondary adoption by the individual as a second wave in an adoption cascade, that may offer very different outcomes when worker compliance, does not match the management decree. Therefore, the traditional models offer mis-applied simple solutions, because the locus of innovation adoption may rest outside the individual, and the class of technology may have high user interdependencies, and high complexity, as well as implementation complexity. Frameworks such as this are more appropriate in researching IS influences and processes which can incorporate broader consequences, such as unseen consequences and disadvantages, as well as advantages for IT departments, user departments, and individual users.

1.5 Conclusion

The TAM (Davis, 1989) the extended TAM2 (Venkatesh & Davis, 2000) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003) have improved the ability to explain technology acceptance, but still have limited explanatory power (Legris, 2003; Venkatesh et al. 2003). Venkatesh et al (2003), suggest that further work is required to discover and investigate boundary conditions of the UTAUT model, but generally there is required “an even richer understanding of technology adoption and usage behavior” (Venkatesh et al. 2003, p. 470). Much of the IS research has centred on rational components of human motivations and behaviours, including computer and technology acceptance. These have been shown to have limited explanation and prediction. Such research has not given sufficient credibility for the complexity of humans and their needs. People do not always respond in rational ways; they hold worldviews that are based in multiple levels of cognitions, emotions and motivations. The ability of the IS and IT industries to predict and manage IS adoption is poor according to Legris et al. (2003), who describe that 26% of systems are considered to be a success and poor productivity is reported. The next chapter addresses this increased complexity of people and the complexity of the human – technology interface.

The computer-human interaction is important in today’s world and into the future. The acceptance of technology has implications for the economic well-being and power of individuals, organisations and nations. Models have been developed to attempt to explain these interactions. The TAM and its variations, at this time, appear to be one of the best models to explore this interaction. The psychological processes in the human-computer interaction pose puzzles that are poorly understood in this issue. The continued examination of these psychological processes is warranted. Clearly, there are further issues impinging on computer use which have not yet been investigated. It is this universe of human behaviours, not captured within present models, which this thesis addresses. Because people place different levels of importance on their goals, individuals have a hierarchy of goals from which they structure their decision-making. Desires, emotions and intentions and their relationship to behaviours may offer further insight into the values that individual use to judge themselves and their world.

In conclusion, where the emphasis remains on an apparent paradox between the promise and actual performance of information systems, research remains focused on the technical and design characteristics (Mansell, 1994). Research and development is, therefore, heavily geared to the technological aspects, such as faster processors, higher-capacity communication networks, and increasing user-friendly human-machine interfaces (Mansell, 1994). Such a technical emphasis masks the precursors and dynamics of design innovations and the re-innovation process (Mansell, 1994), including that of individual differences in abilities, sense of power and agency. An emphasis on the social structure and the social processes that underpin the more opaque technical and institutional innovations is required (Mansell, 1994; Martinsons & Chong, 1999).

The next chapter reviews literature that describes the humans in these interactions - the end-user. What is important about this is that such human processes are inextricably psychological. The user is an individual who has innate preferences, abilities and characteristics, and who learns and undertakes roles and takes on cultural values.

CHAPTER TWO

END-USERS ARE PEOPLE

End-Users are People

This chapter describes key psychological processes that are relevant to how technologies are experienced by users. Processes of learning and symbol use are described, followed by a discussion on individual differences in learning styles, occupational styles, personality factors and human values. Finally, the psychological aspects of transition and change are explored, taking into account cultural, creative and emotional factors.

Much of the IS and IT literature has centred on specific aspects of end-users, such as end-user satisfaction, or in predicting their adoption, acceptance or usage behaviours (Legris et al. 2003). Processes that influence behaviours, attitudes and feelings of the IS users are psychological. Psychology is defined as “the science of the nature, functions, and phenomena of the human mind (formerly also of the soul)” Oxford English Dictionary Online (OED, 2005). A more detailed definition of psychology is “the science that studies behavior and the physiological and cognitive processes that underlie it…” (Weiten, 1993, p. 17). Examining the psychology of the human experience within the human-computer interaction offers a broader framework of study, and involves people’s rational and arational processes as well as those that are conscious and unconscious. However, the IS literature has predominantly emphasised models that are rational and emphasise reasoned actions. These models, therefore, fail to capture the broader and more complex processes at work, while people are engaged with technologies. For example, responses to IS and IT are unique in that individuals bring their views of the world, including their views about technologies, their sense of themselves, as well as their personality characteristics and values, and preferences for learning. There is a need to broaden the research to include the meanings and phenomenological experience that individuals use in their interactions with technologies, and capture variables that are left out of the IS and IT models. The importance of the ‘felt’ sense of using a technology has been emphasised by the phenomenology tradition, and especially in regard to technologies, by the philosophy of science (Ihde, 1973). This emphasis gives a new perspective from which to view end-users.

2.1 The Processes Involved in Learning

The process of learning is crucial to understanding how humans respond to changes in their environment. Learning is the process of taking in knowledge (Reber, 1985), and the integration of new information with already formed knowledge. Technology constitutes change, and the interactions with computers involve learning processes that are concrete, procedural and conceptual. Fundamentally, humans strive for understanding, and attempt to build integrated meaning from their interactions with their world. These interactions begin from innate differences (Bouchard & McGue 2003; Davidson, 2003) with which experiences from people’s activities, interests, competencies, dispositions and environments (Costa & McCrae, 1992a; 1997; Holland, 1985a,) combine to inform meaning and decisions (Kelly, 1955). Meanings spring from “emotions, attitudes, goals and are activated automatically (without conscious effort) [which] means that their presence in the mind and their influence on thoughts and behaviour are not questioned. They are trusted …” (LeDoux, 1996, p. 63). Indeed, “the emotional unconscious is where much of the emotional action is in the brain” (LeDoux, 1996, p. 64). Cognitions, emotions and moods, logical/illogical and rational/irrational distinctions are blurred, and their influence is bi-directional and may be unconscious (Forgas, 2000, p. 6). They can also produce “unverbalizable intuitions ... gut feelings” outcomes (LeDoux, 1996, p. 65). In complex choices the decisions left to such unconscious processes offer more satisfying outcomes (Dijksterhuis, Maarten, Nordgren, & van Baaren, 2006).

2.1.1 The Use of Symbols in Learning

Humans use symbols innately. Learning in infancy is relatively concrete; children gain knowledge of the physical world through sensorimotor understandings (Gardner, 1998). Children categorise information and strive to understand it, organising and interpreting reality (Berger, 1994). Infants also actively seek continued communication with other humans, stroking and massaging adults with messages to attract continued interaction (Gardner, 1998,). This early relationship with another, especially one who is significant, assists in determining the forms of relationships people have with themselves and others in later life (Meares, 2004). The use of symbolic systems first occurs in toddlers, when language and pictures are assimilated and utilised (Gardner, 1998) in ways that are appropriate to the child’s dominant experience (Pettito, 1991, as cited in Berger, 1994). Symbolic abilities outstrip their physical (Berger, 1994), and children work at refining their use of symbolic notation systems.

> “The explosion of spontaneous interest in symbols, the predilection for using them profusely and immersing oneself in others’ use of symbols, proves a uniquely human phenomenon. The domains - the crafts and disciplines of our adult world - are constructed on the basis of symbols; and our capacity to master them, and to invent new systems, also presupposes the symbolic fluency that is launched in the years after infancy” (Gardner, 1998, p. 21).

School learning is heavily de-contextualised, and skills in creating and decoding symbolic notations and systems are practised (Gardner, 1998). Depending on their occupational choice, tertiary level students deal with their required learned material either primarily symbolically or concretely (Holland, 1985a). Their career path will both mirror and reinforce their preferred contact with physical materials or abstractions. However, occupational and social roles use blends of competencies (Gardner, 1993b). In most socially useful roles, "one sees at work an amalgam of the intellectual and symbolic competences, working toward the smooth accomplishment of valued goals" (Gardner, 1993b, p. 317). In spite of such environmental occupational factors, innate differences between people remain (Gardner, 1993). In this way, the social context has a force in determining how an innate tendency will be ignored or orchestrated (Holland, 1985a), and a range of occupations will appear attractive to an individual, usually to conform to the individual's abilities. Individual strengths for symbolic or concrete learning open up possibilities, and combinations of strengths opens multiple possibilities (Gardner, 1993b). Occupational roles often synthesise many differing skill profiles, and impact on the social roles that individuals take on (Holland, 1985), and sense of identity (Barglow, 1994). Thus, the ways people understand the world is framed by their work and social roles (Faunce, 2003).

One of these continuing differences is individuals' proclivity for symbolic use and interest in symbolic systems. Being articulate in symbolic manipulation and use leads an individual to use symbolic "notational systems" such as mathematical or scientific language systems (Gardner, 1993b, p. 310). A comprehensive education transforms individuals' raw potential into "mature cultural roles" (Gardner, 1993b, p. 372). Adults' use of symbolic notation systems is more focused but also more constrained. As a result of this education process such constraints limit peoples' capacity for incorporating novelty outside their expertise. This has limited IS and IT in occupational groups who see technologies as not central to their professional roles. As a means of improving IS adoption in order to gain widespread improvements in knowledge and productivity, it was seen as important to incorporate computer and technology use throughout education (Hu, Clark & Ma, 2003). As a result, during the 1990s all levels of education increased their use of technology, in order to increase users' skill and competence levels. The improved competence required skills-based technological competence, an increased knowledge base as well as improved negotiation and integration of new information (Hu et al. 2003).

2.1.2 The Impact of Learning on IS and IT

Learning and training are considered to have an impact in individuals' adaptations to IS and IT. Because IS and IT evolve so rapidly and are incorporated into people's work and home lives, learning encompasses both work and home contexts. One of the main forces in workforce transformation is technology, and training programs that include technical skills are seen as essential, although costly. For example, the US fiscal budget request for employment and training for 2004 was expected to be $US11 billion (DeRocco, 2003a), and in Hong Kong US$335 million in capital investments and US$ 30 million annually in technology education in 1998–1999 (Hu et al. 2003).

Increased technical skills and knowledge are essential for national economic wellbeing and global competitive advantage (Bandura, 2002; DeRocco, 2003a). A fundamental change in learning occurs because of IS and IT, and the explosion of information availability (Caladine, 1999). Because of this information explosion, there is a need to increase both the efficiency and effectiveness of learning at an individual and management level (Caladine, 1999).

Because the acceptance and success in IS and IT has failed to live up to its expectation, (Myers, Kappelman, & Prybutock, 1998; Triplett, 1999) with legal ramifications and costs (Sipior, Ward & Wagner, 1998), end-user learning and IT training have become an area of research interest. Learning new skills and gaining access to information and education programs has individual, professional, industry and national implications. Work changes provide some workers with opportunities to succeed in gaining new work-skills, but others fall further behind (DeRocco, 2003a). What may cause such differences in users' receptivity to IS and IT and its required updated learning is of interest for IT practitioners and academic groups. A mismatch of learning styles and training methodologies has been implicated in decreased student performance and attrition (Hayes & Allinson, 1993, 1996 as cited in Van Zwanenberg, Wilkinson & Anderson, 2000), as has the mismatching of cognition style and mentor - protégé styles (Armstrong, Allinson & Hayes, 2002). Users' beliefs, emotions and cognitions have also been implicated in perceptions of IT usefulness (Karahanna & Straub, 1999), so it is important to provide training programs that "truly address the underlying motivations of users" (Karahanna & Straub, 1999, p. 238). Many IS studies have examined IS use (Legris et al. 2003), but it is the perceptions of IS by users that offer important clues to what components of their technology interactions are valued.

Because of the dynamic and evolving nature of IS and IT, learning is particularly relevant in that context. It is the learner's interaction with the new material that results in learning (Caladine, 1999; Dahlgren, 1984). Learning is "the process where the interaction of new material or experience with students' existing array of thoughts or knowledge produces an outcome or capability" (Caladine, 1999, p. 12). Learning capabilities are:

1) "intellectual skills – which permit the learner to carry out symbolically controlled procedures";

2) “cognitive strategies - the means by which learners exercise control over their learning”;

3) “verbal information - the fact and organised ‘knowledge of the world’ stored in a learner’s memory”;

4) “attitudes - the internal states that influence the personal action choices a learner makes” and

5) motor skills – the movement of skeletal muscles organised to accomplish purposeful actions” (Gagne, 1992 as cited in, Caladine, 1999, p. 13).

An important element of conceptual learning is fusion of meaning, or the striving for meaning (Dahlgren, 1984). Qualitative aspects of learning are the personalised reformulations of meaning or schemata (Dahlgren, 1984). This view shifts the emphasis from “how much is learned” to “what is learned” (Dahlgren, 1984, p. 24) from discrete packages of knowledge to interrelated fusion of meaning within a construct system. Education has an impact on the use of jargon, the forms of problem solving and how phenomena are apprehended, but conceptual changes are “relatively rare, fragile, and context-dependent occurrences” (Dahlgren, 1984, p 33). Dahlgren (1984) proposed two forms of learning - one which draws on repetition and which remains superficial, or one in which the internal structure of the material is taken in, as well as its location within a “context of understanding” as part of on-going evolution and passionate curiosity (Turkle, 1996) by human consciousness toward meaningfulness, and “an unreachable complete knowledge about reality” (Dahlgren, 1984, p. 34). An important task of learning is understanding both the nature and the relationship held (its context) with a phenomenon (Dahlgrens, 1984). Therefore, “meaningfulness … is imposed by human consciousness" (Dahlgrens, 1984, p. 34).

The applicability of practical knowledge is the tacit knowledge of how things are done, or what things need to be done for problem solving everyday life (Sternberg & Wagner, 1989). Practical knowledge may be, but is not necessarily only, procedural knowledge, because its applicability will vary between contexts, individuals, and for different times for any one individual (Sternberg & Wagner, 1989). Thus, knowledge that is relevant in one context may not transfer to another, be relevant for one individual but not another, or be relevant at one time but not another (Sternberg & Wagner, 1989). Sternberg and Wagner (1989) define practical knowledge as relevant and procedural, which is primarily 'action' based. Academic knowledge is declarative and, depending on an individual's work occupation and life-style, may be less relevant (Sternberg & Wagner, 1989). Knowledge is acquired via three processes:

1) Selective encoding occurs when relevant and irrelevant information are sorted and categorised using "an array of inputs" (Sternberg & Wagner, 1989, p. 259);

2) Selective combination is the integration of new information into a comprehensive cognitive structure; and

3) Selective comparison occurs when the relationship between old and new information is made and the integration more fully fleshed out (Sternberg & Wagner, 1989).

These processes are believed to occur both in children and adult learning situations.

Undertaking deep learning of new material to code and restructure its meaning requires deep, holistic processing and cognitive effort in comparison to surface, atomistic processes such as rote learning. These processes have been shown to require different focus, motivation from learners and have performance outcomes (Marton & Saljo, 1984; Svensson, 1977). Learners move toward "abstracting meaning [to gain a better] understanding of reality" (Marton & Saljo, 1984, p. 53) and require intrinsic motivation and cognitive effort (Marton & Saljo, 1984). This process produces deep learning and has been associated with better performance (Marton & Saljo, 1984).

Any learning requires effort, but deep learning requires more effort. In turn, effort requires attention. Because simply living a life competes with time and effort resources, attention is a finite commodity within a lifetime (Csikszentmihalyi, 1997; Simon, 1983). People, as consumers of information struggle with their "attention budget" limitations and resultant confusion, and are increasingly time-poor (Henderson, 1996, p. 114) and working longer unpaid hours (Wilson, 2004). Automatic thinking and decisions are, therefore, increasingly likely in dynamic and complex work environments with IS and IT (Cooper & Bhattacherjee, 2001), with immediate demands from emails and mobile phones shifting attention away from significant tasks and creativity (Wilson, 2004). Expertise over more than one domain is very difficult if not impossible (Csikszentmihalyi, 1997). As knowledge domains increase in size and complexity, mastery can occur only within one sub-domain, and specialisation occurs (Csikszentmihalyi, 1997). Artists rarely sculpt, cast gold, draw, paint and design buildings and perform in numerous artistic sub-domains, whereas previously they did; mathematicians rarely perform across all sub-domains of algebra, number theory, combinatorix, and topology, for example (Csikszentmihalyi, 1997). As learning workload increases and learner autonomy decreases, superficial learning style becomes more likely (Ramsden, 1984). In an environment where learners' needs are competing for their scarce resources of time, effort, and attention, superficial learning strategies which are more self-management efficient may appear more appealing (Busato, Prins, Elshout, & Hamaker, 1998). Individuals vary in their strengths and focus capacity, so some learning is irrelevant yet may be mandated by social and work changes. IS and IT use may be one knowledge set which is required and demands effort, yet may be personally irrelevant. Therefore, superficial learning about IS and IT may be the preferred response by individuals who put their primary emphasis on other responsibilities and roles; the rate of technological change exacerbates this, so that decision-making based on schemas and stereotyping results (Wilson, 2004).

Individuals vary in knowledge acquisition abilities (for both procedural and academic knowledge) because they vary in their effectiveness of the three skills of selective encoding, selective combination, and selective comparison. In addition, these skills are differentially utilised within different contexts and domains (Sternberg & Wagner, 1989). The form of mental representations required by different domains vary greatly in terms of “linguistic, imagistic, symbolic” (Sternberg & Wagner, 1989, p. 260) skills brought to bear on the knowledge, as does the individual’s capacity to code, integrate and compare new knowledge into these cognitive structures (Sternberg & Wagner, 1989). Sternberg and Wagner (1989) argue that inter and intra-individual differences have consequences in dealing with practical knowledge. This is important, because practical knowledge impacts on individuals’ abilities to deal with their environment in three ways: to adapt to, to select new environments, and to “shape old environments into new” (Sternberg & Wagner, 1989, p. 260).

One very important domain of practical knowledge now required is technological skills and competencies (Bandura, 2002). Practical knowledge forms the basis of real-world interactions, it involves performance and becomes the “tacit knowledge … what one needs to know in order to succeed in a given environment but … is never explicitly taught and … might never be verbalized ” (Sternberg & Wagner, 1989, p. 263). How people acquire practical knowledge, prioritise its relevance, use, and then transfer it, varies with individuals. Use of these technologies involves practical applications and interactions with the real world, which are both *praxis* (Warren, 1998a) and re-conceptualisations of technology's location in a matrix of meanings. e-Learning does not alter the requirement for integrating new meanings, which is the essence of new knowledge (Doty, 2002). Such meanings include how the technology is conceived, how it aids or detracts, what potential it may add to lives, to work; how its use will impact on the user, and the systemic changes that are required by individuals and by the organisation. Other meanings may centre on how one accesses software and hardware components, which may be called on for help, how well the person deals with new situations, and how easily they can access help when required. In other words, there is importance in how the technology fits into a newly configured matrix of understandings for both individuals and society (Mansell, 1994). Limitations to learning can also occur by how new material and technologies are presented, that is, in its teaching.

2.1.3 How Teaching Affects Interaction

How learners are presented with new information will impact on how they interact with it, their perceptions of it, and, as well, their engagement with co-learners (Felder, 1996; Sonnenwald & Li, 2003; Sternberg, 1997). Since workers now require life-long learning and flexibility in careers (Bandura, 2002), training programs that offer flexibility in delivery and their accessibility are required (Barnow Report: Doleta, 2002; DeRocco, 2003a). Some technology-based teaching offers flexibility and accessibility, but suffers from the limitations of the students' technological skills and their "own, individual and sometimes unique psychological baggage" (Caladine, 1999, p. 6), as well as unequal access to the Internet (Caladine, 1999). Computer-based training also involves those learning processes that are both concrete (procedural) and conceptual (Santhanam & Sein, 1994). Web-based instruction offers distance learning, and assists in the development of critical thinking skills, and student autonomy, but is not always suited to all training programs (Barnow Report: Doleta, 2002).

Student recruitment has often been viewed as independent of teaching and course requirements (Birkey & Rodman, 1995). Narrowness in student populations, both by course intake and attrition, has impacted on lack of diversity of abilities and skills within professional groups (Birkey & Rodman, 1995; Felder, 1996). Recent attention to individual differences has lead researchers to question tertiary course construction, delivery and assessment, for example in engineering faculties (Felder, 1996) because engineers need social as well as technical skills during IS and IT implementation. Student differences may be sensitive to learning strategies and training methodologies (Birkey & Rodman, 1995; Sonnenwald & Li 2003; Sternberg, 1997; Yokomoto, 2002). Maintaining the diversity in occupational groups could lessen the impact when new systems are implemented which do not fit with current occupational roles.

2.2 Individual Differences and Learning Style

One source of student differences is learning style. There are idiosyncratic patterns of cognitive styles within different cultures (Sternberg, 1997). Learning style has also been found to vary between different occupational disciplines, but whether learning style is a cause or an effect was not determined (Litzinger, Lee, Wise & Felder, 2005; Slaats, Lodewijks & van der Sanden, 1999). Because technology use may be one significant barrier to diversity of both student intake and course completion, attention to learning style is warranted. Adult learners with more defined, habituated learning style, and established careers in which there is low technology use, or even avoidance, are very vulnerable. Also life-long learning requires adults to remain students.

A difficulty with looking at learning style is that different authors define it quite differently, with emphases on different phases and patterns of the learning transition. These differences make comparisons difficult. However, there is agreement that learning style focuses on how material is perceived, apprehended and processed. Learning style involves cognitive and affective as well as psychological behaviours that are stable when individuals perceive, interact with and respond to new material (Keefe, 1979, as cited in Felder & Spurlin, 2005; Sadler-Smith & Smith, 2004; Sternberg & Grigorenko, 1997a; Van Zwanenberg, Wilkinson & Anderson, 2000) . A number of researchers, including Hayes and Allinson (1996) and Sternberg and Grigorenko (2001), have accentuated style as being stable and “the role of cognition as an underlying process and have separated out phenomena that reflect individuals’ habitual information processing modes (cognitive style), behaviours (learning style) and predispositions (learning preferences) from those that are responses to a given context (learning strategy)” (Sadler-Smith & Smith, 2004, p. 397). Sternberg (1997; Sternberg & Grigorenko 1997a) sees style as a construct that provides an interface between cognition and personality.

The failure to take style into account within education, and in organisational contexts can lead to sacrificing talent which fails to shine within proscribed domains because of its contrast with the dominant style (Hayes & Allinson, 2004; Sternberg, 1997a). The inclusion of teaching methodologies that take account of the different patterns of learning characteristics is very important in teaching generally (Birkey & Rodman, 1995) because different occupational groups may have specific learning styles, although all styles should be encouraged because their skill mix offers their occupation diversity

(Felder, Felder & Diez, 2002; Katz & Heimann, 1991). Learning styles are especially relevant to the teaching of technologies (Birkey & Rodman, 1995). Technical and occupational courses that involved heavy computer use had higher rates of learning styles that feature ‘active experimentation’ (Birkey & Rodman, 1995). Birkey and Rodman (1995) recommended the consolidation of the coursework by emphasising “experiential learning” (Birkey & Rodman, 1995, p. 2) for the computing course student cohort, and to attract other populations by marketing careers and course programs that had wider learning style appeal. These changes offered more ‘collaborative’ and ‘hands on’ learning focus. When supported with additional counselling services, occupational interest and personality assessment, remedial services, cooperative education, as well as some community, educational and business links, very high retention and post-completion employment rates resulted. .

Learning profile descriptions are centred on abilities, skills and intelligences which are centred on the flexibility and focus of thinking of the individual (Gardner, 1993b), and have been amassed to form epistemologies of the brain-basis of intelligence. This reflects a basic property of the nervous system. Together, these views (such as Bouchard and McGue, 2003; Eysenck, 1981 as cited in Gardner, 1993 and Jensen, 1980) form what Gardner (1993) describes as the “tough-minded” (Gardner, 1993b, p. xv) wing of intelligence debate.

The “tender” (Gardner, 1993b, p. xv) other wing of the debate centres on the cultural, contextual and profiles of intelligence, the ways in which individuals and groups perform roles and evolve a broad, almost endless variety of cultures. For Gardner (1993), these cultures produce contextualisation and distribution perspectives that form the “lenses” of language and logic (Gardner, 1993b, p. xvi). So that for Gardner and others (e.g. Slaats, Lodewijks, & van der Sanden, 1999), proclivities in individuals are expressed as preferred activities, in specific tasks, and within domains and disciplines. Thus, individuals' proclivities are found as expressions within contexts. Gardner (1993) has elaborated a three-level conceptual framework to describe assessments of human activity. Human intellectual and emotional proclivities are innate and neurobiological (Davidson, 2003; Gardner, 1993; Herrmann, 1995; Snow, 1989). This level describes the individual - but humans develop within cultures or domains. A domain contains specific symbolic rules (Csikszentmihalyi, 1997) and comprises the disciplines, crafts and occupations in which an enculturation process occurs (Gardner, 1993). Different domains require the use of, and excellence in, different profiles of intelligences, but also one domain requires use of different sets of intelligences. For example, the music domain will appeal to and support individuals high in music intelligence, but other intelligences are also required for success in that domain. Music performance requires bodily-kinaesthetic intelligence and personal intelligences as well as music intelligence (Gardner, 1993b). Individuals may also choose a domain adjacent to that which is their main strength (Gardner, 1993). People are judged within the domain to determine the measure of their success (Csikszentmihalyi, 1997).

When material to be learned contains symbols or rules which do not match an individual's innate styles or intelligences, then the learning process is harder than for others. The technology domain has specific cultures and symbol use. Technologies and IS are often new material presented in learning environments and work places. The new IS and IT material is frequently mandated, and also has a rapid rate of change, which compounds the load for learners.

2.2.1 Measuring Learning Style

A common theme of all measures of learning style is that styles represent preferences rather than abilities. As a result, these measures also value all learning preferences and see them as being complementary parts of a whole. Many of the learning style models have, to some extent, been built on extraversion and introversion.

Felder and Silverman (1988) have amalgamated some known learning style measures especially the Myers-Briggs Type Indicator, [MBTI], by Myers & McCaulley (1985) and added one component, to form the Index of Learning Style (ILS) by Felder and Soloman (1993). The MBTI stems from Jung's theoretical perspective (Felder, 1996), and has an adequate research history within organisational psychology, psychological and occupational counselling, and education (Kaplan & Sacuzzo, 1994). Its four bi-polar dimension preferences are: 1) (E) extravert, focusing on the external world, active in trying things out; or (I) introverts, focused on their internal world, reflective in approach; 2) (S) sensors, focusing on facts, procedures and details or (N) intuitors, focused on intuitions, possibilities and concepts; 3) (T) thinkers, having a preference for logical analytical algorithms or (F) feelers, relying on feeling for personal or social values; 4) (J) judgers, follow agendas and tend toward being under-inclusive or (P) perceivers, adaptive and prone to being over-inclusive of data. The MBTI theory assumes all people use all preferences, but have specific preferred or more rapid responses. The ILS has five learning dimensions which are: 1) the preferential perception being *sensory* (sights, sounds, physical sensations) or *intuitive* (memories, ideas, insights); 2) most effective reception being *visual* (pictures, graphs diagrams) or *verbal* (sounds. written, spoken); 3) organisation of information being *inductive* (data are given, therefore underlying principles inferred) or *deductive* (principles are given, results and applications are deduced); 4) processing of the information is *active*, (interaction with material by physical activity /discussion) or *reflectively* (via introspection); 5) processing toward understanding *sequential* (small incremental steps) or *globally* (large holistic jumps). Felder (1993) cites many investigations utilising the ILS within North American engineering education that revealed a mismatch of students' learning styles and the modes of course instruction. Some engineering educators reported that attrition within the course reduces the diversity of the final professional engineering population, and reduces its creative responsiveness to professional demands (Felder, 1993; Birkey & Rodman, 1995). All styles have their value: observant and methodical sensors are good experimentalists; insightful and imaginative intuitors are good theoreticians, actives are good at team work and administration, reflective good at research and design, sequential good at focused analyses within single domains; while global are good synthesisers, integrating material across disciplines to access broader perspectives and understanding. However, the current teaching methods favour the small proportion of students who are intuitive, verbal, deductive, reflective and sequential (Felder, 1993). Learning style has implications for how people tend to approach learning technologies and IS materials, and the interactions between those experts who teach IS and IT and their students. Hands-on active and sensory learning styles are better suited to procedural learning IS and IT environments.

2.2.2 Measuring Occupational style

Measures pertaining to individual difference preferences deal with theories of vocation, one of which is the Holland's (1985) Self-Directed Search (SDS). Occupational style has been seen as an expression of personality (Holland, 1985b; Herrmann, 1995). These styles are part of the study of individual differences and their effects for personality, traits, and preferences. The SDS describes a conceptual framework of six occupational personality types (Kaplan & Sacuzzo, 1994). The main theme of the SDS (Holland, 1985b) is that personality is an interaction of the innate (i.e. biology) together with experience to produce distinctive skills, ideology, and preferred activities that become traits, behaviours and attitudes that inform occupational choices.

Holland's (1985a; 1985b) work examined personal and environmental characteristics. He developed an hexagonal model to understand career decisions, work competence, engagement, satisfaction and dissatisfaction with career and achievements, and work environments. Holland proposed that people can be characterised by six types: Realistic, Investigative, Artistic, Social, Enterprising and Conventional. The more closely a person resembles a type, the more they are likely to exhibit personal behaviours and traits associated with that type. According to Holland (1985a; 1985b), environments can also be categorised by their resemblance to six model environments. By implication, congruity between individuals and environments allows stronger predictions for educational and occupational choice, expertise, achievement success and stability, plus social behaviour and responsiveness to other influences.

The six personality types evident within occupational groups are a product of individual and cultural influences such as inherited traits, social effects of peers, parents, physical, socioeconomic and environment. Through experience and perceptions, a person gains preferences for specific activities which build on-going interests and competencies, which in turn build particular dispositions, modes of thinking, perceiving and acting. Each type, therefore, has a characteristic repertoire of attitudes and skills. An individual's profile can be mapped as a gradient or spectrum of similarity / dissimilarity to the defined pre-specified models. The six types are described briefly in Table 2.1.

Table 2.1.

Self-Directed Search Occupational Types (Holland, 1985b).

Please see print copy for Table 2.1

Types of environments demonstrate the same features as those of the personality types just given (Holland, 1985a; 1985b). Strong congruities occur between occupations and environments, because individuals are attracted to environments which are attractive to them, so that an aggregating process occurs based on their interests, competencies and outlook on the world. Therefore, the dynamic between individuals and environments provides a best fit between people's internal and external environments. Individuals' behaviours are an inevitable interplay of match and tension between personality and environment. It is this match that allows some accuracy in predicting outcomes such as occupational choice, transition, achievement, range of abilities and educational and social responses. So "[d]ifferent types select and process information in different ways, but all types seek fulfilment by exercising characteristic activities, skills, and talents and by striving to achieve special goals. Consequently, types are often active rather than passive recipients of environmental influence, for they both seek and avoid environments, problems, and tasks" (Holland, 1985a, p. 3). The choice of an occupation exerts considerable influence of individuals' everyday reality, because it offers personal identity, and work-life quality and satisfaction (Bussey & Bandura, 1999). One important expression of personality is the occupation an individual chooses to suit their proclivities and strengths, and which then helps define their identity. "The job is who you are," stated Michael, an injured construction worker, explaining his reticence in changing career (Catterns, 2001).

Studies have shown different levels of acceptance of technologies, technological change and innovation. These differences occur between genders (Bussey & Bandura, 1999), industries and occupational groups (Herbert & Benbasat, 1994; Henderson, Deane & Ward, 1995; Henderson & Deane, 1996). For example, in education, while there is the potential for significant improvements for both students and teachers as a result of computer acceptance, the educational benefits have not yet occurred (Gilbert, 1996 as cited in Hu, Clark & Ma, 2003; Katz & Francis, 1995). Technophobia and computer anxiety were not related to age or gender characteristics, or computer experience among teachers (Rosen & Weil, 1995). Computer assistance was not valuable for teaching (Rosen & Weil, 1995). Katz (1984), and Chandra, Bliss and Cox (1988) found that personality was implicated in innovativeness toward diverse methods of teaching, which included computer use. Further, Offir and Katz (1990) demonstrated that teachers who were higher risk-takers in general, utilised computers to a greater extent in their professional lives, than low risk-taking teachers. This suggests that personality, as it is expressed within the teaching occupation, has an effect on attitudes to computers and consequences for their use. The Social "Personality Type" (Holland, 1985b, p. 3), which includes such professions as teacher, religious worker, counsellor, clinical psychologist, psychiatric caseworker, and speech therapist, lacks mechanical and scientific aptitudes (Holland, 1985b). While teaching is a preferred occupation of high Social type (SDS) and is associated with tender-mindedness from the Eysenck Personality Questionnaire (Katz & Francis, 1995), other personality differences such as risk-taking, and tolerance for ambiguity will further differentiate high and low IT usage among work groups. A lack of autonomy in mandated use of IS and IT, along with perceptions about the lack of relevance of IT to their job, was also found to have effects on technology acceptance in teachers (Hu, Clark & Ma, 2003). Landers and Lounsbury (2006) found that higher Internet use occurred for students with lower levels of Agreeableness, Extraversion and Conscientiousness, perhaps because Internet use does not require face-to-face interactions and has less rigid strictures. Low self-efficacy in computer use lowers the interest in, relevance of, and the pursuit of IT coursework (Bussey & Bandura, 1999).

Nursing is another occupation that has high Social scores (Holland, 1985b). The health industry also has been recognised as being slow in the acceptance of technology (Caputi, Jayasuriya & Fares, 1995; Jayasuriya, 1998). Nursing staff had different attitudes and expectations than clerical staff in health-care settings (Henderson, Deane & Ward, 1995). Nursing has ‘care’ as a focus of work practice (Herbert & Benbasat, 1994; Romano, 1995), has a calling orientation (Gandal et al. 2005), and computer systems use may be seen as distractions for limited time and effort in the professional’s work-life. Therefore in the health industry, mandated IS and IT systems may remain disconnected from a job ideology (Herbert & Benbasat, 1994) which is likely to be oriented to benevolence (Gandal et al. 2005), and thus the source of negative emotions, and organisational, interpersonal and intrapersonal conflict (Crittenden, Harper, O’Shea, Caputi, Rawstorne & Jayasuriya, 1999).

Because people migrate to occupations and specialist areas that match their preferences and abilities, enforced organisational change towards specific procedures and functions may distance them from their preferred activities. The mandated use of computer technologies may, therefore, conflict with their perceptions of their roles and identity. Equally, occupational requirements alter with increased seniority and management, such that individuals who possess entrepreneurial or creative skills to start business, are unable to manage their corporation successfully (Sternberg, 1997). Also, lower-level management involves teamwork and requires compliance, but upper-level requires independence and decision-making, abilities that are progressively filtered out during the management career progression (Sternberg, 1997). The difficulties that are caused by these mismatches will be dependent on individuals’ abilities to be flexible.

Personal identity is bound by occupation and career paths (Holland, 1985a), therefore organisation and skills alterations will become personal or core issues. Patterns of occupations have been relatively stable for both genders, but especially males over the last 50 years (Jepsen & Choudhuri, 2001). Since perceptions of occupations are stable over time, training, and populations (O'Dowd & Beardslee, 1960, 1967 as cited in Holland, 1985a), it is likely that personal and social occupation meanings are difficult to shift, regardless of technical or organisational change requirements, although this may depend on the individuals' occupational self-investment (Faunce, 2003). Self-confidence, as well as self-appreciation (Goman, 1992) and emotional and financial robustness are required to master vocation change and associated settling problems (Holland, 1985a). A high sense of self-efficacy enables individuals to consider an increased diversity of occupational roles (Bussey & Bandura, 1999), and improves their abilities to negotiate changes that are required to those roles and workplaces (Bandura, 2002).

One important area of organisational change due to technology, is the increasing use of virtual teams, for low supervision, collaborative work which offers joint outcomes from people who are separated by time, distance and culture (Bandura, 2002). Stronger definition of an occupational profile (the stronger differentiation between the highest and lowest SDS code scores) has implication for a person's career stability, their decision-making abilities or vocational maturity (Holland, 1985a). Individuals and organisations that are more differentiated into occupational categories will find change more difficult, especially if they have stable, clear integrated goals, tasks and rewards, that is, a clear identity (Holland 1985a). Occupational stability increases with age; for women it is associated with academic achievement, while for men it is associated with a clear set of career goals (Jepsen & Choudhouri, 2001). Occupational groups have similar personality characteristics; they perceive contexts and issues in characteristic ways (Astin & Holland, 1961, as cited in Holland, 1985a), although there may be variations due to factors such as age, gender, ethnicity and intelligence (Holland, 1985a). The desire for "psychological congruence" (Holland, 1985a, p. 12) between individuals and their work situations and friendships leads to increased enjoyment, satisfaction and achievements in contexts that are similar. However, discomfort, frustration and destructive interactions occur in incongruent contexts and relationships (Holland, 1985a). People appear to protect their self-esteem by coming to value what rewards their job offers (Faunce, 2003). Work environments allow individuals' competencies and interests to be expressed, and may support worker-job congruence satisfaction (Gottfredson & Holland, 1990). This tends to encourage stability, comfort and conformity (Holland, 1985a). People's aspirations and work histories are congruent, and allow predictability within a work field (Holland, Gottfredson & Baker, 1990; Oleski, & Sublich, 1996). In addition, employers discourage change, as do family and friends and co-workers, thus the SDS body of occupational research proposes a relatively closed social system, although it does remain open to dynamic individual perceptions of self-efficacy (Bandura, 2002; Holland, 1985a) and cultural forces (Holland, 1985). This means that mandated change which accompanies the adoption of technology may suit some conscientious workers who enjoy orderly environments, and therefore enjoy the efficiency that an IS offers. However, an IS may pose difficulties for others, for whom it forces learning that does not fit their highest abilities as well as reducing their social contact within their work environment.

2.2.3 Measuring Personality Factors

Very broadly, personality is an external manifestation of an inherent 'entity' that has some causal component in behaviour that, theoretically, has "genuine explanatory power" (Reber, 1985, p. 535) and it is in this context that personality will be used in this thesis. A stable personality and on-going sense of self is tied to a person's access to his or her thoughts, senses and emotions, his or her body, decisions and behaviours (Baumeister, 1997). The sense of self is based in anatomy and physiology, which is modified through experience and the coding of those experiences (Miller, 2001). Personality, and one's awareness and sense of self, has been shown to be stable in health, with consistencies in what James (1890, as cited in Miller, 2001) described as the *me self;* that of the *material self* (clothes, cars, the body), *the social self* (the self recognised by others), and the *spiritual self* (the internal philosophical values of the person such as religion or political ideology) (Miller, 2001).

Personality describes the durable disposition towards particular ways of behaving in a variety of contexts and events. Reber (1985) defines 'type theories' of personality which work on the assumption that each individual is a representation of a balance of basic temperaments, while trait theories assume that an individual's personality is a "compendium of traits or characteristic ways of behaving, thinking, feeling reacting" (Reber, 1985, p. 533). They are complementary terms, in that typology is focused on commonality among individuals, whereas traits focus primarily on differentiation among individuals (Reber, 1985).

As a result of factor analysis, personality inventories have established stability in the five factors which appear to describe the parsimonious but complete personality constituents (Murphy & Davidshofer, 1994). These five factors have been given various names (Saucier & Ostendorf, 1999). Although there is variation in what comprises the sub-components and their relative importance, general agreement has been reached that five factors constituted the main constructs required to describe personality (Digman, 1990; Goldberg, 1990; 1993b; John; 1990; Ostendorf, 1990a cf. McCrae & Costa, 1987 as cited in Saucier & Ostendorf, 1999). Saucier and Ostendorf (1999) describe the phenotypic personality variation as that which was determined by most personality researchers as being distinguishable; that which constitutes observable attributes of the character traits. Lexical models have also provided cross-cultural verification with similar factor structures emerging from comparisons of nine languages of different heritages (Saucier & Ostendorf, 1999). These factors are Neuroticism (or emotionality), Extraversion, Openness, Agreeableness, and Conscientiousness (Costa & McCrae, 1992b). Mount, Barrick, Scullen and Rounds (2005) describe a higher-order structure for integrating the SDS vocational types and NEO personality factors. Three higher-order dimensions were proposed. The first dimension is "*Interest versus Personality Traits*" (i.e. interests in which people engage with liked activities and avoid disliked activities, versus "self-regulation which require attentional, emotional and effortful control" (Mount et al. 2005, p. 469). The second is "*Striving for Personal Growth versus Striving for Accomplishment*" (Mount et al. 2005, p. 469) and the third dimension is "*Working with People versus Working with Things*" (Mount et al. 2005, p. 471).

Studies of personality factors have shown these factors to be very stable over time and contexts; they are antecedent to affect (e.g. Watson & Clark, 1997; Watson, Clark & Tellegen, 1988) many behaviours and interactions including values (Gandal, Roccas, Sagiv & Wrzesniewski, 2005; Luk & Bond, 1993). Therefore, the inclusion of personality factors would add considerable explanation and prediction in the human-computer interaction. Karahanna and Straub (1999) investigated the psychological antecedents of two TAM constructs to help further understand what impact they may have on perception and acceptance, and what motivates users. Individuals experience interactions with their world of people and technologies as both perceptions and as emotions.

2.2.3.1 The NEO Measure of Personality

The NEO is a well-known and researched personality measure that presents the five-factor structure, with six sub-components for each of the five factors (Costa & McCrae, 1992b). The five factors within the NEO are Neuroticism, Extraversion, Openness (to experience), Agreeableness, and Conscientiousness. Their sub-components, termed *facets* in the NEO, follow. The facets of Neuroticism are: Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness and Vulnerability. The facets of Extraversion are: Warmth, Gregariousness, Assertiveness, and Activity, Excitement-seeking and Positive emotions. The facets of Openness are: Fantasy, Aesthetics, Feelings, Actions, Ideas and Values. The facets of Agreeableness are: Trust, Straightforwardness, Altruism, Compliance, Modesty and Tender-mindedness. The facets of Conscientiousness are: Competence, Order, Dutifulness, Achievement-striving, Self-discipline and Deliberation.

The NEO has been used to successfully predict behaviours over a wide variety of contexts and foci for behaviours, including health psychology, behavioural medicine, occupational and organisational psychology and educational and moral reasoning research (Costa & McCrae, 1992b). Interpretation of blends of the factors to predict behaviours is possible and helpful in delivering a more fine-grained account of personality, according to Costa and McCrae (1992b) thus supporting their adherence to the circumplex structure. The circumplex describes an interpersonal circle of traits in which the alignment of similar traits is close, e.g. Extraversion and Agreeableness are similar in that they describe interpersonal warmth, but extraverts typically display dominance, while high scorers on agreeableness are self-effacing (Costa & McCrae, 1992b).

The Extraversion presentation is well-known, and, at core, describes individuals who actively seek company with others and are friendly, warm, socially confident and at ease (Watson & Clark, 1997). In their need for excitement they are daring, spontaneous, excitement and pleasure-seeking. Other characteristics include the tendency to be assertive and forceful, and even aggressive. As well, these individuals are active, fast moving, energetic, mentally alert and determined. Their tendency for positive emotions shows them to experience joy, and be keen, praising, humorous, and positive (Costa & McCrae, 1992; Watson & Clark, 1997). Watson & Clark (1997) view assertiveness, activity and positive emotions as being associated with trait Positive Affect. Positive Affect (PA) is both a cause and effect of behaviour, especially social or goal-oriented behaviour. PA provides the energy, alertness and focus resources for high performance, the optimism to expect competence and success, as well as pleasure from such engagement (Watson & Clark, 1997).

Studies exploring Openness, as defined by the NEO Openness Scale, have shown that people high in Openness actively seek new experiences, and are reflective about those experiences (McCrae & Costa, 1997). Openness includes the pursuit and enjoyment of ever more interest in a range of fields, liking complexity and being comfortable with ambiguity, being non-conforming, having broad attitudes and “rich and complex emotional lives” (McCrae & Costa, 1997, p. 832), which comprise both inner and outer experiences. As well, Openness involves being flexible in behaviour, and, in general, having more intellectual fluidity and fluency, attitude revision, curiosity and imagination. In short, Openness abilities parallel creativity (McCrae & Costa, 1997).

The Agreeableness facet describes people who are high in trust and forgiveness and who are straightforward in their interactions. As well as being tolerant, they tend toward generosity and warmth, sympathy and gentleness. They are undemanding and compliant, and do not show-off (Costa & McCrae, 1992). They have high life-satisfaction rates because they have satisfying interpersonal relationships, perhaps because of their high altruism and generosity.

Conscientiousness characteristics include efficiency, organisation, thoroughness, ambition, self-discipline, and planning (Costa & McCrae, 1992). High-scoring individuals are purposeful, persistent, careful and trustworthy; and conscientiousness is associated with high work performance and integrity, and the development of one’s identity (Hogan & Ones, 1997). Often highly Conscientious people are comfortable with conforming to authority, and are socially easy (Hogan & Ones, 1997) and are happier because they because they generally are achieving their goals.

Costa and McCrae (1992) also outline coping mechanism and their typical associations with personality factors and response outcomes. Typically, Neurotic coping relies on escapism, indecisiveness, sedation, self-blame, doubt and hostility. High scorers worry about the opinions of others and want succour. More useful coping effects were positive thinking, rational behaving and restraint for high Extraversion scorers, and use of humour or faith for high and low Openness scorers. Extravert high scorers want affiliation, attention and hedonism, while high Openness scorers seek novelty, stimulation, and aesthetic experiences and adventure. Agreeableness scorers are nurturing, and self-abasing. Highly Conscientious scorers, because of the value they place in order and achievements, are low in impulsivity, so their weaknesses may be toward extreme versions of orderliness and structure where they may be miserly, compulsive, overly needy and obstinate (Hogan & One, 1997).

Researching how personality and human values govern human behaviours in IT contexts may offer fresh insights. The congruity of an innovation with the previous beliefs and experiences of potential adopters hastens its adoption (Rogers, 2003). Human values are central to the decision processes, and, therefore, will govern the clarity, meanings and the enthusiasm given to an adoption (Rogers, 2003). Because human values form an integral part of any decision-making process, the contribution they make in IS and IT contexts warrants investigation.

2.2.4 Human Values and IT Behaviours

Human values are “the principles or standards of a person or society, the personal or societal judgment of what is valuable and important in life” (Oxford English Dictionary, OED). Values are, therefore, by definition stable and unchanging, or slow to change. Values shape the way in which people act at an individual and group level. It is for these reasons that values are important in a study involving the psychological aspects of people, their ideologies and use of technology. There are five features of the conceptual definition of values (Schwartz, 1994). A value is 1) a belief; 2) involving goals and forms of conduct, that 3) is generalised (thus superordinate and subsuming others) and 4) becomes protocols and judgments for behaviour, people and events and 5) has an hierarchical structure for assigning value priorities (Schwartz, 1994). These features separate, conceptually, values from needs and attitudes (Schwartz, 1994). Schwartz’s taxonomy for human values is shown in Figure 2.1.

The primary aspects of values are that they motivate with direction and intensity, function as standards over different times and contexts, and are acquired. Schwartz (1992, 1994) proposed the structure of a general universal set of human values, along with two other sets of principles. First, there are two bi-polar dimensions that represent opposing sets of values, both spatially and conceptually. Secondly, that conceptual mixing of individual values occurs at category margins. The content of value types, Universalism and Benevolence will be in conflict with Power and Achievement; similarly, the content of value types Tradition and Security will conflict with the Stimulation and Self-Direction (see Figure 2.1).

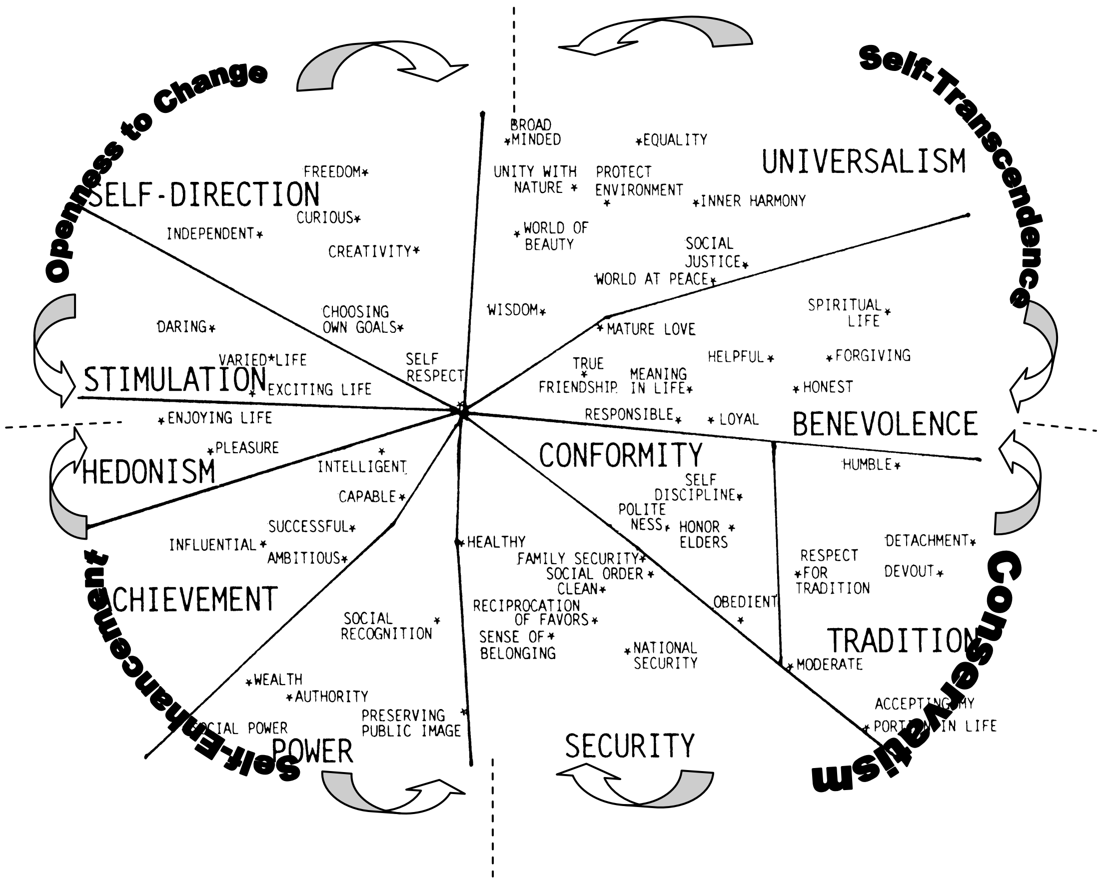

Figure 2.1 Value type model with bi-polar value dimensions (Adapted from Schwartz, 1994, p. 24, 31).

The higher order pole of Self-Transcendence emphasises egalitarianism and welfare concerns, and contrasts with Self-Enhancement and its emphasis on an individual’s success and dominance over others. In contrast, the dimension Openness to Change, which emphasises independence of thought and action, is in opposition to Conservation that focuses on submission and compliance to social practices. Hedonism relates to both Openness to Change and Self-Enhancement (Schwartz, 1992). Therefore, the values model assists in understanding motivation and social experience for both individuals and societies.

Individualistic and competitive learning style preferences generally cross-culturally predict academic achievement, although cooperative learning improves overall student success (Sonnenwald & Li, 2003). Compliance, self-control and sharing of credit and blame are emphasised in collectivist cultures. These aspects of culture are dynamic over time, and context specific (Matsumoto, 1996), but national groups can be located along this dimension in descending order of individualism: United States, Australia, Great Britain, Canada, the Netherlands, and New Zealand. Collectivist nations in descending order were Venezuela, Colombia, Pakistan, Peru, Taiwan and Thailand (Hofstede, 1980, as cited in Sternberg, 1997). This places Australians as highly valuing individualism and internalism.

Warren (2001) describes an historical unfolding of contrasting dimensions that fit with Schwartz’s (1992; 1994) human values structure. The instrumental perspective of an authoritarian style focuses on power for individuals and groups (Warren, 2001). Ultimately, this perspective favours a need for mastery and control over the environment, which is uncritical of, and very readily accepting of technology and specialisation. This perspective holds a position that technology has the answers (Warren, 2001, p. 3). The contrast of this pole is an aesthetic style, focused on “deeper, universal … truths” (Warren, 2001, p. 4) and a sense of flow and detachment from reality, so that it is able to view without judgment, and link “beauty and goodness” (Warren, 2001, p.7). This axis describes opposing perspectives of dystopian view of controlling technologies in contrast with Romantic utopian views of the person in harmonious relations with nature, before or beyond or enjoined with technology

(Coyne, 1999). This bi-polar dimension has a similar description to Schwartz's Self-Enhancement through Self-Transcendence dimension.

Work fulfils the need for income, advancement, with "cognitive-instrumental attitudes toward themselves and others" (Habermas, as cited in Barglow, 1994, p. 103). An occupation and work, therefore, are utilitarian and based on a principle of self-enhancement, focused on achievement and power. However, at this level, work fails to provide a network of cultural and moral integrating depth. Previously, this integration was provided by 'a calling', a Calvinist notion, within which a systemised foundation was made available to both individuals and societies, for identity, status, and modes of private and public behaviours (Barglow, 1994). A calling is now replaced with the notion of 'self-destination', and the responsibility for self-construction, the attendance to future selves along with the decrease of social and ethical considerations for occupational choice, as well as the dropping away of unpalatable parts of some jobs (Barglow, 1994). This decrease in emphasis of ethical aspects is one of a number of sources of compartmentalisation, and unauthenticity, that humans now routinely use throughout their lives (Barglow, 1994). Many professions and professionals experience vulnerability to a sense of failing self (Barglow, 1994, p. 61), generalised anxiety (Rice, 1999), unhappiness, professional and personal dissatisfaction (Sternberg, 1997). Barglow (1994) and Rice (1999) see this anomie as a response to the dehumanising effects of technologies, and a relationship-impoverished social framework. Change is on-going; its rapidity is often challenging and incomprehensible (Jones, 2001). Rapid change and its destabilising effects, such as those found in contexts undergoing technological (or organisational change due to technology) may induce spiritual, religious or philosophical responses to underpin the meaning that people use to make sense of the change. Religion is thought to support and buffer individuals in stressful contexts (Rice, 1999). Spirituality has been a long-standing human response to the human condition and its complexities, and holistic views of people often incorporate a spiritual requirement (Rice, 1999).

Change, and especially on-going technological change, induces broad and encompassing human responses. Understanding such change requires encompassing a more holistic framework. By incorporating a wider nomological net, the capture of conscious and unconscious meanings formed by users about IS and IT may add to understanding the management of IS.

2.3 Shared Processes

This section describes a number of bodies of research that have studied processes that are common to all people. This research moves from a focus on individual differences to group processes.

2.3.1 Culture

For Personal Construct Psychology, construing is an individual act even when it relates to another person (Kelly, 1955). In contrast, according to social constructionists, fundamentally all interactions between individuals are socially and culturally formed (Gergen, 1985; Kress, 1993). No individual construction of meaning is possible within interactions because group processes are at work, and individual evolution always involves an enculturation process (Kress, 1993). Meanings are therefore communicated within interactions. Social constructionists (such as Shotter, 1992) propose that human realities are constructed within conversation, because it is within such shared interactions that realities are re-made and reviewed, and assessed, and offer the power to open people to alternative points of view away from those which are "unconsciously reproduced" (Shotter, 1992, p. 176). Communication in its various forms: "dramatic, scientific, juridical, literary etc, - open up to us different forms of human being"; ways of social interaction and social reality (Shotter, 1992, p. 176).

The social constructionist investigation of meanings stemmed from discontent about there being an objective basis to knowledge that exists without reference to its context (Gergen, 1985). Much of what is described about the world, both in scientific as well as everyday experience, is as a result of social artefacts, the "active, cooperative enterprise of persons in relationship" (Gergen, 1985, p. 267) which culturally prioritise and reward institutions and lines of inquiry (Gergen, 1985). However, there are also multiplicities of social and cultural groupings that occur. Tensions occur between and within different groups because of their "contradiction and contestation" (Kress, 1993, p. 4). Much of what is shared in communication is both the "difference and … the resolution of the difference at one and the same time" (Kress, 1993, p. 5). Positioning one perspective as "truth" (Gergen, 1985, p. 268) is a means of hegemony, favouring one and discrediting other positions.

Two levels of cultural practice interactions occur in this regard: both the product and the process act on individuals and groups. The individual performs two roles, as the agent who acts, but also the object and instrument of cultural norms (Kress, 1993). How objects and concepts are viewed, is historically and contextually dependent (Gergen, 1985). Further, the cultural framework guides the type and style of tools made, the technology of their manufacture, and the way in which it engages the user in its use i.e. the "mode of relating to nature" (Kress, 1993, p. 7). Thus tools carry meaning and become signs in a system of signs, which together form a complex of meanings about the area of culture, as well as an activity (Kress, 1993). These relationships are interpenetrative. This is equally true of computers as tools.

Culturally-formed notions and patterns of behaviour are invisibly ‘ordinary’ (Ihde, 1973, 1983; Kress, 1993). Routine, practical events are expressions that hold ideological order and social class, which determined the content, context and methodology of production (Kress, 1993). Similarly, scientific enquiries and technological solutions are value-laden, and hold ideological and social orientations which are invisible (Shotter, 1992). In addition, because of the uniformity of the outcomes, any differentiation is difficult for those who are new. In comparison, for adults practised in their cultural milieu, individual differentiations are easily perceived because practised users of a culture attend to the differences and variation rather than the similarities. This means that the differences within a group are seen more easily by its members who do not see how different they are from other groups (Kress, 1993). Within groups, perceptions of differentiation are accentuated, and the uniformity is unseen.

2.3.2 Tribalism and Domains: Group Processes and Power

The membership of a culture and its homogeneity has important implications for how people behave. Occupational groups fail to see their homophily (Rogers, 2003; Shotter, 1992), that is, the uniformity of their thinking and problem solving styles, as well as their expertise with their concepts and occupational tools. “Tribalism” (Herrmann, 1995, p. 107) extends to language and educational practices, methods of presenting material, common expressions of experiences and perceptions, dress codes, and ways of offering support and comfort (Herrmann, 1995). Within one context and culture, uniformity and alignment in perceptions are more easily understood, easier to manage, are rewarding and rewarded (Armstrong, Allinson & Hayes, 2002; Herrmann, 1995; Holland, 1985). The other effect of homophily’s facilitating social effect within its group’s members, is the separation that can occur between occupational groups. Group membership sanctions specific frames of reference, and distances those who are different and enables marginalisation to occur even within sub-tribes (Herrmann, 1995). Dissonance, enclosed channels of communication, jargon which alters rapidly, and humour that puts down outsiders can effectively marginalise different groups. In-group behaviour and inclusion can be signalled by use of specific language, or rules. “Weblish” is a new and rapidly changing language formed by communication via high technology tools, via the Net. New phrases and words are absorbed and transmitted globally, very rapidly (Australian NetGuide, 2000, p. 30) but demonstrate group memberships of its use.

Individuals and groups need psychological openness at least, but perhaps also creativity, to understand, accept and adopt innovations. Csikszentmihalyi (1997) defines a domain as a set of symbolic rules and processes that is nested within a culture which has symbolic knowledge which is shared between those within a specific society. Domains are ways of making a living, they equate to the occupation chosen as an individual’s match of abilities, measure of success and system of rewards (Csikszentmihalyi, 1997). Different domains have different structures: some are organised tightly, others are diffuse. Mathematics, for example, has strict internal logic, within a system that maximises “clarity and lack of redundancy”, as does chess, microeconomics and computer programming, while psychology’s system is relatively diffuse (Csikszentmihalyi, 1997). Diffusion of thought within a system has the effect that innovations take longer to be assessed by the field. Csikszentmihalyi (1997) argues that although the tightness of structure of the domain does not affect its importance, advancement or seriousness, it does affect its perception and its ability to quantify its effects, and thus receive advantages in funding, and commendation for leaders in the field. This leads to different levels of tolerance for ambiguity within different professional fields. Different professions respond differently to events, innovations and to change.

One example is traditional medicine, which is evidence-based and intolerant of complementary and alternative medicine’s (CAM) approach, because it has a non-traditional, holistic and non-rational background. However, in spite of the CAM industry failure to provide evidence-based methodologies, the adoption by the general population of CAM continues to increase (Taylor, Walsham, Taylor, & Wong 2004). Within the domain of health/medicine, there are two very different sets of health treatments and practices that have evolved: traditional medicine which is tightly structured, and CAM which is loosely structured and regulated, and in how it performs its research. CAM practitioners’ tolerance for ambiguity and lack of strict explanation and research has not been an impediment to its gaining acceptance within the Australian community, although traditional medicine has been slow to quantify CAMs’ success and recognise potential treatment interactions (Taylor et al. 2004). The more easily measured a variable is, the more it is utilised, and built into a system of awards. Logical positivism has enshrined what is measurable as markers of what is ‘real’. A second example, from economics, is the dominant use of a measurable variable such as Gross National Product weighted as having more value than social or environmental costs (Henderson, 1996).

The coherence of a group and its culture vary, and will alter the group’s ability to accept innovation. Creativity occurs most prodigiously at the co-mingling of different cultures of “beliefs, lifestyles, and knowledge” bases (Csikszentmihalyi, 1997, p. 9), and is generally stymied within a homogenous culture. Innovations, whether in the form of objects or abstractions or theories, are the products of creativity. Both creativity and early innovation adoption rely on the individual’s openness, self-efficacy, intelligence, ability to think in abstraction, diversely, and, less dogmatically, ability to deal with ambiguity and risk (Csikszentmihalyi, 1997; Rogers, 2003). New acts involve new thoughts and ways of thinking, which in turn may generate new acts (Kelly**,** 1955). Sustained positive, focused, and engaged activity produces attitudes and greater exploratory behaviour toward the technology (Csikszentmihalyi, 1990). However, these processes may only describe voluntary contexts. Mandated adoption situations and the process they involve may be very different. The acceptance of change can occur as long as there is sustaining cognitive cohesion from superordinate constructs or mental maps (Kelly, 1955, p. 496).

The poor acceptance rates in IS and IT were discussed in Chapter One. It has been well documented that few of those failures were related to technical problems, and that most difficulties were as a response to social factors which, in turn, stem in part from work-groups' perceptions. These perceptions drew on how work-groups saw IS and IT and their uses, but also the relationship between different groups in the adoption process. Managers in many of their IS and IT-related decisions required to integrate IT in their organisations, lacked both expertise and understanding about the relative value of IT, and were vulnerable to inherently political, competing user-group relationships with IT 'experts' (Bird, 1992, as cited in Martinsons & Chong, 1999). Thus, at times, a political decision drove a new IS design from an emphasis on performance to a redirection of information flow and redistribution of power and authority (Bird 1992; Davenport et al. 1992; Bloomfield & Coombs, 1992; Burkhardt & Brass, 1990; Long, 1993 as cited in Martinsons & Chong, 1999). This means that IT can affect task performance and, to a lesser extent, task management and organisational practice, in positive and negative ways (Gunn, 1993). Hence, organisational culture, management systems and the change in management process have been implicated in IS failure, so that adoption becomes a political weapon within different work-group cultures. This means that cultural or tribalism effects are significant in the IT evolution and practice. Email use offers one example.

Email communication can change social processes, and so assist in strengthening some group cohesion, while enabling marginalisation and dissonance (Romm & Pliskin, 1997). New alliances can spring up, across time, space and social boundaries (Romm & Pliskin, 1997). Some features specific to email, that is, the speed, multiple addressability, recordability, processing (manipulation of the message prior to re-transmission), and routing (re-transmitting to different groups) have political ramifications (Romm & Pliskin, 1998). While email has a strong inherent democratising potential (Sproull & Kiesler, 1991), its effects can be either positive, because it use can increase social cohesion and group decision-making and flatten hierarchical structure (Bandura, 2002), or negative, due to flaming, and reduced inhibition and individual responsibilities (Sheehan, 2003). Romm and Pliskin (1998) cite one example where the political use of email in a socially volatile setting was controlled by the IS workers on behalf of their managers (Romm & Pliskin, 1998). Political behaviour may be against the organisation, used to gain more power, or exist as conflict between parties (Romm & Pliskin, 1997). However, the same technical features of email could assist in socially positive effects. These can be the democratising flattening of the structural hierarchy whereby lower-tiered employees gain access to top management (Romm & Pliskin, 1998), or the spontaneous alteration from one-to-many communication to become the media of discussion (Romm & Pliskin, 1997). Greater sensitivity to cultural change is required, because email’s political potency can be used against any group, including management.

Consider the two ‘online help’ cartoons (Figures 2.2.and 2.3), which illustrate homophilic tensions. Implicit is the message that a modem, operating system, and computer brand are such commonplace concepts and technologies that an individual who does not understand should be marginalised and ridiculed, providing further marginalisation. These cartoons illustrate the group process that have occurred for both Greg and the user; there are large differences in expertise between Greg and his caller, Greg’s expertise and specialisation of jargon and knowledge is invisible to him, the domain is tightly maintained and rapidly evolving with on-going tools and practices, and has required him to remain open and creative in specific ways, has given him opinion, confidence, authority and power. Greg shows typical homophilous member’s inability to recognise the impact of their cultural processes, contexts and ways of being.

Another online system support helpdesk operator gave the following story of a ‘dumb user’. The user took as literal the IT operator’s requests to point to the screen in order to drive the command to ‘shut down’ the screen. This confusion had occurred as a result of the IT analyst having meant the end-user to point the cursor by manipulation of the mouse button control (Pogue & Schorr, 1999). What this story fails to take into account is the experience of the user who is likely to have observed and operated some interactive touch screens, whereby instructions to the computer are mediated via the screen.

Please see print copy for Figure 2.2

Figure 2.2. Cartoon 1: Group members’ inability to see their homophily: Greg technical support. Illiad, 1997.

Please see print copy for Figure 2.3

Figure 2.3. Cartoon 2: Group members’ inability to see their homophily: Greg technical support.

2.3.3 Diversity and Tolerance for Differences

Receptivity to innovation, tolerance for diversity, risk taking and scientific enquiry fluctuate, and may be societal, and have an impact on a group's progressiveness (Diamond, 1998). Societies can vary in how tightly they are organised, and social interactions are therefore governed by protocols of behaviour and thinking (Ng, 2001). When conformity is valued, and social needs are asserted over individual needs, a collectivistic focus for in-group behaviours and social approval dominates (Masumoto et al. 1996; Ng, 2001). Further, when harmony is valued above the negotiation of individual goals, freedom and open exchange of ideas, the need for the absence of conflict is seen as beneficial. In comparison, other societies may view individual subjugation as constraining. Finally, societies may vary in how hierarchical or egalitarian they may be. When tightly-held views about norms, customs and conformity are held to be important for collectivist societies (as in Eastern), divergent thinking is constrained (Ng, 2001). Such constraint may offer advantages, because it enables specific focusing of collective energies for a common goal. This occurred when Japan was creating its technological expertise, which gave rise to its strong global relative economic advantage (Matsumoto et al 1996).

The ability to tolerate differences, change and innovation, in order to work with heterophilous others requires an effort to accommodate the increased difficulty in communications, and reframe the differences (Herrmann, 1995). The synergy that can evolve from the acceptance of diversity and different styles can lead to improved acceptance and creativity, and problem-solving responses (Herrmann, 1995; Naisbitt & Aburdene, 1990). Individuals being encouraged to find their individual goals, their creative potential and pursuing them, and being encouraged to stand separate from their cultural uniformity, fosters the ability to understand, to deal with differences with equity, and work collaboratively. These characteristics, in turn, enable creativity and ability to absorb such differences as being valuable (Herrmann, 1995). Merging institutions, industries and universities offer pooled resources, with improved productivity and outcomes (Bandura, 2002). The value that individuals working independently, but collaboratively, on projects, offer is enormous potential for innovative and synergistic problem-solving solutions. When such collaborative efforts are well supported by IS and IT, so that teams can comprise people of different locations and cultures, the breadth of experience, range of their skills and talents and availability of knowledge (Bandura, 2002; Henderson, 1996) offers far great potential than previously available at any other time in history (Henderson, 1996). Ultimately, cyberspace technology offers interactive complex “living systems” which propose that changes to human beliefs, goals, values and allegiances “for unifying global concerns and ethics” (Henderson, 1996, p. 252) give an historically unique vantage point which is situated above local concerns (Henderson, 1996).

2.4 Conclusion

This chapter has described the processes that humans routinely undertake. The fundamental and on-going process that people undertake in their lives is that of learning, much of which is symbolic and styled. Individuals place different emphases on learning and manipulating symbolic languages and systems. People vary in how much they prefer to deal with abstractions, or concrete objects. Individual differences include personality variables, which help shape people’s learning and occupational styles, and their values These styles and values also help form the cultural contexts from which individuals and groups view their world, and understand and tolerate diversity. The next chapter will describes the literature which illustrates both the phenomenology of the technology-human interaction, and the philosophical background which frames how those interactions are perceived.

CHAPTER THREE

EXPERIENCES AND MEANINGS

Experiences and Meanings

The majority of IS and IT literature in which the human-computer interaction is studied has centred on traditional models which do not adequately address more complex interactions between the person and technology, especially of the role of psychological variables. This chapter is involved and complex. It will discuss some of the complexities, and the multiple levels on which these complexities affect the interaction between humans and technology. Including these issues into such a discussion is important, because the concepts form a backdrop to IS and IT use which is not readily apparent to end-users, yet impacts on them and the understandings they bring to technology use.

The models discussed in the Chapter One have been used to address people's technology use and adoption. The TAM examines the rational and conscious interaction of users and the technology. In its original form, the model was reductionist, and focused on effort and usefulness as antecedents to 'intention to use' and 'use' of a technology (Davis, 1989). While later versions of this model sought to increase the TAM's explanatory power by increasing the model's complexity, these additions appeared to be fragmented and lacking an overarching theoretical framework (Legris et al. 2003). The DOI model (Rogers, 2003) examines the adoption process of a technology. It is based on a larger set of variables, and considers diffusion as a social process that takes account of the adopter's perceptions, culture and needs. Two notions reviewed in IS adoption literature are those of *assimilation* and *infusion,* which, to some extent, describe the quality of the human-innovation engagement, but do not describe the end-users' 'felt experience'. This 'felt experience' describes the phenomenological involvement of a person in engaging with their environment, and more specifically with a technology (Ihde, 1973). The sense-making perspectives that users bring to their technology interactions have not been articulated in the traditional models, although the subjective nature of IS has been acknowledged (Ballantine et al. 1998). These models may, therefore, present an inadequate nomological net to capture the data necessary to explain the use and adoption of technology. Hence, they present simplistic models with which to examine adoption, assimilation and other complexities of technology use (Chin & Marcolin, 2001). In a departure from the TAM and DOI models, this chapter centres on the experience felt by humans in their interaction with an innovation or technology from the point of view of the phenomenology of technological, IS and IT experience.

The literature that describes these aspects of the human-technology interaction stem from a variety of sources: philosophy, philosophy of science and technology, and psychology. This literature is complex, and describes different levels of technology use and its meanings, as well as multiple and varying levels of awareness, and multiple 'felt' experiences. The wider range of experiences cited in the chapter include those that are sensory; those that are transparent-opaque; those based in utility and language, or self concepts such as competence, mastery and affiliation, incompetence, vulnerability and alienation; those that offer access to metaphysical states of freedom, fantasy, and symbolic meanings and virtual worlds, as well as the relationship with a technological 'Other' (Barglow, 1994; Coyne, 2001; Ihde, 1973; Suler, 1998; Turkle, 1997, 2007a). The meanings that have emerged from these experiences are discussed in Section 3.1.

3.1 Meanings

The meanings given to an innovation or technology are the fundamental set of judgments a user brings to their interactions with technology. Although other individuals can provide information about the innovation, and reduce the potential adopter's uncertainty, the meaning for each individual is changed by his or her experience of the technology (Rogers, 2003). Personal experiences are interpreted and given meaning, because this process is fundamental to human beings and underscores "our existential reality" (Warren, 1998, p. 160). The meanings are individual, built by the person's interpretation of these interactions with the technology and the environment. Although these meanings may be significant in the interaction a person has, such meanings may operate at a different level of awareness from high (conscious) through to a low level of awareness (pre-conscious or unconscious). Some meanings and phenomenologies that have described the human-technology / computer interaction are now considered.

3.1.1 Utility

A very conscious experience of using a technology is its utility. The experience of using computers is on one level external; it is also concrete in terms of the functionality it will provide. The utility may be experienced as an increased capacity to categorise, label (Barglow, 1994), centralise and control an information resource; maintain, retrieve, secure, analyse and audit information (Connolly & Begg, 2002); with computer modelling, to assist in predictions of the future; and, with explanations and control of complex systems, to create better order (Coyne, 2001). Widely-available database information systems, for example, have offered powerful data-management and improved productivity that are described as being intuitive to use (Connolly & Begg, 2002). The popular IS and IT research models fundamentally address technological usage, specifically usefulness and ease of use; and use perceptions were the basis of the TAM (Chin & Marcolin, 2001). How a user experiences an IS interface, in terms of their perceptions of its helpfulness, value, effectiveness, efficacy, convenience, benefit, function and advantage has implications for its utility. For example, inadequate understandings of database management systems principles have produced poor systems with low efficiency, and precipitated, a “software crisis …or software depression” (Connolly & Begg, 2002, p. xxxv). Different areas of research are required to examine the depth of IT usage, such as user competence, their tasks and sub-goals, and their desires for fuller use, and the IT’s functionality (Chin & Marcolin, 2001). There is a need to understand the “richness [of the] dynamic processes” involved in IT use (Chin & Marcolin, 2001, p .10).

3.1.2 Inquiry Shaped by Technological Interactions

Ontological and epistemological understandings of humans are altered by technology. These changes, in turn, impact on how humans reflect on themselves (Turkle, 2007) and see their place in the universe (Barglow, 1994). This leads to the technology interaction shaping the further direction of technology, and frames the environment which helps to determine the worth of the technologies and innovations (Barglow, 1994). Part of this technology environment is its culture and stories. Moreover, information technologies and cultures are so tangled that the narratives from each impact and interact with the others (Coyne, 2001; Pitt, 1995). These technological narratives are about humans’ location and importance in the world. For example, people’s physical location does not change, but their electronic connection through the Internet alters their psychological distance. This offers new possibilities in communication, for example, by ‘seeing’ goods and purchasing on-line from Amazon.com or eBay.com, and increasing the power of their search to a range that is global.

Technological narratives are also involved in redefining work practices. In architecture, computer aided design (CAD); in the drawing and presentation of plans, changes, work processes and outcomes (Coyne, 2001, p. 275); but they also alter how a worker may use an IS and IT to pursue their individual expression of aesthetics or mastery. These narratives, therefore, contain metaphysical concepts that are nested within the IS and IT interactions. By inhabiting a virtual world that transcends the material world (Turkle, 2007a), people are able to do what is impossible in the real world: “moving through objects. Be in two places at once, handle numerical data as though it were physical, and merge with other minds” (Coyne, 2001, p. 64).

These technological engagements are empowering at a pragmatic level to reduce production costs and rehearse outcomes using virtual construction (ARUP, 2005), but also Romantic because they link to notions of creativity, freedom and an holistic unity beyond matter (Coyne, 2001). The techno-romantic version of this focuses on the “degree of absorption into technology that not only the body but technology is transcended” (Coyne, 2001, p. 67). The technology narratives act powerfully because they have a future orientation and by-pass the immediate, physical and bodied, which may break down, be clumsy, or disappointing.

The narratives emphasise the abstract, fantasy and a utopian vision. An example, Figure 3.1, comes from a motor industry advertisement. What is missing from such a utopian perspective of the future and technologies’ contribution to it, is a heavy population, and crowded footpaths and roadways.

Another example comes from Arup’s (2005) advertisement which sells their architectural and engineering expertise and technology, in which the virtual present is a retrospective of the future: “[H]arness the benefit of hindsight” (www.arup.com, Virtual Construction, 2005). Both examples demonstrate how the abandonment of the real and the clumsy, while embracing the technological future, allows transcendence toward freedom and further technological solutions.

Please see print copy for Figure 3.1

Figure 3.1. Toyota Advertisement "Can't wait for tomorrow"

"Imagine a world where cars only emit water. Cities would be greener. No more choking exhaust fumes – instead, life-giving water. Hydrogen Fuel Cells would provide cars with clean, silent, electric power. Bulky engines would be replaced by motors hidden in the wheels, so drivers could enjoy extra space and comfort. It's technology we're developing in our Fine-N concept car. That's why we can't wait for tomorrow". *Toyota advertisement: Can't wait for tomorrow*. 6th August 2005. Good Weekend. The Sydney Morning Herald.

Machines such as audio-visual equipment, or scientific instruments such as telescopes or microscopes, utilise a sensory extension or reduction by altering our abilities to create new measures of what is 'real'. For example, the human conceptions of the universe stem from stars that are more distant from the earth becoming visible by different generations of instruments of telescope, lens, mirror and radio telescope (Ihde, 1973). These are tools for learning that transform our perception and understanding, but, importantly, affect the whole gamut of self-reflections (Turkle, 2007a) and self-understandings (Ihde, 1973). These self-understandings include our experience, the sense of body and competence - the alteration of “one’s ‘I can’ ” (Ihde, 1973, p. 201).

As perceptions of the universe change and become more defined through technological intervention, confidence and competence in technology evolves. This increased competence has an iterative and reflexive component, in that the extensions to human capabilities that are given by technologies further extend the boundaries of what is possible (Barglow, 1994). People engage with computers, systems and technologies as well as reflect on this engagement and the changes they bring, a term Turkle (1984) describes as “the subjective computer” (Turkle, 1984, p. 13). Increasingly, the sensory modality of vision is given a dominant place in the technological world (Ihde, 2002). Some observations cannot be made directly, but such “instrumental mediation …links the body and thus the lifeworld to what is perceived by science” (Ihde, 2002, p. 59). Vision is extended outward via telescopes, inward via microscopes, and in different ways via x-ray, nuclear magnetic resonance, ultrasound images and spectrometers. In science, such “praxis was multisensory and embodied” (Ihde, 2002, p. 59). Phenomena are confirmed by triangulation, nuanced and enhanced by specific techniques, so that these approximations of the life-world are mediated by technology. Technology has created alterations for many of the senses (Ihde, 2002).

In a similar fashion, “technological near distance” (Ihde, 2002, p. 58) perceptions are altered by communication media such as telephony, email, televisual communication and conference calls (Ihde, 2002). Perhaps more importantly to the meaning given to these technology-mediated experiences, is the on-going sense of emotional proximity, despite the technology-altered nature of the encounters. A sense of connectedness, affiliation and community occurs through emails (Karahanna & Straub, 1999) and Internet chat rooms (Coyne, 2001). There is maintained a sense of ‘seeing’ the other person, despite the spatial distance, because what maintains the closeness is emotional proximity (Karahanna & Straub, 1999). Virtual proximity has fuelled the use of short message service (SMS) exchanges, and has had a profound effect on cell-phone sales and use (Norman, 2004).

Information and computer technologies alter with humans' sense of themselves and their position *in* the world, and their hold *on* the world. The human experience involves the outgoing relation from the human to the world, as well as the experience back from the world, that is, the reflective experience (Ihde, 1973, p. 189). There is considerable transformation to our world and our experience of it (Ihde, 1973, p. 201), "…thus the way that the World is perceived and understood affects the way we conceive of ourselves" (Ihde, 1973 p.189). Our experiences *of*, *through* and *with* machines, technologies and IS eventually forms a backdrop, so that they become inter-twined with our whole sense of the world and who we are, and what we can do, and achieve within our world to give a pervasive mastery. In turn, this impacts on "what kind of people we are becoming" (Turkle, 1984, p. 13). This mastery promotes the notion of human supremacy over themselves, over other humans, over the biosphere, and their environment (Ihde, 1983). What is more fundamentally at stake is an account of human importance, and its reflection on instrumentality and how it is applied to the world.

A notion that helped legitimise and strengthen the social hold of technology was its conflation with moral enlightenment (Barglow, 1994). Since the mediaeval period, order was equated with virtue; orderliness presented both method and diligence. Social and technological engineering were associated with inventiveness, productivity, and efficiency; the machine became synonymous with the good life, prosperity order and regulation (Barglow, 1994). These notions have reduced any examination of progressiveness, because machinery and technology are widely viewed as ‘good’. Technology brings prosperity and symbolises discipline and order (Barglow, 1994).

The consequences of emphasising the technical, quantifiable, objective, and factual, (the lens of reality), leads to a reduction in perceived value of ethics. Ethics are simply viewed as being irrelevant. Thus, the tradition of ownership of rights, moral obligations and dignities are no longer afforded to the individual (Barglow, 1994). In turn, the ‘lens of reality’ legitimises technical reason as being sufficient to sweep away ethical considerations, leading to iterative expansion of control of the physical environment. When the value placed on an object or person relates to its utility or function, the respect given to it depends on its purpose or efficiency. The whole world is seen as an object for maximising advantage financially or socially, without compunction, reflection, or reflexivity, and ethical concerns have been reduced (Barglow, 1994). The reasoned-rationalist emphasis on objectivity and objectification encourages the stripping of any special sanctity for humans, who may become objects who serve a function (Barglow, 1994). For example, as individuals come to be seen as a count in an output, as a sales personnel’s productivity or a consumer’s visit to a website, their human attributes are valued for the additional personal information they provide for consumer preferences and behaviour data collected by data surveillance as passive digital persona (Clarke, 2001). In this manner, people are stripped of their humanity, to function as data in consumerism, both as sellers and purchasers. Emphasising the importance and moral righteousness of order, prediction and explanation, along with the extension of senses and competences, accentuates the importance of humans and their technological solutions. With such emphasis, any countering view-points drop from focus.

3.1.3 Identity

Within the contemporary "culture of narcissism" (Barglow, 1994, p. 11) individuals show concern not only for who they are, but also emphasise the evolution of themselves. In doing so, the self becomes objectified, an object to be presented, managed, and re-presented (Barglow, 1994). In this manner, presentation of the professional and personal self becomes a work in progress (Barglow, 1994). The subjective 'I' becomes an interrogator and manipulator of the object 'me', and the notion of instrumentality initially used in regard to machines, is focused on individuals themselves. These notions of malleable selves as a "symbolic product" (Barglow, 1994, p. 21) which has an exchange value and is a commodity, reinforces anxiety about "making something of oneself" (Barglow, 1994, p. 21). The on-going need for personal progress, rather than offering security of the self, unconsciously fuels an emotional response and a sense of ennui, absence, emptiness and confusion (Barglow, 1994). Even among accomplished individuals there is an experience of insecurities, and lack of secure identity (Barglow, 1994). After losing his computer's hard-drive, Harley (2004), a journalist, lost access to his past contacts, notes and broadcasts, and a means of stabilising his identity (Harley, 2004). Harley "loved" his computer (Harley, 2004, p. 283), perhaps as a reliable buddy, but also as the fabric of his life which supported his identity. The laptop was the means of accessing fragmented parts of himself, redeemable in the future.

From childhood onwards, having, and being seen to have, the right professional and personal "accoutrements" (Barglow, 1994, p. 21) becomes important. Media focus on, and representations of, 'perfect' lives of celebrities, for example, reinforce a sense of ambiguity and of the distance between the fantasy celebrity and the ordinary reader whose lives are "too difficult and threatening" (Friedlander-Kahn, 2003). Manipulation in the media, by altering celebrities' photographs and emphasising their lives and their relative importance in the world, continues to destabilise individuals' sense of themselves as intrinsically having entity, being unique and valuable.

The process of self-identity and self-construction has been tied to mastery, and the gaining of control over objects and processes in order to meet one's needs, and moving toward independence and self-determination (Barglow, 1994). But this "individualist credo" (Barglow, 1994, p. 61) is socially inequitable in availability, and fails to deliver security of the self, such that even successful professionals are vulnerable to emptiness, alienation, ennui, loss, and fragmentation due to fuzzy and altering boundaries between institutions, people, roles and machines (Barglow, 1994).

While computer use is rational and offers intellectual and pragmatic advantages, it may disengage the user from an holistic experience of the world (Suler, 2005a). The computer experience is dissociative because it separates the "thinking from the lived experience" (Barglow, 1994, p. 88). In addition, a metaphysical paradox may operate: if computers are so capable even though they lack a controlling agent, then perhaps humans are just information-processing systems which are less capable than computers (Barglow, 1994), and, by inference, less worthy.

In adolescence, the need for identity is strong. Adolescents' computer use has an additional component to pure function: it aids in self-definition and self-creation for self-examination and reflection. Computer interaction can offer companionship without the mutuality and complexity of human relationship. Additionally, there is ambiguity in computer use. The autonomous individual exists with a set of connectedness; however, while on one level IS and IT give control, power and adaptability, they also meter a "*programmed society*" (Barglow, 1994, p. 5 italics in the original) in which the individual becomes the source, as well as the inputter and user of the data. Such dystopia leaves little room for celebration of the self-determined and self-realised individual (Barglow, 1994), because the autonomy is institutional and orchestrated, but also unfulfilling (Barglow, 1994).

Computer-mediated communication can provide increased and different forms of community with people (Suler, 2005a), although they also provide the means of building community with the computer, which reduces the engagement of people off-line and in the real world (Turkle, 1997b). Therefore, the quality and emphasis of relationships in general is altered, and the resulting social outcomes are complex and ambiguous (Turkle, 1997b). One such change may be a preference for virtual interactions, because they offer greater intensity, fewer complications, increased safety, are easier to leave and provide reduced responsibility by reducing the emphasis on "solving real problems" (Turkle, 1997b, p. 244). However virtual interactions may also offer playing with new psychological well-being via the integration of "the multiplicities of selfhood" (Suler, 2002, p. 456). Users negotiate and re-cycle through many aspects and states of themselves in ways akin to working and playing in multiple windows on line, termed "nonpathological multiplicity" by Turkle (1997a, p. 79).

Exploration of the self and identity is visible in any heavy computer use, but especially when either negative or positive emotions are apparent or experienced, or the computer is thought of as "more than just a machine" (Suler, 1998, p. 7) because it offers companionship. Computer addictions occur when computer use becomes an unfulfilling substitution for missing components in the user's real life. Computer interaction can "offer companionship without the mutuality and complexity of human relationship. They seduce because they offer greater levels of control, but they can trap people into an infatuation with control, with building one's own private world" (Turkle, 1984, p.

19). The games café world is a world-wide phenomenon that is expanding rapidly at 25 percent per year (Austin, 2001). Games café “are absolutely everywhere” (Sieling, as cited in Austin, 2001, p. 4), though mostly hidden from view. Gamers are not easy to interview, “they are quite literally in a world of their own, wearing headphones and reluctant to take their eyes from the screen in case they are cut down in a hail of bullets, or overrun …” (Austin, 2001, p. 4). Gamers are attracted to the creativity, excitement, unpredictability, and the lateral thinking required to solve previously unmet problems. They may become regular players, playing for hours, and up to ten or more hours continuously (Austin, 2001). It is addictive, with some games likened to “crack” (Austin, 2001, p. 5), destroying interpersonal relationships and physical fitness (Moses, 2006). The over-use of computers and computer games allow the distortion of identity, and users seek competence and mastery of increasingly more difficult games, either as means of intrinsic regulation or introjection or identification regulation. Therefore, overuse occurs for personal pleasure or to impress others (Ryan & Deci, 2000).

While utility and perceptions about the importance of their computer use have a primary influence on people’s intention to use computers, the playfulness and enjoyment offered by a computer system influence the acceptability of useful system (Davis, Bagozzi & Warshaw, 1992). Perceptions of playfulness and the enjoyment that an IS offers influences peoples’ intention to use computers. Usefulness involves performance outcomes, while enjoyment is the process of using an IS (Davis et al. 1992).

Technology enables changes to occur in social and economic structures, so that enterprises previously unrelated become linked. The post-industrial period has seen shifts in how economies and their decisions processes operate (Barglow, 1994). Corporations have replaced small business firms, and have become influential by way of funding research and university facilities (Sheehan, 2003), as well as sponsoring the arts and public facilities, which results in the melding of “military-industrial-government-university-media-medical complex” (Barglow, 1994, p. 74). Such economic transitions have also brought about adjustments and reshuffling within organisations, as they shift to economic rationalisation. These strategies have unsettling consequences for workers for whom work practices, colleague networks and identity frequently alter, and people ‘interface’ with different workers and technologies with on-going changes (Barglow, 1994).

However, social and class structures remain, and traditional power and elitism is maintained by the limitations to the technological access given (Turkle, 1997b). Technologies exacerbate the tensions between the experiential and subjective ‘I’, and roles that people perform, to increase the separation of the sentient, the emotions, and the bodily, from the scientific, reasoned, procedural and systematic. This model presents humans as computers who are “detached, ownerless, cognitive processing, the machine [which] symbolises an *absent* subject” (Barglow, 1994, p. 89, italics in the original), placing further strain on the selfhood. Barglow (1994) illustrates this point with the existential dream of a programmer who fears she is as invisible in real life as she is to the software user. She also fears she may live in virtual reality, and, consequently, not exist. Indeed there is evidence that the programmer is “psychologically invisible” to the user (Nass et al’s study, 1997, p. 156). Barglow (1994) argues that an alteration in perceptions about the post-industrial world has come about as a result of philosophical and psychological reflection on the relationships that humans hold with technologies, and the synergies that result. In using technologies other than computers, humans retain their sense of subjectivity and can clearly hold their definition of what it is to be human. Other technologies do not challenge humans’ sense of agency, self-perception and identity in the way that IS and IT do (Barglow, 1994).

3.1.4 Transparency

During the initial phase of learning to use a technology, an individual’s interaction with it is sensory and relatively opaque. The experience is cognitively taxing, and the interaction is complex and effortful. However, as learning progresses, the nature of the relationship changes. While the skills are being learned, the attentional demand is focused on strengthening associations between the stimuli and appropriate responses (Mitchell, Hopper, Danials, George-Falvy & James, 1994). During this period, individuals’ sense of their self-efficacy increases, and they judge a task to be simpler and faster. Increasingly, their perceptions of the context and task characteristics are less emphasised in favour of their motivational and affective responses to it (Mitchell et al. 1994). Well-routinised experiences with a technology increasingly make the task transparent, as schemas are built (Norman, 2004). Such transparency is sought in technology use (Friedman & Kahn, 1997), so that the embodiment with the technology has no sense of mediation. At best, this becomes an immersive experience (Coyne, 2001).

Humans use many devices, some of which are relatively concrete, such as a hand drill, while some are relatively abstract, such as mathematical language. Interactions between people and machine “develop depth of feeling and involvement” (Turkle, 1984, p. 7). A simple tool such as a hand drill may be experienced as balanced, smooth operating, well-oiled, or difficult to turn and rusty. Such tool usage is primarily sensory, and the interaction remains different to that of the individual’s use of mathematical formulae, which is mental. The resistance of the wood is felt at the end of the drill, such that the experiential focus is not at the hand/drill juncture, but is at the drill/wood juncture (Ihde, 1973). Thus, the machine is a means of experiencing the world: it is transparent, and the machine is embodied within the experiencing person. Human-machine learning covers a broad range of interconnectedness (Ihde, 1973), from the embodiment relations of tools such as drills or saws used in technical contexts, or paint, clay or bronze in art contexts, through to the other end of the continuum and the "opacity relations" of computers and mathematical calculators (Ihde, 1973, p. 201). Tools commonly perceived transparently are cars, boats and hand tools (Barglow, 1994). One example that Ihde (1973) gives for this "World *through* transparent machine" (p. 191) phenomenon, is driving a car. When one drives a car one feels the car / road surface juncture, and the adhesion of the tyres in cornering, as well as an emotion "a reflective enjoyment" (Ihde, 1973, p. 191) of the human-machine phenomenon. An illustration of this opacity-to-transparency gradient is learning to drive a manual car. The combinations of hand manipulated gears, and three foot-pedals, along with steering control, are difficult to co-ordinate (Ihde, 2002). Successful co-ordination produces smoother gear changes and higher gears and speeds, along with exclamations of positive affect "Awesome!" (Ihde, 2002, p. 137). With practice, the co-ordinated movements become routine, the process of negotiation with the road and the environment transparent. The driving becomes so easy it is invisible, driving is automated by schemas, and attention generally can be turned to other matters while driving (Norman, 2004). Because driving relies on this built expertise, it requires little skill most of the time, but this under-prepares drivers for dangerous situations that will predictably occur during a driver's lifetime (Norman, 2004). Only when such schemas fail to account for the events as they are unfolding for the driver, when an error occurs (Norman, 2004), or there is a fault in the car, does the opacity of the human-car interaction return: the car becomes an object to be related *to*, rather than *through* (Ihde, 1973). This change ends the transparent driver-car relationship (Ihde, 1973).

The relationship transforms, from a first phase where the machine is an object to be related *to*, which is effortful and opaque. In the second phase, the machine is an object to be related *through,* and seems intuitive and transparent. This is direct and explicit learning that requires linkages to conceptual and ideological knowledge bases. Adept users of a machine have decreased their awareness of their competency, and the transformation they have undertaken (Ihde, 1973). Indeed, a well-designed computer interface should disappear (Friedman & Kahn, 1997). Additionally, the nature of some machines places them in relations such that individuals ‘converse’ with the machine, and the machine becomes an ‘Other’ (Ihde, 1973). Within the human-computer interaction, the relationships occur *with* the computer, to form a “conversation … and the machine emerges as a quasi-Other” (Ihde, 1973, p. 196). At an emotional or visceral level, humans attend to what the computer “says” in response to their interactivity with it (Ihde, 1973, p. 196). How machines are experienced forms part of a person’s reflected and reflexive self-experience (Ihde, 1983; Turkle, 1997a, 2007a). The machine as an ‘Other’ becomes integrated with the “whole sense of the world” – so familiar that it is taken for granted (Ihde, 1973, p. 196).

Human experiences *of*, *through* and *with* machines eventually form a backdrop, so that they become inter-twined with their whole sense of the world and who they are, and what they can do and achieve within their world (Ihde, 1973; Turkle, 1984, 1997a, 2007a). This is experience *among* machines (Ihde, 1979, p. 56). Successful technology “does not call attention to itself, it ‘withdraws’ in use” (Ihde, 1983, p. 52). In its idealised form, perfect technology offers functions that are phenomenologically non-technological; offers capabilities that are omnipotent, beyond human (Suler, 1999); and supports a human “wish to be godlike” (Ihde, 1983, p. 52). But in doing so, the considerable transformation of the world, and the human experience of omnipotence only as a result of technology, are made less visible, and offer false reassurance.

3.1.5 Perception of Competence

Another set of meanings possible for an individual during his or her interaction with an innovation or technology is based on competence, and is linked to the transparency-opacity gradient. The level of competence from learning and mastering a technology is via building propositional knowledge bases through procedural and sensory-motor actions. Recombinations of knowledge bases are assimilated (Gallivan, 2001) and infused (Cooper & Zmud, 1990). Thus "knowing that" is built from "knowing how" (Warren, 1998b, p. 16). As learning and transparency progresses, and the interaction become intuitive, the depth of the learning gone before is masked (Ihde, 1973, p. 197; Mitchell et al. 1994; Norman, 2004). The mastery of procedures, equipment and conceptual frameworks can change the meanings for the action, and how and why it is performed. Mastery may be concerned with control or achievement. Mastery may also be concerned with social or material competence of an external entity (Barglow, 1994), or of internal processes of self (Barglow, 1994; Warren, 1998). This describes a process of 'activity to thought' and "practice to theory" (Warren, 1998, p. 138) in other words, of praxis (Warren, 1998). The active struggle during learning requires work. However, Deci and Ryan (1985a) note that this struggle is intrinsically enjoyable and optimally includes the process of flow (Csikszentmihalyi, 1997). When an activity is reflected on so that the reflection forms an interpretation of the world, it may guide on-going transformations and actions (Warren, 1998; Bandura, 1989). The rumination or reflection on stored meanings, which may be included in self-reflections, may become a pivot for motivations and values (Warren, 1998). Feelings, mental energy and attention are significant parts of these processes (Csikszentmihalyi & Rochberg-Halton, 1981 as cited in Norman, 2004). In essence, as perceptions of competency build, learning increases further increasing competency. As perceptions of competency increase, this leads to actual competency and resilience to setbacks (Bandura, 2001).

3.1.6 Congruence

A component of the set of meanings that need to be established during the innovation or technology's acceptance is the congruence it holds for the potential adopter (Klonglan & Coward, 1970). Adoption is facilitated by congruence with individuals' past experiences, the embedding culture and their milieu, and values (Lansing, 1987). For example, car ownership and driving offer symbolic meanings such as power, autonomy (Barglow, 1994) and independence, as well as explicit transport advantages. Car use and ownership may be high because these meanings are congruent with initiation into adulthood (Rice, 1999). Another example concerns magic and technology. Magic and technology have similarities: the desired outcome is seen in an idealised form which is brought about by distancing from natural laws and human limitations although this distancing by magical incantations in the former, and scientific evolution in the latter (Rapp, 1981). Personal computing power is still linked to magic by virtue of images of wizards and the mediaeval (Coyne, 2001). In addition, the "modern spirit …characterised by a ' striving for infinity' " (Rapp, 1981, p. 97) enabled the development of technology by virtue of increasing personal autonomy and rationality, secular thinking, and valuing of creativity (Rapp, 1981). Again, the congruence required for adoption (as described in general terms by Lansing, 1987) relates to individual users' past experiences and values. Individuals' past experiences are likely to include autonomy and independent use of computers. As well, they are likely to have experienced the embedding computer culture. Computer culture includes games, animated assistants and computer parts that offer images and language about "spiritual guides", infinity, and "higher states" of unity with computers (ABIT, 2005, see Figure

3.2) and alternative worlds, power, magic and wizards (Leadtek WinFast PX6600, see Figure 3.3).

Please see print copy for Figure 3.2

Figure 3.2. Users Manual from ABIT Motherboard.

> "The ABIT uGuru technology allows end-users to reach a higher state of hardware performance, stability and service. ABIT uGuru acts as a spiritual guide, sharing with ABIT users, tips for hardware monitoring, over-clocking, BIOS flashing and audio tweaking functions in an easy to use, Windows-based interface. The ABIT uGuru family currently includes four major categories: 1. ABIT EQ, 2. ABIT OC Guru 3. ABIT Flash Menu 4. ABIT BlackBox" (2005).

Please see print copy for Figure 3.3

Figure 3.3. Packaging Box for 3D Card Graphics processing unit by Leadtek.

> "Leadtek: We Make Dreams a Reality. WinFast PX6600 GT TDH Extreme Version 128MB DDR3. "WinFast PX6600 GT series delivers extraordinary new technologies that streamline the creation of stunning effects in games and other 3D real-time applications. The revolutionary technologies power worlds where reality and fantasy meet; worlds in which new standards are set for visual realism and quality, performance, and video functionality". (2004, 3D card purchased 2005).

3.1.7 Symbolism

Symbolic meanings are given by humans innately (Gardner, 1998). Therefore, technology experiences and interactions are given symbolism. The creative experience in IS use can be from the outputs and productivity gain as well as the engagement with an interactive and attentive 'Other' (Suler, 1998, p. 7). 'Flow' and cognitive absorption is experienced with IS fantasy games such as Riven and Warcraft (Moses, 2006), as well as for other software systems (such as information searching using Google search engine) geared to productivity. Reliability is an important component in the trust relationship people build with technologies (Norman, 2004). Therefore, a metaphor that computers can be assigned, is of a trusted partner (see Figure 3.4 for an example).

Please see print copy for Figure 3.4

Figure 3.4 End cover of users manual from ABIT Motherboard (2005).

Attachments to objects are strong and commonplace, and can arise for three reasons: symbolism, utility and beauty (Schultz, 2000). Objects such as cars and computers take on symbolisms beyond their function, and represent more than their utility value. For example, the makers of Apple computers are different to their competitors in their understandings of the unconscious forces at work within individuals' acceptance of computers and systems. The original iMacs were bright lolly-coloured, offering a tacit but unambiguous lolly metaphor. Sweets are attractive, easily available, trusted, ingested, and assimilated. These iMac computers were also literally transparent. This metaphor has worked very successfully, with brightly-coloured "fruit-flavoured" or "jelly bean" (Barker, 2002, p. 14) all-in-one machines boosting Apple stock 400% within two years (Barker, 2002). This light-hearted appeal worked against iMacs for business contexts (Norman, 2004).

Enhanced status may be given to the ownership or use of an innovation, where fads and fashion can occur, for example, for clothing (Rogers, 2003) just as much as for technologies such as cars (Barglow, 1994) and iPods. Cars can present as symbols for distinctiveness, charisma and social standing (Barglow, 1994). Cars can also appeal to our sense of what is beautiful or stylish (Barglow, 1994), to elicit emotional responses (Norman, 2004). Cars are bounded and self-contained, comfortable inside, and thus exaggerate the contrast to an alien and hostile outside (Barglow, 1994). They are technical cocoons (Ihde, 1979; Ihde, 1983). Cars are so protective of the weather elements that motorists fail to appreciate their vulnerability to storms and subsequent flooding, making drowning deaths in cars the primary cause of deaths in floods (www.illinoisfloods.org). Car cocoons are individualised, and enable the mental freedom for concentration and reflection, and for cognitive and emotional mental processing (Csikszentmihalyi, 1997). Additionally, while cars are symbols and objects of power and "invincibility", they afford anonymity for the driver: a potent mix that may account for higher rates of adoption in the USA than population increase (17% in comparison to 10%) (Rice, 1999). Cars are given names, indicating a subjective and emotional response, perhaps because they afford protection, and a reflective mental space (Csikszentmihalyi, 1997). They support the notion of autonomy, and the individual's expression of it (Barglow, 1994), as well as metaphors of destination and self-driving agency (Barglow, 1994). They give expression to a driver's power, speed and mastery (Barglow, 1994). Cars, therefore, can carry symbolic meanings that extend their functionality. In a similar way, computers also extend their functionality to include the emotional responses they elicit.

Schultz (2002) describes the reasons for his love of his Mac computers. Attachment firstly can spring from the object's symbolic meaning, and hence the value placed on it, e.g. Schultz's (2000) wedding ring, which represents lasting love and commitment. Macintosh computers differ from PCs because they symbolise for Schultz (2000, p. 4) "bigger terms …[like] creativity, simplicity, quality, counter-culture values, thinking different, iconoclasticism, nonconformity”. The Mac’s utility offers another source of symbolic attachment: its instrumentality is valued (Schultz, 2000). Increasing the functions, productivity, roles, assistance and simplicity increases its value, so that the Mac also “symbolises rational values” (Schultz, 2000, p. 4). Macs are beautiful: “they look good and feel good” (Schultz, 2000, p. 4). Symbolism, utility and beauty also may have an interaction effect. The sensory and tactile qualities, as well as the subsequent emotions, are valued (Norman, 2004). Objects that allow connections between thinking and ideas may become “passionate life companions” (Turkle, 2007a, p. 51).

3.1.7.1 Metaphysical Aspects of Technology

The metaphysical, although ostensibly not connected with IT, is tied to the use and work of, and reflection about, IS and IT. Themes of the metaphysical underlie IT. Contrasting themes occur. The ‘real and sensory’ is distinguished from, yet still merged with ‘fantasy, mind, soul, creativity and beauty’. For example, the external computer tower and keyboard is both real and sensory, but may also be cased with a theatrical and whimsical motif-ed external shell. The hardware is essential to the users’ phenomenological experience of cognitive engagement with the software. The theme of the ‘pure versus the carnal’ describes the ‘freedom,’ ‘connectedness’, ‘understanding’, and ‘immersion in information of electronic data’ that can benefit or harm. The possibilities for ‘order as well as disorder’ underscore IS and IT narratives that are comprehensive and powerful (Coyne, 2001, p. 15). Management information systems are built to capture and manage data to improve order, but are subject to failures. These themes are versions of the two metaphysical traditions of the material and the ideal (Warren, 1998a). The dualism in these recurring metaphysical themes helps give IS and IT credibility, even though IT outcomes often are projective and ambiguous (Coyne, 2001). Computers offer openings to other worlds (such as the Internet and games) and other on-going linkages (such as hyperlinks), with new information, images and potentialities, which offer both connectedness (e.g., to ideas; to virtual realities and other users; to possible selves), disconnectedness (e.g., with reality; with the immediate and proximal; and present identity) (Coyne, 2001), and juxtaposition of unlikely elements in a way that is surreal and draws on absurdist traditions (Coyne, 2001). Computers and the Internet provide wide contrasts in informational content, from government or academic works to the bizarre or absurd, which is uncensored (Sheehan, 2003). The disconnection also offers anonymity, ethical detachment (Bandura, 2002; Suler, 2005a), anonymous pornography and paedophilia, prostitution, theft, deformation and plagiarism (Giussani, 2003; Sheehan, 2003). Computer games offer terror and safety (Coyne, 2001), virtual death, excitement and mastery (Austin, 2003). The orderliness of prediction and explanation that is offered by computers and IS and used for better control has an empiricist basis (Coyne, 2001). Computer modelling was thought to offer comprehensive solutions for planning, and prediction of current situations into the future (Coyne, 2001). Closer prediction would allow better economic and political decision-making, so these rationalist systems-theory approaches were seen as critically important (Coyne, 2001). However, they have been found to be inadequate, and have been updated to more complex, interconnected network systems, which in turn, require even more use of communications technologies (Coyne, 2001; Grant, Hall, Wailes & Wright, 2006). Both the rationalist messages centred on ‘organisation’, and the Romantic, centred on ‘freedom’, flourish in IS and IT cultures, and flow on to institutions and end-users. Society is required to adapt to the new generation of technologies that are “formed beyond its powers of knowledge or control” (Barglow, 1994, p. 15), such is the pervasive power of technological culture and outcomes.

3.1.7.2 Scientific and Technological Hegemony

As well as these dualist metaphysical themes of fantasy and reality, there also operates an invisibility. Because of humankind's propensity to make ordinary any experience, the interaction between person and machine becomes natural and invisible. Part of the impact of technology is its invisibility in shaping people's experience of the world (Ellul, 1954, as cited in Warren, 1998b). This limits the insights delivered by science and technology because they remain bounded by their domain, even if they concern reality (Heidegger, 1977). The technological familiarity means that people may "not critically reflect on its meaning for human life" (Ihde, 1983, p. 11), especially when interpretation is mediated by dominant experience (Ihde, 1983). Familiarity with the Internet and the connections it provides for commercial transactions, emails and chatrooms, for most people hides other potential negative outcomes. Poorer quality social interactions, on-line identity misrepresentation and identity theft, as well as subversive surveillance and flawed data surveillance (Clarke, 2001), are possible negative consequences. Choices to engage with technologies reduce the attention and time that can be allocated to other pursuits (Lee, 2006). So attending to computer games, for example, detracts from physical activity and sport (Moses, 2006). Peer groups may support such decisions, as people find gaining mastery of computer games enjoyable, offering status and skills, which are intrinsically and extrinsically rewarding. In comparison, bushwalking, for example, may appear irrelevant and offer few validated extrinsic rewards. By simply following the decision paths of subjective norms and peers, people reduce other sources of information (Rogers, 2003) so that the decision appears natural. This means that other potential understandings are hidden. Any unquestioned and unquestionable 'naturalness' represents an hegemony (Gramsci, 1965/1975 as cited in Warren, 1998). The pressures for an advanced technological life are perceived only at an unconscious level, but contract people's abilities to understand the "real state of affairs" (Marcuse, 1941, 1955/1969, 1964/1970, as cited in Warren, 1998b, p. 130). Returning to the bushwalking example: when bushwalking is seen as irrelevant, then natural environments, by association, can become perceived as less relevant also. In comparison, computer games offer procedural tasks, technical competence and useful outcomes, but also encourage an instrumentalist way of thinking.

Heidegger (1954/1977 as cited in Warren, 1998a) argued that technology-human interactions condition human thinking towards calculative, rather than meditative, thinking. This calculative emphasis focuses on the trivial, the everyday, and is instrumentalist. Utilitarianism focuses on cost-benefit analyses for maximising economic benefits for an individual or organisation, and often features technologies, technological competence and solutions. Technologies are often an intrinsic part of instrumentalist contexts. Instrumentalist perspectives de-emphasise meditative thinking, and disengage people from thinking about costs which may be broader and less well defined. Part of that which is disengaged from, are activities that do not support a strong sense of identity and a sense of community (Barglow, 1994). Technical competence is built, but such competence does not support a broader sense of purpose or fulfilment (Barglow, 1994) and an achievement orientation emphasises independence and narcissistic goals. Such orientation moves people away from an integrated sense of self-knowledge that is rooted in "intrinsic predilections and integrated values" (Deci & Flaste, 1996, p. 136). Power and achievement and career orientation vary with individual differences (Gandal et al. 2005). Human values that emphasise self-enhancement occur in economics students, even before they begin their study or training towards a career path as financial advisors and policy makers (Gandal et al. 2005). The drive to succeed, and valuing extrinsic outcomes, becomes the context of “a society that is always shifting underfoot” (Deci & Flaste, 1996, p. 137). As such, even learning in modern institutional settings has increasingly emphasised extrinsic learning, so people have become accepting of external motivation and rewards (Ryan & Deci, 2000). Modern technologies are qualitatively different to those which are older, in that the modern are more infusing and projective (Turkle, 1997b), as well as intrusive and dominating, and at their worst, nihilistic (Heidegger, 1977). This is a shift away from an existentialist and metaphysical perspective, in which a shared social world is seen as integral to human well-being views (Barglow, 1994). In a cyclical pattern, the instrumentalist perspective places an emphasis on rationalism and technical competence, which, in turn, encourages a utilitarian and instrumentalist perspective which stresses the notion of advantage (Barglow, 1994). Models of organisational and social structures that are based in computer models and rationalism are utopian, and reductive of the human component (Barglow, 1994).

Dominance over nature is a common industrialised theme, and controlled environments are sought in buildings and vehicles. Ironically, these are also sought in recreational vehicles that intrude into natural environments. These smaller versions of “technological cocoons” (Ihde, 1983, p. 21) highlight a contemporary existential praxis that aims to subdue nature, even when engaging with it (Ihde, 1983). The utopian perspective that has framed the call of progress from “naïve progressivism of previous centuries” (Ihde, 1986, p. 80) which favoured technical solutions, has begun to founder, because of compounding ecological and global problems (Ihde, 1986, Henderson, 1996). Ultimately, Ihde (1986) concluded that technology is non-neutral, and that both utopian and dystopian perspectives are mere trajectories that are reductive of the real complexities that accompany technology engagement.

3.1.7.3 Digital Narratives

A form of symbolism nested within the technological solutions that have been found for everyday and real problems, is that of the digital narratives. Digital narratives describe four contexts of the digital age, but each expresses variations about unity: virtual communities, virtual reality, artificial intelligence and artificial life. Virtual communities express their unity as tribes through the network of communications, of email, on-line-chat, computer role games, and video conferencing (Coyne, 2001). Virtual reality expresses unity as the immersion in cyberspace, virtual landscapes, and architecture, where people meet and converse with other people, and try out different identities while evolving toward the ideal. Virtual reality describes immersion and engagement. Artificial intelligence describes the unity between human and machine, and the match between mind and computer. Artificial life describes the evolving decentralised holistic behaviour in artificial organisms towards a unity (Coyne, 2001, p. 3).

The digital narrative framework is underscored by both romanticism and rationalism (Coyne, 2001). Romanticism involves metaphors that link ancient, mediaeval or magic with IS and IT (Coyne, 2001), while empiricist metaphors suggest order, orderliness, and replication to acquire virtue (Barglow, 1994). Computer software, hardware and network connections are, because of their complexities for most users, unknowable, “labyrinthine … ‘black boxes’ [which are] even unpredictable and irrational” (Coyne, 2001, p. 38). Cyberspace is “ineffable and contradictory” (Coyne, 2001, p. 52). IS and IT narratives also include Internet connectedness, the power of words and languages, shamans, mediaeval-based computer games, sensual pleasures and ecstatic experience. They are based in hierarchies, power, magic, wizardry, irrationality and chaos, as well as orderliness, and rationality, which potentiate by linking to well-known cultural mythologies and symbolic understandings (Coyne, 2001). The ability for categorisation and order of, for example, models of prediction, using IS and IT, is rationalist in tradition. However, when this encyclopaedic tradition is used to make accessible a mix of the bizarre, of pictures of the grotesque or pornographic, mediaeval carnivalesque or sideshow displays using the vast electronic resources of the Internet, the technologies offer access to the irrational as well as the rational (Coyne, 2001; Sheehan, 2003; for example see the Cornell University website, 2003). Some early computer games had mediaeval tone, and metaphorically linked the church and religion, chivalry, feudalism, serfdom with the occult or sorcery. These links bring together rationalistic and scientific explanations of the natural world, with magic. Such games as Myst and Riven were designed to encourage computer engagement with “the non-intimidating, whimsical and fantastic worlds” which would “create not only a new world, but a different way of seeing environments, puzzles, and in a bold move, the way people viewed computer games as a whole” (Cyan Worlds, 2005).

> The mediaeval world of IT is a flirtation with the irrational and the other, continuing the Enlightenment and romantic tradition. Having defined what is certain, sure, and reasonable, the Enlightenment manufactured and promoted the unreasonable, the vast array of human experience that it was forced to leave out of its reflections, appropriated, enhanced, redefined, and repackaged by the culture of the romantic (Coyne, 2001, p. 40).

As such, IS and IT links with idealism. Components of this romantic-idealist reference that frames IT are the unity of the mind and machine, and draw on software-mind metaphors and speech. Computers are affecting how people view “concepts of animate and inanimate, conscious and not conscious" (Turkle, 1984, p. 16). There is an assumption of humans inhabiting an internal world, the 'command central' or the agent in charge, and it is presumed that inanimate objects do not have a "center of subjectivity" (Barglow, 1994. p. 81). There is much borrowing of computer language to describe human thinking, and the reverse, implying that: humans are information systems. Examples include that thinking is carried out in 'hardware'; that humans have, and use, a 'buffer', which needs clearing; that there are "default solutions"; that "emotional problems are errors that we can extirpate" (Turkle, 1984, p. 17); and that brains are "hard-wired". These examples describe specific cognitive functions located in the brain. Schultz, (2000) suggests that perhaps the brain is a neuro-chemical machine, and that mind is to brain as software is to hardware. Language such as "wetware", "input, feedback [and] information system, [and] intelligence" (Barglow, 1994, p. 14) and " 'word-processor' as the person, software and the device on which it runs" (Barglow, 1994, p. 14) demonstrate the joint subjective-objective unity of human beings and machines, where humans approximate machines and machines mimic humans. An emphasis on the holism of the mind – spiritual connection celebrates with 'cybernetic rapture' the communication of shared thoughts and information (Coyne, 2001). The description of the motherboard that ABIT predicts will act as a "spiritual guide" (Figure 3.3) refers to both idealism and androids. The capacity to be unimpeded, creative and imaginative celebrates the freedom from the material and natural world of physical body and time, place and state (Barglow, 1994; Coyne, 2001; Leys, 2000). The notion of unity is also portrayed in IS and IT utopias as the interconnectedness of the World Wide Web, and virtual communities with increased and egalitarian communication and closer community. An on-going conflation of possibilities and actuality (Coyne, 2001), along with confidence in the possibilities of technologies, their development and their solutions, distorts the current technological reality towards a fictitious unity with the future.

Digital narratives also extend the use of the Romantic notion of unity to include the ‘post-human’: the person-machine. Androids and Sci-Fi’s post-humans blur the boundaries between man and machines even further. Familiarity with such fiction extends notions of self-determination, sentience, and desires being accorded to special machines e.g. Data from ‘Star Trek: The Next Generation (Jonson, 2003). Even when projections of the future have proved to be inaccurate, they predispose audiences to accept new views and mix the present and the future. Such conflation is typical of technology narratives and their quest for unity (Coyne, 2001). The AppleMaster program was designed to link the “best and the brightest … under the banner of ‘the merging of today’s minds with the minds of tomorrow’ ” (Leys, 2000, p. 4). These narratives may impact on how users approach IS and IT, because they are represented as offering simplicity, freedom, connectedness and improved capabilities and knowledge resources.

The praxis and work of IT is, on one level, pragmatic. IS and IT reports focus on acceptance and use. They are undertaken within specific IS and IT or digital contexts such as email use, CAD design, 3-D art (macspeedzone.com, 2001), music software (Leys, 2000) or user interface usability. However, they also are suggestive of an abstract quality about the reasonableness or desirability of the IT experience or outcome.

> “PowerBook G4. The heart of a supercomputer. The body of a spacecraft. The spirit of Apple. The new PowerBook G4 packs a Power PC G4 processor with Velocity Engine and a breathtaking

> wide-screen display into a thin, light futuristic design. PowerBook G3: A new breed of portable" (Apple, 2001).

The overt message is about power: "Power to burn" (Apple, 2001). The covert message is about merged human-machine boundaries, and the fit between human and technology. The shift to wearable user interfaces is the augmentation of human intelligence and human-computer symbiosis, to reduce bodily clumsiness and cognitive limitations (Billinghurst & Starner, 1999). The assumption that underpins these devices is technologically utopian: the users' cognitive or emotional movement towards unity. This unity may be with the software or hardware (human with machine), or with other humans (human with other humans via machine). According to its advertisement, the Apple PowerBook G4 has a heart, body and spirit (Apple, 2001) suggesting it is android. Virtual contact with a community of like-minded others, such as co-workers or friends (Agarwal & Karahanna, 1999), potential lovers (Clay, 2000), or political rebels (Romm & Pliskin, 1998) via email in cyberspace, is idealist in that it removes bodily considerations of location or physical disability (macspeedzone.com, 2001). As such, even empirical IS and IT reports have a symbolic component that is idealist.

3.1.8 Consciousness

In addition to the '*to* and *through'* aspects of human computer interactions (Ihde, 1975), there is a tendency by users to *project* their way of construing other people into their computer interaction, that is, of seeing others in, and building others into the interaction. It may be that these apparently wispy notions prevail in a relatively functional determination of how, and to what extent, individuals (end-users, trainers, super users, and designers) use and *see* the utility of tools and computers in their lives. A participant in Lloyd's (1998) research described a computer as being helpful but annoying, just like her mother. “[I]t types up your assignments …nice and neatly …but sometimes it won’t do what you want it to, it’ll move stuff around and you don’t know why it’s done it. That’s what my mother does, she’ll move stuff around and I don’t know where she’s put it” Lloyd (1998, p. 39).

Additionally, hidden behind a person’s use of a technology is his or her decision to use it. Hidden behind this decision to use it is a notion of their ideology towards that technology. For example, a person who has dystopian beliefs concerning technology may have a predisposition toward symbolic rejection of a technology. This position may become exacerbated when the technology use is mandated. This focuses on only conscious decisions to use technology. However, unconscious processes have important input. **“**Your conscious life, in short, is nothing but an elaborate post-hoc rationalisation of things you really do for other reasons” (Ramachandran, 2003). Rationality, sanctified by scientific process and supported by technology, its evolution and unfolding emphasis on utility, only deals with part of the human-computer interaction. The other, largely-dismissed component, is the unconscious relationship that humans build with computers.

3.1.9 Eroding Boundaries

One metaphor given to the human body is that of a machine (Descartes, as cited in Barglow, 1994). Descartes separated the mind from the merely mechanical body, and liberated the mind to be centre of autonomy and freedom or creativity (Barglow, 1994). Thoughts become the vehicle of the more “essential self” (Coyne, 2001, p. 24), amenable to fabrication and re-fabrication, which can be more broadly communicated via IS and IT. Computer technology is a vehicle to ‘create’ outputs, which, on the one hand can be ordered and procedural, but also can be achieved in multiple ways, and individualised and unique.

A person’s interaction with a computer system may have abstract and sensory components. It fosters a more symbolic relationship, different to cars, because the interaction occurs on the keyboard and mouse, literally outside the box, but at the same time within the computer, screen and the user’s experience of the interaction, in that, it is immersive (Coyne, 2001). Computers are the “carrier of mythology that articulates and conceals how the world is put together” (Barglow, 1994, p. 2).

> …we are shaped in relation to the devices we create and manipulate… What changes from one cultural or historical context to another is not the existence of reciprocal relationships between instruments and their users, but the forms that these relationships assume. Even within a single context, this dialectic of subject and object does not unfold in the same way for everyone. Personal identity formation is an individual matter, as are the varieties of empowerment and disempowerment that we experience in relation to the machines that serve us and that sometimes we serve. (Barglow, 1994, p. 2).

But computers pose even more complex problems as objects to be related ‘*to’* and ‘*through’*. One of the difficulties faced by IS and IT researchers is that computers appear to elicit concrete and abstract interactions within end-users, and appear to have an unconscious or even projective component in their use. Whereas cars have their boundaries strongly defined, computers blur boundaries. The “eroding boundaries [include those] between the real and virtual, animate and inanimate, and the unitary and multiple self" (Turkle, 1997b, p. 10; Charles, 1999). These erosions occur in scientific endeavours such as Artificial Life (A-Life), and computer-neural interfaces, as much as individual users trying virtual identities in Multi-User Domains (MUDs) or projecting human characteristics into their computer. Turkle (1984) gives an example of a grade Six student, Tanya, who developed a special and individual writing relationship with 'her' classroom computer which she had named Peter. She identified with Peter's learning, "heard it within her 'ears,' felt it in her 'fingers' and 'emotions' " (Turkle, 1984, p. 125). IT effaces the boundary. Computers do not affirm the inside / outside dualism because the physical dimension of the computer is not central to the experience of the user (Barglow, 1994).

Eroding boundaries are clearly evident in the digital dreams described by dreamers. Dreams are "imagery during sleep" (Reber, 1985, p. 216), and perhaps offer symbolic representations of motivations and meanings (Reber, 1985). Digital dreams include confusing juxtaposition of human, animal and technological elements, movements in, out and within computers and computer code languages, as well as simultaneous multiple locations and relationships (Wilkerson, 2002). For example, Dreamer Gina wrote of her dream involving a multiple-layered relationship: online with Warlock in a chatroom, and with Scott living next door, and the fusing of these two identities as they communicate synchronously with her, via typing and speech, to rescue her from a fire (Wilkerson, 2002). As well, dreams blur boundaries about cyberspace and the real, for example an anonymous dreamer who enjoyed using the 'delete' key from their keyboard to delete household items (my spiffy delete key, Wilkerson, 2002).

Humans inhabit an internal and subjective world, view their 'command central' as the agent in charge, and presume that innate objects do not have such a centre of subjectivity (Barglow, 1994.). "The model of the computer as capable of performance without a performer clashes head on with our view of ourselves as ultimately being in control" (Barglow, 1994, p. 90). Within Western thought (which springs from Judaeo-Christian roots) individual subjectivity and agency are strong notions and cultural forces (Barglow, 1994).

The boundaries between what is human, in contrast to non-human, have become blurred. The boundary between what is animate-inanimate maintains that the animate has something that is special. There is more to human beings than machines "they've got a sort of *flame* inside them, something alive, something that flickers unpredictably, wavering, uncertain – but something *creative*" (Turkle, 1997b, p. 155). The qualities that remain unequivocally human are those of "emotions, bodies and an intellect that cannot be captured in rules" (Turkle, 1997b, p. 177). Plasticity in how the cerebral cortex performs tasks and the adaptability of neuronal connections, are some currently unresolved differences between the mind and advanced microchips (Fox, 2007). However, the separation of AI (Artificial Intelligence) and A-Life from real life is becoming less defined (Coleman, 2006; Turkle, 1997b). AI develops "smart artefacts" (Turkle, 1997b, p. 125) and researches computer simulation of the mind. A-Life builds organisms and systems that are life-like, and would be, if they were found within nature (Turkle, 1997b). These merging boundaries mean that philosophy is brought into everyday life (Turkle, 1997b), challenging "our most fundamental, social, moral, philosophical and religious beliefs" Turkle, 1997b, p. 151), because they aim to recreate life, and intelligence as well (Turkle, 1997b).

Part of the erosion of boundaries between human and computers also involves the responsibility for the errors or limitations. In building computer and software systems that accentuate intelligent agents in computer use, users even more heavily attribute error to computers. This allows humans to deflect their responsibilities for the computer outcomes from themselves. When IS and IT form part of the decision processes (such as for IS in aviation, health systems, guided missile launch), relocating the source of responsibility as IS and IT decisions, and outside of the user, may decrease the ethical consideration a user may put into their work context, which may have implications for the industry (Friedman & Millett, 1997) and heighten the importance for human-computer boundary blurring, and its study.

3.2 Technology Transference

Transference is an important additional feature to humans' interaction with objects. The transferring of emotion or "affective attitude" from one person to another, or to an object, describes an almost universal psychological process (Reber, 1985, p. 785). Norman (2004) explores the human proclivity to animate objects. Norman's (2004) view of human-machine relations suggests that the driver's emotional response may extend to the car itself, beyond enjoying the ability to feel the road surface juncture, to corner, and to feel the adhesion of its tyres with the road. Such projection, rather than being isolated, stems from an innate "interpretative mechanism" through which humans interpret their experiences (Norman 2004, p. 136). Individuals are locked into their own interpretations of their experience, and can only extrapolate from their own observations and reflections of their subjective experience to build a very successful repertoire of reading others' responses (Norman, 2004). The responses of others to such interpretations assist in fine-tuning their abilities to read visual and auditory cues, and body language in general. Human social and emotional development, over millions of years, has proved essential to correctly interpreting and reinterpreting interactions between individuals and groups, as well as animals and objects (Norman 2004). Social working alliances between humans, human groups and animals, functioned well to provide the resources humans have required (Diamond, 1998). Being able to interpret animal and situational stimuli has had important implications for human survival. “Humans are social animals” (Nass et al. 1997, p. 158) with deep biases toward social interpretations (Nass et al. 1997), even for computer and other inanimate interactions. The ready and intuitive impressions strongly inform humans at a visceral and behavioural level, and predispose humans to emotions and anticipations. An affirming experience, or pleasurable design, is felt as positive emotion and the object is similarly imbued (Norman, 2004). The gratification of multi-dimensional needs is offered in Internet services: mastery, social reinforcement or avoidance (Fenichel, 2003). A difficult experience, and poor or disliked design, produces negative emotions and “blame [on] the product” (Norman, 2004, p. 138). Although blame and credit are social judgments, and, therefore, unreasonably infer that the machine is “a causal agent” (Norman, 2004, p. 139), such psychological processes are not rational. Built on predictions of behaviour from previous experience, cognitive and emotional responses are applied to both the animate and inanimate things, because an important part of the interaction and exchange is relational and develops trust (Norman, 2004).

Simple inanimate objects can be trusted because they are simple and highly reliable, while complex objects have higher probabilities of failing, and are seen as untrustworthy (Norman 2004). There has been an increase in the invisibility and contradictory nature of technology’s mechanisms and operations, requiring more trust to be given to objects. Surveillance is more common, but is less overt (Agre & Mailloux, 1997). In addition, increased manufacturers’ promises have raised users’ expectations for newer technologies, especially computers (Norman, 2004; ABIT, 2005).

When an implicit contract of trust fails, feelings of lack of control and anger, or rage, are irrational but appropriate emotions (Norman 2004). “[Computers] lose files and they crash, often times for no apparent reason. Moreover, they express no shame, no blame. They don't apologise or say they are sorry. Worse, they appear to blame us, the poor unwitting users. Who are 'they'? Why does it matter? We are angered, and appropriately so" (Norman, 2004, p. 141). With an unpredictable and crowded journalist's life in harsh conditions, and no back-ups performed for months, losing his hard-drive along with its data created a personal crisis for Harley, a sense of losing his files, stories, contacts and identity (Harley, 2004). Living in extreme circumstances, Harley (2004) had developed a reliable buddy relationship with his laptop, which became acutely apparent at its loss. Harley mourns its loss. "I feel vulnerable; not because we are heading for a war zone but because I have lost the laptop I loved. It was my brain, my backup – my life on call. Now that memory is gone, and without it I'm not sure of who I am or where I'm going. My life has become a string of stories, and with no record of them I am unsure of my past, my present, my future. My broadcasts have become my being" (Harley, 2004, p. 283). The laptop was critically important to Harley. It supported the fabric of his life and identity, and was a reliable companion. With its unexpected loss, Harley (2004) vents both positive and negative emotions, expressing his love for the computer, and "rage [which] is volcanic" (Harley, 2004, p. 282) toward the IT expert who had wiped his data.

Such contracts of trust with inanimate objects are built on reliability, and "to perform precisely according to expectation" (Norman, 2004, p. 142). They are gathered via recommendations and advertisements towards a conceptual model of the item. As well, an object's practice of keeping the user informed and able to predict its operations, is an important contributor to trust. These involve a negotiation of trust and vulnerability (Norman 2004).

3.2.1 Computer Transference: the Computer as an 'Other'.

The machine can act as a projection of part of the self, a mirror of the mind. What people make of computers mimics their own concerns (Suler, 1998). Jung's (1966; 1981) psychodynamic approach to human activity and understanding is relevant to this thesis. Jung (1966) described a general phenomenon, named transference, whereby an individual's images and perceptions of other people, events and the external world are, in fact, part of an individual's own process which begins at birth. These reactions are ambiguous; they are originated towards the individual's parents (Jung, 1966; Suler, 1998). "Thus transference displaces upon a third person those psychic contents that took shape when the subject first began to relate to the environment and with which they are still identified" (Humbert, 1988, p. 67). The traits attributed to another person, Jung proposed, belong to the self. Transference is described as occurring naturally, a projection of ourselves. Within a psychotherapy context, the analyst, rather than simply responding to the projected material, captures it, frames it and submits it to the analysand's inspection. This process utilises the 'feeling function', removed from objective, abstract knowledge. Within a therapy context, emphasis is placed on the growing awareness of the extent and quality of the analysand's unconsciousness intruding into their perceptions. In other contexts, however, these projections may remain undefined and unexamined. This may be especially true in technology transference.

Transference can be projected to computers, because they mimic thinking and ways of behaving (Barglow, 1994; Suler, 1998; Turkle, 1984, 2007a). People speak of being compellingly grabbed by computer games – like playing with a mind (Suler, 2005).

Although some researchers (Barglow, 1994; Suler, 1998; Turkle, 1984, 2007a) have examined social responsiveness to technologies, generally, academia has been dismissive of it having any importance (Nass et al. 1997). Investigations have suggested two types of social responses to technologies: one of deficiency, where only poorly adjusted people would give social responses to technologies; or one of a distal relationship, where people are responding to the invisible person, who is the creator behind the computer or software (Nass et al. 1997).

However, there has been some research validating normal individuals' responses to technologies as social objects. Johnson, Marakas and Palmer (2002a; 2002b) found that individuals responded to computers as social entities, but were uncomfortable in admitting such feelings and perceptions (2002b). These reactions varied with personality differences (2002a). Nass et al. (1997) found that social responses to computers were commonplace, and occurred without individuals' awareness, and that the interactivity followed societal conformities. People followed politeness etiquettes and avoided direct criticism of a previously-used computer, thus avoiding 'hurting' that computer's feelings (Nass et al. 1997). People identified a stylised computer personality and its correlation with their own; additionally, they showed a preference for a personality with matched theirs, in similar response to friendships and partnerships (Nass et al. 1997). This may have large implications for users' acceptance of technology, because, unwittingly, computer-user interfaces may reflect the software writer's style, thus the results may project multiple styles, inherently unattractive, but also emphasise technical expertise, i.e. inherently more formal and distancing, at the expense of more personable interactivity (Nass et al. 1997). Both flattery and sincere praise from a computer increased people's positive interaction with that computer. The user improved their sense of empowerment; enjoyed the interaction more; desired increased computer contact, and gave a higher evaluation of the computer interaction (Nass et al. 1997). Dominance / submission and male /female compatibilities were shown, and differences in levels and areas of expertise were gender-related. The final study by Nass et al. (1997) showed that people's responsiveness was proximal, i.e. to the computer itself, rather that the programmer. "[C]omputers *are* social actors" argue Nass et al. (1997, p. 158), and individuals' responses to technologies are "deeply infused social responses [which] are unconsciously triggered" (Nass et al. 1997, p. 158) and occur over broad sets of circumstances.

A different interpretation of people's responses to computers was proposed by Keisler and Sproull (1997). Anthropomorphising occurs when a user's response is an "as if" response, rather than attributing humanity to the computer (Keisler & Sproull, 1997). They argue that limited social responses, including matching human and computer personality, can "elicit and engender strong feelings and social responses in people" (Keisler & Sproull, 1997, p. 197) similar to people's responses to many artefacts, because of the context and expectations of people.

Suler (1998) explored the concept of transference to computer adoption and utilisation. Unlike televisions and movies, computers and humans are interactive, with a degree of unpredictability, which adds a level of complexity, and mimics human-to-human interactions. With new software that is highly visual and auditory, and having options for customising operating systems and software, computers can be tailored to mirror an individual's desires in companionship (Suler, 1998). Furthermore, Suler (1998) argues that when individuals are presented with interactions that remain neutral and malleable in behaviour, they fall back onto past models of relationships to theorise, predict and construct the new relationship. Among the armament unconsciously and automatically brought to bear on these relationships are thoughts, feelings and actions, old templates that hold the perceptions and behaviours. With this complex transfer of the old, is the "transfer of meaning …. the on-going process of making sense of things" (Walker, Harper, Lloyd, & Caputi, 2003, p. 525). Kelly (1955) referred to a phenomenon in psychotherapy which he termed 'secondary transference', in which the client's views of the therapist are "lifted directly from former experiences" (Kelly, p. 674) to make sense of the event. Making sense of the world involves psychological processes which produce actions, thoughts and emotions (Dunnett, 1988). Such processes begin in childhood, and among the important earliest sense-making, centres on relationships and dependency (Kelly, 1955). An infant in its formulation of critical interpersonal relationships, including the differentiation of themselves from others, uses construing and interpreting. This begins the process of identification of the self, with a sense of individuality, in contrast with others and the world. The self becomes an important anchor as a context for the experience of the world that includes people, objects and situations. Where these constructs or interpretations are about the 'self', they are likely to be more extensive (broader in range), and more defined (more detailed) because of the duration and centrality of 'self' to the individual's life (Kelly, 1955). One important context of the self in relation to the world, may be in terms of relative power, because power is an early and important context throughout personal development. Suler (1998) describes five types of human computer transference interactions which are based on power between the computer and user. These may be manifest in various forms, including one briefly alluded to by Suler (1998) of sexual or erotic dialogue.

3.2.2 Forms of Transference

All computer transferences involve blending of the user's psychological space (an "extension of their intrapsychic world") with the 'cyberspace' created by the computer (Suler, 1998, p. 7). This blended "transitional space" where the relationship templates the individual uses in ordinary life are free to “express themselves, to play, work, fight, and ideally make peace with each other” (Suler, 1998, p. 7). According to Suler’s (1998) forms of computer transference, four forms describe unequal power relations between the transferrer and the computer, while the fifth type expresses an equitable power relation.

The first type of transference is “You as you, Computer as parent”. The relationship formed with a computer may be based on the model of relationship formed with a parent. This form occurs when computers are seen as powerful. They may be perceived as more knowledgeable, faster thinking, more focused, and thus evoking emotions that are associated with an authority figure: “admiration, awe, fear, competition” (Suler, 1998). Another form of power relations with computers is a potential need for nurturing and protection from contaminants from the Internet, such as viruses, in a way that was similar to an inadequate or frail parent (Suler, 1998). Suler (1998) also describes the sexual or erotic transference in which computers may be used to represent the parent in Oedipal relationship between parent and child.

The second type of transference “You as parent, Computer as you” is a reversal of the first type. The user becomes the commanding, dominant manipulator, at worst an abuser, exhibiting anger when faced with computer non-compliance. Rage aimed at, and physical damage to, computers as a result of frustration in poor computer performance has been reported (Kaufman, 2003). These actions may occur because of a discrepancy between expectation and performance for both hardware and software (Norman, 2004). It may also be the result of poor usability design by software engineers (Lambert, 2003 as cited in Kaufman, 2003), poor deeper-level knowledge, fear by end-users (Edelmann, 2003 as cited in Kaufman, 2003), or frustrating problem-solving and poor communication between user and computer (Marcus, 2003 as cited in Kaufman, 2003).

Because people invest in their computers, customising them with pictures and names, they respond with anger when they are let down personally by system failure (Edelmann, 2003 as cited in Kaufman, 2003). A more mild form will exhibit nurturing protectiveness toward their computer, enabling it to develop its unique abilities, personalising and shaping the computer to reflect their own abilities and personality (Suler, 1998). With this type of transference, computers never become overtly dependent and demanding, or independent and planning to leave the relationship (Suler, 1998; Turkle, 1984).

The third type outlined by Suler (1998) “You as you, Computer as wished-for parent” describes a user’s wish that their parents had been different to their actuality. The unconscious wish is transferred to the notion that the computer has those desired characteristics. Perhaps parental characteristics were unpredictable, or inattentive, or over-busy, or, conversely, overly-loving and involved. The user’s computer can be valued for its predicability, attentiveness and attendance, responsiveness and the individual’s own ability to control it, and the intimacy of their involvement with it. This response may occur even to the extent that it is seen as a benevolent helper that assists the individual on their professional or career pathway.

The fourth type of transference describes another reversal, “You as wished-for parent, Computer as you”. The user becomes the parent with the desired characteristics, to redress the imbalance experienced in their childhood. Perhaps by being overly involved with their computer, building an elaborate knowledge of computer systems, or being computer obsessed, over-protective about its use and the possibility of exposure to viruses, or physical damage (e.g. the sign placed on a computer monitor by Penna, 2004).

The final type of transference that Suler (1998) describes is “You are me, I am you, we are all together”. Suler calls this form “selfobject” transference, (Suler, 1998, p. 6). It outlines the identification with, and behaviour-mirroring patterns of, others to bolster the individual’s self esteem and confidence. The sense of togetherness brought about by blending of self and others can be extended to the blending with computers, software and hardware (Suler, 1998). Thus, the computer is seen as part of the user, a reflection of who they are, “participating in all the amazing, powerful things a computer can do, … users strengthen their own confidence and feelings of success …. The computer becomes a reassuring extension of their motivations, personality and inner psychological life – like a good buddy, a sibling… a twin” (Suler, 1998, p. 7), and a best friend (Schultz, 2000, p. 4). This computer buddy has no personhood or soul, but can mimic thinking, and, in the near future, may model emotion (Schultz, 2000). Each of these five user responses described by Suler (1998) contains an emotional component.

The self-other relationship is that of the “fellow” (Meares, 2004, p. 56). The description of the self from William James is a duplex of consciousness, one pole of which is outer awareness, the other reflective awareness of “inner events” (Meares, 2004, p. 54). Such duality offers a notion of the shift in awareness between the inner and outer experience depending on the social ecology (Meares, 2004). In psychological wellness, the duality of “aloneness-togetherness” (Hobson, 1985) provides sufficient autonomy that one’s independent world continues when with another, and when alone the person does not feel isolated (Meares, 2004). The ‘self’ is part of an ecology, formed simultaneously with itself and with others, to different degrees depending on the context of relatedness. It provides continuity of the self, a sense of connectedness with another and with oneself, a “fellow-feeling” (Meares, 2004, p. 56). Such multiple selves and roles may offer practice in healthy multiplicity and psychological flexibility (Turkle, 1997a).

Transference and its emotional tone appeared to affect individuals' approach to a new relationship (Berk & Andersen, 2000). Computers may form part of a person's social ecology, in that they provide, when a person is alone, a 'fellow' who is non-intrusive, but attentive and interesting; the corollary is that when with another, a person determines the degree of engagement with the computer 'fellow'.

3.2.3 Computer Transference as Dependency.

Technology transference was shown to vary between individuals (Lloyd, 1998). Lloyd (1998) defined these groups statistically using multi-dimensional scaling; separate clusters identified in a visual examination of a multi-dimensional scaling plot. Lloyd, (1998) found that individuals demonstrated a variety of proximities in the psychological relationships held with technologies and computers. Four groups of computer transference were identified, varying from dependent to independent, and balanced to phobic (Lloyd, 1998). There were 'dependent' participants, who like, or depend on, computers; 'balanced' participants, who were neutral about computers; 'phobics', those who feared computers; and 'independent' participants, who appeared strong-willed, and valued independence (Lloyd, 1998, p. 35).

There are differences in how individuals react to computers. Computers can be partners in a great diversity of relationships. They can enable users to make predictable and well-defined worlds, or test themselves to live "close to the edge" (Turkle, 1984, p. 91). There are individual differences in the ways people interact with computers, even during the same tasks (Turkle, 1984). Some programmers create highly-predictable worlds, in order to affirm themselves as 'capable' and able to maintain control (Turkle, 1984). Others create worlds always borderline for being out of control, thus they become "wizards of brinkmanship" (Turkle, 1984, p. 15). Programmers may experience programming as constructing worlds that offer alternative realities and experimental forums (Turkle, 1984). Such use is in itself neutral, and can be used positively for the exploration of multiple selves and identity (Turkle, 1984, 1997a; Suler, 2003, 2005a).

3.3 Conclusion

The self-understanding generated by the use of the human-machine dyad is:

1) that the use of any machine transforms the quality of the experience, regardless of whether it is noticed;
2) the transformation in the use of the machine is from the *thought-through* to the *intuitive*;
3) the transformation occurs by inclination rather than determination.

This last point describes the path led by specific technologies, and plays a subtle role in the evolution of the technologies and people's use of them (Ihde, 1973).

Although the bulk of IS and IT research has studied rational responses that people have shown to computers and technology, there is evidence that arational, unconscious and emotional ways of relating to technologies occur. These interactions occur at many levels, and have power because they reside as well-known metaphors and narratives that offer meanings that are sensory, symbolic, philosophical and metaphysical, as well as utilitarian and concrete. Phenomenology offers a method to understand the meanings that people find in their technology interactions. The propensity to build relationships with inanimate objects and technologies is innate, and follows social conformity patterns. This may be stronger with computers. As a result of computers' ambiguity and responsiveness, there is a mimicry of the mind-body separation and the celebration of mental freedom. The invisibility of the technological background limits the ontological interpretations that people may see, so that science and technology defines the possibilities and solutions to metaphysical questions that are raised.

This chapter has reviewed a range of literature that deals with a broader range of issues raised in the interaction between humans and technologies. These concepts form an important background often invisible to IS and IT use, which imparts distinctive meanings to technology use for many end-users. It illustrates many issues that are missing from common perspectives on IS and IT use, and provides rationale for a broader examination of the topic. The next chapter, Chapter Four, presents an outline of the psychology which is used as a framework for understanding people, and how they understand their world. Personal Construct Psychology presents a constructivist approach and methodology, which offers an examination of the phenomenology of technology experience and use.

CHAPTER FOUR

THE PERSONAL CONSTRUCT PSYCHOLOGY THEORETICAL FRAMEWORK

The Personal Construct Psychology Theoretical Framework

The current IS and IT models of technology acceptance described in Chapter One are rationalist, and in focusing on utility and functionality, they exclude much of the complexity of the human-technology interaction. Important parts of the interaction occur at multiple levels of consciousness, which include the arational and unconscious. In Chapter Two, a background was given to individual differences, as well as describing individual and group processes. In Chapter Three, another body of literature that illustrates the ‘felt’ experience of human-technology interaction was described. These literature streams explore the complex issues of the phenomenology, the ‘self’ identity, and the blurring of various boundaries with technological interactivity. However, they have not been sufficiently included in the major IS and IT models. This chapter describes Personal Construct Psychology or Theory (PCP or PCT). The theory, which is a constructivist psychology, proposes that each person’s view of his or her world is individual and unique (Kelly, 1955, p. 55). People develop understanding and form meanings in their interactions with others, events and objects (Kelly, 1955). People’s sense of themselves, and being located within such a network of people, objects and situations, guides their interpretations and path through their world.

Personal Construct Psychology provides the theoretical framework for this thesis. Personal Construct Theory is valuable epistemologically, because as an over-arching theory, it provides a structural framework and methodologies for research and usage. As an existential phenomenology approach, PCP allows the examination of a person’s ‘felt’ experience of being in the world, providing a framework for exploring the issues raised in Chapter Three. Its hermeneutics have been successfully applied to many domains, including industry, business organisation and management, education, vocation and therapy (Fransella, 2003; Ravenette, 1999; Stewart & Stewart, 1981; Winter, 1992). A technique of capturing the meaning-making and felt-sense of technology use was required. Personal Construct Psychology offers these possibilities. This theory offers a phenomenological, comprehensive and integrated framework (Warren, 1998b).

The theory provides an integrated view of the person, as well as imaginative ways of exploring their thoughts and emotions (Bannister & Fransella, 1986). It is an appropriate theory from which to explore workers' cognitive world, because Kelly's (1955) theory pertains to each individual's self-definition and relationships with others, and their making sense of their world, in the past, present as well as the future (Walker, 1996).

Constructivism's fundamental tenet is that perception and experience form 'constructs' (Reber, 1985). Constructs are a person's psychological pathways, which are put together in a system of meanings so the person is able to anticipate the future (Kelly, 1955). Social constructivism, often termed constructionism, to differentiate, generally proposes that constructs are socially born (Gergen, 1985). On the other hand, Personal Construct Psychology (Kelly, 1955) emphasises the personal quality of an individual's unique experience which shapes their resultant construct system. Individuals actively form meanings and predictions in their interactions with people, events and objects, using their unique construct system, in a process that is iterative, reflexive and on-going (Kelly, 1955). The construct system provides a framework from which individuals hypothesise what will occur, and provides explanations for what has occurred. Because construct systems are built on the unique interpretations of experiences, constructs and the system of which they form part, remain individual. Such interpretations, which include those new situations and learning material with people and technologies, are not constrained by a person's environment or biography (Kelly, 1955). An individual's personal view of the world (their world i.e. their “psychological material”, Epting, 1984, p. 3) is shaped by their experiences, which in turn shape their view of the world. In other words, individuals’ responses are mediated by their constructs, which, cyclically, further impose order on the individual’s subsequent experience (Kelly, 1955). Their view of their world and life is used to predict future events, so that they integrate anticipatory predictions on which to model their individual futures. This model consists of a unique system of personal meaning dimensions or constructs.

Because most of this hypothesis formation is performed at a low, or no, level of conscious awareness, an individual’s model of the future, although not described by words, may act at a deep level (Dunnett, 1988). This deep level of action may have profound consequences for the individual’s ways of thinking, feeling and behaving (that is, the way that individual goes about living their life), yet remain relatively difficult to examine (Dunnett, 1988). Pre-verbal constructs may be core of an individual’s construct system, but work at a low level of consciousness. Such pre-verbal constructs may involve the self and other people, as well as inanimate objects (Kelly, 1955, p. 461). A person’s knowledge grows from the understandings and meanings developed from the relationship between similarities and dissimilarities. Playing with such contrasts gives rise to the ability to understand and to anticipate (Ravenette, 1999).

Consciousness is also dynamic. Its scope broadens to include new events and deepens to illuminate more fully old ones. Its organisation changes as an outcome of experience. Just as the organisation of knowledge is shaped out of the interplay of opposites, so the organisation itself changes out of the interplay between the individual and his environment. The environment here includes all that is felt to be other than self: objects, persons and their interrelationships. The person also is a part of that network of relationships, as also are the contents of knowledge he has of himself: his own thoughts, feelings, actions and processes (Ravenette, 1999).

Consciousness, therefore, is a rich source from which to understand individuals, because it is the means by which they adapt to the "phenomenal world of people, and objects, and their interrelationships" (Ravenette, 1999, p. 67).

4.1 Constructs and Elements.

Constructs, although often generated by engaging in a social process (Walker, 1996), always remain individual and personal. Constructs are "transparent patterns or templates which [a person] creates and then attempts to fit over the realities of which the world is composed" (Kelly, 1955, p. 8). They are bi-polar, and dichotomous, such as a good-bad dimension or table-chair construct (Kelly, 1955). Constructs are integrated within a system of other constructs. The individual's perception of similarity and dissimilarity among objects, events and people form the basis of discrimination of constructs (Kelly, 1955). These are termed elements. The range of elements, that is, the people, objects and events, to which a construct may be applied, is called its range of convenience. When new elements can be easily added to the construct, then it is called a permeable construct. Permeability allows constructs to be either better defined or extended, and thus enables change in a person (Winter, 1992). If workers have permeable construct systems, then elaboration of their construct system will result in openness to new approaches, ideas and technologies in their work lives. However, impermeable constructs do not allow the inclusion of new elements because of their novelty, and restrict the degree of change in the individual.

Because some constructs are more central to the individual than others, there is a hierarchical structure to the personal construct system. This unique system of patterns reduces any inconsistencies in how individuals predict and explain events (Kenny, 1988). Superordinate constructs are abstract, rigid and significant. Superordinacy in the construction systems means that the construct subsumes another, while subordinancy means that the construct is subsumed within another (Kelly, 1955). Super-ordinate constructs, therefore, have a great deal of influence within the construct system, and will force changes to many other constructs if they are altered (Viney, 1990a). Core constructs are the most super-ordinate constructs (Kenny, 1988) and govern a person's construct maintenance processes. Built up over time, and "deeply embedded" (Raskin, 2002, p. 4) core constructs lie behind a person's sense of self (Ravenette, 1999), and thus their sense of identity and existence (Kelly, 1955). They also offer stable responses to, and interpretation of, the world. People, therefore, act as if their attitudes and beliefs spring from a real and permanent core, the inner self (Viney, 1990a). These beliefs relate to both their personal and social identity (Dalton & Dunnett, 1990). Peripheral constructs may be altered without serious modification of the core structure, and relate to general events (Kelly, 1955).

Consider the following example of how a superordinacy of constructs may affect behaviour outcomes. Health workers' core constructs may relate to caring for their patients, and may subsume many facets of this care, including their patients' physical, psychological and treatment management. So when the health workers' employer does not allow sufficient time for a caring examination to be performed, or mandates their focus on a personnel or patient management system, the worker may experience stress, and a cascade of symptoms including non-compliance and dissatisfaction.

In the construct system of most people, there tends to be a greater number of subordinate constructs which are concrete. Constructs may also vary as to the level of cognitive awareness. High-level awareness constructs are readily expressed, with both poles easily examinable and fall within the range of convenience of the person's major constructions. Also constructs are said to be comprehensive if they incorporate or subsume a wide variety of events, and incidental if they only subsume a narrow variety of events (Kelly, 1955). In the strictest interpretation, both poles of a subordinate construct are subsumed within one pole of its associated superordinate construct (Chiari, Mancini, Nicolo & Nuzzo, 1990). In a similar fashion, tight construing leads to unvarying predictions, whereas loose construing may lead to a number of anticipations, while still maintaining their identity. For workers whose professional knowledge base is primarily practical, constructs within the hierarchy of construct system may have low level of cognitive awareness, and thus be difficult to articulate. Understanding of another person's construct system requires the exploration of open and hidden thoughts and feelings, and elucidates causes that had remained hidden. Generally, others can view construct poles as meaningful contrasts, so that the view of another's construct system appears logical. However, opposing poles, which look illogical, may be logically consistent although unique to the individual (Winter, 1992), such as "control-frustration" (Ravenette, 1999, p. 243-244).

There are two further aspects in PCP that are relevant to the theoretical development of the thesis. The first aspect is that of transference, that is, the transfer of constructs from an original element and context to another. Kelly (1955) referred to this as secondary transference, in which the client's view of the therapist comes directly from their prior experiences. A brief description of that process is reported next. The second aspect is the methodology used within this thesis.

4.2 Technology and Computer Transference and Personal Construct Psychology.

Transference is described by Reber (1985) as the shifting of an emotion from one person onto another person or object. He notes that many experts see "transference as a state that is ubiquitous in human interaction" (p. 786). How people relate to technologies and computers will have implications for the ways in which they behave towards them. It has been speculated that people relate to technologies as if they were human, or had human characteristics (Nass et al. 1997; Norman, 2004; Suler, 1998; Turkle, 1984).

Turkle (1984) describes a developmental process from childhood, whereby children's explanations of the thinking and interactive computer processes demonstrate the computer's being alive. While adolescents are dismissive of that stance, Turkle's (1984) research suggests that some adults' relationship with computers borders between life and non-life. Indeed, for some individuals who spend large amounts of their lives interacting with computers, either for leisure or work, or those who avoid computer use entirely, there will be qualitative differences in how that how that human-computer interaction is expressed and valued. Other researchers hold that this model of deficiency by Turkle (1984) and others, which describes developmental immaturity or psychological or social dysfunction, is restrictive, and that a technology and computer interactivity model is more general and occurs in normal, well-adjusted people (e.g. Nass et al. 1997; Norman, 2004). Individuals' ways of viewing people and technology may blur, and the constructs for each are applicable to each other, or may be rigidly separated. People transfer their experiences of past relationships into their current relationships with technologies and computers. People continually anticipate their lives, and seek explanations for events (Kelly, 1955), including how the technology, and computers especially, behave. Technology and computer transference may be modelled on past and present human interactions (Suler, 1998).

Transference often involves childhood accounts of parents (Soldz, 1993). Because these accounts are located in the present, they should be viewed as “useful metaphors” rather than childhood reality (Soldz, 1993, p. 176). Kelly (1955) stressed the essence of transference was not of its origins (i.e. relating to parents), but in its current impact on relationships, especially in terms of usefulness in anticipating, and making sense of the world, both generally and in terms of relationships. Kelly (1955) proposed that all construing involved transference (Soldz, 1993). Soldz (1993), in viewing constructivist, rather than psychodynamic transference, described stable relationship patterns that occur both inside and outside therapy.

The constructs that govern sense-making, prediction and actions, include many levels of effect for individuals. These are lived discriminations, some of which are abstracted, symbolic and un-verbalised (Kelly, 1955), which are mixtures of conscious, not fully conscious and unconscious “needs wishes fears and hopes … [that]… shape our relationships and our image of ourselves in those relationships” (Suler, 1998, p. 1) with technologies, and constitute powerful transference interactions (Suler, 1998) which have deeper symbolic meaning (Suler 2000). Computer transferences involve blending of the user’s psychological space and intrapsychic world with the ‘cyberspace’ created by the computer, to form a blended “transitional space” where the relationship templates are expressed (Suler, 1998, p. 7).

It may be role-relations processes that are taped into in this human-computer interaction research. Just as the interpersonal process between two people is instigated, defined and negotiated by sending and interpreting messages within the interaction, so too may the relationship one has with a computer. Relational messages are given by body language: the relaxation or tension of arms, legs, hands, facial movements, what is said, or not said, tone of voice, and emotions, bodily expressed “symbolized experience” (Faidley & Leitner, 1993, p 74). Computers cannot read human body messages, when understanding them requires “sensitivity to non-cognitive forms of awareness” (Faidley & Leitner, 1993, p 74). However, individuals practised in normal human interpersonal process would still exhibit body messages. “Complementary responses” (Faidley & Leitner, 1993, p 76) are demanded by computers and software from an individual for the human-computer relations to continue, and will wait indefinitely for an appropriate response, while ignoring inappropriate ones. People are swept into being “relational partners” (Faidley & Leitner, 1993, p. 74) with computers and technologies because a person working with an IS or IT must converse (Ihde, 1973) and negotiate with it “to get it to do what they want it to do” (Wyld, 2004, p. 7).

4. 3 The Repertory Grid Methodology.

Although each person’s construct system is unique, it has also common features through shared experiences, and is interactive with others. The use of a Repertory Grid allows the examination of the structure of individuals’ construct system and sub-systems: their “psychological space” (Kelly, 1955, p. 277) and the “degree of intimacy with ... and locus of influence” (Kelly, 1955, p. 238) of other people in their life.

Transference was thought to be a part of the individual’s response towards the technologies with which they interact. For the current studies, the transference response enabled the investigation of the rational and arational content of the human-computer interaction. Personal Construct Psychology argues that people constantly use their judgments about the world (as they see it) to decide courses of action that are available to them. Each discrimination stems from implicit theories they hold. By using the Repertory Grid to capture the multiple judgments a person makes, the exploration of the structure and content of these implicit personal theories is possible. Because the personal theories are integrated, there are links between all these constructs that a person makes (Fransella & Bannister, 1977). Smaller sub-systems of personal theories are nestled within a larger, over-arching construct system (Fransella & Bannister, 1977). In this study there was the aim of gaining access to these personal theories and their geography, because they govern behaviour, or provide an “open channel of movement” (Kelly, 1969b, p. 293) along which probable decision paths lie.

4.3.1 The Use of Constructs and Elements within Repertory Grids.

A construct or “reference axis … [may be] unverbalised, frequently unsymbolised and occasionally unsignified in any manner, except by the elemental processes it governs” (Kelly, 1969, as cited in Fransella & Bannister, 1977, p. 3). Some personal constructs are “ vaguely perceived impulses or unverbalized experiences” (Faidley & Leitner, 1993, p. 71), yet being “lived out” fully, daily, in ways that are not articulated. Constructs are obtained by the comparison and contrast of elements (Bell, 1990). In this research thesis, comparisons of three elements were utilised to elicit from participants how two elements were alike in a way that was different from the third element (known as triadic elicitation in the literature). Thus the construct was the descriptor of both the similarity and its contrast. While Repertory Grids may use sets of elements and constructs that are defined by the researcher, they may also have either set predefined, and the other set generated by the participants. In general, a number of constructs are elicited in order to constitute a decision matrix of the Repertory Grid. Participants are asked to affirm the preferred pole for each of their constructs, and then rate each of the elements across the bi-polar construct descriptor. Any analyses of the Repertory Grid are based on the assumption that all of the constructs may constitute and reveal a ‘positive and negative’ distinction (Adams-Webber, 1990, p. 50). Therefore, the Repertory Grid is a compact data set, from which three questions can be answered: “(h)ow do the elements relate together, (h)ow do the constructs relate together, and (h)ow do the elements relate to the constructs?” (Bell, 1990, p. 29).

Elements in Repertory Grids should be homogenous (Stewart & Stewart, 1981; Tan & Hunter, 2002). However, Walker et al. (2003) presented a different view because they saw value for insights provided by a ‘hybrid’ form, in which both human and object elements are mixed. These ‘hybrid’ Repertory Grids, which are termed Transference Grids, expose many levels of constructs by participants, including those transferred from humans to technologies, and vice versa. Kelly (1955) saw the differentiation between cognition, affect and conation as unimportant, and abandoned this “classical threefold division” (Kelly, 1955, p. 130) to accept constructs as pertaining to all. This lack of division offered by Personal Construct Psychology (and Repertory Grids), therefore provides freedom to explore such constructs, which are precursors of actions and behaviours (Ravenette, 1999). Repertory Grids therfore offer an efficient exposition of individual and group constructs that govern decision processes made in determining technology acceptance and human-technologies interactions.

4.3.2 Assumptions of Repertory Grids

Six assumptions underlie Repertory Grid elicitations (Kelly, 1955; Fransella & Bannister, 1977). The first assumption is that there is permeability of the constructs that are elicited, i.e. that the construct is open to the addition of new elements, or others not used in formation of the construct. These new elements can be added beyond the context for the person's current understanding for that construct. Malleability is required by the participant, in order for new elements to extend the person's current understanding of how they use that construct for anticipating the future. Kelly (1955) thus assumes that the participant's framework for viewing their worldview, is verbally articulated, captured and revealed in that specific grid, and their established worldview will be utilised in how to see new situations and people (Kelly, 1955). Consequently, as well as a means of capturing participants' current world views, the Repertory Grid can be used as a measure of prediction for how participants are likely to use those views to anticipate and mould their future worldviews.

The second assumption is that the Repertory Grid technique captures pre-existing constructs. Even when there are newly-formed constructs, they are relatively stable - it is their articulation and development that has been altered (Kelly, 1955). The third assumption is important, in that Kelly (1955) assumes, within the Repertory Grid, that the list of elements used for the describing the constructs available to the person (the elicitation of constructs) sufficiently represents their world. More than this, these elements should represent the people (and things) with whom they have important or pivotal relationships, so that they present a mirror by which the person sees themselves and their roles with others (Kelly, 1955). Kelly was asserting that the human elements selected for the grid should have social significance for the participant, while also allowing the diversity of their significant elements to be explored, articulated and, hence, exhibited (Stewart & Stewart, 1981). This assumption is especially important in the context of the Transference Grid because it may contain unusual elements (i.e. types of technologies), which is beyond Kelly's original use of the Repertory Grid that related solely to people. However, this extension is valid because Kelly saw that the grid makes plain the use that individuals make of people as objects, in that they act as boundaries and entities "with whom the subject has had to deal in his daily living" Kelly, 1955, p. 219).

The fourth assumption posits that the bulk of the constructs captured within Repertory Grids demonstrate the participant's understanding of how other people view the world (Kelly, 1955), i.e. their relationship to others or "real social interaction" (role constructs) (Kelly, 1955, p.230). Not only do participants' constructs describe their view of relationships, but also their judgments of concepts that other people use in relationships (Kelly, 1955). Therefore, Kelly saw Repertory Grids as demonstrating the participant's understanding of other people. The grid methodology is based on Kelly's "direct approach" (Kelly, 1955, p. 219) of directly asking participants for information, in this case, of the concepts they use in their relationships, which is aimed at eliciting the "personal-social behaviour we wish to understand" (Kelly, 1955, p. 219). The fifth assumption is that the participant includes their own behaviour and identity within the constructs articulated within the Repertory Grid test. Kelly (1955) states that this is a sound assumption. The sixth and final assumption is that the person assisting in capturing the participant's worldview of the grid (the "examiner" Kelly, 1955, p. 231) is able to understand, interpret and form meaning from the participant's communication about their concepts and conceptual framework. Kelly (1955) states that this is the least reliable of his six assumptions, because it rests on similarity in interpretations that are shared between the participant and the examiner, or the examiner's skill and ability to join (and have empathy for) the participants' perspective (Kelly, 1955).

Personal Construct methodologies stress the idiographic nature of individuals. The exploration of a person's personal world, investigation of both its richness and scope, and assessment of these qualitative and quantitative aspects are offered by PCT. Each person is unique. Repertory Grids enable a mathematical examination of the participant's "psychological space" (Kelly, 1955, p. 302), and provide a cognitive map of the person's personal world (Tan & Hunter, 2002). "Thus for any of us, the sharing of personal experiences is a matter of construing the other person's experience and not merely a matter of having him hand it to us intact across the desk. The psychology of personal constructs therefore lends itself quite conveniently to the handling of the theoretical problem of gaining access to private worlds" (Kelly, 1955 p. 200). Personal Construct Theory states that because of a sufficient commonality in thinking, one person can understand the private world of another. Not only does an individual make sense of his or her own experience and the occurrences within it, but also actively works on understanding other peoples' interpretations of their experiences. This view stems from a belief that people are actively engaged in making sense of their situations, and continue to engage in making meaning, rather than passively accepting their lot. Although each cognitive map is unique, they help provide mapping facilities to elucidate constructs that are both individual and common, and that contribute to those in the organisational pool (Tan & Hunter, 2002). Furthermore, Repertory Grids provide these cognitive maps that are free from observer bias, and offer the reception of participants' construct systems "in a value-free and incremental fashion" (Stewart & Stewart, 1981, p. 10). This freedom to choose constructs allows individual differences to be reflected within the results of the grid (Stewart & Stewart, 1981). Grids also allow people to express an abstract concept to be re-worked, so its meaning can be interpreted into a more concrete form (Stewart & Stewart, 1981). Tan and Hunter (2002) state "the assumptions, expectations, values and beliefs (i.e. the thinking or cognition) of … stakeholders can lead to more successful information systems outcomes" (Tan & Hunter, 2002, p. 40). Therefore, Repertory Grids offer an important contribution to information systems acceptance, because they allow a specific methodology to examine the multiple levels of cognition held by numbers of participants who play a role in the acceptance of technology (Tan & Hunter, 2002). Individual and personality differences are expressed during grid elicitation (Stewart & Stewart, 1981). Understanding these multiple-level constructs may contribute to “organisational cognition and hence organisational action” (Tan & Hunter, 2002, p. 40) because “actions emerg[e] from the sensemaking activities of individuals or groups within the organization” (Weick, 1995, 2001, as cited in Tan & Hunter, 2002, p. 40). Kelly (1955) saw that when people were seen to be passive recipients of events, there had occurred a decision to acquiesce, rather than true engagement with the process. He saw that people generally opt for ways of dealing with life events as an expansive process, because they wish to extend their thinking and domains of knowledge by “extension [and] definition” (Kelly, 1955, p. 67), so passivity is unusual. This view of the individual as active agent, and the importance that individuals place on meaning-making, represents a paradigm shift from individual action being determined by external events (i.e. reactive) to one that is internal (i.e. proactive). Therefore, individual actions emerge from sense-making by individuals or groups, and achieve “shared action” (Jelinek & Litterer, 1994 as cited in Tan & Hunter, 2002, p. 40).

Repertory grids have other advantages. They offer compact volumes of information, so that seven to ten triadic elicitations fulfil the relevant constructs for any domain (Reger, 1990 as cited in Tan & Hunter, 2002), and fewer participants are required for a full description of the domain (Tan & Hunter, 2002). Furthermore, grids allow comparisons between individuals and groups, and comparisons between different groups, group and industry norms, to enable insight into these differences, and map and visualise changes both required and those occurring. Benefits for supplying a standardised set of elements for all participants' grids are that they allow comparison of the results between individuals or groups for a given set of objects, defined by either the research aim or an existing theory (Tan & Hunter, 2002).

4.4 The Transference Grid

A Transference Grid is used "to determine the extent to which constructs about people will also be applied to computers (or indeed other forms of technology)" (Walker et al. 2003, p. 526), and offers useful and "interesting insights into how people see technologies" (Walker et al. 2003, p. 533). It is premised on the assumption that people develop a relationship with technologies, i.e. they engage with the technologies because of complexities in their use, and similarities to their relationships with other people. The aim in using the Transference Grid is to explore the qualities in human-technologies relations. The methodology is based on the principle that elements are the objects of the participants' attention, and the constructs are discriminations attached to the interpretations of those elements. Constructs are described using word labels, and the links (the relative rating) between elements and constructs provide differentiation between elements along each construct (Tan & Hunter, 2002).

The exploratory nature of the Transference Grid as a Repertory Grid technique would allow participants' responsiveness to a range of technologies, and test their perceptions of the computer as a social entity and agent. This required the relaxation of the assumption of homogeneity of the elements. The investigation of the roles of technologies and computers as agents, relates to the previous theoretical writing of Suler (1998-2004), Turkle (1984; 1997b), and Norman (2004), and the empirical studies of Friedman and Millett (1997), Keisler and Sproull (1997) and Nass et al. (1997). Part of the specificity of the Transference Grid is its inclusion of constructs which are elicited with reference to humans (that are built on theories about people, such as personality), along with the inclusion of constructs elicited with reference to technologies (that are built on theories about those objects). The advantage of the Transference Grid is the inclusion of two sets of construct sub-systems that rationally people keep separated. Nass et al. (1997) found that their subjects were unaware of their social responses to computers. Johnson et al. (2002b) found that their subjects were embarrassed by their desire to give anthropomorphic responses. Generally, Repertory Grids assist the vocalisation and documentation of the pattern of constructs that form a governing matrix of cognition and affect, the hierarchy and structure of which is very important to the functioning of that person. The contrast of both poles of each construct enables a complete rendition of the bi-polar reference axis: understanding on a construct requires understanding of its antithesis (Fransella & Bannister, 1977). Thus the matrix structure of the Repertory Grid is important, because it reveals the relations between constructs and the events (the elements) on which they are based, and how they fit into an over-arching set of theories or “metatheor[ies] sharing assumptions and assertions” (Granvold, 1996, p. 345). People’s knowledge of their world is evolutionary and iterative, cognitive and affective, and works at two levels of centrality and abstraction.

Human functioning includes “interacting, interdependent subsystems [which] functions interactively with other systems – living and non-living” (Granvold, 1996, p. 346), and provides expectations of interpersonal and environmental interactions (Granvold, 1996, p. 346). The Transference Grid gives access to the network of constructs that are recursive, increasingly complex and integrated, and integrative of the self and an environment which increasingly has technological and computer components.

4.5 Conclusion

How much people inter-weave or separate the human and object components of their lives is the subject of this thesis. The transference of personal constructs; the structured, emotional and cognitive material which consciously and unconsciously individuals use to assess and predict their human and technological world, is the heart of this thesis. The capture of this material via the Transference Grid methodology enables a review of the elements, the people and technologies, and the constructs which people apply to both, or as separate sub-systems of constructs. Such a review may help to clarify group differences that may occur for occupational and personality groups. Of concern to many industries and managers, is how to motivate individuals and teams of workers to deal with the myriad and rapidity of changes including the technological. Therefore, understanding the needs of individuals and teams of workers is crucial (Benson & Dundis, 2003). Understanding shared constructs for different occupational groups may contribute to team learning environments in technology acceptance and use.The next chapter, Chapter Five gives an overview of the three studies conducted within this thesis. Chapter Five outlines the research aims and measures, and the research questions.

CHAPTER FIVE

THE CURRENT STUDIES

The Current Studies

5.1 Rationale

This chapter provides an overview of the three studies which comprise the thesis. Study One explores a new methodology for examining technology transference. The second study utilises and refines the methodology, and examines the relationships between measures of individual differences and transference. Study Three elaborates on Studies One and Two by testing individual differences and transference in a real-world setting. In earlier chapters it was argued that there was paucity in the current measures of the human-computer interaction, especially in the area of technology acceptance. This paucity resulted in a narrow focus, both theoretically, and in the range of experiences taken into account by the existing body of IS and IT literature. It was also argued that the narrow focus of measures limits what initially may be seen as peripheral, but may impinge substantially on the outcomes of the human-technology interaction. One such outcome may be the phenomenological relationship that humans build with technologies: the 'felt' experience of using a technology. This experience is often described in anthropomorphic terms, as projections of emotions and beliefs (Norman, 2004). The 'felt' experience is encountered as part of the making of meaning, and projected from past interpersonal relationships. This may be termed as an 'Other' (Ihde, 1973), and refers to transference: that is, a relationship that is transferred from past interpersonal experiences and relationships.

The construct of transference is fruitfully explored within the framework of Personal Construct Psychology (PCP). It emphasises taking past interpersonal experiences into the account with the making of meaning during transference encounters, rather than only one's experiences with their parents. The other important contribution that comes from PCP is a methodology: that of the Repertory Grid (Kelly, 1955). The Repertory Grid methodology enables the definition of the events (referred to as elements) and discriminations (referred to as constructs) which are relevant to a person, to be explored. Further, the methodology offers the relationship delineated between elements and constructs to be quantified using a rating scale. It was a variation of this methodology, a Transference Grid, which offered an opportunity to explore the phenomenon of transference, and how people bring it into their interactions with technology. The human elements in the Transference Grid were originally suggested by Kelly (1955), but technology substitutions, such as car, work and play computers and mobile phone for some elements, were made. The benefits in making such substitutions were that the well-researched analyses used for Repertory Grids would be available and valid for Transference Grids. These analyses would give reliable research outcomes, but open up a new area of research endeavour within the IS and IT field of research. Technology transference research would, therefore, open up for analysis an area that had been theorised to occur (Barglow, 1994; Norman, 2004,; Suler, 1998; Turkle, 1984, 1997b, 2007a) but had not been subject to any specific empirical enquiry.

Because there have been industry differences in rates of acceptance of technology, predictably, individual differences play a role in different rates in transference or acceptance. Following this line of reasoning, measures of individual difference (such as personality and occupational style) were included within these studies.

5.2 Methodological Issues

5.2.1 Approaches of Measuring Technology Transference

Given the absence of previous published research on the criteria for measuring transference, there are no pre-existing rules about what is a transference construct in personal construct psychology. Building on Lloyd's (1998) research, constructs that demonstrated applicability to both human and technologies were termed transference constructs. Accordingly, there are two non-transference categories of constructs, 1) when human-elicited constructs could not be applied to technologies, and 2) when technologies-elicited constructs could not be applied to humans.

Three approaches to measuring transference were used. A Multidimensional Scaling (MDS) Approach utilised the MDS solution for a Transference Grid. A Frequency Approach utilised the frequency with which people place a rating on the Transference Grid matrix. The grid is a decision matrix in which each bi-polar construct may be rated for each element or event. A Qualitative Approach made use of two related methods. The first method posed a series of anthropomorphic questions to participants: 'if the computer was a person, what sort of person would it be'; 'the degree of the computer maleness : femaleness'; 'what is the name of your computer'. The second examined themes derived from the constructs. These themes were assessed in comparison to a human values taxonomy, and assessed in regard to power.

5.2.2 A Multidimensional Scaling Approach: The Solutions from Multidimensional Scaling (MDS)

The MDS Approach for measuring technology transference relies on the proximities of the elements resultant from an MDS analysis. This approach of Repertory Grid analysis is suggested by Bell (1994) because of advantages that it offers. Multidimensional scaling is a frequently-used repertory grid analysis. An MDS solution displays the elements' distances, their locations and clusters. It can be used to compare individual participant's grid structures and, hence, the psychological proximity of the elements given. A visual representation and interpretation of the MDS solution allows an approach for assessing technology transference. The MDS Approach also enables an assessment of a two-dimensional structure under which the clustering arrangement of elements occurs.

Multidimensional scaling results in a set of co-ordinates that can be represented as a two-dimensional map (Bell, 1990). Four quadrants comprise the map; two quadrants occur where Dimensions 1 and 2 have data co-ordinates which are both positive, or both negative. The third quadrant occurs where Dimension 1 co-ordinates are positive while Dimension 2 co-ordinates are negative, and the fourth quadrant occurs in a reversal of this. An example of an individual Transference Grid multidimensional scaling solution is shown in Figure 5.1. In this example, there is a cluster of elements with data co-ordinates which are positive in both dimensions (e.g., 'Lover', 'Mother', 'Mobile Phone'). One element has data co-ordinates which are negative in both dimensions i.e. 'Hated Person'. The elements 'Father' and 'Work Computer' have negative co-ordinates in Dimension 1, and positive in Dimension 2; the elements 'TV', 'Car', and 'Play Computer' have positive co-ordinates in Dimension 1 and negative in Dimension

2. Points presented within the map are arranged so that the map inter-point distances accurately reflect the data discrepancies (Bell, 1990, p. 33) and are “true dissimilarities” (Kruskal, 1964b, p. 115). Kruskal (1964b) proposes that the number and the identification of the elements, or “points” (Kruskal, 1964b, p. 116) within the solution, is important, and that they should make sense and offer useful insight to the experimenter (Kruskal, 1964b).

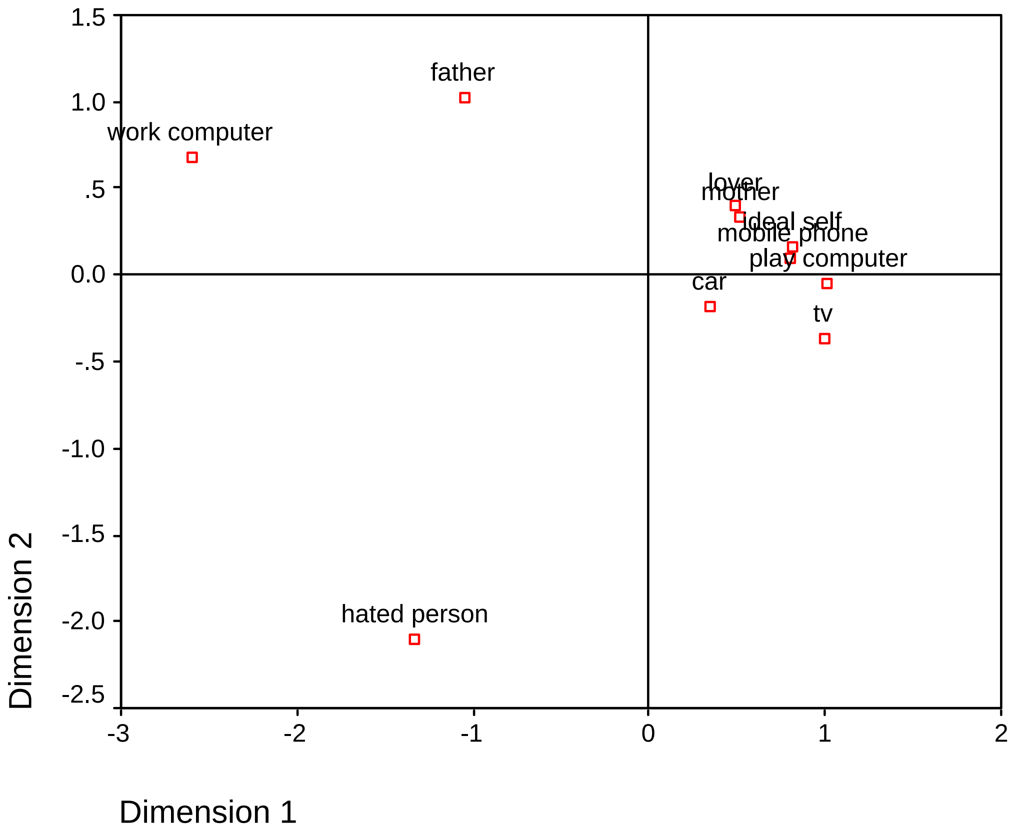

Figure 5.1. A multidimensional scaling solution example.

Descriptions of the two dimensions are open to interpretation, but each represents a trend apparent across all data points (Bell, 1990). Therefore, each dimension can be thought of “as a super-construct of a continuous or graded nature” (Bell, 1990, p. 33). In addition, a “determination of regions of similarity in the space” allows a researcher to loculate and enclose boundaries within which the points clustered on the map are similar in some way (Bell, 1990, p. 35). In this way, the proximity clustering of elements in the MDS solution describes the cognitive or psychological similarity of elements. Specifically, in Figure 5.1, Ideal Self was set up to be a major "fixed" element (similar to' self', or 'mother' according to Bell, 1990) which was assumed to have a positive valence; it operates within the grid structure as the most positive element boundary, while 'Disliked / Hated Person' operates as its counter-point. In Figure 5.1, seven elements are clustered, and distinct from the three elements of 'Father', 'Work Computer' and 'Disliked / Hated Person'.

Individual grids can also be aggregated to comprise a 'super-grid' because the elements are shared by all participants. Thus, both individual and group plots were produced, using individual and 'super-grid' Transference Grid data.

5.2.3 Frequency Approach: The ratings on the Transference Grid

For this approach, two very similar methods were used: the counting or frequency of constructs. The presence of transference was indicated in Method 1, only when rating occurred for all elements across the construct, and in Method 2 when rating occurred for any individual element within the construct row. Method 1 indicated that transference had occurred, while Method 2 demonstrated the relationship between the elements and constructs. For example, when rated similarly, a similarity between two elements such as play computer, and lover, is inferred. The transference categories are illustrated in Figure 5.2.

Method 1 is illustrated by the ratings coloured pink, because constructs 1 and 2 i.e. 'outgoing – quiet', and 'generous – stingy' elicited by comparing the three circled human elements, are then used (i.e. transferred) to rate all the technologies. These two constructs are termed transferred constructs.

Figure 5.2.

Positive Constructs	Mother	Father	Ideal Self	Lover	Hated person	TV	Play C	Work C	Car	Mobile -phone	Negative Constructs
1.outgoing	X	X	X	X	X	X	X	X	X	X	quiet
2.generous	X	X	X	X	X	X	X	X	X	X	stingy
3.truthful	X	X	X	X	X			X	X	X	deceitful
4.leisure						X	X	X	X	X	work
5.fast	X	X	X	X	X	X	X	X	X	X	slow
6.socialisation	X	X	X	X	X	X	X	X	X	X	solitary
7.fun	X	X	X	X	X	X	X	X	X	X	dreary

Figure 5.2. Four grid rating categories of a completed Transference Grid. The pink and blue categories are ratings that are transferred. Note that the positive pole of the construct (as defined by the participant) was placed on the left side of the grid matrix in Study One.

Play C and Work C = Play computer and work computer elements.

Method 2 is illustrated by the construct 3 ‘truthful – deceitful’ in which some elements (‘TV’ and ‘Play computer’) were not rated for this construct. In a similar fashion, the blue rating categories also represent transferred constructs, because the constructs 5 to 7 (i.e. ‘fast – slow’, ‘socialisation – solitary’ and ‘fun – dreary’) were elicited using comparisons of technologies. However, there was no transference for construct 4 (‘leisure – work’). Both categories represent transference, and occur when the ‘range of convenience’ of a construct accommodates both classes of elements (i.e. human and technologies) within the one grid construct. The yellow and green ratings are two non-transferred categories, because those ratings were given for constructs from their origins.

A third frequency measure was obtained by determining the number of participants’ MDS solutions which showed high, moderate and low transference, when measured by inter-element proximity clusters. Visual inspection of the clusters of elements determined the level of transference for Method 3. Close proximity of mixed elements, when human and technology elements clustered, was used as a measure of transference.

5.2.4 Qualitative Approach: Themes derived from Anthropomorphic Questions and Transference Grid Constructs.

The first method of the Qualitative Approach of examining transference posed a series of anthropomorphic questions to participants: “If the computer was a person, what sort of person would it be; what gender is the computer; and what is your computer’s name”. The purpose of this approach was to establish that transference was more human-focused or object-focused. Johnson et al. (2002b) suggest a continuum of participants, some of whom responded to their computer as a social agent, although many expressed discomfort in admitting it, especially to IT rationalist anchored researchers “blinded” to alternative perspectives (Johnson et al. 2002b, p. 35).

The second method of the Qualitative Approach identified themes derived from the Transference Grid constructs. Perceptions of relative power between people and their computers were accessed using this method, based on the theoretical position proposed by Suler (1998). Suler (1998) suggested that five types of transference occur, in which some people see themselves as having more power than their computers (and therefore parenting it, either by bossing or nurturing their computers); or less powerful (and being admiring or timid with their computers); or responding as an equal, and reacting to their computer as if it was a buddy. Themes were assessed using a taxonomy of human values (Schwartz, 1992, 1994). Accordingly, Schwartz’s (1992, 1994) taxonomy of human values was the framework used for the thematic analysis.

5.3 The Studies

5.3 1 Study One

Participants in Study One were a small undergraduate sample. Study One aimed to test the measurement of transference, the methodology of the Transference Grid, and the methods of analyses. Three approaches of assessing technology and computer transference were proposed and tested. These approaches were described in Section 5.2. As shown in Figures 5.1 and 5.2, ten elements were used in Study One. Adapted from a similar study by Lloyd (1998), these elements were ‘Mother’, ‘Father’, ‘Ideal Self’, ‘Lover’, ‘Hated / Disliked Person’, ‘TV’, ‘Play Computer’, ‘Work Computer’, ‘Car’ and ‘Mobile Phone’. All three measures of transference described in Section 5.2 were used to explore how commonly transference was encountered, and to explore its nature.

Research Question 1 examines: Do the methods identify and explore technology and computer transference?

5.3.2 Study Two

Study Two was the second of the pilot studies. Some changes in the methodologies were required from Study One. This study examines the evidence for, and outcomes from, technology transference.

Participants

A small sample of Psychology students comprised the sample. In addition to the sample of thirteen university students, there was a need to broaden and critique the Transference Grid on a critical, non-student, convenience sample of five participants.

Method

The addition of individual difference measures and modification of the Transference Grid were necessary following Study One. One major limitation of the Transference Grid in Study One was in regard to the element set, so the ‘Self’ element was added. The additional material included individual difference measures, and the addition of ‘Self’ element in the Transference Grid. Because the ‘self’ is an important anchoring concept from which people assess their relationship with the world, it was included in the element set for Study Two. Other minor changes to Transference Grid methodologies were made. One example of these changes was that of the preferred poles of each of the constructs being indicated by an asterisk. Previously, in Study One, the preferred pole of a construct had been recorded on the left side of the grid, but could lead to response bias according to Walker (2000, personal communication). To ensure the reliability of Transference Grid due to changes from Repertory Grid methodology, which only includes similar elements, reviews of the grids were undertaken. These reviews included the examination of each Kruskal’s Stress (a goodness of fit measure), to assessing the results of the MDS solutions (Kruskal, 1964a).

Research Question 2 examines evidence for technology transference and computer transference in three parts:

Research Question 2.1: Is there evidence of technology transference and computer transference?

Research Question 2.2: How common is technology transference and computer transference?

Research Question 2.3: What is the nature of technology transference and computer transference?

Research Question 3 poses: What is the relationship between learning style, occupational style and personality? Because of the addition of these individual difference measures,

Research Question 4 is: Is there evidence for the influence of individual differences for computer use?

Research Question 4.1 examines the influence that Extraversion, as well as Social, has on interpersonal interaction, and therefore influences computer use: Do both Social and Extraversion high scorers have lower rates of computer usage? Does their computer usage show higher rates of interpersonal activity, e.g. email use among friends? This was examined to determine different patterns of computer use for different occupational styles.

Research Question 4.2: Does technology transference vary with individual differences measures? Do High Social scorers have different rates of technology transference or computer transference compared to high-scoring Realistic participants? Are there mean differences in rating scores for high / low scoring Social and Realistic (i.e. Comparison of Transferred to Non-transferred element ratings) for high and low ‘Socials’ and ‘Realistics’, and Extraversion and Agreeableness.

5.3.3 Study Three.

Study Three was the final study of this thesis. Based on the outcomes of Studies One and Two, the research aim was to use the Transference Grid methodology, with participants in a series of industry settings.

Method

Participants

As Studies One and Two were undertaken with small samples of university students, it was proposed that a larger sample of workers from a broader 'real world' work context should comprise the final study sample.

Procedure

The measures in Study Two were replicated in the real world and the Research Questions were again addressed.

Research Question 5 continues to examine evidence for technology transference and computer transference, but within the context of workers.

Research Question 5.1: Is there evidence of technology transference and computer transference within workers?

Research Question 5.2: How common is technology transference and computer transference within workers?

Research Question 5.3: What is the nature of technology transference and computer transference within a sample of workers?

A second research aim sought to explore the nature of individual differences and its influence on technology and computer transference. **Research Question 6 remained unchanged from Research Question 3 in Study Two**. A lesser aim was to simply explore the relationships between individual differences, those of learning and occupational style, and personality. What are the associations between learning style, occupational style and personality in workers? However, Research Question 6 took on more importance, because occupational difference may be more pronounced in different work groups, because of the body of literature shows evidence of different acceptance of IT in different occupations. Therefore, the addition of a personality measure, along with the measure of learning and occupational style, enabled associations between these individual differences to be tested with these participants from a variety of industry settings. By incorporating a real world sample from a variety of industry settings, occupational and personality differences will be more differentiated.

The seventh Research Question concerns the role of individual differences / personality. **Research Question 7 is the major thrust of the thesis. This question examines the relationship between individual differences, and technology transference and computer use.** Research Question 7.1 is unchanged from Research Question 4, but has a broader basis with participants from a variety of industry contexts. This enables an evaluation of different patterns of computer use for different occupational styles.

It was important to extend the study to include components from a well-known, and researched, measure of technology acceptance as well as measures of technology transference. **Research Question 8 investigates the Technology Acceptance Model (TAM).** It was evident that Studies One and Two could have been strengthened by the inclusion of variables from the model of technology acceptance. Part of the strengthening of this design would allow the triangulation of the outcomes of transference measures with outcomes of technology acceptance measures, and also with those of individual difference measures. To this end, the ‘Symbolic Adoption’ version of the well-researched IS and IT measure of technology use, the Technology Acceptance Model by Davis (1989) was added in Study Three.

Therefore, **Research Question 9, which investigates an extension of the TAM (i.e. individual differences as TAM external, or non-core, variables), was added**. A version of the TAM that included items measuring the symbolic adoption of technology (Karahanna & Agawal, 1999) was utilised. Symbolic adoption refers to the mental evaluation of a technology as being worthwhile, and includes notions of positive evaluation, commitment, enthusiasm, and the return of a user’s resources (Karahanna & Agawal, 1999).

A final Research Question 10 addresses the impact of technology transference. Specifically, **Research Question 10.1**: What are the consequences of technology transference?

Research Question 10.2: Does technology transference have an influence on the technology acceptance as measured by the TAM or computer use?

The next chapter describes Study One, which trialled the Transference Grid and analysis methodologies. The aim was to test the measures as suitable criteria to identify and explore the nature of technology and computer transference.

CHAPTER SIX

STUDY ONE

Study One.

6.1 Research Question.

This pilot study was designed to measure transference, and to test the Transference Grid.

Research Question 1 asks: Do the methods identify and explore technology and computer transference?

Three different measures of technology transference and computer transference were devised. These three approaches were described in Section 5.2 in Chapter Five.

6.2 Method

6.2.1 Participants

Fifteen undergraduate Psychology students from the University of Wollongong participated in this study. The mean age of the participants was 21.00 years (SD = 4.72). Twelve of the participants were female. The mean computer experience of the participants was 6.95 years (SD = 4.02) years, and most of this experience was located at home 77.2% (SD = 25.10), on PCs 76.67% (SD = 28.30). The purpose of their computer use was entertainment 12.9% (SD = 15.00), assignments 53.67% (SD =28.70), work 14.0% (SD = 18.00) and communication 19.4% (SD = 13.20). These participants used computer systems that included word processing 50.33% (SD = 20.90), spreadsheets 7.27% (SD = 10.80), database 4.4% (SD = 10.00), statistical package 2.1% (SD = 5.20), with internet access 35.87% (SD = 21.20). The type of internet use was chatrooms 11.6% (SD = 22.4), emailing friends 30.0% (SD = 32.0), or work/ uni related 17.33% (SD = 24.7). They used the internet for information searching

39.67% SD = 30.0), but little else, at 1.5% (SD =2.9). Their mean frequency of computer use was 10.53 (SD = 8.1) hours per week.

6.2.2 Measures

The Demographic Questionnaire

The demographic questionnaire contained items asking the participant's age and gender, the length (years, months), location (work, home) and type (PC, MacIntosh) of computer experience, purpose of computer use (entertainment, assignments, work, communication), use of computer systems (word processing, spreadsheets, database, statistical package, internet and intranet), type of internet use (chatrooms, emailing friends, work/ uni related, information searching, and other), frequency and duration of computer use (in hours per week). Two anthropomorphic questions were posed: "If you thought of a computer as a person, what sort of person would it be?" and the "Degree of maleness / femaleness?"

The Transference Grid Methodology

In this study, participants were asked to complete a Transference Grid. This methodology was based on the Lloyd's (1998) Transference Grid, which used a triadic elicitation comparison of human elements. That is, participants were asked, "How in some way are two of the elements alike in a way that is different from the third". This grid was comprised of ten elements, five of which were human, (namely 'Mother', 'Father', 'Ideal Self', 'Lover', 'Hated/ Disliked Person'), and five non-human, (namely 'TV', 'Play Computer', 'Work Computer', 'Car' and 'Mobile Phone'). Seven constructs were elicited by the participant using the sequential form of elicitation (Fransella & Bannister, 1977). In detail, this method entails using the first three elements as a contrast to elicit from the participant the first construct, the second, third and fourth elements to construct the Construct 2, and so on. Construct 3 was elicited by comparing the third, fourth and fifth elements. These three constructs formed the three human-elicited constructs. Using the same sequential form of elicitation, the four non-human constructs were captured by contrasting the sixth, seventh and eighth, to form Construct 4; seventh, eighth and ninth elements for Construct 5; and eighth, ninth and tenth for Construct 6. This sequence was altered for Construct 7, which was elicited by contrasting elements 6, 9 and 10. Figure 5.2 in Chapter Five is a completed grid, and is repeated here for review. In Study One, the rating scale used when completing Transference Grids was 1 to 4. The transference categories are illustrated in Figure 5.2.

Figure 5.2.

Positive Constructs	Mother	Father	Ideal Self	Lover	Hated person	TV	Play C	Work C	Car	Mobile -phone	Negative Constructs
1.outgoing	X	X	X	X	X	X	X	X	X	X	quiet
2.generous	X	X	X	X	X	X	X	X	X	X	stingy
3.truthful	X	X	X	X	X			X	X	X	deceitful
4.leisure						X	X	X	X	X	work
5.fast	X	X	X	X	X	X	X	X	X	X	slow
6.socialisation	X	X	X	X	X	X	X	X	X	X	solitary
7.fun	X	X	X	X	X	X	X	X	X	X	dreary

Figure 5.2. Four grid rating categories of a completed Transference Grid. The pink and blue categories are ratings that are transferred. Note that the positive pole of the construct (as defined by the participant) was placed on the left side of the grid matrix in Study One.

Play C and Work C = Play computer and work computer elements.

6.2.3 Procedure

Each participant completed the demographic questionnaire, followed by the Transference Grid. Completion of the Grid was conducted one-to-one or two-to-one with the researcher. The two anthropomorphic questions were included in the demographic questionnaire. The time for the completion of the study procedure was unrestricted, and the task duration varied; however, most students performed the task within one hour.

6.3 Results

The presentation of the results follows the three different approaches to measuring technology and computer transference: the MDS, Frequency, and Qualitative Approaches.

6.3.1 The MDS Approach: Measure of Transference using MDS Analyses of Transference Grid Elements and Dimensions

Examples of Individuals' Inter-Element Distances

A visual inspection of the multidimensional scaling (MDS) analyses of individual participants' results was performed, by assessing their inter-element proximities and resultant clustering, which was described in Section 5.2.2. In a similar study, Lloyd (1998) had performed MDS using two dimensions, and had concluded that this analysis had yielded evidence of transference when close proximity between human and technology elements was observed.

The degree of proximity of human and technology elements represents a level of transference: tight grouping represents high transference, moderate clustering represents moderate transference, complete separation of human and technology elements represents no transference, and inclusion of one technology but no others, represents specific transference. A range of transference levels shown by participants is illustrated in Figures 6.1 to 6.4. In addition, as a means of addressing Research Question 1, an exploration of the relationships people form with technologies as an 'Other', based on numerous theoretical propositions such as Ihde (1973; 1983), Barglow (1994), and Suler (1998), was used. These relationships describe the ‘felt’ experience of using a technology, as well as an experience described in anthropomorphological terms, as projections of emotions and beliefs (Norman, 2004) from past interpersonal relationships (Suler, 1998).

Visual examination of the MDS solutions for all participants was performed. This second method of identifying transference was explored within the MDS Approach, by examining any themes or “super-constructs” (Bell, 1990, p. 33) which emerge to explain the first and second dimensions of each solution. Such themes are subjective, but offer additional insights (Block & Block, 2005). This analysis enables insights into two continuums which show a conceptual gradation from high to low for some attributes (Block & Block, 2005). A consistent interpretation of the Dimensions 1 and 2 for each MDS solution was possible, from a visual review of all MDS solutions for Study One. These reveal the same two-dimensional structures as those illustrated in Figures 6.1 to 6.4, and presented for each MDS result.

The first Transference Grid MDS solution to be presented in this section is illustrated in Figure 6.1 (participant cb0381). The participant, cb0381, is an eighteen-year-old female, with four years of computer experience. The MDS representation from this participant exemplifies high technology transference. There is one very tight cluster of elements that is a mixture of human and technologies. As can be seen in Figure 6.1, five of the 10 elements (‘Lover’, ‘Mother’, ‘Ideal Self’, ‘Play Computer’, ‘Mobile Phone’) lie in the positive quadrant for both Dimension 1 and Dimension 2, while two elements (‘Car’ and ‘TV’) are located within that cluster, but just on the negative pole of Dimension 2. ‘Father’ and ‘Work Computer’ elements are separate from each other, and that main cluster, but are located in the negative quadrant of Dimension 1, and positive quadrant of Dimension 2. Thus, the element (‘Hated/ Disliked Person’) in the double negative quadrant, is isolated from the rest of the elements. In Figure 6.1 (participant cb0381), Dimension 1 was taken to be Affect, because of the location of ‘Ideal Self’ and ‘Hated Person’ elements. Due to the location of elements which require little effort (such as ‘TV’, ‘Play Computer’) or are of little relevance (such as ‘Hated Person’), Dimension 2 was taken to be Level of Effort or Engagement, or Salience.

Kruskal (1964b) defines stress as “the measure of how well the configuration [of the hypothesised formula] matches the data, … that is the root mean square residual departure from the hypothesis” (p. 115). “The smaller [the stress] the better”, according to Kruskal (1964a, p. 3). The stress value for this participant’s grid is 0.062, which is good to fair (where 0.05 is evaluated as ‘good’ according to Kruskal, 1964a, p. 3); its squared correlation coefficient (RSQ) is 0.99, and indicates a near perfect fit between the data and the solution (SPSS, 1988).

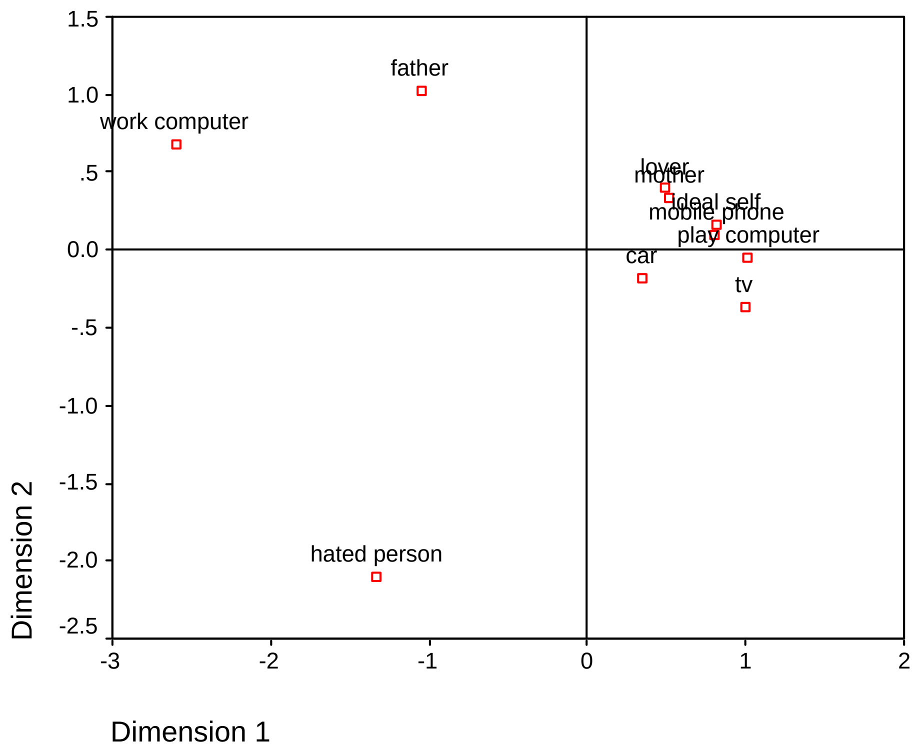

Figure 6.1. Multidimensional Scaling solution for a participant (cb0381) who exemplifies high transference.

The second grid result (participant ah1071) to be presented in this section exemplifies moderate technology transference (see Figure 6.2). Participant ah1071 is a twenty eight-year-old male with fourteen years of computer experience. There is one cluster of human elements which also includes the ‘Car’ and ‘Mobile Phone’. As can be seen in Figure 6.2, these two technology elements are in proximity to positive elements of ‘Lover’, ‘Father’ and ‘Ideal Self’, and, more distantly, to ‘Mother’. These elements are rated as being closer to the participant’s preferred construct pole. The elements ‘TV’, ‘Work’, and ‘Play Computer’ are separate from that main cluster, and are located in the negative quadrants of Dimension 1 and Dimension 2, and rated closer to the non-preferred pole. The element ‘Disliked / ‘Hated Person’’ is isolated from the rest of the human elements in the negative quadrant for Dimensions 1 and 2.

Figure 6.2. Multidimensional Scaling solution for a participant (ah1071) who exemplifies moderate transference.

As illustrated in Figure 6.2, again, Dimension 1 was taken to be Affect, because of the location of ‘Ideal Self’ and ‘Hated Person’ elements. As for the previous MDS solution, Dimension 2 was again interpreted as Salience, Effort or Level of Engagement. The Kruskal stress of this participant's grid is 0.07, which is acceptable, better than fair (where 0.1 is evaluated as 'fair' according to Kruskal, 1964a, p. 3), its RSQ is 0.98, which is also acceptable (SPSS, 1988).

Figure 6.3 illustrates a participant who demonstrated a specific transference which was limited to her car. Rw1180 is an eighteen-year-old female with 12 years computer experience. Visual examination of the MDS solution for this participant shows no computer transference. Her technology transference was to the car, in that the 'Car' element lies as the most positive element in Dimension 1 (for Affect), and neutral for Effort or Level of Engagement, or Salience.

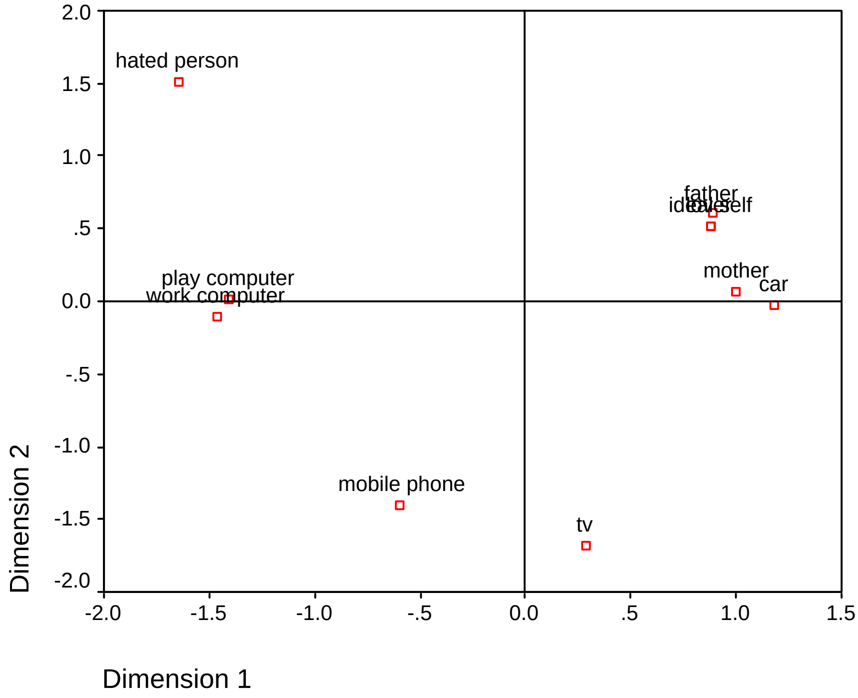

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Figure 6.3. Multidimensional Scaling solution of a participant (rw1180) who exemplifies specific transference.

Her 'Mother', 'Ideal Self' and 'Father', as well as the 'Car', are located in the positive quadrant for both Dimensions 1 and 2. Respectively, the Kruskal stress and RSQ for the MDS solution were 0.061 (which is good to fair), and 0.983 (which shows a near perfect fit between the data and solution, SPSS, 1988). The ‘TV’ and ‘Mobile Phone’ are seen as requiring low effort, in contrast to the ‘Hated Person’.

The final participant to be illustrated in Study One is pn7180. She is a nineteen-year-old female, with ten years of computer experience. The MDS solution for this participant’s grid (see Figure 6.4) reveals low computer or technology transference. There are five distinct sets of clusters which are either human or technology element sets. A separation of human and technology elements is demonstrated. Dimension 1 reveals an axis between the ‘Ideal Self / Lover’ and ‘Hated Person’, while Dimension 2 demonstrates the axis between the ‘Hated Person’ and ‘Mobile Phone’. Again, for this participant, Dimension 1 was interpreted to be Affect, and Effort could describe Dimension 2. The Stress at 0.04 is good (Kruskal, 1964a, p. 3), and RSQ is 0.99, which is acceptable (SPSS, 1988).

Figure 6.4. Multidimensional Scaling result of a participant (pn7180) who demonstrated low transference.

The four MDS solutions represented in Figures 6.1 to 6.4 revealed differences in the cluster patterns of elements. Each MDS solution was unique, but demonstrated clusters of elements which consisted of human and technologies. Building on Lloyd's (1998) criteria of element proximity as demonstrating technology transference, these MDS solutions support the incidence of technology and computer transference. Research Question 1 asked whether the MDS approach for assessing technology and computer transference describes the data. These results indicate that, overall, high levels of transference occurred, and that the MDS Approach offered methods of analyses which are able to capture this.

Two consistent themes, or super-constructs (Bell, 1990), could be used to describe the MDS solutions dimensions, using element locations to interpret the themes. Both themes described gradations. Dimension 1 was consistently interpreted as Affect, because of the location of 'Ideal Self' and 'Hated Person' elements. Dimension 2 was interpreted to describe Effort, Salience or Engagement, due to the location of elements which may involve low effort, such as 'TV', 'Play Computer', or be of little relevance, such as 'Hated Person'.

6.3.2 The Frequency Approach: Analysis of Technology Transference of Transference Grid Ratings

The Frequency Approach measure of transference is based on the Transference Grid methodology, and further addresses Research Question 1. There are two methods to this approach. Method 1 utilised the frequency with which people place a rating on the Transference Grid matrix across all elements, across one construct row. (Refer to Section 5.2 for review). In Study One, a total of 107 constructs were elicited. Seven constructs were elicited by eleven participants, one participant elicited six, and three participants elicited eight constructs. Ninety nine (92.5%) constructs were given a rating for the whole construct row of the Transference Grid (i.e. transferred from the elements on which they were elicited, to the other). This indicates that a frequency of 92.5% constructs showed a 'range of convenience', incorporating both element sets.

Method 2 describes transference which occurs when people can assign a rating for each Transference Grid matrix cell, rather than for the whole construct row. The second method resulted in a frequency of 94.4% of transference (1010 cells from a total of 1070 matrix cells were rated). These results indicate that participants found the descriptions they gave separately to humans and technologies, were 94.4% applicable to both. High frequencies of transference (92.5 and 94.4%) were found. In addition, only one participant did not exhibit full transference (i.e. 6.67%) from this university sample of the 15 participants. Using the MDS approach of assessing the proximities of mixed element clusters, the frequency of participants demonstrating high trahsference was seven, four participants exhibited moderate transference, three with low, and one participant had no transference. Research Question 1 posed whether using the frequency approach identifies technology and computer transference. Regardless of the method used, these frequency results indicate high levels of transference were captured.

6.3.3 The Qualitative Approach: The Nature of Technology and Computer Transference

6.3.3.1 Analysis of the Anthropomorphic Questions

Research Question 1 asked whether the methodologies identified transference, as well as exploring the nature of transference. This section deals with the second part of Research Question 1. An analysis of the content of the two anthropomorphic questions posed to participants describing the computer as a person was conducted. The responses given by participants in anthropomorphising their computers offer an insight into the notions of an ‘Other’, which underlies such transference (Ihde, 1973). Participants’ responses suggested a variation in their perceptions of computer attributes. Responses ranged from technological and scientific, analytic, rational, organised and intelligent, hardworking and achievement-oriented, introverted, co-operative, friendly and smart, through to unpredictable, inflexible, frustrating, boring and difficult, and unemotional. The gender attribute given to computers were dominantly masculine (58.87% male). A full list of the descriptions given by participants to portray the ‘Computer as Person’ is listed in Table 6.1. Specifically, participants were asked ‘If you thought of a computer as a Person, what sort of person would it be?’, and the ‘Degree of maleness / femaleness?’

Table 6.1

Description given by participants of computer as person, and computer gender attribution.

Participant	Sex	Computer as sort of Person	Male %	Female %
ah1071	m	Blonde	1	99
jv0980	f	Stubborn, erratic, hard to understand	95	5
vc0880	m	Serious, intelligent, inflexible	70	30
ng0775	f	Analytical, intelligent, boring, little emotional expression	70	30
ms0474	m	Nerd	80	20
cb0381	f	Co-operative most of the time	35	65
pn7180	f	Very technologically advanced, friendly & helpful	60	40
pc1165	f	Pleasant but shy, friendlier as I learn more, means to an end	0	0
hg6680	f	Highly educated, very succinct, very organised	60	40
jr0781	f	Intelligent, informative, mathematical, scientific	60	40
rw1180	f	Quiet, hardworking, goal oriented	67	33
kl1280	f	Aging, annoying, and needs to go to hospital frequently	70	30
rh1080	f	Sometimes easy to get along with, but also frustrating	60	40
ar0581	f	Smart, keeps to themselves, quiet, a loner	70	30
jl0780	f	Boring	85	15
		Average gender attribution	**58.9**	**34.5**

Participant sex: m = male, f = female.

Overall, the attributes projected to computers are centred on orderliness and diligence, intelligence, assertiveness, agreeableness and low gregariousness, flat affect and low trustworthiness. Computers were seen as predominantly masculine.

6.3.3.2 Thematic Analysis of Transference Grid Constructs using a Human Values Taxonomy

A taxonomy of constructs was attempted using Schwartz's (1992, 1994) system of human values. A random selection of grids (eight from the 15 participants) was selected for co-rater reliability assessment of the construct themes. The co-rater was a professional male, who was inexperienced with this rating approach, but received a short session of training. He recognised themes and categorised them according to the taxonomy moderately easily after some practice. The inter-rater agreement was 82%. Schwartz's established and well-researched circumplex of value types structure was found to have a satisfactory architecture for understanding the array of constructs, when an additional category of 'Utility' from Lloyd's (1998) thematic analysis was included. Lloyd (1998) had found five themes which described the clusters found in MDS solutions. These included love, independence, obligation, knowledge and utility. With the exception of utility, the themes from Lloyd could be described within Schwartz's (1992, 1994) taxonomy. All constructs were meaningfully categorised within this extended version of Schwartz's value structure, with the exception of five constructs (4.67%). These five constructs, not easily classified within this taxonomy, could be categorised as either of two categories from Schwartz's (1992) taxonomy. For example, one construct 'good brand - crap brand' could be classified within Schwartz's categories of 'social recognition' or 'responsible'. The categorisation would depend on whether the participant was focused on gaining 'respect and social approval' by owning good brand (thereby relating to Social recognition [Power] category), or the participant's meaning was centred on the function being ‘dependable’ and ‘reliable’ (and thus Responsible [Benevolence]). Other constructs in this non-specific category described a personality characteristic ‘down to earth – headstrong’; ‘optimistic – pessimistic’. The list of the extended human value types, and the frequency and percentage of the constructs classified for each category, are shown in Table 6.2. For ease of comparison with the Schwartz’s circumplex representation, the values are listed in Table 6.2 in order as they appear Schwartz’s (1992, 1994) original.

Table 6.2.

Type and Frequency of Construct Categories

Value type (Schwartz)	Frequency of constructs within category	% of constructs within category
Self respect	0	0.00
Power	12	11.22
Achievement	4	3.74
Hedonism	19	17.76
Stimulation	7	6.54
Self-Direction	10	9.35
Universalism	2	1.87
Benevolence	25	23.36
Tradition/conformity	11	10.28
Security	1	0.94
Utility*	11	10.28
Category unsure	5	4.67

*Based on Lloyd (1998).

Exploring participants' perceptions of a power differential between themselves and their computer may expand and enrich understandings of the human-computer interaction. Suler's (1998) notion of transference is quite specific, in that it centres on power relations within human-computer interaction. He posited that some individuals see computers as very powerful in comparison to themselves, while others see themselves as retaining the dominant power. Such differences in interaction may influence an end-user's negotiation and confidence in using IS and IT. To see whether this power interaction was found within the Transference Grid, constructs designated as being located within the 'power' category were examined. Constructs classified as 'Power' were examined to determine the percentage in which the 'Ideal Self' was rated as more or less powerful than either 'Work' or 'Play Computers'. This would determine if some participants perceived their ideal self as being greater, or less powerful, than their computer, and would impact on their sense of agency in regard to this 'Other'.

6.3.3.3 Differential in Power between Ideal Self and Computer Elements

The aim of the power classification was to explore Suler's (1998) theoretical position that people show a transference relationship with computers that shows a child-parent or buddy relationship, which, in essence, are based in unequal or equal power relations. Table 6.3 lists the participants' constructs, the category of their Power values type (Schwartz, 1992, 1994), and the Transference Grid ratings given to those three elements. From Table 6.3, it can be seen that twelve constructs were categorised within the 'Power' value dimension, and distributed within 'wealth' value type, 'authority' and 'ambition'. One participant exhibited four of their seven constructs as falling within 'Power' values, two participants exhibited two power constructs each, and all other power constructs came from four other participants. Therefore, 50% (seven of 14) participants in this study demonstrated ‘Power’ as a theme in their constructs, but overall only 12 of 107 constructs (i.e. 11.2 %) related to ‘Power’, and power relations within the human-computer interaction.

The findings in Table 6.3 provide some support for Suler’s notion of transference, because seven participants demonstrated a relationship with computers that involved power. By comparing the rating given to their ‘Ideal Self’ and computers, a determination of each participant’s power differential for these elements was made. Some participants rated their ‘Ideal Self’ as being more powerful than computers, while others rated their ‘ideal’ as less powerful. Cross-referencing this category of Power values type (Schwartz, 1992, 1994) with the description these participants gave of the sort of person a computer would be (in Table 6.1), appears to corroborate Suler’s position that some individuals see themselves in a more positive way than computers. For example, ah1071, who described the person-as-computer in derogatory terms, i.e. ‘blonde’ (in Table 6.1), described his Ideal Self as equal to, or better than, both computers (in Table 6.3). Other participants saw computers as conscientious and socially isolated (ar0581 and rw1180), and unpredictable (kl1280 and rh1080). These participants all demonstrated a transference pattern based on power, as theorised by Suler (1998).

Table 6.3

Element Ratings of Power Constructs

Participant	Bi-polar constructs	Swartz's value type of Power	Ideal Self	Play Computer	Work Computer
ah1071	Love of money-paranoid	Ambition	1	1	1
	Great root-untrustworthy	Authority	1	2	4
	Fast-cost big bucks	Wealth	1	1	1
	Red-expensive	Wealth	1	4	4
ar0581	Stubborn-give in easily	Authority	2	3	1
hg0680	Enjoys money more-stingy	Wealth	2	1	4
kl1280	Independent, responsible with money – dependent, generous	Wealth	1	1	3
	Cheap/pleasure to use – ineffectual/time-consuming/expensive	Wealth	2	3	2.5
ng0775	Financial gain-financial loss	Wealth	1	3	1
rh1080	Very generous with money– conservative with money	Wealth	1	2	2
	Not cost me anything – expensive to run	Wealth	2	2	1
rw1180	Stubborn-intolerant	Authority	2	2	1

Note: The rating scale was 1-4, where 1 indicated the participants' preferred pole, and 4 indicates their non-preferred pole of a bi-polar construct.

Participant ah1071had four constructs which demonstrated a power theme. Two of these power constructs revealed his 'Ideal Self' as equal to computers. His 'Ideal Self', 'Play Computer' and 'Work Computer' were rated as 1, across the three elements. This indicates that these three elements were perceived as having no power difference for the constructs related to ambition (love of money – paranoid), and wealth (fast – cost big bucks). The two other power constructs, which were related to authority (great root – untrustworthy) and wealth (red – expensive), revealed a power differential in which his

‘Ideal Self’ was more powerful than the computers. Participant ar0581’s one power construct related to authority (stubborn – gives in more easily), demonstrated a power differential in which the ‘Work Computer’ was perceived as more powerful than the ‘Ideal Self’ or ‘Play Computer’. For participant hg0680, the power differential based on their construct related to wealth (enjoys money – stingy), showed an unequal power in which the ‘Play Computer’ was perceived as being more powerful than their ‘Ideal Self’, or ‘Work Computer’. The next participant, kl1280 had two power constructs related to wealth (independent, responsible with money – dependent, generous), and (cheap, pleasure to use – ineffectual, time-consuming, expensive). The construct ‘independent, responsible with money – dependent, generous’ demonstrated equal power for the ‘Ideal Self’ and ‘Play computer’ elements, which was greater in comparison to the ‘Work Computer’. Their second construct (cheap, pleasure to use – ineffectual, time-consuming, expensive) revealed greater power to the ‘Ideal Self’ than the ‘Work Computer’, which had more in comparison to the ‘Play Computer’. Ng0775’s power construct which was related to wealth (financial gain – financial loss), showed equal power between ‘Ideal Self’ and ’Work Computer’ which was greater than the perception of power for the ‘Play Computer’. The first of two power constructs, both of which were associated with wealth for participant rh1080 (very generous with money – conservative with money), revealed greater power for their ‘Ideal Self’ in comparison with either of the two computers. The second of their two power constructs (not cost me anything – expensive to run) revealed a power preference for the ‘Work Computer’. The final participant with a power construct which related to authority (stubborn – intolerant) revealed a power differential for the ‘Work Computer’ compared to their ‘Ideal Self’, or ‘Play Computer’.

Examination of the participants' perceptions of their dominance of, or equality with, their computers illustrates some variability. The responses in which the 'Ideal Self' is described as having most power, coincides with derogatory descriptions of the computer. Such descriptions include 'blonde', 'ageing, annoying, often unwell', 'analytical, annoying, boring', 'sometimes easy to get along with, but also frustrating'. Conversely, participants who perceived the computer as more powerful, appeared to revere its informational capacity or its ability to assist with goals. Descriptions such as 'smart, keeps to self, a loner'; 'educated, succinct, organised'; 'quiet, hardworking, goal-oriented' are illustrations of these descriptions. One participant, who demonstrated both dominance and weakness, described perceptions that appeared ambivalent 'Sometimes easy to get along with, but also frustrating'.

Some participants in Study One demonstrated a transference pattern based on power, as theorised by Suler (1998). This Qualitative Approach to measuring transference was useful in examining an additional component to the meanings given within computer-human interactions. However, the range of usefulness of one method of the Qualitative Approach was limited, because about 88% of transference constructs were not descriptions of power. Transference constructs, in decreasing frequency, described value types of 'Benevolence' (23.36%), 'Hedonism' (17.76%), 'Power (11.21%), 'Tradition/conformity' (10.28%), 'Utility' (10.28%), (Lloyd, 1998), 'Self-Direction' (9.35%), 'Stimulation' (6.54%), Uncategorised constructs (4.67%), 'Achievement' (3.74%), 'Universalism' (1.87%) and Security (0.93%).

6.4 Discussion

The aim of this pilot study was to trial a methodology in relation to transference, to explore the incidence of transference, and to trial methods of analysing data obtained using these methodologies. In Study One it was found that the Transference Grid methodology was an appropriate measure of technology and computer transference. The Transference Grid methodology was tested, and found to be satisfactory utilising a small sample of students. In addition, the usefulness of the methodology in establishing the frequency and nature of transference occurrence was supported. The grid methodology provided support that transference is common, and that individuals differ in the relationships they form with technologies. One source of that variation is in the attributes given to computers, the power differential participants felt towards computers, and by which they evaluate technologies.

The current study also raised questions concerning technology and computer transference. These questions include

(i) how, or whether, perceptions of computer gender and descriptions of computer-as-person enable the nature of transference to be explored?

(ii) in examining the nature of technology transference and the structure under which it operates, does a person's sense of power influence their computer interactions?

(iii) to what extent do human values impact on technology transference?

In this study, Schwartz's value structure was extended to include a category termed Utility, which was required in order to classify 11 constructs (10.28%) with this theme. All constructs were meaningfully categorised within this extended version of

Schwartz’s value structure, with the exception of five constructs (4.67%) which were found to be ambiguous, or difficult to classify into this extended structure. It is understandable that a study on human values fails to provide a notion of ‘use’, or ‘usefulness’, because the notion centres on function and functionality, whereas human values provide guiding principles, which are abstractions. ‘Utility’, however, is a commonly-accessed notion in IS and IT studies, found as latent variables, such as the Technology Acceptance Model’s (Davis, 1989) ‘perceived ease of use’, and ‘perceived usefulness’.

6.5 Conclusion

Although Study One has demonstrated and explored the nature of transference, an additional study was warranted because of the limitations found. One limitation related to the element ‘Self’. Some participants perceived their ‘Ideal Self’ as being greater, or less powerful, than their computer. It would have been more suitable to base this determination on ‘Self’ rather than ‘Ideal Self’. However, within this study, ‘Ideal Self’ was the only element available for this analysis. Study Two replicates and extends the Transference Grid methodologies, and adds measures of individual differences. These measures added extra dimensions to descriptions of the person. In addition, although a small group of undergraduates comprised the sample again, a supplementary convenience sample of workers trialled these research approaches.

CHAPTER SEVEN

STUDY TWO

Study Two

Introduction

Study Two examines the evidence for, and consequences from, technology transference. Study One identified technology transference, and illustrated some different responses that a student sample had toward technologies. However, the study had shown some limitations. There were methodological and design improvements for Study Two. These included changes to the Transference Grid, and the addition of individual difference measures in order to explore their part in the different utilisation of technologies. Individual difference measures included the measures of learning style (ILS, Felder & Soloman, 1999), and personality (NEO-FFI, Costa & McCrae, 1991) and occupational style (SDS, Holland, 1985b, 2001). Study Two also used psychology undergraduate students, but also extended the sample to include a small, convenience, non-student sample.

7.1 The Research Questions

7.1.1 Research Question 2 examines evidence for technology transference and computer transference in three parts:

Research Question 2.1: Is there evidence of technology transference and computer transference?

Research Question 2.2: How common is technology transference and computer transference?

Research Question 2.3: What is the nature of technology transference and computer transference?

7.1.2 Research Question 3 poses: What is the relationship between learning style ILS and occupational style SDS, and personality NEO-FFI?

Research Question 3 proposes that there are associations between measures of Individual differences, that is, between measures of learning style (ILS), occupational style (SDS) and personality (NEO-FFI) namely:

- **Research Hypothesis 3.1**: *that Extraversion (NEO-FFI) and Social (SDS) and Active (ILS) are positively related*
- **Research Hypothesis 3.2**: *that Extraversion (NEO-FFI) and Verbal (ILS) are positively related.*
- **Research Hypothesis 3.3** *that Reflective (ILS) and Investigative (SDS) are positively related.*
- **Research Hypothesis 3.4**: *that Enterprising (SDS) and Openness (NEO-FFI) are positively related.*
- **Research Hypothesis 3.5**: *that Enterprising (SDS) and Extraversion (NEO-FFI) are positively related.*
- **Research Hypothesis 3.6**: *that Sensing (ILS) and Realistic type (SDS) are positively related.*
- **Research Hypothesis 3.7**: *that Artistic (SDS) and Visual (ILS) are positively related.*
- **Research Hypothesis 3.8**: *that Conscientiousness (NEO-FFI) and Conventional (SDS) are positively related*
- **Research Hypothesis 3.9**: *that Openness (NEO-FFI) and Realistic (SDS) are negatively related*

What effect does personality, learning and occupational style have on technology transference? The importance of these effects stems from the difference in their permanence, because learning style is amenable to change, while personality is relatively stable. This variation in stability will have implications for individual differences in areas such as learning and training, attitudes to novelty and change, to innovations, and to perceptions of the utility of a technology. With the addition of the individual difference measures, Research Questions 4 examines the relationship between individual differences and technology transference, as well as technology and computer use.

7.1.3 Research Question 4 asks if there evidence for the influence of individual differences for computer use?

Research Question 4.1 asks whether technology transference varies with individual differences? Do high Social scorers have different rates of technology transference, or computer transference, compared to high scoring Realistic participants? Do high Extraversion scorers have different rates of technology or computer transference compared to high scoring Agreeableness participants?

Research Question 4.2 examines the influence that Extraversion (NEO) as well as Social (SDS) has on interpersonal interaction, and therefore influences computer use: Do both Social (SDS) and Extraversion (NEO) high scorers have lower rates of computer usage? Does their computer usage show higher rates of interpersonal activity, e.g. email use among friends? This was examined to determine different patterns of computer use for different personality and occupational styles.

Research Question 4.3 proposed that individuals with higher technology and computer transference show higher computer use.

7.2 Method

7.2.1 Participants

Thirteen undergraduate psychology students from the University of Wollongong participated in this study. An additional five participants, who constituted a convenience sample, were also surveyed. Participants in this additional group were adults who were independent of the development of the research, and were naive to the study, but would both assess and critique the tasks, and give informed feedback. This sub-sample was interviewed after the initial data collection. They were seen to be important in assessing the measures when they were to be taken into work environments, as was planned for Study Three. Therefore, in total, eighteen participants comprised this study, 15 of whom were female.

The mean age of participants was 25.60 years (SD = 12.41), with a mean of 7.17 (SD = 3.78) years computer experience, which was mostly centred at home (64.39%), and utilised for assignments (54.71%), work (19.71%), communication (15.29%) and entertainment (10.29%). Software utilised was word processing (58.53%), and Internet (27.06%), with decreasing use of spreadsheets (7.35%), statistics (6.18%), and Intranet (1.76%). The use of the Internet was focused on emailing friends (37.94%), information searching (25.29%), emailing for work (18.53%), and other (7.35%), and chatrooms (3.24%).

7.2.2 Materials

There were five measures in Study Two. The first measure was the demographic questionnaire, to which was added one further qualitative question: “ what is the name of your computer". Three measures of individual differences were also administered: the Index of Learning Style (ILS) by Felder and Soloman, (1999); The Self-Directed Search (SDS) by Holland, (1985b, 2001); the NEO-FFI by Costa and McCrae (1991). The fifth instrument was the modified Transference Grid.

7.2.2.1 Index of Learning Style

The Index of Learning Style (Felder & Soloman, 1999) is a measure of learning style that categorises individuals along five bi-polar dimensions in how they approach interaction with new material. The model classifies individuals along a continuum from Sensors (S) to iNtuitors (N), Visual (Vi) to Verbal (Ve), Inductive (I) to Deductive (D), Active (A) to Reflective (R), and Sequential (Seq) to Global (G) learners. The first two categories, Sensors (S) versus iNtuitors (N), and Visual (Vi) versus Verbal (Ve), refer to the perceptual level. Inductive (I) versus Deductive (D) refers the organisational level, while Active (A) versus Reflective (R), and Sequential (Seq) versus Global (G) refer to the processing level of their style. This model of learning style incorporates concepts from other measures of learning style, including the Myers-Briggs Type Inventory (Myers Briggs & McCaulley, 1985), and Kolb's Learning Style Inventory (Kolb, 1984).

The ILS (Felder & Soloman, 1999) is an ipsative scale in its beta form, and was developed for use with students of tertiary level of education. It measures four of the model's five learning preferences, and all but the Inductive (I) or Deductive (D) style are included (see Chapter Three Section 3.2.1 for details). The psychometric properties of the ILS (Felder & Soloman, 1993) have recently been established (Litzinger, Lee Wise & Felder, 2005; Van Zwanenberg, Wilkinson & Anderson, 2000; Zywno, 2003). According to Van Zwanenberg et al. (2000), its ipsative nature restricts its usefulness to individuals' assessment of the relative strengths of their learning preference, rather than any normative comparison. However, Zywno (2003) held that the ILS has advantages relative to other measures of learning style in that it uses simple, accessible language, and that it is short. In addition its availability via public domain on Felder's web-site (Felder, 2006) is also advantageous. Litzinger, Lee Wise and Felder (2005) concluded that the ILS demonstrated construct validity, and was a suitable tool for the assessment of learning styles across the faculties of education, liberal arts and engineering. Given that one of the aims of this study was to assess the impact of learning style on technology acceptance, the ILS could be used as a measure to explore the learning preferences of a sample of workers from a broad range of occupations and industries. Cronbach's alpha coefficients were reported as ranging from between 0.56 to 0.77 (Litzinger et al. 2005), which was acceptable for an attitude test (Tuckman, 1999, as cited by Zywno, 2003). Other studies have found alpha coefficient results that were comparable: 0.53 to 0.70 (Zywno, 2003); 0.54 to 0.72 (Livesay, Dee, Felder, Hites Nauman & O'Neal, 2002, as cited in Zywno, 2003); and some that were poorer: 0.41 to 0.65 (Van Zwanenberg et al. 2000).

7.2.2.2 Self-Directed Search

The Self-Directed Search (Holland, 2001, Australian Edition) is a relatively well-known, self-administered, self-scored and self-interpreted vocational assessment tool. It has undergone many revisions (1970, 1972, 1977, 1979, 1985, 1990, 1994 and Australian edition, 1985 and 2001). Its aim is to provide a robust scientific and practical vocational assessment, with good reliability (Gottfredson & Holland, 1996). The Cronbach's alpha coefficient range for the summary scores was reported as 0.86 to 0.91 for women aged 19 to 25 years, and 0.87 to 0.92 for women 26 to 74 years, while the equivalent range for men was reported as 0.88 to 0.91 for men 19 to 25 years, and 0.90 to 0.92 for men 26 to 74 years (Holland, 1985b, p. 49). The Self-Directed Search (SDS) was developed on workers and students over a very broad age range from an extremely diverse range of occupations and occupational aspirations, thus its application is suitable for adolescents and adults. This theory of occupational personality classification groups people into six categories: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C) (RIASEC). The aim was to create a classification system that fulfils the need for “comprehensiveness, independence of categories, classification by a single principle” (Holland, 1985a, p. 122). It allows for an integration of a participant’s occupational aspirations, occupational preferences, and abilities and skills, to summarise an occupational choice or decision already made. The scale includes 228 items, 66 of which describe activities, and 66 describe competencies, that is, 11 items categorised into each of the six sub-scales. Fourteen items for each of the sub-scales evaluate participants’ attitude to occupations, and a 7-point rating scale allows self-estimates of the six sub-scales for abilities and skill levels. The assessment measures the fit between an individual and their vocation choice, or range of choices. The theory proposes that both people and work environments can be classified into six types, which can act as both a means of explanation, and description. People fall into these six categories because of their preferences for individual differences and similarities. The profile characteristics of a person high on a particular sub-scale will resemble the profile for that particular category and matching vocational area. The final score from an individual’s SDS is a three-letter ranked summary of the three categories that have the highest scores. The SDS is associated with Holland’s RIASEC theory, the “most widely used organising principle for vocational interest assessment in the world” (Gottfredson & Holland, 1996, p. 703). Holland (1985b, p. 39) refers to the proximity within the hexagonal arrangement of similar vocation classifications, thus representing psychological proximity between like occupations. The SDS has been criticised for demonstrating gender bias, however, this may be a function of its ability to measure gender differences (Zhang, 2000).

7.2.2.3 The NEO-FFI

The NEO –FFI (Costa & McCrae, 1991) is the short form of the five-domain personality assessment NEO PI-R (Costa & McCrae, 1992b). Both NEO scales measure five domains of personality, and their most germane facets. The five domains are Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A) and Conscientiousness (C). The NEO-FFI produces a comprehensive measure of the five domains. Each domain comprises twelve items to represent its six facets. It is a normative survey, and used specifically when a measure of personality is required, and time is short (Costa & McCrae, 1991). The NEO-PI-R has been demonstrated to show acceptable internal consistencies, coefficient alphas of 0.86 to 0.92, and three month re-test reliability (Costa & McCrae, 1992b) on a wide range of participant samples, including clinical to college student samples (Costa & McCrae, 1992b). Because use is made of the shortened twelve-item scales in this NEO-FFI version, there is reduced reliability and validity than the full version, with coefficients of 0.68 to 0.86 (Costa & McCrae, 1992b, p. 53). Its longer counterpart the NEO PI-R, has shown the measurement of "enduring dispositions" (Costa & McCrae, 1992b, p. 45). The five factors can account for all of the major dimensions within personality questionnaires (Costa & McCrae, 1992b). The score summary for each of the domains demonstrates a participant's "emotional, interpersonal, experiential, attitudinal and motivational style" (Costa & McCrae, 1992b, p. 14).

7.2.2.4 Description of Reviewed Transference Grid

Study Two used a Transference Grid methodology that was modified from Study One, as previously described. Four changes to the Transference Grid were made. First, the element ‘Self’ was added to the Transference Grid. Second, was the removal of the preferred/not preferred bias; and third, the moderation of the element ‘Hated Person’ to ‘Disliked Person’. The fourth change was the randomisation of the triadic element selection.

The Addition of the ‘Self’ Element

It had been expected that the ‘Ideal Self’ and ‘Hated / Disliked Person’ elements would allow sufficient diversity of the element set to explore and evaluate them. While that was true, in that these elements provided satisfactory extremities relative to other elements, it became apparent that another element, the ‘Self’, should be included for Study Two. The ‘Self’ element would provide a location of themselves in relation to all other elements, in regard to the constructs they elicited. This meant that the human elements provided to participants should constitute a range of ‘significant others’, as well as ‘significant selves’ and offer key people to be contrasted within the Transference Grid decision matrix. The inclusion of the ‘Self’ element was seen to be important in Study Two because the ‘Self’ serves “as an implicit basis of comparison in categorising the other figures” (Adams-Webber, 1990, p. 61). The inclusion of ‘Self’ therefore provides an explicit point of reference from which others are contrasted. In other words, the ‘Self’ was required within the set of elements because the ‘Self’ is an important anchoring structure from which people assess their relationship with the world. In the Repertory Grid, the ‘Self’ element generally provides a measure of similarity with other elements, and the ‘Self’ data set is used to determine relative proximities between the ‘Self’ and other elements. In the case of these Transference

Grids, where the range of elements contrasted has greater diversity than usual, placement of the ‘Self’ element was now seen to be crucial in the notion of technology transference.

Left-Right Bias

In Study Two, the potential problem of the preferred construct pole bias was eliminated by writing the participant’s most immediate construct response, (the emergent pole) on the left side of the grid matrix, and the contrast pole on the right. An asterisk was placed beside whichever pole is preferred by the participant, after all the constructs were elicited, during the rating procedure. Thus, the location of the preferred pole fluctuated during the grid construction depending on whether its elicitation occurred first or second. Walker (personal communication, 18/4/00) had criticised the initial methodology of placing the preferred pole to the left, and non-preferred pole on the right side of the grid. This methodology, she argued, could lead to bias in how participants’ rate their constructs.

Modification of the Hated Person Element

Another modification was suggested by Caputi (personal communication, 1/5/00) who stated that if elements are too “black and white”, then triadic elicitation gives rise to super-ordinancy or “superordinateness” (Kelly, 1955, p. 1044) of constructs. In response to this limitation, the methodology was modified so that the term ‘Disliked Person’ was substituted for the ‘Hated Person’ element. This element is less extreme, and Kelly only utilised the notion of like and dislike (Walker in personal communication, 18/4/00). With reference to Repertory Grid elements, Kelly described the notion of “shadow figures” (Kelly, 1955, p. 291); these are not the real people “in the flesh”, but the perceptions of real people by individuals. The grid verbalises the individual's conception of their 'shadow figure' (for example an anti-boss), who may be inverted in comparison of others' perspectives of that person (a good boss), but truly represents how the construer sees their boss.

Randomisation

Randomising the sequence of three human elements used to elicit constructs eliminated the issue of unequal representation of elements. Walker (personal communication, 18/4/00) suggested that the sequential form elicitation was not a suitable method because it did not allow equal representation of elements. Mother, for example (an important element in a notion of transference), was under-represented, as was 'Hated Person'. Walker (personal communication, 18/4/00) also argued that element representation would impact on the type of constructs elicited. Walker suggested that randomising the elements chosen would neutralise any bias effects.

7.2.3 Procedure

The student sample completed the demographic questionnaire, and the three measures, individually within a quiet office within the School of Psychology at the University of Wollongong. The revised Transference Grid was completed with the researcher, duplicating the procedure in Study One. An additional convenience sample of five adults completed the measures in a quiet location within their own homes, following the same procedure as the student sample.

7.3 Results

The results are presented in three sections. Section 7.3.1 reports the results for technology transference, the categories of transference constructs, and presents four individual Transference Grid cases. Section 7.3.2 deals with the associations between the individual difference measures. Section 7.3.3 deals with transference, and some transference associations, that were revealed in this study, and associations between transference and occupational groups.

7.3.1 Evidence of Transference using the MDS Approach: MDS Analyses of Transference Grid Elements.

7.3.1.1 Examples of Individuals' Inter-Elements Distances: Four Transference Grid Case Presentations.

Research Question 2 examines evidence for technology transference and computer transference. **Research Question 2.1** poses if there is evidence of technology transference and computer transference.

Evidence for transference was sought using the MDS Approach, in which patterns of inter-element proximities were visually examined. Individual participants' grid results were analysed using Euclidean distance as derived from Multidimensional scaling, and examining clustering patterns between 'Self' and other human elements, with technologies.

A review of four cases is undertaken, using MDS analyses looking only at two dimensions. These cases exemplify differences found in the MDS solution results. Three of these participants demonstrated full transference. There is one example of each of high, moderate and low transference. One participant demonstrated 50% of transference. The first case to be examined is Participant mm0482. She is an eighteen-year-old female, with eight years computer experience.

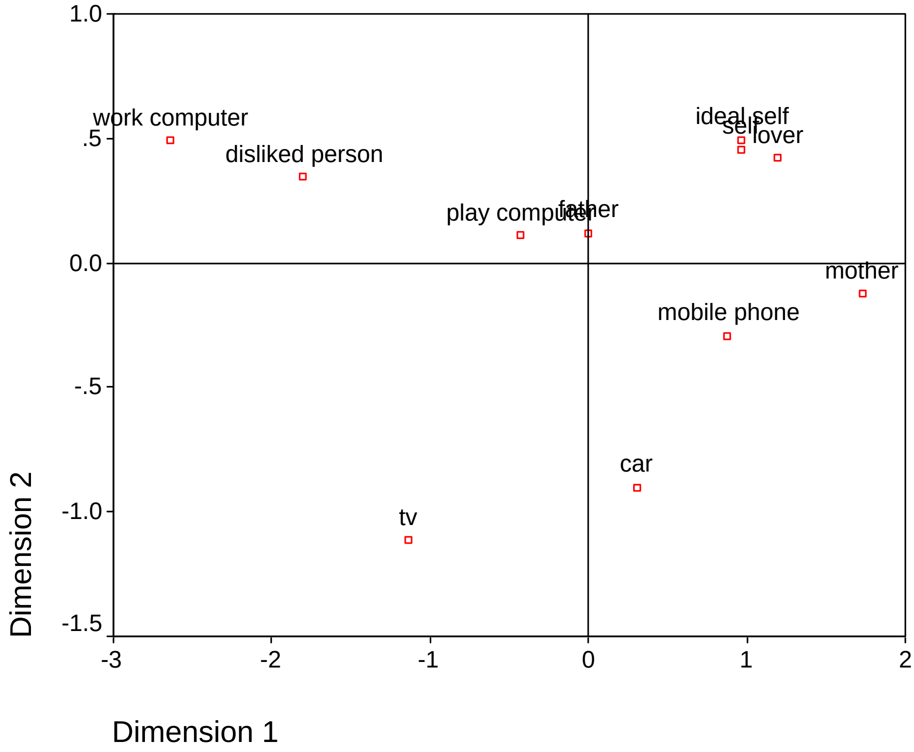

Figure 7.1 The Multidimensional Scaling Solution of mm0482.

The Kruskal stress of this participant’s grid is 0.09, which is fair, (where 0.1 is evaluated as ‘fair’ according to Kruskal, 1964a), its RSQ is 0.97. This MDS solution, in Figure 7.1, shows the elements ‘Ideal Self’, ‘Lover’ and ‘Self’ to lie within the double positive quadrant, for both Dimension 1 and 2. The interpretation of Dimension 1 from the position of element ‘Mother’, and ‘Ideal Self’, and its contrast with ‘Disliked Person’ and ‘Work Computer’, is Affect. Dimension 2 is interpreted to be level of Effort or Engagement, or Salience. The elements ‘Mobile Phone’, ‘Car’ and ‘TV’ are technology elements that require decreasing levels of effort, but return decreasing levels of affect. The ‘Work Computer’ location adjacent to the ‘Disliked Person’ element indicates this participant’s strong dislike for this element, and the amount of effort involved in relating to it.

Figure 7.1 shows the location of element clusters in which Participant mm0482 demonstrates two clusters, one of which has most of the human elements, as well as one technology, the ‘Mobile Phone’. All other technologies form a separate cluster, as well as the ‘Disliked Person’ and ‘Father’ elements. Participant mm0482 sees her ‘Ideal Self’ as most closely associated with her ‘Lover’; her ‘Mother’ is in close proximity with her ‘Mobile Phone’ element. The Frequency Approach, the third method of inter-element proximity in the MDS solution, indicated that mm0482 had high levels of transference.

The next case is of bm1145, who was a fifty-four-year-old female, with 2.5 years of computer experience. For this participant, all the constructs elicited were fully transferred, that is, the constructs’ range of convenience covered all the elements.

Bm1145’s MDS solution, in Figure 7.2, illustrates two major clusters. The major division occurs between elements ‘Lover’ and ‘Mother’, so that one cluster incorporates all elements in the positive half of Dimension 1 (i.e. ‘Ideal Self’, ‘Work Computer’, ‘Self’, ‘Car’, ‘Mother’), and the other is all other elements which lie within the negative half. The Kruskal stress of this participant’s grid is 0.11, which is fair, (where 0.1 is evaluated as ‘fair’ according to Kruskal, 1964a), and its RSQ is 0.94, which is ‘satisfactory’.

The interpretation of Dimensions 1 and 2 for the second case were the same as those proposed for the first case. Bm1145’s multidimensional scaling solution in Figure 7.2 illustrates Dimension 1, which was taken to be Affect, with poles of ‘Like – Dislike'. Dimension 2 was taken to be Salience, or Level of Engagement or Effort.

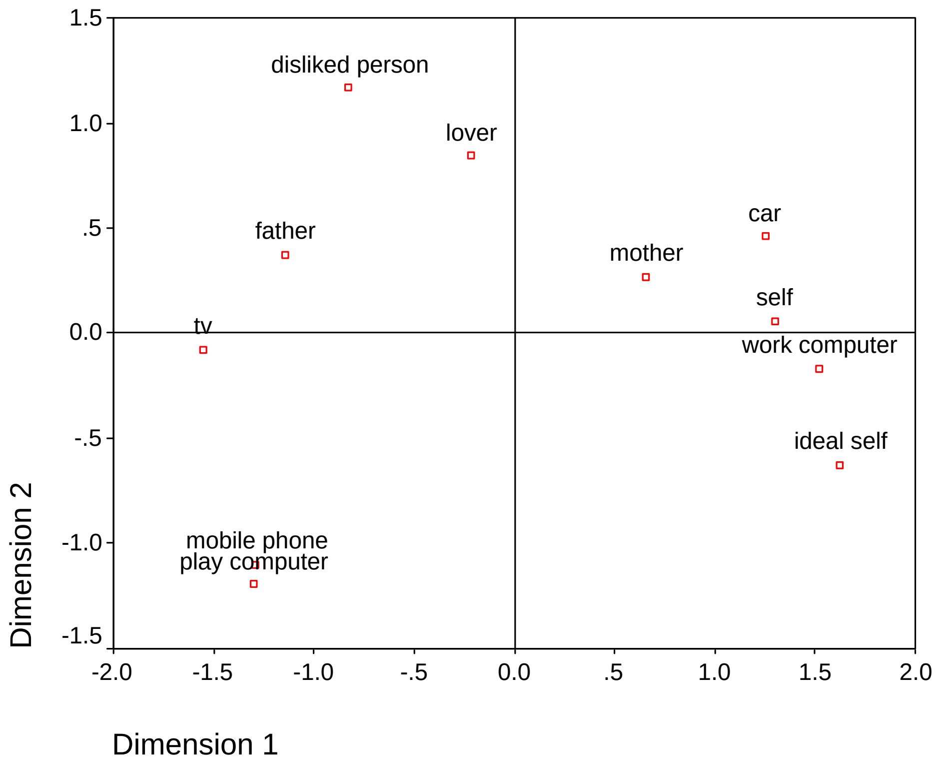

Figure 7.2 The Multidimensional Scaling Solution of Participant bm1145.

Participant bm1145's grid analyses demonstrate a positive orientation toward her 'Work Computer', in spite of her short experience with them. Not only is the 'Work Computer' use 'compulsory', it also is 'pleasurable', and 'future oriented', similar to the 'Self' and her 'Ideal Self', and her 'Car'. Thus her grid, and its MDS solution, demonstrated an acceptance of evolution, and on-going change. Bm1145's MDS solution also shows an organising principle of achievement, in which technologies and humans assist to different extents toward that goal. Using the third method of the Frequency Approach of inter-element proximity in the MDS solution revealed that bm1145 had low levels of transference.

The next illustrative case from this study is Participant fe1978. She is a twenty-two-year-old female, with four years computer experience. The Kruskal stress of this participant's grid is Stress = 0.08, which is fair-good, (where 0.05 is evaluated as 'good', and 0.1 is evaluated as 'fair', according to Kruskal, 1964), and its RSQ is 0.97.

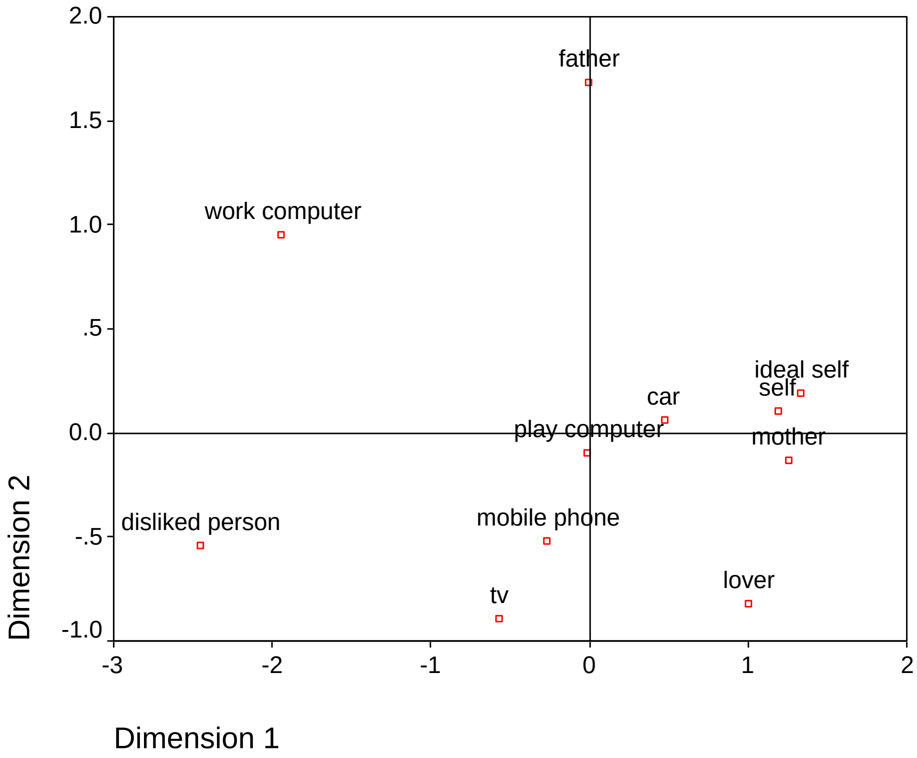

Figure 7.3. The MDS solution of Participant fe1978.

It can be seen by the location of element clusters in Figure 7.3, that for Participant fe1978, the 'Mother', 'Self' and 'Ideal Self' elements form a cluster with the technology element 'Car'. The 'Work Computer' and 'Disliked Person' elements have proximities closest to the technologies elements of 'TV', 'Mobile Phone' and 'Play Computer', and demonstrate that her transference associated with these technologies exhibits negative affect. Participant fe1978 sees the 'Self' as most closely associated with the 'Mother' and 'Ideal-Self', and distant from the technologies, most especially with the 'Work Computer' as well as the 'Disliked Person'. Interpretation of their Dimension 1 was also taken to be Affect, with poles of 'Ideal – Dislike'. Dimension 2 was interpreted as

Salience, or Level of Engagement or Effort. Fe1978 demonstrated moderate levels of transference using the inter-element proximity method of the Frequency Approach.

Table 7.1

Transference Grid Bi-polar Constructs of Participant ca0681

Preferred Pole		Non-Preferred Pole
1) artistic ability & good at everything	-	no artistic [ability]
2) always think of those around them	-	only ever thinks of themself
3) carefree	-	more complicated thoughts
4) can accept different opinions	-	think everyone should think as they do
5) can accept loss	-	stubborn
6) for enjoyment & entertainment	-	used for what has to be done
7) can be moved around easily	-	stays in one place
8) communication reasons	-	mobile reasons
9) recreation reasons	-	work reasons
10) electronic things	-	battery operated

The fourth, and final, participant case study was Participant ca0681. She was one of three participants in Study Two not to exhibit full transference, and one of two who did not transfer all their technological elicited constructs to human elements. Participant ca0681 was an eighteen-year-old female who did not record her computer experience. Her constructs are listed in Table 7.1. The constructs elicited for technologies were not applicable to human elements, so that Constructs 6 to 10 were not transferred.

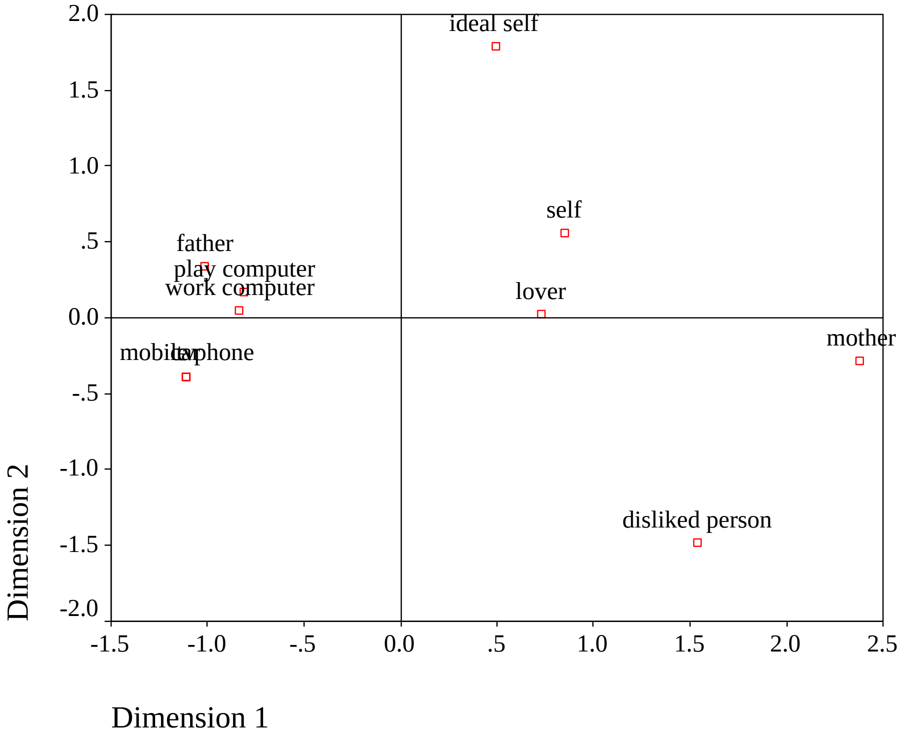

Figure 7.4 Multidimensional Scaling Solution of Participant ca0681

Figure 7.4 is a Multidimensional Scaling solution for participant ca0681. This participant transferred no technology elicited constructs, while showing no difficulty with the transference of human elicited constructs onto the technology elements. This indicates that the range of convenience of human elicited constructs was broader than those of technology constructs. The Kruskal stress of this participant’s grid is 0.06, which is ‘good to fair’ (where 0.05 is evaluated as ‘good’ according to Kruskal, 1964a), and its RSQ is 0.99, which demonstrates a near perfect fit between the data and the solution (SPSS, 1988).

It can be seen in Figure 7.4, by the location of element clusters, that participant ca0681 demonstrates the ‘Self’ - ‘Lover’ elements form a cluster with the ‘Ideal Self’ element. This group, along with ‘Mother’ and ‘Disliked Person’ elements, comprise a cluster most distal to all other elements (‘Father’ element and all the technologies). Therefore, the ‘Father’ element alone has proximities closest to the technologies elements, and demonstrates technology transference. Participant ca0681 sees the ‘Self’ as most closely associated with the ‘Lover’, and in close proximity with her ‘Ideal Self’, and distant from the technologies, and her ‘Father’.

A negative view of technologies is also demonstrated in ca0681’s MDS solution. According to her Transference Grid ratings, technologies along with the ‘Father’ element are egocentric, and not artistic. Her inability to use the technology elicited constructs for humans can be understood on two levels. Firstly, these constructs are relatively concrete, and specific to the technologies on which they were elicited. Secondly, overall, her account of technologies describes flat affect, that is, they are rational, ‘very intelligent, logical, to the point’, although technologies can accept diversity. The ‘Play Computer’ element, more than the other technologies, was rated as having more artistic ability than the ‘Self’. For Participant ca0681, Dimension 2 was interpreted to be Affect, with poles of Like – Dislike, because of the vertical placement within the solution of ‘Ideal Self’ and ‘Disliked Person’ elements. Dimension 1 was taken to be Salience, or Level of Engagement, or Effort, because of her perceptions of ‘Father’, which is rated similarly to the ‘TV’ , ‘Car’, ‘Mobile Phone’, ‘Work Computer’ and ‘Play Computer’ elements, as being ‘carefree’ and more easily amenable to change, in contrast to the other human elements

The four grids reported in Section 7.5.1.1 demonstrate the ability of the Transference Grid methodology to provide evidence of technology transference and computer transference in answer to **Research Question 2.1**. They also provide an exploration of the meanings that participants brought to their interactions with technologies and humans.

These Transference Grids and MDS solutions have revealed the idiographic nature of construing. However, there are features common to all the grids. These MDS solutions were analysed in two dimensions. From the four individual illustrative MDS solutions, there were two consistent interpretations for the super constructs. Overall, after a review of all 14 of the other Transference Grids MDS solutions from Study Two, a common set of super-constructs was found. These MDS solution results demonstrate that one dimension is Affect, with a second dimension of Level of Effort, or Engagement, or Salience. The consistency of these two super-constructs indicates that two organising principles have been used by this sample in their assessment of the elements.

7.3.1.2 Analysis of Technology Transference using Frequency Approach of Transference Grid Ratings

Research Question 2.2 asks how common is the phenomenon of technology and computer transference? Transference occurred in 89.9% of this sample. Using Method 1 (see Section 5.2.3), it was found that that 161 of a total of 179 constructs (i.e. 89.9%) had a range of convenience inclusive of both human and technological elements. Method 2 (see Section 5.2.3) demonstrated a frequency of 95.5% of transference, as 1881 cells of the matrix of 11 elements by 179 constructs (hence a total of 1969 cells) were rated. This indicates that participants found the descriptions they gave separately to humans and technologies were 95.5% applicable to both. With outcomes of 89.9% and 95.5 %, both these measures of transference revealed high transference rates. Using the frequency method, in which Transference Grid MDS outputs are classified according cluster proximities, four participants demonstrated high transference, four participants demonstrated moderate transference and ten participants showed low transference. Overall, the frequency methods indicated that technology and computer transference is common, thus supporting **Research Question 2.2**.

7.3.1.3 The Examination of the Nature of Technology and Computer Transference

Research Question 2.3 explores the relationships people form with technologies as an 'Other' from theoretical positions (Ihde, 1973; 1983), namely, 'What is the nature of technology transference and computer transference?' As in Study One, this qualitative aspect of the thesis examines whether there is evidence of computer transference, based on notions of computer "gender" and descriptions of the computer as person. In addition, it asks 'In examining the nature of technology transference and the structure under which it operates, does a person's sense of power influence their computer interactions?', and 'To what extent do human values impact on technology transference?'

7.3.1.3.1 Analysis of the Anthropomorphic Questions

A content analysis of the questions posed to participants describing the computer as a person was conducted. These responses offer an insight into the themes given by participants in anthropomorphising their computers. A full list of the descriptions given by participants to portray the 'computer as person' is presented in Table 7.2. Specifically, participants were asked 'If you thought of a computer as a person, what sort of Person would it be?' and the 'Degree of maleness - femaleness?' and 'What is the name of your computer'.

Participants' responses reported perceptions ranging from logical, constrained, systematic, assertive, inventive and clever, through stubborn, domineering, inflexible to spineless and undemonstrative, lacking affect, or even upsetting, complicated, disobedient and difficult.

Table 7.2

Description given by participants of computer as person, and computer gender attribution.

Participant	Sex	Computer as sort of person	Male %	Female %
jr1078	f	Structured	70	30
bb0582	m	Creative, ingenious, critical thinking with decisions	50	50
ct0478	f	A short fat man with glasses (similar to George on Seinfeld)	100	0
dd1081	f	Diverse, interesting, knowledgeable	70	30
mm0482	f	One that never did what you want it to	90	10
b0881	f	Highly intelligent, logical and emotionless	60	40
cy1179	f	Complicated / intelligent / boring	75	25
ca0681	f	Very intelligent, logical, to the point	50	50
fe1978	f	Use computer only as necessity, don't enjoy computers prefer people	90	10
kd0580	f	Uptight, methodical, boring, intellectual	50	50
ja0371	f	Confident & intelligent	50	50
el0779	f	Helpful	55	45
bm1145	f	Unreliable bossy – emotionless	0	100
ks0478	f	Young	50	50
vh0248	f	A tech head	60	40
lr0980	m	Smart, outgoing, doesn't stand up for them, does what people tell it	50	50
db0350	m	Troublesome & obstinate	50	50
lr0379	f	Very logical person-completes all activities, conversation & thoughts, slow methodical	50	50
		Average gender attribution	59.4	40.6

Participant sex: m = male, f = female.

In short, there appeared to be four sets of themes, which centred on computers' cleverness or heightened abilities, their domineering nature, their lack of emotion, and their complexity, and hence difficulty. The degree of maleness ascribed to computers is 59.44 %, femaleness was 40.56%, that is, predominantly masculine characteristics, and 38.9% of participants reported a name for their computer. Based on these findings, **Research Question 2.3** supports the notion that there are relationships formed with computers as an ‘Other’ which have components about their power or abilities, their structure or methodical approach, dominance or lack of emotion.

7.3.1.3.2 Thematic Analysis of Transference Grid Constructs using a Human Values Taxonomy.

As utilised in Study One, a taxonomy of constructs based on Schwartz’s (1992, 1994) system of human values was used to explore whether a person’s sense of power influences their computer interactions. As a means of exploring the nature of technology transference and the structure under which it operates, participants’ perceptions of the power difference between themselves and their computers was assessed. Section 6.3.3.2 describes this analysis sequence.

The constructs from all the participants within Study Two were classified in the same manner as described in Study One. The same co-rater for Study One assessed Study Two. He was a professional male, and was easily able to use the taxonomy categories for construct themes. The inter-rater assessment was acceptable, with 85.48% agreement. All the constructs from Study Two were classified accordingly. These transference constructs, in decreasing frequency, described value types of ‘Benevolence’ (22.91%), ‘Tradition/Conformity’ (16.76%), ‘Hedonism’ (14.53%), ‘Self-Direction’ (11.17%), ‘Achievement’ (7.82%), ‘Stimulation’ (7.26%), ‘Power’ (5.59%), ‘Utility’ (5.03%), ‘ Security’ (5.03%), and ‘Universalism’ (3.91%).

Suler’s (1998) notion of transference quite specifically centres on power relations within human-computer interaction, and that some individuals see computers as very powerful in comparison to themselves, while others see themselves as more powerful. Power differences in these interactions may influence an end-user’s negotiation in learning, and confidence in using IS and IT. Examination of this power interaction, using the Transference Grid constructs classified within the ‘power’ category, was undertaken to determine the percentage in which the ‘Self’ was rated as more, or less, powerful than either ‘Work or Play Computers’. This analysis is similar to that of Study One, but is different in that it centres on the ‘Self’, rather than an idealised ‘Self’, as was the case in Study One.

Power constructs were examined in the same manner as in Chapter Six. The list of participants’ constructs, and the category of their Power values type (Schwartz, 1992, 1994), is shown in Table 7.3. As well, Table 7.3 lists the Transference Grid ratings given to the ‘Self’, ‘Play Computer’ and ‘Work Computer’ elements. From Table 7.3, it can be seen that ten constructs were categorised within ‘Power’ value dimension, and distributed with decreasing frequency within ‘Social Power’ value type, and, equally, ‘Wealth, and ‘Authority’. One participant, ddf1081, exhibited three of their ten constructs as falling within ‘Power’ values, another participant lr0379 showed two constructs, and the other five participants exhibited only one ‘Power’ construct each. Therefore, 38.9 % (seven of eighteen) participants in Study Two demonstrated ‘Power’ as a theme in their constructs, but overall only 10 of 179 constructs (i.e. 5.59%) elicited within this second study related to ‘Power’, and power relations, within the human-computer interaction.

7.3.1.3.3 Differential in Power between Self and Computer Elements.

Table 7.3 lists the participants’ constructs, along with the Power category (Schwartz, 1992, 1994), and the elements’ ratings for ‘Self’, ‘Play Computer’ and ‘Work Computer’.

Table 7.3

Element Ratings of Power Constructs

Participant	Bi-polar construct	Schwarz' Value Type of Power	Self	Play Computer	Work Computer
b81981	Down to earth - conceited	Social	2	2	2
bb0582	Good with money - bad with money	Wealth	3	4	4
bm1145	Intentional, deliberate use - social use	Authority	1	4	1
ddf1081	Strong-willed – willing to discuss	Social	3	2	3
ddf1081	Not pushy - pushy	Social	1	1	3
ddf1081	Competitive - hates competition	Authority	1	1	3
jr1078	Strength - weakness	Social	3	4	3
ks0478	Not so intensely irritating - in your face, showing off	Social	2.5	2.5	2.0
lr0379	Fiery, more up front - placid	Social	1	4	3
lr0379	Not physically intimidating – forceful and physical	Social	2	1	1.5

Note: The rating scale was 1-4, where 1 indicated the participants' preferred pole, and 4 indicates their non-preferred pole of a bi-polar construct.

In Table 7.3, it can be seen that participant b81981 had one construct which demonstrated a ‘Power’ theme. This construct showed equal relations between their ‘Work’ and ‘Play’ computers, (i.e. all were rated as 2 across all three elements), placing them toward their preferred pole of the bi-polar construct concerning social power (down to earth – conceited). In comparison, participant bb0582 demonstrated a power differential which gives greater power to the self, compared to either computer, based on the construct ‘good with money - bad with money’ themed about wealth. Two of the three ‘Power’ constructs elicited by participant dd1081, were categorised as social power. The first ratings (strong-willed – willing to discuss) indicated the ‘Play Computer’ as having more social power than either the ‘Self’ or ‘Work Computer’. Their next construct (not pushy - pushy) indicated the ‘Work Computer’ as being pushy, and themselves and the ‘Play Computer’ as being closer to the preferred pole of being ‘not-pushy’. This participant’s third ‘Power’ construct (competitive – hates competition) related to authority, displaying a ‘Power’ advantage to the ‘Self’ and ‘Play Computer’. Social power is the theme of jr1078’s construct (strength – weakness), in which the ‘Self’ and ‘Work Computer’ have more power than the ‘Play Computer’. The construct ‘Not so intensly irritating – in your face, showing off’ from ks0478, demonstrated a theme of Social power which was more applicable to the ‘Work Computer’, rather than either the ‘Self’ or ‘Play Computer’.

The final ‘Power’ constructs of lr0379, (‘fiery, more upfront – placid’), and (‘not physically intimidating – forceful and physical’) were related to social power. The first (‘fiery, more upfront – placid’) demonstrated a greater power for themselves, in comparison to the ‘Work Computer’ or ‘Play Computer’. The second construct (‘not physically intimidating – forceful and physical’) demonstrated the ‘Play Computer’ as being less intimidating than the ‘Work Computer’ or the ‘Self’.

The finding provides evidence of the power differential proposed by Suler (1998). Some participants described some of their interaction with computers in terms of ‘power’. Further, some participants located their ‘Self’ as being more powerful than computers, while others located their ‘Self’ as equal, or less powerful. Cross-referencing this taxonomy with the description these participants gave of the sort of person a computer would be, appears to corroborate Suler’s position that some individuals see themselves in a more positive way than computers. In this study, for example, both bb0582 and lr0379 saw themselves as being more powerful than either their ‘Work Computer’ or ‘Play Computer’ (in which their ‘Self’ element had a smaller rating response than either the work or play computer). However, they described the person-as-computer differently; bb0582’s description is positive, in that they see the computer as imaginative and supportive, while lr0379’s description supports a view of the computer as more logical and conscientious. All these participants viewed themselves having equal, or more, power than computers within these power constructs, Dd1081 elicited the only power construct in which a computer (the Play Computer) was demonstrated as having more power than the human. Dd1081’s description of the computer as a person corroborates their view of computers as ‘diverse, interesting and knowledgeable’; there is no derogatory sense of lack of emotionality in this description, in contrast to other participant’s descriptions of computers as being ‘logical but emotionally and relationally sparse’.

7.3.2 Individual Difference Measures Associations

Individual Difference research is a well-researched body of literature, spanning learning and cognitive style, occupational and vocational styles, and personality. Because of documented variation in computer acceptance in industries, it was argued in Chapter Three that individual difference measures were required in this thesis, to assess their influence on technology and computer transference. This section addresses **Research Question 3**, 'What is the relationship between learning style ILS and occupational style SDS and personality NEO-FFI?'.

The associations for the personality, occupational and learning style variables were investigated using a Pearson product-moment correlation coefficient. The correlations are shown in Appendix A (Appendices A-1 to A-4).

The associations between the NEO-FFI and the ILS are reported first. In summary, a strong positive correlation was found between Extraversion, Active r (16) = 0.61, p = 0.008, and its negative correlate Reflective learning style r (16) = -0.67, p = 0.002. No association was found between Extraversion and Verbal variables r (16) = -0.36, p = 0.15) respectively. An association between Openness and Visual /Verbal was found at r (16) = -0.50, p = 0.037 and r (16) = 0.50, p = 0.037 respectively. An association that was not predicted was found, a negative correlation between Conscientiousness and Intuitive r (16) = -0.57, p = 0.016).

The second set of associations reported is between the SDS and the ILS. Social was found to have strong correlations with Active/ Reflective: positive for Active r (16) = 0.57, p = 0.014, and negative with Reflective r (16) = -0.56, p = 0.016. An unpredicted, strong, association between Social and Sequential / Global was found, with r (16) = -0.54, p = 0.021), and r (16) = 0.55, p = 0.018 respectively. No association was found between Reflective learning style and Investigative type r (16) = 0.04, p = 0.89. No relationship was found for Realistic type and Sensing, r (16) = - 0.11, p = 0.67), or Artistic (SDS) and Visual (ILS) r (16) = 0.03, p = 0.90.

The set of associations between the NEO-FFI and SDS are reported third. A strong positive relationship was found between Extraversion and Enterprising r (16) = 0.62, p

= 0.007, but none was found between Extraversion and Social r (16) = 0.37, p = 0.13. No significant relationship was found between Enterprising and Openness r (16) = 0.08, p = 0.76). The predicted associations between Conscientiousness and Conventional, and Openness and Realistic were not found.

Some individual differences were found to be related. Some learning and occupation style and personality variables were found to be significantly related. There were associations found between Extraversion and Enterprising, and Extraversion and Active. Openness was found to be correlated with Visual / Verbal, and Social with Active / Reflective. These associations were predicted. The correlations between Conscientious and Sensing / Intuitive, or Social and Sequential / Global, were not predicted. Therefore, **Research Question 3** found evidence for some of the predicted associations, but not all. Overall, these results indicate that Extraversion was associated with high social dominance (in Enterprising) as well as high activity (Active). Such high activity was also found to be related to high social skills and occupational preferences in Social. Openness was found to be associated with high verbal skills. Conscientiousness was associated with logical sequencing within Sequential in the ILS, suggesting the correlation occurs with components describing methodical and orderliness facets within Conscientiousness.

7.3.3 The Influence of Individual Differences on Technology and Computer Transference and Computer Use.

Research Question 4.1 asked whether the occupational styles influence levels of computer transference. High scorers in Social may show higher levels of technology transference, in comparison to high scorers in Realistic and it was expected that high scorers in Extraversion and Agreeableness would show higher levels of technology transference. In order to test this research question, a one-way between-groups multivariate analysis of variance (MANOVA) was conducted. From the sample, two groups were formed. Using the frequency approach Method 2 as the measure of transference, one group of participants, whose transference scores were low (i.e. 70-85% of transference), and the second group of high scorers (86-100% of transference) were compared. There were no demonstrated violations of the assumptions, although the group sizes were unequal. The independent variables were two levels of technology transference (low 70-85% and high 86-100%); the dependent variables were Social and Realistic (SDS), and Extraversion and Agreeableness (NEO). These variables were chosen because of differences in the personality characteristics in their propensity for interpersonal interaction. The means, and standard deviations, are listed in Table 7.4. It can be seen from Table 7.4 that there is little difference between the means for the dependent variables.

Table 7.4
Transference Group Means for specific SDS and NEO variables

	Transference Groups %	Mean	SD	N
Realistic	70-85	11.33	8.50	3
	86-100	14.40	8.80	15
Social	70-85	36.00	3.61	3
	86-100	33.13	4.52	15
Extraversion	70-85	62.00	12.12	3
	86-100	56.27	8.94	15
Agreeableness	70-85	50.33	20.43	3
	86-100	43.53	11.70	15

No significant difference was found for the dependent variables, indicating that there were no differences between the NEO or SDS scores for technology transference: F (4, 13) = 0.523, p = 0.721; Pillai's Trace = 0.14; and partial eta squared =0.14. There were no differences in transference scores for occupational or personality scores: Research Question 4.1 is not supported.

Research Question 4.2 examines the proposition that the preference for social and interpersonal interaction that Extraversion (NEO) and Social (SDS) have, influences computer use: Do both Extraversion (NEO) and Social (SDS) high scorers have lower frequency of computer usage? Do high scorers in Extraversion and Social demonstrate higher rates of interpersonal activity, e.g. email use among friends or workers? This **Research Question 4.2** was examined using a one-way between groups multivariate analysis of variance (MANOVA) for high and low scoring Extraversion groups. There was no significant difference in the use of chatrooms, and email communication for work or to friends for Extraversion high scorers (F (4, 12) = 1.32, p = 0.32; Pillai's Trace = 0.31; and partial eta squared = 0.31. A second one-way, between-groups, multivariate analysis of variance was conducted for high and low scoring Social groups. There was no significant difference in the frequency of computer use, or the use of chatrooms, and email communication for work or to friends between Social high and low scorers: F (4, 12) = 0.68, p = 0.62; Pillai's Trace = 0.19; and partial eta squared = 0.19. These results do not support **Research Question 4.2**, that high social interaction leads to reduced computer frequency of use, and increased mandated computer use.

Research Question 4.3 proposed that higher technology and computer transference leads to higher computer use. The descriptive statistic results are shown in Table 7.5. From Table 7.5, it can be seen that there are large differences in the percent mean scores between high and low transference groups in the use of Mac computers, the purpose of computer use (for work and communication), and email. This is a descriptive analysis because of the small number of participants in the low transference group.

Table 7.5

Transference Group Means for Computer Experience and Use

	Transference Groups %	Mean %	SD	N
Computer Experience (Years)	70-85	7.00	4.24	2
	86-100	6.99	3.94	14
Location of computer work	70-85	40.00	14.14	2
	86-100	35.79	30.79	14
Location of computer Home	70-85	60.00	14.14	2
	86-100	64.21	30.79	14
Type of Computer PC	70-85	95.00	7.071	2
	86-100	75.36	22.74	14
Type of Computer Mac	70-85	5.00	7.071	2
	86-100	24.64	22.74	14
Purpose: Entertainment	70-85	10.00	.00	2
	86-100	8.93	6.84	14
Purpose: assignments	70-85	80.00	14.14	2
	86-100	51.43	31.53	14
Purpose: work	70-85	7.50	10.61	2
	86-100	22.86	32.21	14
Purpose : communication	70-85	2.50	3.54	2
	86-100	16.79	11.37	14

Word Processing	70-85	55.00	35.36	2
	86-100	59.64	22.41	14
Spread Sheet	70-85	10.00	14.14	2
	86-100	7.50	13.83	14
Database	70-85	5.00	7.07	2
	86-100	2.50	5.80	14
Statistics	70-85	10.00	14.14	2
	86-100	6.07	8.36	14
Internet	70-85	20.00	.00	2
	86-100	26.43	21.16	14
Intranet	70-85	.00	.00	2
	86-100	2.14	4.69	14
Chat-rooms	70-85	2.50	3.54	2
	86-100	3.57	7.19	14
Email friends	70-85	2.50	3.54	2
	86-100	43.57	33.65	14
Email work	70-85	50.00	28.28	2
	86-100	15.36	14.34	14
Info Searching	70-85	35.00	21.21	2
	86-100	22.14	23.01	14
Other use	70-85	10.00	.00	2
	86-100	6.07	13.89	14
Frequency hours per week	70-85	5.50	2.83	2
	86-100	9.77	7.25	14

The means, and standard deviations, were examined to reveal the difference between low and high technology transference and computer use. There was insufficient variance in the percentage of transference, using the Frequency Approach Method 1 (see Section 5.2), because there were two participants in the condition of low (70 - 85) percentage of transference. Therefore, parametric tests were not applicable. There were differences between low and high technology transference scores on the computer use dependent variables. These variables included the type of computer (Mac or PC), and the purpose of use, for entertainment, assignments, work, and communication. Therefore, **Research Question 4.3**, which proposed that high transference enhances the human-technology interaction, and leads to a higher levels of use, could not be tested, due to the small number of participants who exhibited low transference. This indicates that the majority of participants exhibited a high (86 -100) percentage of transference.

7.4 Discussion

Research Question 2.1 asked if there was evidence of technology transference and computer transference. **Research Question 2.2** sought to determine how common is the phenomenon of technology and computer transference. Using the Method 1 of the Frequency Approach, a high frequency of elements (89.89%) was transferred across the full construct row, that is approximately 90% of the constructs had a range of convenience which incorporated people and technologies. Using Method 2 of the Frequency Approach, 95.56% of the elements were rated for some of the construct across a row, i.e. there was partial transference. Assessing the frequency using the MDS inter-element proximity clusters, four of the eighteen participant MDS solutions showed high, four showed moderate and ten showed low transference levels. This study has shown clear evidence of technology and computer transference, and that it is common.

The Qualitative Approach was used to assess **Research Question 2.3**, about the nature of technology transference and computer transference. The Qualitative Approach gave a measure of transference which demonstrated the nature of transference, when all of the participants described “their computer as a person”. Many of these responses used descriptions of computers as having reduced affect or increased rationality. Many participants described their computer as a diminished but gendered human being, e.g. “a tech head” or “nerd”. However, these participants did place a computer within a context of objects and people in their life to whom they related, and as part of their network of human values. As in Study One, this Qualitative Approach of the thesis examined whether a person’s sense of power influences their computer interactions, and to what extent human values impact on technology transference. The human values taxonomy was used to categorise the themes of all the participants’ constructs. In turn, the percentage that centred on power was analysed to describe the power differential participants perceived between themselves and their computers. The transference that Suler (1998) had described was based on such power relations affecting the form of the relationship between computers and humans, that is either master, servant or partner. Most participants in the current study perceived themselves as more powerful than their computers. Although the power type of transference described the categories of transferred constructs adequately, it described a small percentage of constructs (3.9%). Therefore, it is limited in its explanation, especially in terms of the other construct themes, and how participants may see technologies in general, and computers specifically. One feature explored by this categorisation methodology for this sample, was that the majority of transferred constructs focused on Benevolence, Conformity / Tradition, and Hedonism, following themes of affiliation and communication, work, and restriction, and fun and leisure. The attributions that participants gave to computers are centred on notions of computers’ high capabilities, their dominance, lack of emotion, and their complexity, and hence difficulty. There are perceived as masculine, and approximately 40% had been given a name by the sample.

Research Question 3 addressed the relationships between learning style ILS, occupational style SDS, and personality NEO-FFI. The second Results section tests the hypothesised associations between learning and occupational style, and personality. There were strong associations found between the Extraversion facet and the Enterprising style of relating to the world. While Enterprising style describes a focus more on commercialism, ambitiousness and persuasion, and Extraversion emphasises gregariousness, warmth and the propensity for positive emotions, there is overlap of characteristics of leadership (Enterprising) and assertiveness (Extraversion), energy (Enterprising) and activity (Extraversion), adventurousness (Enterprising) and excitement seeking (Extraversion), optimism (Enterprising) and positive emotions (Extraversion). These overlapping set of correlations may influence the acceptance of technology, because they focus on the characteristics that facilitate high-scoring individuals to ask the questions they require to build a knowledge structure when learning, are unconcerned by approval from others, and dominate an environment.

Between Extraversion and Active learning style a strong positive association was found, and a corresponding strong negative association was found for Reflective style. Difficulties for Active learners in the acceptance of technology may present when being taught passively, either by lecture format or lacking praxis. While experiential learning is routinely taught in computer training, computer use in itself is relatively passive, and, therefore, may be difficult for individuals who are kinaesthetically focused. Certainly constructs elicited on the television, and to a lesser extent, the Play Computer, had passivity as a theme.

Research Question 4 examined evidence for the influence of individual differences for transference or computer use. Research Question 4.1 asks whether high Social scorers have different rates of technology transference, or computer transference, compared to high-scoring Realistic participants. In summary, Research Question 4 posed that the percentage of transferred ratings would vary with occupational style, and specifically, that individuals high in Social would carry their propensity to form relationships into those with technologies. Participants who exhibited high levels of transference showed no difference in their Social, Realistic, Extraversion or Agreeableness levels, or in their use of technologies or information systems. Conversely, no differences in the percentages of transferred ratings were found between participants who were high, and low, in Social or in Realistic levels of the SDS. Also, no differences were found in the frequency of use, and the type of computer-mediated communication for high Extraversion and Social scorers. Research Question 4.3 examined whether high transference enhances the human-technology interaction and leads to higher levels of use. This research question could not be tested due to the small number of participants who exhibited low transference. Although this limited the type of analysis that could be performed, this result also shows that most participants exhibited high levels of transference, indicating that it is a common phenomenon.

7.5 Conclusion

This study was exploratory. What role that technology and computer transference played in the human computer interaction remained unresolved by this study, but transference was shown to occur frequently, and showed common patterns, for example of the MDS solution super constructs, as well as unique results of inter-element clusters. Most individuals demonstrated high levels of transference, and most anthropomorphised computers. This anthropomorphism may have implications on the quality of the human-technology interaction, but no differences in patterns of computer use were found to be statistically significant. The outcome for Study Two demonstrated mixed results. What was clear at the end of this study, was that the addition of a model of technology acceptance would strengthen Study Three.

7.6 Limitations of the Study

Two major limitations were found for Study Two. The lack of external validity that existed in Study One continued in Study Two, since both studies used a non-random sample drawn from a restricted group. Both studies suffered from having a very small sample of participants, and, as a result, had limitations in the applicability of some statistics, and for the generalisability of the results. The addition of the individual measures in Study Two extended the study to examine the consequences of technology and computer transference.

Study Two was a follow-up pilot to determine that the measures were valid, and provide data that could demonstrate group differences (in learning style, occupational style, and personality) for perceptions of technologies. Again, in this study, Suler’s taxonomy of power transference was useful, in that it allowed the pattern of transference to be assessed. However its range of usefulness was very limited, because it applied to a very small proportion of the constructs elicited in this study, that is, only 4 % of transference constructs were descriptions of the theme of ‘Power’. This means that the value of this methodology is limited because of the frequency of its applicability. However, whether this is a problem due to the sample, or a more general limitation that will continue to restrict the methodology’s utility can only be tested on a heterogeneous sample. This will be done in Study Three, with a larger sample of workers who use technologies in their work-life.

Study Two demonstrated a need to include a model of IT acceptance and the need to broaden the sample to work groups in a number of industries. Study Three added the modified TAM (Symbolic Adoption) by Karahanna and Agarwal (1999). This model was chosen because it was expected to reveal a similarity between Symbolic Adoption (SA) and technology and computer transference. SA was defined by Karahanna and Agarwal (1999) as “a peak motivational state reflective of a users’ mental evaluation of the technology and its use as a worthwhile concept” (Karahanna & Agarwal, 1999, p.7). It was seen as being multi-faceted, and includes four dimensions: “mental acceptance, use commitment, effort worthiness, and heightened enthusiasm”. The motivation for the study by Karahanna & Agarwal (1999) was to more fully understand people’s *behaviours* in the use of technology, when use is involuntary. Therefore, the focus of their study centred on individual’s intention to explore a technology, and their utilisation of novel procedures. Karahanna and Agarwal (1999) argued that the mandatory use of technology that has been symbolically rejected by users can have implications for the end-users’ level of its usage, misuse, and even sabotage (Karahanna & Agarwal, 1999, p. 7). However, the symbolic adoption construct they explored included a positive motivation state, and involves the notion of commitment (Karahanna & Agarwal, 1999, p. 7). The aim of the current studies was somewhat different, but related. The aim was to gain insights into individual’s mental acceptance of a technology in making meaning of the *relationship* they form with technologies. Part of this relationship would include an ‘arational’ component, which is beyond the reasoned or sensible use of technology, and is emotional. While much of the technology utilisation that is evidenced in individuals’ lives is clearly rational, because it is tied to undertaking and maintaining work, financial and social patterns and relationships, the technology relationship contains another, more complex, affective and powerful component. How this ‘arational’ component is related to the construct of symbolic adoption required definition. For this reason, inclusion of the TAM (Symbolic Adoption) measure was incorporated in Study Three.

CHAPTER EIGHT

STUDY THREE.

Study Three.

Introduction

The aim of Study Three was to examine technology and computer transference, individual differences, the Technology Acceptance Model and their inter-relations. Technology and computer transference is the relationship that individuals transfer to technologies from their experiences with people, objects and situations. In this study, the analysis of these transference relationships was extended to real-world work environments. Individual differences are the sets of related variables of learning and occupation preferences and personality. The variables measured within the Technology Acceptance Model with Symbolic Adoption (Karahanna & Agarwal, 1999) are technology acceptance and the levels of use, as measured by self-reports, of Internet and business software IS. Study Three also examines these inter-relations. This study therefore examines the influence that individual differences have on technology transference, and on the technology acceptance and use outcomes, as well as the influence that technology transference has on technology acceptance and technology use.

8.1 Research Questions

8.1.1 Technology and Computer Transference

Research Question 5 continues the examination of evidence for technology transference and computer transference, but within the context of workers.

Research Question 5.1: Is there evidence of technology and computer transference within workers?

Research Question 5.2: How common are technology and computer transferences within workers? To what extent do these transferences operate in a sample of workers who are professionals?

Research Question 5.3: What is the nature of technology and computer transference within a sample of workers?

8.1.2 Individual Differences.

Research Question 6 explored the relationships between individual differences; those of learning and occupational style, and personality. There has been a growing body of literature which describes the relations found between measures of learning and occupational preferences and personality. However, these have different levels of stability and malleability, and hence different effects.

Chapter Two reported a body of literature which shows evidence of different acceptance of IS and IT in different occupations. The research aim in Research Question 6 is appropriate, because occupational difference should be more pronounced in different work groups. **Research Question 6** proposes that there are associations between measures of individual differences, that is, between measures of learning style (ILS), and personality (NEO-FFI) and occupational style (SDS). Research Hypotheses 6.1 to 6.8 relate to the NEO and the SDS measures, Hypotheses 6.9 and 6.10 refer to the NEO and the ILS measure associations, and Hypotheses 6.11 to 6.18 relate to the SDS and the ILS measures.

Research Hypothesis 6.1 states that Extraversion and Social are positively associated.

Research Hypothesis 6.2 is that Extraversion and Enterprising are positively associated.

Research Hypothesis 6.3 states that there is a negative association between Openness and Realistic.

Research Hypothesis 6.4 states that there is a positive association between Openness and Investigative.

Research Hypothesis 6.5 is that Openness and Artistic are positively related.

Research Hypothesis 6.6 states that Openness and Enterprising are positively related.

Research Hypothesis 6.7 states that Agreeableness and Social are positively related.

Research Hypothesis 6.8 states that Conscientiousness and Conventional are positively related.

Moving to the hypothesised associations between NEO and ILS,

Research Hypothesis 6.9 states that Extraversion and Active / Reflective are associated.

Research Hypothesis 6.10 states that Conscientiousness and Sensing / Intuitive are associated.

The final set of associations to be examined is those between the SDS and ILS measures.

Research Hypothesis 6.11 states that Realistic and Sensing / Intuitive are associated.

Research Hypothesis 6.12 states that there is an association between Investigative and Reflective/Active.

Research Hypothesis 6.13 states that there is an association between Artistic and Intuitive/Sensing.

Research Hypothesis 6.14 states that there is an association between Artistic and Visual / Verbal.

Research Hypothesis 6.15 is that there is an association between Social and Active / Reflective.

Research Hypothesis 6.16 is that Enterprising and Active / Reflective are associated.

Research Hypothesis 6.17 is that Enterprising and Verbal / Visual are associated.

Research Hypothesis 6.18 is that Conventional and Sensing / Intuitive are associated..

Research Hypothesis 6.19 is that Conventional and Sequential/ Global are associated.

8.1.3 Individual Differences, and Technology and Computer Transference

Research Question 7 concerns one consequence of individual differences. This research question sought to explore the nature of individual differences and its influence on technology and computer transference, and is the major thrust of the thesis. Do occupational style or personality factors influence technology transference? Are there common features for technology transference regardless of individual differences? Specifically, **Research Question 7 addresses the level of computer transference and asks whether it will vary between groups, based on personality and occupational style measures:**

Research Hypothesis 7.1 states that participants with high Social scores will display high levels of computer transference.

Research Hypothesis 7.2 states that participants with high Realistic scores will display low levels of computer transference.

Research Hypothesis 7.3 states that participants with high Agreeableness scores will display high levels of computer transference.

Research Hypothesis 7.4 states that participants with high Extraversion scores will display high levels of computer transference.

8.1.4 The Technology Acceptance Model

The importance of including a well-known and researched model of technology acceptance, as well as measures of technology transference was argued in Section 7.6. The results of Study Two had suggested that Study Three would be strengthened by including components of the Technology Acceptance Model (TAM, Davis, 1989). To this end, a version of the TAM by Davis (1989) was tested in Study Three. This version of TAM by Karahanna and Agawal (1999) has items measuring core variables of the TAM, plus Symbolic Adoption of, and intention to use the technology. This model will be referred to as the TAM (Symbolic Adoption). This model was chosen because it was expected to reveal a similarity between Symbolic Adoption (SA) and technology and computer transference. Strengthening the design in this way would allow the triangulation of transference measures with components of the technology acceptance model, along with those of individual difference measures. The core variables used in this study are Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude (Attit), Symbolic Adoption (SA) and an intentional component which focuses on exploration, Intention to Explore (IntExp). Symbolic Adoption refers to the mental evaluation of a technology as being worthwhile and includes notions of positive evaluation, commitment, enthusiasm, and the return of a user’s resources (Karahanna & Agawal, 1999).

Research Question 8 investigates the TAM (Symbolic Adoption), and states that in workers with different IT contexts, replication of Karahanna and Agarwal’s (1999) results will occur. Specifically,

Research Hypothesis 8.1 states that positive Attitude toward the use of technology has a positive influence on Symbolic Adoption of the technology.

Research Hypothesis 8.2 states that Perceived Usefulness of a technology has a positive influence on Symbolic Adoption of the technology.

Research Hypothesis 8.3 states that Perceived Ease of Use of a technology has a positive influence on Symbolic Adoption of the technology, via its effects on the mediating construct of Perceived Usefulness.

Research Hypothesis 8.4 states that Symbolic Adoption of a technology has a positive influence on Intentions to Explore the technology.

8.1.5 Individual Differences and the Technology Acceptance Model.

Research Question 9 investigates an extension of the TAM (Symbolic Adoption) by including individual differences (personality variables) as TAM non-core variables. Therefore, personality variables will influence component variables of the TAM. Specifically,

Research Hypothesis 9.1 states that high levels of Neuroticism will be associated with low levels of Perceived Ease of Use and Perceived Usefulness. In the literature, the Neuroticism domain describes six fundamental facets of Anxiety, Anger-Hostility, Depression, Self-Conscientiousness, Impulsiveness, and Vulnerability (Costa & McCrae, 1997). These descriptions are independent personality facets, but they also overlap in characteristics such as anxiousness, irritability, lack of confidence and self-confidence. Individuals high in these personal characteristics may not fully engage with technology interactions, because they will not find these interactions easy, due to their wariness in making errors, lack of confidence in their abilities, generalised lack of optimism, sensitivity to ridicule, and public self-consciousness. In addition, these people have low perceptions of their abilities to handle difficult situations. This will affect their perceptions of a technology's ease of use and its usefulness.

Research Hypothesis 9.2 states that high levels of Extraversion will be associated with high levels of Perceived Ease of Use and Perceived Usefulness. In comparison with Neuroticism, individuals high in Extraversion have characteristics of outgoingness, sociableness, enthusiasm and pleasure seeking. The high levels of enthusiasm, energy and assertiveness in Extraversion will affect their perceptions of a technology's ease of use, and its usefulness.

Research Hypothesis 9.3 states that individuals with high scores in Openness will display high levels of Intention to Explore. Shared characteristics of individuals who are high in Openness are their proclivity to be imaginative, inventive, and original and unconventional. In addition, they share a wide range of interests, and are curious (Costa & McCrae, 1997b). These characteristics will affect their propensity to explore, and hence their intention to explore a technology.

Research Hypothesis 9.4 states that individuals with high levels of Agreeableness will display high levels of Symbolic Adoption in computer acceptance. Agreeableness has characteristics of tolerance, and lack of intolerance. The lack of headstrongness and assertiveness, argument, aggression and showing off will affect Agreeableness high-scorers' compliance in accepting a socially-condoned or mandated technology.

Research Hypothesis 9.5 is that individuals with high levels of Conscientiousness will display high levels of Symbolic Adoption, if the technology is congruous with their values. Individuals high in Conscientiousness have the shared characteristic of thoroughness, and a high need to be organised, methodical and precise. High levels in ambitiousness and efficiency will also affect these individuals' Symbolic

Adoption, and acceptance of a technology. Individuals high in Conscientiousness are also more likely to recognise the benefits of increased order in an organisation setting given by technology, especially in terms of accountability and financial management. Therefore, Conscientiousness will influence Symbolic Adoption.

8.1.6 Technology Transference and Technology Acceptance and Use.

Research Question 10 proposes a relationship between technology transference and component variables of the TAM.

Research Hypothesis 10.1 states that individuals with high levels of technology transference will demonstrate high levels of Symbolic Adoption within the TAM model.

Research Hypothesis 10.2 states that individuals with high levels of technology transference will demonstrate high levels of computer use.

8.2 Method

8.2.1 Participants

The 71 participants for Study Three were drawn from a range of professional groups in diverse work contexts e.g. building and health industries. It was important that participants had differentiated occupational orientations; consequently only work groups and third-year university students were included. Participants were mainly female (54.9%) and 43.7% male, with one participant's sex not recorded. Only sixty-nine Transference Grids were conducted, as two participants failed to complete them. The mean age of participants was 39.64 years (SD = 13.05), with 11.71 years of computer experience (SD = 5.31).

8.2.2 Additional Measures

Level of Construct Difficulty

An additional measure, recording the difficulty with which participants found the Transference Grid task, was included in the interviews. This measure was included to assess the level of difficulty participants found with the transference task. This objective assessment was performed because transference, i.e. the human tendency to “read emotions and intentions into all sorts of things” (Norman, 2004, p. 194) occurs at low levels of awareness (Norman, 2004), or is uncomfortable to admit to in rationalist instruments or environment (Johnson et al. 2002b). After completing the Transference Grid interview, participants were asked to rate the transference task; “How easy was it for you to rate the non-human constructs and the human constructs? On a scale of 1 to 5, where 1 is very easy, and 5 is very difficult, how did you find using the technology constructs with people?”; “Using the same scale, where 1 is very easy, and 5 is very difficult, how did you find rating people constructs with technology?”. Each participant’s two responses were recorded on their Transference Grid sheet.

Technology Acceptance Model (Symbolic Adoption).

The thesis would be strengthened by exploring links between technology transference with the TAM variables, although links with computer use had been examined, but not found to be supported, in Research Question 4 of Study Two. Thus, the question that had remained unanswered by the studies in this thesis was: “Can the technology transference be shown to have an effect on components of computer acceptance?” Because of its common usage within the literature on computer use and acceptance, its robust psychometric characteristics, the key variables in the TAM were added. These variables within the TAM (Symbolic Adoption by Karahanna & Agarwal, 1999) were added for Study Three. Four forms of these TAM variables were utilised, one focused on Microsoft Office Word, and the second on Kronos, which is a personnel management application used widely throughout NSW Health in Australia. The third form focused on Hosrep, a patient management system, and the fourth focused on Austlii, a Law data base. These systems are described in Section 8.2.3.

Karahanna and Agarwal (1999) looked at the determinants of IT adoption behaviour by exploring the notion of Symbolic Adoption (SA). SA provides insights into “an individual’s voluntary mental acceptance of a technology” (Karahanna & Agarwal, 1999, p. 4) and occurs when a user sees that learning a technology has “intrinsic value ” (Karahanna & Agarwal, 1999, p. 7). The TAM (Symbolic Adoption) by Karahanna and Agarwal 1999 was built as an extension to the Technology Acceptance Model (Davis, 1989; Davis et al. 1989). The TAM provides a framework for the measure of IT acceptance and use, although this version with Symbolic Adoption (Karahanna & Agarwal 1999) remains relatively unknown. Core TAM variables within the model used in Study Three, are Perceived Ease of Use (PEU with four items), Perceived Usefulness (PU with four items), Attitude (Attit), and Intention to Explore (IntEx). An extended measure of Attitude, with nine items, was used. These items included that interaction with the software would be ‘fun, pleasant, positive, pleasurable, exciting, wise, enjoyable, good and beneficial’. SA had four items of Heightened Enthusiasm, three of Use Commitment, three of Mental Acceptance and two of Effort Worthiness. Four contexts of the TAM were used. One focused on Microsoft Office Word, the other focused on a specific information technology system (Kronos, Hosrep, or Austlii) local to each sub sample work-group. The four TAM contexts were sought for two reasons. Firstly, it is possible that some participants did not use the word processing software in the course of their work or daily life, although they did utilise another IS. Hence, four TAM contexts increased the chance of net capture of data from participants. Secondly, it allowed some comparison, from a participant's perception, of one information system to another. While the TAM is described as 'robust' and suitable for investigating many types of IS and IT, capturing a participant's perception of two information systems allow some degree of comparison of different IS and IT. The variables of the TAM exhibit good internal consistency over many studies (Adams, Nelson & Todd, 1992; Davis, 1989; Davis, Bagozzi & Warshaw, 1992), with reported Cronbach alpha coefficients ranges of 0.68 - 0.98 for Usefulness, 0.86 - 0.95 for Ease of Use and 0.85 for Attitude (Davis, 1989).

8.2.3 Procedure and Participant Recruitment

Permission for the study to be conducted in work settings was sought and gained from their respective management and relevant Ethics Committees. Depending on work circumstances, different work-sites handled the additional time-load and reduced work production resulting from the research process in different ways. Some work-sites required an initial contact to be made, and the self-administered questionnaires to be given to those participants wishing to be involved in the study. Other work-sites were able to support staff with sufficient time away from duties to complete the interview in one sitting. All participants were given the same sequence of questionnaires, namely, the demographic measure, the ILS, the SDS and the NEO-FFI. For a description of these measures refer to Section 7.4 and they are available for review in Appendix C. If participants were completing the measures in the presence of the researcher (depending on their work environment), they then completed the Transference Grid interview, and concluded with two forms of the TAM, e.g. TAM_{Word} and TAM_{Kronos}. Where it was not possible to schedule this length of time, the participants finished all the questionnaires, including the two forms of the TAM without the researcher. In such cases the Transference Grid interviews were conducted with the researcher at a separate time.

The five sites were visited during the data collection phase. The first site was that of a small business of architects, engineers and support staff. At that site, because all nine participants had private work desks and space, they completed the questionnaires at their work desks. As each participant indicated completing the inventories, they proceeded to a private room where, together with the researcher they completed their Transference Grid. For this group, no methodology for testing the difficulty of completing the Transference grid had yet been devised, so the level of rating the difficulty was not recorded. The TAM (Symbolic Adoption) based on Microsoft Office Word (subsequently referred to as TAM_{Word}) was mailed three weeks later to this group of participants, completed within their work environment, and returned by post.

The second work site was a small metropolitan teaching hospital which allowed the 25 participants time away from their duties to complete their questionnaires within one sitting. The TAM measure was based on KRONOS, a specific pay management information system. This TAM will subsequently be referred to as $\text{TAM}_{\text{Kronos.}}$ These interviews occurred in a private office within the work environment. The TAM_{Word} was left with participants for completion in their own time. These participants engaged in a wide range of occupations including the management of general and building maintenance, patient, financial and nursing administration at many levels, as well as physio and occupational therapy, social work, dietetics, and administrative assistants.

The third work-site was the medical imaging department of a moderate-sized metropolitan teaching hospital. The 12 participants at this site included diagnostic radiographers, sonographers, nurses, managers and clerical staff. Due to low staff levels within the imaging department, little work-release time was available to participants. This meant that participants completed the questionnaires, and the TAM based on an IS ‘Hosrep’ outside of their work time, or, if possible, during quiet periods at work time. ‘Hosrep’ is a patient management system. Transference Grids were completed during work time with the researcher. The Transference Grid interview was carried out in private, within a departmental office.

Participant recruitment also took place within the University of Wollongong. Faculties within the university were invited to take part, and all departmental heads were contacted. The only positive response was from the Law Faculty, whose students undertake a double degree. By third year, many Law students are paralegal workers within the legal profession, and are, therefore, in a work environment and using these skills and legal database. The 11 participants were interviewed within the School of Psychology, where they completed the questionnaires, the Transference Grid and the TAM based on ‘Austlii’. Austlii is a database from the Australasian Legal Information Institute, which Law students access during their coursework. The database has public access, and includes law, legislation and case law for the Australian Commonwealth and State jurisdictions, as well as New Zealand and South Pacific.

The fifth recruitment period involved a mix of 14 workers at a heavy-industry manufacturing plant. These participants included diverse occupations: IT workers: systems analyst, computer programmer; metallurgist; and engineers: materials, mechanical, electrical, as well as process supervision. They completed the questionnaires and the TAM_{Word}, outside of work time. Transference Grid interviews occurred within the work-site and time. After each individual participant had completed their Transference Grid, feedback on their learning and occupational style and personality was given by the researcher.

8.3 Results

Seventy-seven percent of the participants’ computer use was at work; their home computer use was less frequent, but varied (22.71%; SD = 23.87%). The mean frequency of computer use, in hours per week, was 23.91% (SD = 15.87%). The bulk of computer experience was using PCs rather than Macintosh computers (91.8%; SD = 14.67%).

8.3.1 Technology Transference.

8.3.1.1 The Frequency of Technology and Computer Transference.

Research Question 5 asked whether the phenomenon of technology transference is common in workers. Described in Section 5.2.3, the three methods of the Frequency Approach were used to assess **Research Question 5**. In the current study, using Method One revealed that 84.4% of constructs were transferred. Using Method Two, it was revealed that a transference rate mean of 94.29%, and a range of 61.82% to 100%. The percentage of participants whose MDS solution clusters showed high transference was 26.09%, 30.43% had moderate transference, and 43.48% had low transference. **Research Questions 5.1 and 5.2**, which asked whether there is evidence of transference, and how common process transference is, are therefore supported. These results indicate that there is evidence of transference among workers of different occupational backgrounds, and that it was common, and showed variability from low to high levels of transference.

8.3.1.2 The Nature of Technology and Computer Transference.

Research Question 5.3 asked about the nature of technology transference and computer transference within a sample of workers. This question was addressed using two methods of analysis described in Section 6.2.3, as well as a third, rating the level of difficulty scale.

A third form of analysis, new to this study, also examines the nature of transference. How difficult was the process of transference reported by participants? Constructs elicited on human elements, and subsequently transferred to technologies, were described as being more difficult to rate (M = 3.72; SD = 0.93) than technology-derived constructs that were subsequently used to describe humans (i.e. transferred to human elements), with a mean of 3.06 and SD = 1.15).

8.3.1.2.1 Anthropomorphic Descriptions of Computer

An anthropomorphic description of the sort of person a computer would be, was given by these participants. The participants' descriptions of computer as person are in Table 8.1. From Table 8.1, it is seen that some participants described computers as methodical, socially isolated and rigid (as for participants em0643, mb11270, and ds1163), and unpredictable (participants nm0444 and md1155). However, responses to the participants included a range of perceptions: logical, constrained, well-organised, assertive, inventive, clever and surprising, through stubborn, narrow, domineering, rigid, to spineless and undemonstrative, lacking in emotion, poor communicator, nerd, mechanical, unpredictable, complicated, disobedient and difficult. The full set of anthropomorphic descriptions is given in Appendix B.

Table 8.1

Description of computer as person.

Participant	Description of computer
	Lack of emotion
cs.ds1163	Computer nerd, socially rigid, pot to assist, low humour
cs.te0354	Cold hard & cynical because it gives nothing
cs.mg1148	Smart but not intelligent, without emotion, just black and white
l.pc0180	Organised, unemotional, empty
b.bw0747	Cold calculating, impersonal
	Complexity-difficulty
li.nm0444	Normally dependable, but subject to occasional irrational behaviour
li.ai0449	Difficult, hard to understand
cs.mm0249	Rigid & infuriating, I suppose, not friendly at all
cs.es1262	A resource person, frustrating, slow or very hard taskmaster
cs.bs0950	Bitch
cs.km1175	Intelligent but frustrating, crashes, unreliable person
cs.md1155	Cantankerous, misbehaves, moody
s.vw1078	Fickle person-unpredictable, jams in sys are irritating
l.rj0379	Frustrating, useful, not friendly, not good interact, hate them,
s.jf0161	Unknown, a lot they withhold
	Height abilities
cs.br0853	Very clever person, can store & proces lots of info quickly,temperamental
cs.eg0447	Awesome-so much to offer me, not yet discovered
l.mt0679	Efficient, neat, ordered
b.bs0761	Thinking, analytical, creative
b.rb0772	Organised - hardworking
	Organisation, ordered
li.rs0350	Well organised, tidy
li.em0643	Methodical
li.zs0730	Business
cs.mb1170	Organised person
s.mr0356	A librarian-way of accessing the knowledge
l.mt0679	Efficient, neat, ordered
b.aa57	A newsreader, journalist
b.et0059	Pedantic
b.rb0772	Organised - hardworking
	Limited
cs.al0266	Its a tool, (like a pen or a phone)
cs.ed0732	Robot, mechanical, only capable of giving back what's put in
cs.db0952	Brilliant, but only as good as what they've learnt
	Friend
cs.lb0842	Friend because it helps me, its reliable
	Friendliness Positive & Negative
cs.mw0660	Certainly not a friend b/c its not a friendly system
s.kf1051	Hosrep: friendly and not lose things; Word: things get lost
l.rj0379	Frustrating, useful, not friendly, not good interaction, hate them,
c.sf0277	Energetic and friendly

Research Question 5.3 sought to explore workers' perceptions about the nature of computer transference. In short, there appeared to be six sets of themes. The most predominant theme centred on computers' complexity and subsequent difficulty. Computers' heightened abilities, organisation and orderliness, their lack of emotion, friendliness and limitation were, in decreasing frequency, other themes describing computers anthropomorphically. Of the 64.47% of participants in Study Three who gendered computers, 63.98% attributed male characteristics, and 36.02% attributed female characteristics. A large minority of participants, 35.53%, did not give computers a gender.

8.3.1.2.2 The Thematic Analysis of Transference Grid Constructs

Research Question 5.3 posed a question about the nature of technology and computer transference. Using the same methodology as Studies One and Two, Schwartz's (1992; 1994) taxonomy of human values was used for classifying the constructs elicited in Study Three. Constructs from the 69 Transference Grids was classified within the human values type. If there was disagreement between the raters about which of two value types best categorised a construct, then each of the two value types was awarded a half count i.e. a frequency count of 0.5. This occurred for one construct: ' forthright, strong –never having an opinion' which was classified by the researcher as belonging to either the Power or Self-Direction category, while the co-rater classified this construct as Self-Direction. The same professional male co-rater as for Studies One and Two categorised the construct themes into the human values taxonomy. For the co-rater reliability assessment, almost twenty four percent of the grids (23.89%) were selected for agreement of the construct themes. This method was found to be satisfactory, and the rater - co-rater assessment was found to be 88.25%. All except 1.61% of constructs (i.e. 12) were categorised within the taxonomy. Examples of these uncatorgarised constructs include ‘irritating – mindless’, ‘no hardship – has had times of hardship’, ‘younger – older’, ‘visual – mechanical’ and ‘optimism – pessimism’. Table 8.2 shows the frequency of constructs within each human value type. The value types, in decreasing order of frequency, were ‘Benevolence’ (24.77%), ‘Hedonism’ (14.9%), ‘Self-Direction’ (11.54%), ‘Utility’ (10.40%), ‘Stimulation’ (9.33%), ‘Achievement’ (7.72%), ‘Universalism’ (6.78%). ‘Power’ (4.70%), ‘Conformity’ (3.36%), ‘Security’ (2.48%), ‘Tradition’ (2.42%) and ‘Un-sure Category’ (1.61%).

Table 8.2.
Frequency of constructs within the human value types (Schwartz, 1992).

Please see print copy for Table 8.2

The results indicated that the highest proportion (approximately 25%) of the total constructs from Study Three described benevolence, and had themes about honesty, love, loyalty, responsibility, friendship, helpfulness or of a spiritual nature. These results, for **Research Question 5.3**, indicated that general goodwill is implicated in the nature of technology and computer transference.

8.3.1.2.3 Differentials in Power: Self and Computer Elements

Continuing the analysis of Research Question 5.3 about the nature of technology and computer transference, what do the Power constructs within Study Three describe? Power relations within human-computer interaction were examined using the same methodology as in Studies One and Two. The relative power between the three elements: ‘Self’, ‘Work computer’ and ‘Play computer’ for all constructs classified as the Power value type is shown in Table 8.3. From Table 8.3, it can be seen that 35 constructs were categorised within the ‘Power’ value dimension. These Power constructs showed ‘Social power’, ‘Social recognition’, ‘Wealth’, and ‘Authority’ as sub-categories. ‘Social power’ was by far the most frequent sub-category, with 24 constructs from the Power category. One participant, pc0180, exhibited three of their eleven constructs as falling within ‘Power’ values, seven participants exhibited two Power constructs each, and all other Power constructs came from 18 other participants. Therefore, 37.68 % (26 of 69) participants in Study Three demonstrated ‘Power’ as a theme in their constructs, but overall only 4.70 % (35 of 745) constructs elicited within this study related to ‘Power’, and ‘Power relations’ within the human-computer interaction. A further seven of these constructs were not applicable to technology elements, that is, these constructs showed a range of convenience restricted to humans.

In Study Three, some participants described some of their interaction with computers in terms of ‘Power’ as described, because they related their computer use within notions of some form of power differential. The most frequently used notion of power expressed within the constructs was ‘Social power’, which describes ‘dominance or control over others or resources’. The major expression of this ‘Social power’ centred on being

Table 8.3

Element Ratings of Power Constructs

Participant	Bi-polar construct	Power Value Sub-category	Self	Play Computer	Work Computer
nm0444	Highly competitive – non competitive	Social power	3	na	na
	Communication – relaxation	Social power	3	1	1
at0163	Expresses opinion – doesn't express opinion	Social power	2	4	2
em0643	More forceful – give in too much	Social power	3	2	2
ds1163	Charm & wit – charm less & witless	Social power	2	5	5
ke0845	Forthright, strong opinions – never having an opinion	Social power	1	2	1
	Communication – enjoyment, recreation	?	1	6	1
te0354	Important – frivolous	Social recognition	3	6	3
lm0445	Communicate well – communicate appallingly	Social power	1	1	1
mb1170	Self assured – fear	Social power	2	5	3
bd0952	Voicing opinion – direct, to the point	Social power	2	5	6
bs0950	Aggro, no people skills – tight with money	Social power	2	1	1
	Independent financially – not independent, freeloading	Wealth	1	na	na
nj0553	Tough – soft hearted	Social power	4	na	na
md1155	Respected – despised	Social recognition	3	5	3
kf1051	Submissive – domineering	Social power	2	1	6
jf0161	more cautious about spending money – spontaneous	Wealth	2	na	3
vw1078	Insecure – manipulative & self-	Social power	2	na	na

	serving				
kg1178	Want to be on top – content with where they are	Social power	2	5	3
	Selfish sometimes – thinks they're doing right thing, but not	Social power	3	3	4
mr0356	Strength – softness	Social power	2	5	3
	Unfailing strength – weaker, more mortal, human	?	2	6	3
ly1179	Volatile – aggressive	Social power	5	2	4
hf1179	Very confident – arrogant	Social power	2	3	2
mm0480	Toys, like to have the best – can't afford, not the best, transport, mean	Social recognition.	2	Na	Na
	Best you can get – dodgy	Social recognition	3	na	na
pc0880	Cunning, manipulative – easy going, no interest in making waves	Social power	4	4	3
	Domineering, insulting, put you down – subservient	Social power	2	5	5
	Argumentative, headstrong – easy, follows the line	Social power	2	5	3
mt0679	Income related – leisure related	Wealth	1	4	1
et0059	Very strong, do what's necessary – level of insecurity	Authority	2	3	3
bs0761	Able to stand up to people – not easy to stand up to people	Social power	4	na	na
es2154	Is self oriented – people people	Social power	5	2	2
	Have to pay for them – given to me		2	2	6
ka0373	Personal – communal	Social power	2	2	4

Note: The rating scale was 1-6, where 1 indicated the participant's preferred pole, and 6 indicates their non-preferred pole of a bi-polar construct.

forceful, forthright, opinionated or strong. This notion was extended, by some participants, toward more extreme forms of power, i.e. aggression and volatility, egocentrism, manipulation and competitiveness. However, a financial aspect of the human-computer interaction was also associated within the value sub-type ‘Wealth’, either as a means of generating income, being cautious with money, or as a cost. The third notion subsumed within the ‘Power’ value concerned communication. Communication tended to be a multipurpose construct, contrasted with relaxation and de-focused attention, and giving the ability to build knowledge bases or inform people.

Some participants in Study Three described themselves as being more powerful than computers, while others located their ‘self’ as less powerful. Suler’s notion of a differentiated transference in power was useful in this study, because it allowed the pattern of transference to be assessed, in terms of the power relations placed on technologies by participants. However, its range of usefulness was shown to be very limited, because only about 4.70% constructs were descriptions of power. This Qualitative Approach enabled the nature of transference to be explored, and revealed some underlying themes in answer to **Research Question 5.3.** Computers were described as being forceful, sometimes aggressive and volatile, and having financial implications. Work and play computers were perceived differently, the play computer being more despised, submissive, but also softer and part of leisure.

8.3.2 Assessing Relationships between Individual Difference Measures

As a means of clarifying the individual difference characteristics which influence technology transference and components of technology acceptance, which is explored later in the thesis, it is important to examine the relationships between the individual difference measures. **Research Question 6 sought to explore the relationships between individual differences, that is, the associations found between the sub-scales of learning style, occupational style and personality in workers.**

Reliability scores for each measure were determined by Cronbach alpha coefficient, and all were found to be acceptable. Descriptive statistics and reliability of the ILS, SDS, NEO-FFI and the TAM are reported in Table 8.4. In the current study, the Cronbach's alpha coefficient on each of the ILS sub-scales ranged from 0.61 to 0.80. Although low, at 0.61, this is an acceptable reliability value for the purpose of this study, and is better than those reported in the literature (see Section 7.2.2.1 for details). Cronbach's alpha coefficient for this sample for the SDS in Study Three was measured at 0.78, with a range from 0.69 to 0.84, which is comparable with values reported in other studies (Holland, 1985b). The Cronbach's alpha coefficient of the NEO-FFI for this sample in Study Three, ranged from 0.76 to 0.86, which is comparable with reported values. Table 8.4 shows the reliability and descriptive results for the measures that assessed the components of TAM. Within Study Three, the Cronbach alpha coefficients ranges for each of the TAM contexts, TAM_{Word}; TAM_{Kronos}; TAM_{Hosrep} and $TAM_{Austlii}$ were 0.94 to 0.95; 0.88 to 0.94; 0.81 to 0.94; and 0.86 to 0.95, respectively. Due to the small sample sizes for Hosrep and Austlii, these TAM forms were dropped from Study Three. (Their descriptive statistics and reliability coefficients are included in Appendix B-27).

Table 8.4.

Statistics and reliability coefficients for the sub-scales of ILS, SDS, NEO-FFI and TAM.

Construct	Mean	S.D.	Reliability*
ILS	(n=74)		
Active	5.57	(2.36)	.61
Reflective	5.42	(2.36)	.61
Sensing	6.42	(3.11)	.80
Intuitive	4.58	(3.11)	.80
Visual	7.07	(2.35)	.66
Verbal	3.93	(2.35)	.66
Sequential	5.21	2.37)	.61
Global	5.79	(2.37)	.61
NEO-FFI (NEO)	(n=76)		
Neuroticism	21.79	(8.59)	.86
Extraversion	29.66	(6.39)	.78
Openness	29.43	(6.37)	.76
Agreeableness	31.07	(7.08)	.82
Conscientiousness	33.41	(6.56)	.82
SDS	(n=70)		.
Realistic	19.36	(9.2)	.80
Investigative	22.43	(8.7)	.79
Artistic	18.87	(9.7)	.84
Social	27.53	(7.3)	.69
Enterprising	22.24	(8.2)	.79
Conventional	22.01	(8.3)	.76
TAM Response for WORD (TAM_{Word})		(n=53)	
Perceived Ease of Use (PEU)	14.02	4.09	.95
Perceived Usefulness (PU)	14.46	4.82	.94
Attitude (Attit)	40.83	10.58	.94
Symbolic Adoption (SymAd)	42.74	11.52	.95
Intention to Explore (IntExp)	9.08	3.54	.94

TAM Response for Kronos (TAM $_{Kronos}$) (n=25)			
Perceived Ease of Use (PEU)	13.88	4.37	.92
Perceived Usefulness (PU)	10.68	4.81	.94
Attitude (Attit)	37.96	10.49	.88
Symbolic Adoption (SymAd)	39.25	11.82	.92
Intention to Explore (IntExp)	6.48	3.57	.92

* Cronbach's alpha coefficient.

Research Question 6 proposed that there is an association between the sub-scale measures of learning style, occupational style and personality. To test the series of hypotheses from **Research Question 6**, and allow comparisons to be drawn between this sample and those from the body of literature, Pearson product moment correlation analyses for the NEO-FFI, the SDS and the ILS were conducted. These hypotheses are examined in same order as set out in Section 8.1.2.

The results for the associations between the measures for personality and occupational style (NEO and SDS) are shown in Table 8.5. From Table 8.5 it can be seen that **Research Hypothesis 6.1** was supported. Extraversion and Social were associated. Extraversion was moderately correlated with Enterprising, therefore **Research Hypothesis 6.2** was also supported. **Research Hypothesis 6.3**, predicting a correlation between Openness and Realistic, was supported. **Research Hypothesis 6.4** predicted an association between Openness and Investigative, which was not supported. **Research Hypothesis 6.5**, that Openness and Artistic are positively related, was supported, however, a stronger additional association between Openness and Social which was not predicted, was also found.

Table 8.5

Correlations between the sub-scales of NEO-FFI and SDS.

	Neurotic	Extraversion	Openness	Agreeableness	Conscientiousness
Realistic	-.18	-.09	-.26*	.06	.10
	(.16)	(.47)	(.03)	(.65)	(.44)
Investigative	-.26*	.18	.06	.09	-.07
	(.03)	(.15)	(.65)	(.47)	(.60)
Artistic	-.03	.05	.50**	.17	-.08
	(.79)	(.72)	(.00)	(.17)	(.55)
Social	-.08	.48**	.55**	.09	-.03
	(.53)	(.00)	(.00)	(.47)	(.78)
Enterprising	-.23	.48**	.28*	-.30*	.09
	(.07)	(.00)	(.02)	(.01)	(.45)
Conventional	.11	.01	-.15	-.01	.31*
	(.37)	(.92)	(.23)	(.92)	(.01)

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed). Sig. (2-tailed) N=68 Pairwise
P values are in brackets.

Research Hypothesis 6.6, that Openness and Enterprising are positively related, was supported. **Research Hypothesis 6.7** was not supported, Agreeableness and Social were not positively related, although Agreeableness demonstrated a moderate negative correlation with Enterprising which was not predicted. **Research Hypothesis 6.8**, that there is an association between Conscientiousness and Conventional, has been supported. Associations between NEO and ILS are shown in Table 8.6. **Research Hypothesis 6.9** that Extraversion was moderately correlated with Active / Reflective, was supported. A moderate positive association between Extraversion and Intuitive / Sensing which was not predicted is also noted. Two associations that were not predicted, between Openness and Intuitive / Sensing, and Global and Sequential, were found. **Research Hypothesis 6.10**, predicting Conscientiousness and Sensing / Intuitive was supported.

Table 8.6.

Correlations between sub-scales of the NEO-FFI and ILS

	Neurotic	Extravert	Openness	Agreeable-ness	Conscient-iousness
Active	-.05	.47**	.00	-.19	-.28*
	(.72)	(.00)	(.99)	(.12)	(.02)
Reflective	.05	-.46**	.02	.17	.27*
	(.67)	(.00)	(.90)	(.16)	(.03)
Sensing	.23	-.36**	-.49**	.06	.31**
	(.06)	(.00)	(.00)	(.63)	(.01)
Intuitive	-.23	.36**	.49**	-.06	-.31**
	(.06)	(.00)	(.00)	(.63)	(.01)
Visual	-.12	-.09	-.10	-.13	-.19
	(.31)	(.46)	(.43)	(.31)	(.12)
Verbal	.12	.09	.10	.13	.19
	(.31)	(.46)	(.43)	(.31)	(.12)
Sequent	.16	-.10	-.29*	.06	.28*
	(.19)	(.40)	(.02)	(.63)	(.02)
Global	-.16	.10	.29*	-.06	-.28*
	(.19)	(.41)	(.02)	(.64)	(.02)

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed). Sig. (2-tailed) N=70.
P values are in brackets.

As well, Conscientiousness was shown to have a small positive correlation with Reflective / Active which was not predicted. In addition, Conscientiousness was shown to have a small positive correlation with Sequential and negative correlation with Global which was not predicted. Thus, **Research Hypothesis 6.10** was supported, but Conscientiousness was found to have other associations which were not predicted. The final set of associations to be examined is that between the sub-scales of the SDS and ILS. These are shown in Table 8.7. **Research Hypothesis 6.11**, which predicted the correlation between Realistic and Sensing / Intuitive was not supported. An association between Realistic and Visual / Verbal which was not predicted was found. **Research Hypothesis 6.12** was not supported, no association between Investigative and

Reflective was found. A small positive association between Investigative and Global and Sequential was found, although it was not predicted. **Research Hypothesis 6.13**, predicting an association between Artistic and Sensing / Intuitive was supported. **Research Hypothesis 6.14** predicted a correlation between Artistic and Visual / Verbal which was not found. **Research Hypothesis 6.15**, that an association between Social and Active / Reflective occurs, was supported. The predicted association between Enterprising and Active was found, thus **Research Hypothesis 6.16** was supported. **Research Hypothesis 6.17**, which predicted an association between Enterprising and Verbal was not supported. **Research Hypothesis 6.18**, that Conventional and Sensing are positively related, was supported. **Research Hypothesis 6.19** was supported, that is, that Conventional and Sequential are positively related.

Table 8.7

Correlations between the sub-scales of SDS and ILS.

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Active	-.03	.04	.01	.31**	.34**	-.06
	(.82)	(.72)	(.96)	(.01)	(.00)	(.61)
Reflective	-.01	-.08	-.01	-.29*	-.33**	.07
	(.91)	(.50)	(.96)	(.02)	(.01)	(.60)
Sensing	.01	-.06	-.39**	-.38**	-.36**	.25*
	(.91)	(.66)	(.00)	(.00)	(.00)	(.04)
Intuitive	-.013	.055	.39**	.38**	.36**	-.25*
	(.91)	(.66)	(.00)	(.00)	(.00)	(.04)
Visual	.39**	.05	.09	-.17	.04	-.20
	(.00)	(.68)	(.44)	(.16)	(.77)	(.10)
Verbal	-.39**	-.05	-.09	.17	-.04	.20
	(.00)	(.68)	(.44)	(.16)	(.77)	.10
Sequent	-.21	-.27*	-.15	-.08	-.15	.28*
	(.08)	(.02)	(.22)	(.50)	(.20)	(.02)
Global	.21	.29*	.16	.08	.16	-.27*
	(.08)	(.02)	(.19)	(.48)	(.20)	(.03)

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed). Sig. (2-tailed) N= 69
P values are in brackets.

Of eight hypothesised associations between the sub-scales of personality and occupational style measures NEO-FFI and the SDS, six of these predictions were supported, but three additional associations, not hypothesised, were found. This finding indicates that six of the eleven outcomes (55%) were correct. For the associations hypothesised between the NEO-FFI and ILS, two were predicted and supported, but five additional associations, which were not predicted, were found. These results indicate that two of the seven outcomes (29%) were correct. Between the SDS and ILS measures, of nine associations predicted, five were supported, but an additional four unpredicted associations were found. Five of thirteen outcomes (38%) were correct. **Research Question 6**, therefore, found evidence for only some of the predicted associations. The findings show that Extraversion was correlated with high social interactivity and social influence, high activity and intuitiveness. These indicate that participants scoring high in Extraversion are likely to engage with new environments and activities, have high interactivity with other people, including taking leadership roles and being persuasive, intuitive and conceptual thinkers. The findings also indicate that Openness was correlated with abilities to create music or imagery, with people who are intuitive and socially influencing and active, and who think holistically and can make conceptual links. These results may indicate that participants who score high in Extraversion and Openness may be more engaged in their interaction with technologies and be more persuasive than low scorers.

8.3.3 Individual Differences and Technology Transference: Differences in Transference Grid Results.

8.3.3.1 Analysis of Constructs

Research Question 7 asks whether technology and computer transference varies between groups based on personality and occupational style measures. Do different transference frequencies occur for sub-samples derived from each of the NEO and SDS sub-samples? Participants who scored above the sample means for each of the factors for the NEO and SDS, were categorised as ‘high’ scorers, and their individual Transference Grids were aggregated to form a series of super-grids. One super-grid for each of the five NEO factors, and the six occupational SDS types was formed. Separating participants by including them in the super-grid only if their score was greater that the sample mean, offered a way of accentuating each sub-sample’s differentiation for those NEO and SDS characteristics. Method 2 of the Frequency Approach (described in Section 5.2.3) was used to calculate the percentage of constructs transferred by each of the NEO and SDS sub-samples. This method illustrates the different frequencies of technology transference that occurred for each NEO and SDS sub-sample. The list of these frequencies is shown in Table 8.8, which shows that the sub-samples with highest frequency of transference were Extraversion, Openness, Investigative and Conventional. The lowest frequency of transference occurred for the sub-samples Enterprising, Conscientiousness, Artistic and Social.

Table 8.8.

Comparison of Transference Frequency for Super-grid Sub-samples

Sub-Sample	Total Number of Participants in Sub-sample (n)	Total Number of Constructs (n)	Constructs Transferred (n)
Neuroticism	29	314	80.6% (253)
Extraversion	27	295	91.2% (269)
Openness	35	383	89.3% (342)
Agreeableness	18	185	83.8% (155)
Conscientiousness	19	201	76.6% (154)
Realistic	5	53	83.0% (44)
Investigative	16	174	86.2% (150)
Artistic	7	77	80.5% (62)
Social	22	242	80.6% (195)
Enterprising	4	49	69.4% (34)
Conventional	15	161	85.1% (137)

NB. Some participants demonstrated multiple high scores, and therefore re-occur in different sub-samples.

This indicates that individuals high in optimism, activity, and abstract-thinking, who are complex and curious, but also conventional, efficient and practical, showed greater transference experience and its measurement. This also indicates that more ambitious, domineering, persuasive, concrete, methodical as well as artistic or socially-skilled individuals showed less transference.These results, shown in Table 8.8, support **Research Question 7**, and indicate that the frequency of technology and computer transference varies between groups based on NEO-FFI and SDS measures. Although the frequency of transference does vary, the frequency of transference across the super-grid sub-samples overall was high, since even the lowest frequency for sub-sample

Enterprising demonstrated that almost 70% of constructs were applicable for both humans and technologies.

8.3.3.2 Analysis of Elements

This section also deals with group differences in transference, but is focused on the elements from the Transference Grids. Using the same aggregated super-grids described in Section 8.3.3.1, which were comprised of participants who measured above the sample mean for each NEO and SDS sub-sample, are distinct transference patterns of inter-element proximities and clusters shown? **Research Question 7**, asked whether technology and computer transference varies between groups based on NEO and SDS measure, and can be analysed using inter-element proximities and clusters in MDS super-grid solutions. These MDS solutions, composed of the super-grid results for each of the NEO and the SDS sub-samples, follow. These are used to illustrate the differences expressed by each of these sub-samples of participants. The first set of MDS solutions to be shown will be the NEO factors. These Figures are shown in Appendix B, however, they are summarised in Table 8.9. Appendices B-1 to B-10 are the Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness MDS solutions respectively, and refer to the same sub-samples (n = number as shown in Table 8.8).

Table 8.9.

Comparison of Super-grid MDS solutions and Inter-element Proximities.

Sub-Sample	Cluster Most Proximal to Self	Cluster Most Distal to Self
Neuroticism	Ideal Self, Lover	Disliked Person, Work Computer, Car, Mobile Phone
Extraversion	Ideal Self, Lover	Disliked Person, Play Computer, TV.
Openness	Ideal Self, Lover	Disliked Person, Play Computer, TV.
Agreeableness	Ideal Self, Lover, Car	Disliked Person, Play Computer, TV
Conscientiousness	Ideal Self, Father	Disliked Person, Play Computer, TV
Realistic	Lover, Father	Disliked Person, Play Computer, TV
Investigative	Mother, Lover,	Disliked Person, Play Computer, TV
Artistic	Ideal Self, Lover	Disliked Person, Mobile Phone, Work Computer,
Social	Ideal Self, Lover	Disliked Person, Work Computer, Mobile Phone, Car
Enterprising	Ideal Self, Father, Lover	Disliked Person, Play Computer, TV
Conventional	Lover, Father, Mother, Ideal Self	TV, Play Computer, Mobile Phone

Proximity refers to the Euclidean distance from ‘Self’ to other elements.

In summary, in people in the ’high’ group for each NEO factor shown in Appendix B-1 to B-10, a common pattern of inter-element proximity for ‘Ideal Self’ and ‘Self’ is seen. In three MDS solutions, those of Neuroticism, Extraversion, and Openness, the element ‘Lover’ was included as the closest element to the ‘Ideal Self’ and ‘Self’ cluster. There were two exceptions to this proximity pattern, for the MDS solutions of Agreeableness and Conscientiousness super-grids. Within the Conscientiousness MDS solution, the element ‘Father’ is the closest element to the ‘Ideal Self’ and ‘Self’ cluster. In the

Agreeableness MDS solution, technology transference is shown, in which the ‘Car’ is included within human cluster elements. All the MDS solutions demonstrated the element ‘Disliked Person’ as most distal from the ‘Ideal Self’ or ‘Self’. In all MDS solutions, except that for Neuroticism, the elements ‘TV’ and ‘Play computer’ were the elements closest to ‘Disliked Person’; in Neuroticism, the ‘Car’, ‘Mobile Phone’ and ‘Work computer’ elements were located in this position. All MDS solutions show the ‘Work computer’ element to be positioned high in Dimension 2, but with the exception of the Neuroticism solution, in which the ‘Play computer’ and ‘TV’ are tightly clustered, positioned high in Dimension 2. Another exception in Neuroticism, from the common pattern, was the location of ‘Disliked Person’ located in the negative quadrant for Dimension 2.

The second set of analyses to be shown is the SDS sub-samples. Each participant who scored above the sample means for the SDS was categorised as a high scorer. A series of super-grids for each of the six occupational types were formed by an aggregation of their individual Transference Grids. Appendices B-11 to B-22 are the MDS solutions for the Realistic, Investigative, Artistic, Social, Enterprising and Conventional sub-samples results respectively.

The Self-Directed Search MDS solutions are also summarised in Table 8.9. In summary, for all the SDS MDS solutions there is a uniform inter-element pattern, in which the ‘Self’ or ‘Ideal Self’ is furthest from ‘Disliked Person’ element. The MDS solutions reveal that all SDS sub-samples show the ‘Ideal Self’ as the highest scoring element in the positive half of Dimension 1. For all the MDS solutions, with the exception of the Conventional, the element ‘Work Computer’ was located most positive in Dimension 2. Three of the solutions show a tight proximity with ‘Self’ and ‘Ideal Self’. Additional elements proximal to this ‘Self’ and ‘Ideal Self’ cluster were a parent

('Father' for Realistic, and 'Mother' for Investigative and Conventional). The Artistic and Social MDS solutions showed the 'Lover' element as forming a tight cluster with 'Self' and 'Ideal Self'; and for the Enterprising MDS solution, a parent and lover ('Father' and 'Lover') were proximal to the 'Self' and 'Ideal Self'.

Research Question 7 explored whether technology and computer transference varied between sub-samples comprised of NEO and SDS high scorers. These results found evidence for some individual difference variations, as well as some consistent results across all the MDS solutions. Some element proximities and locations within these MDS solutions offered some insights into how these elements may be perceived. One of the most common outcomes, for example, was the 'Work Computer' element's large distance from the 'Play Computer'. The 'TV'' and 'Play Computer' elements shared closer proximity than do the two computers' although the two computers are the same class of object.

8.3.4 Results for the Technology Acceptance Model (TAM)

Research Question 8 investigates the TAM (Symbolic Adoption), and states that in workers with different IS and IT contexts, replication of Karahanna and Agarwal's (1999) results will occur. One difference was that Karahanna and Agarwal's (1999) model focused on use as the behavioural intention variable. In Study Three, the intention focused on the intention to explore.

Four contexts for the TAM were tested for Word, Kronos, Hosrep and Austlii. These contexts were four IS applications which had different characteristics and uses. The TAM was described in detail in Section 1.1. However, due to the small sample sizes for Hosrep and Austlii (which were therefore dropped from the study: see Appendix B), only analyses for TAM_{Word} and TAM_{Kronos} were performed. In this study, the TAM was tested using a partial least squares method of structural equation modelling (SEM), specifically using the software PLS-Graph (Chin, 2001). Two time constraints had restricted the sample size in this study. First, data collection using the interview process for the Transference Grid methodology was time-consuming for both participant and interviewer, and second, the interviews took place within a work context.

Partial Least Squares is a construct path modelling methodology which is less restrictive about its source data in terms of sample size and normality of the data distribution. Therefore, PLS is a suitable analysis in this study, where the sample size was smaller than comparable studies. PLS-Graph is a software program for PLS analysis. It gives a graphical representation of the relationships between the latent variables and their indicators. In path modelling, a construct is a “theoretical concept that is not directly measurable … [they are] also known as a latent variables” (Chin, 2001, p. 17).

Calculation of the path coefficients and R-squared values for the TAM variables was performed using PLS Graph (Chin, 2001), with individual item scores used as the indicators. The bootstrapping procedure was conducted to produce t-statistics and standard errors. This procedure is performed to correct for the possibility of interdependence between bootstrap estimates, and allows adjusted t-statistics, and hence significance, to be determined (Chin, 2001). Additional measures included in the analysis, were block indicators’ composite reliabilities and the average variance extracted. When a composite reliability is 0.70 or greater, it is considered acceptable (Fornell & Larcker, 1981 as cited in Barclay, Higgins & Thompson, 1995). The amount of variance within the indicators in relation to the measurement error gives the average variance extracted (AVE). In order to justify the use of a construct, the AVE should be greater than .50 (Barclay et al. 1995). The means, internal consistency, and correlations for the PLS results for Word, are shown in Table 8.10 and are shown to be satisfactory. Correlation of the loadings and factor loadings enable the discriminant and convergent validity of the model to be assessed. To determine the discriminant validity, the indicators should load more highly on the construct of interests although different interpretations and decision outcomes are possible (Barclay et al, 1995). In Table 8.10, the correlation of constructs and AVE were satisfactory, since the diagonal elements are greater than the those corresponding figures off the diagonal.

The core variables for the TAM with Symbolic Adoption for Microsoft Word are shown in Figure 8.1. It can be seen in Figure 8.1 that the explained variance of Intention to Explore (IntExp) by this model was 0.43%. The strongest influence for this Intention to Explore (IntExp) came from Attitude (Attit), although this model failed to find that either Attit or Symbolic Adoption (SA) significantly contributed to IntExp. PU contributed most to the 77% variance explained by Attit, with a path coefficient of 0.62 (p = 0.000, t = 5.34), although PEU also significantly contributed (β = 0.30, p =0.013, t = 2.54). SA, with an explained variance of 78%, was significantly influenced by Attit (β = 0.50, p = 0.001, t = 3.55), but not PU (β = 0.31, p = 0.075, t = 1.80). PEU strongly contributed to PU (β = 0.79, p = 0.000, t = 13.86). This indicates that SA was an important contributor in the model in the Word context.

Research Hypothesis 8.1, that positive Attitude toward the use of technology has a positive influence on Symbolic Adoption of the technology, was supported. **Research Hypothesis 8.2**, was that Perceived Usefulness of a technology has a positive influence on its Symbolic Adoption. This hypothesis was supported. **Research Hypothesis 8.3**, that Perceived Ease of Use of a technology has a positive influence on Symbolic Adoption of the technology via its effects on Perceived Usefulness, was also supported.

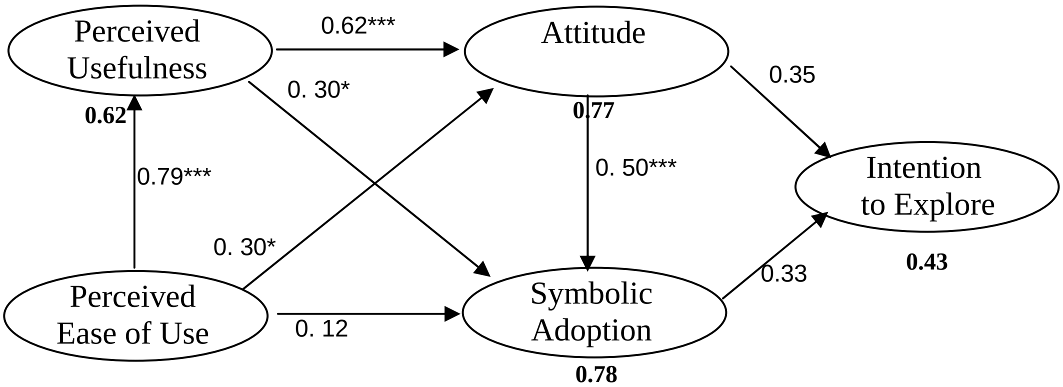

Figure 8.1.

Technology Acceptance Model with Symbolic Adoption for Word.

Circles depict latent variables. The item measures are not depicted in these results. Numbers on arrows connecting constructs are path coefficients (β). R-square results are located below each construct. (N = 52; bootstrap n=100, df =99). *** indicates β is significant at the 0.01 level, * indicates β is significant at the at 0 .1 level.

Research Hypothesis 8.4, that Symbolic Adoption of a technology has a positive influence on Intention to Explore the technology, was not supported; Attitude was found to have a stronger influence. In comparison to Karahanna and Agarwal's (1999) study, there is considerably more influence in Word for Attitude and Symbolic Adoption.

Table 8.10.

Means, standard deviations, internal consistencies, correlations of constructs for Word (hypothesised model).

				Internal Consistency		Correlation of Constructs				
	No Items	Mean	Std Dev.	Reliability (Cronbach's Alpha)	Composite Reliability (Fornell)	Attit	PU	PEU	SA	Int Ex
Attit	9	40.83	10.58	.94	.97	.88				
PU	4	14.46	4.82	.94	.97	.86	.94			
PEU	4	14.02	4.09	.94	.97	.79	.79	.95		
SA	12	42.74	11.52	.95	.97	.86	.83	.76	.87	
IntEx	3	9.08	3.54	.94	.97	.63	.67	.76	.63	.96

Composite reliabilities are calculated using factor loadings and residual variances: Consistency = $(\Sigma\lambda_{yi})^2/\{(\Sigma\lambda_{yi})^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$
Diagonal elements are the square root of Average Variance Extracted (AVE).
$AVE = \Sigma\lambda_{yi}^2/\{\Sigma\lambda_{yi}^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$

The core variables for the TAM with Symbolic Adoption for the Kronos context are shown in Figure 8.2. The means, internal consistencies, and correlations for the PLS results for Kronos are shown in Table 8.11 and can be seen to be satisfactory, although the composite reliabilities for Attit and SA were just acceptable. From Figure 8.2, it can be seen that the variance explained of IntExp by this model was 0.01%. Attit contributed to SA, although this model found that neither Attit or SA significantly contributed to IntExp, with path coefficients of -0.02 and -0.10 respectively.

Research Hypothesis 8.1, which states that positive Attitude (Attit) toward the use of technology has a positive influence on Symbolic Adoption (SA) of the technology, is supported. Perceived Usefulness (PU) contributed most to the 47 % variance explained by Attit (β = 0.51, p = 0.002, t = 3.14), although Perceived Ease of Use (PEU) also significantly contributed (β = 0.27, p = 0.092, t = 1.7). The 73 % variance explained by SA, was significantly influenced by Attit (β = 0.57, p = 0.000, t = 3.69) but not influenced by PU (β = 0.24 p = 0.162, t = 1.41). **Research Hypothesis 8.2** was not supported, because PU was not found to have a positive influence on SA of Kronos. Perceived Ease of Use strongly contributed to PU (β = 0.51, p = 0.002, t = 3.13).

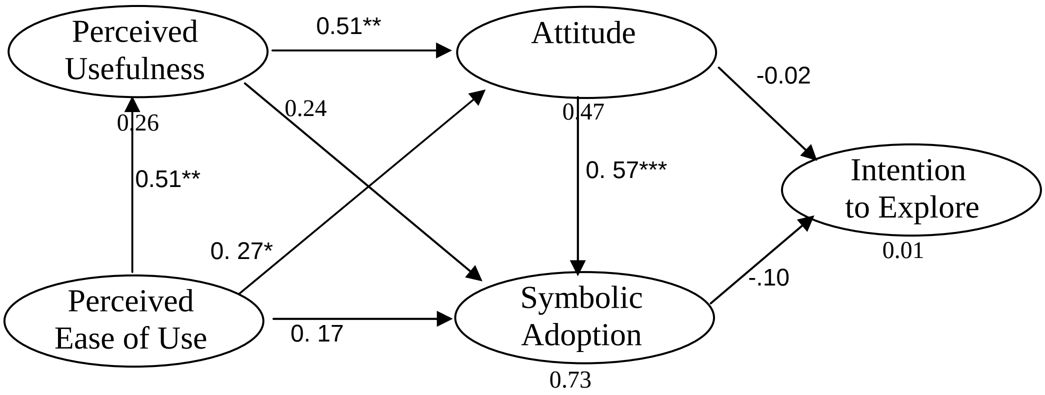

Figure 8.2 Technology Acceptance Model with Symbolic Adoption for Kronos.

Circles depict latent variables. The item measures are not depicted in these results. Numbers on arrows connecting constructs are path coefficients (β). R-square results are located below each construct. (N = 25; bootstrap n = 100, df = 99). *** indicates β is significant at the 0.01 level, ** indicates β is significant at the 0.05 level, * indicates β is significant at the 0.1 level.

Thus **Research Hypothesis 8.3**, that PEU of a technology has a positive influence on its SA via its effects on the mediating construct of PU is not fully supported because there is a clear flow of influence from PEU, through PU, to Attit, and on to SA, rather than directly to SA.

Table 8.11.

Means, standard deviations, internal consistencies, correlations of constructs for Kronos (hypothesised model).

				Internal Consistency		Correlation of Constructs				
	No Items	Mean	Std Dev.	Reliability (Cronbach's Alpha)	Composite Reliability (Fornell)	Attit	PU	PEU	SA	Int Ex
Attit	9	38.0	10.5	..88	.90	.72				
PU	4	10.7	4.8	.94	.96	.66	.92			
PEU	4	13.9	4.8	.92	.94	.52	.51	.90		
SA	12	39.3	11.8	.92	.93	.80	.66	.58	.72	
IntEx	3	6.5	3.6	.92	.95	-.11	-.20	.21	-.12	.92

Composite reliabilities are calculated using factor loadings and residual variances: Consistency = $(\Sigma\lambda_{yi})^2/\{(\Sigma\lambda_{yi})^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$
Diagonal elements are the square root of Average Variance Extracted (AVE).
AVE = $\Sigma\lambda_{yi}^2/\{\Sigma\lambda_{yi}^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$

8.3.5 Extending the TAM to include Personality Measures

Research Hypothesis 9 posited that there would be individual differences in computer acceptance based on the Technology Acceptance Model (TAM). This hypothesis explores the relationship between the components of the TAM, and a set of external variables. The TAM was tested in four contexts, in Word, Kronos, Hosrep and Austlii. The mean and standard deviation, and Cronbach alpha results for the TAM for Microsoft Word and Kronos are reported in Table 8.4, along with the individual difference measures. Again, due to the low sample numbers for the Hosrep and Austlii, no further analyses were performed.

The inclusion in the TAM of individual difference variables is important, because such differences have persistent implications for the ways people interact with their world (e.g. Costa & McCrae 1994; Watson, 1988; Watson, Clark & Tellegen, 1988; Watson &

Clark, 1997), and therefore make use of technologies (e.g. Ceyhan, 2006; Landers & Lounsbury, 2006; Harper, Caputi & Jayasuriya, 2004; Thatcher & Perrewe, 2002).

8.3.5.1 Results of Personality Variables and Technology Acceptance Model for Word

A preliminary PLS analysis was conducted on the TAM_{Word} and NEO item variables. As for the PLS results reported in Section 8.3.4, the bootstrapping procedure was conducted to produce t-statistics and standard errors. As well, measures of block indicators' composite reliabilities and the average variance extracted were included in the analysis. From Table 8.12 it can be seen that both the correlation of constructs are satisfactory since the diagonal elements are greater than the corresponding figures off the diagonal. With the exception of Agreeableness, and Conscientiousness, the composite reliabilities were satisfactory. Of the 92 items for the TAM_{Word} with the five NEO precursor variables, 44 items were found to have unsatisfactorily low inter-item correlations, and were removed. Inter-item correlations were required to be greater than 0.60 for the item to be retained in the analysis. The final construct correlations are shown in Table 8.12. The subsequent bootstrap results for the constructs and paths are shown in Figure 8.3. The majority of items for both Agreeableness and Conscientiousness had also been found to have unsatisfactory low inter-item correlations, i.e. less than 0.60 and were dropped from the analysis.

It can be seen from the PLS results in Figure 8.3, that the explained variance of IntExp provided by this model was 52.3%. The strongest contributor to this was SA ($\beta = 0.21$, $\underline{p} = 0.05$, $t = 2.0$), to a lesser extent was Attit ($\beta = 0.37$, $\underline{p} = .33$, $t = 0.98$), and the NEO variable of Openness ($\beta = 0.32$, $\underline{p} = 0.004$, $t = 2.92$). The explained variance of Attit was 77%, to which PU ($\beta = 0.62$, $\underline{p} = 0.000$, $t = 5.61$), and PEU ($\beta = 0.30$, $\underline{p} = 0.01$, $t = 2.6$) contributed in decreasing amounts.

Table 8.12.

Means, standard deviations, internal consistencies, correlations of constructs (hypothesised model) for Word.

				Internal Consistency		Correlation of Constructs									
	No Items	Mean	Std Dev.	Rel	CR	Attit	PU	PEU	SA	IntEx	N	Ex	Op	Ag	Csc
Attit	9	40.83	10.58	. .94	.97	.88									
PU	4	14.46	4.82	.94	.97	.86	.94								
PEU	4	14.02	4.09	.94	.97	.79	.79	.95							
SA	12	42.74	11.52	.95	.97	.86	.83	.76	.87						
IntEx	3	9.08	3.54	.94	.97	.63	.67	.76	.63	.96					
N	4	6.5	3.0	. 68	.80	-.21	-.21	-.29	-.25	-.17	.73				
Ex	3	8.2	2.1	.62	.82	.46	.49	.46	.48	.40	-.25	.72			
Op	6	15.0	4.4	.79	.82	.26	.33	.43	.32	.49	-.34	.30	.71		
Ag	1	3.3	.6	-	.67	.05	.06	.14	.23	.35	-.10	.01	.27	1.00	
Csc	2	6.3	1.2	.69	.37	.24	.37	.28	.38	.32	-.16	.25	.26	.29	.88

Rel is Reliability measured by Cronbach's Alpha
CR is Composite Reliability (Fornell)
Composite reliabilities are calculated using factor loadings and residual variances: Consistency = $(\Sigma\lambda_{yi})^2/\{(\Sigma\lambda_{yi})^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$
Diagonal elements are the square root of Average Variance Extracted (AVE).
$AVE = \Sigma\lambda_{yi}^2/\{\Sigma\lambda_{yi}^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$

The model also shows that PEU (β = 0.72, p = 0.000, t = 9.01) contributed to PU, with 65% of variance. The explained variance of PEU was 24%. The strongest contributor to PEU was Extraversion (β = 0.41, p = 0.000, t = 4.24), so that an individual's level of Extraversion helped determine how easy they found Word to use. Extraversion also contributed marginally to PU (β = 0.18, p = 0.056, t = 1.93). Neuroticism marginally contributed to PEU (β = -0.19, p = 0.10, t = 1.65), but not to PU (β = 0.04, p = 0.6, t = 0.53). Agreeableness (β = 0.16, p = 0.14, t = 1.48) and Conscientiousness (β = 0.08, p = 0.31, t = 1.02) did not significantly contribute to the model.

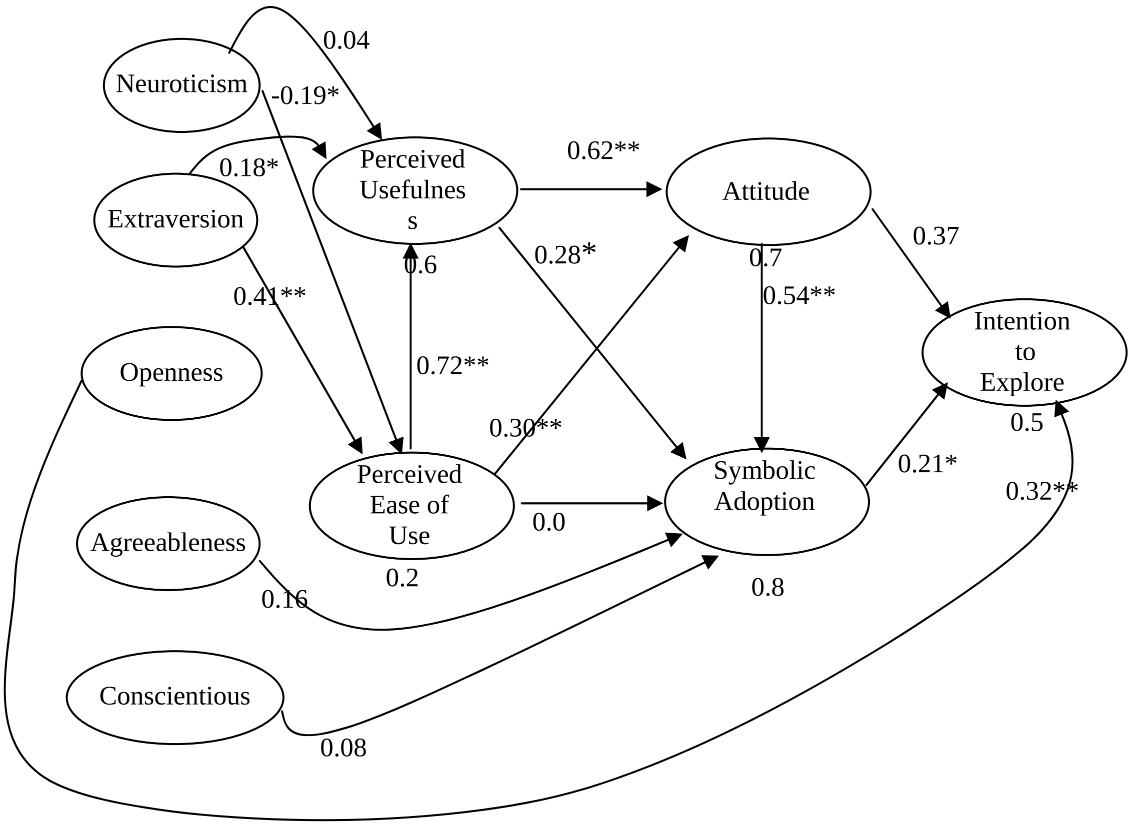

Figure 8.3. Exploratory PLS results for the TAM for Microsoft Word, with all NEO variables.

Circles depict latent variables. The item measures are not depicted in these results. Numbers on arrows connecting constructs are path coefficients (β). R-square results are located below each construct. (N = 52; bootstrap n = 100, df = 99). *** indicates β is significant at the 0.01 level, ** indicates β is significant at the 0.05 level, * indicates β is significant at the 0.1 level.

Extraversion influences PU marginally, and PEU directly. PEU then influences PU, which in turn influences Attit, SA and then IntExp. In decreasing amounts, respectively, most of the explained variance occurs for SA, PU, and Attit. The **Research Hypothesis 9.1**, that high levels of Neuroticism will be associated with low levels of Perceived Ease of Use and Perceived Usefulness, was partially supported, Neuroticism was found to influence Perceived Ease of Use, but not Perceived Usefulness. The items that contributed to this influence measured Self-consciousness, Anxiety, Depression and Vulnerability. **Research Hypothesis 9.2**, that high levels of Extraversion will be associated with high levels of Perceived Ease of Use and Perceived Usefulness, was supported. The influence for Perceived Ease of Use and Perceived Usefulness came from items that measure Warmth, Positive emotions and Activity. **Research Hypothesis 9.3**, that individuals with high scores in Openness will display high levels of Intention to Explore, was also supported. Openness items which contributed to this influence measure were Aesthetics, Ideals, and Feelings.

Research Hypothesis 9.4 states that individuals with high levels of Agreeableness will display high levels of Symbolic Adoption. This hypothesis was not supported, with no significant influence from Agreeableness occurring for Symbolic Adoption. The **Research Hypothesis 9.5**, that individuals with high levels of Conscientiousness will display high levels of Symbolic Adoption if the technology is congruous with their values, was also not supported, as no significant influence of Conscientiousness was found. The low inter-item correlations for both Agreeableness and Conscientiousness, and subsequent removal of the majority of items, limited the influence of these NEO factors to the model. These outcomes also reduced the generalisability of these results, especially for these NEO factors.

8.3.5.2 PLS Results of Personality Variables and Technology Acceptance Model for Kronos

The results of the PLS analyses of the TAM for the second of the IS contexts are now discussed. This context was for Kronos, which is a personnel management application used widely throughout the NSW Health department. The PLS results are shown in Figure 8.4. The means, and correlations of constructs, are shown in Table 8.13. Again, the additional measures included in the analysis were composite reliabilities, and the average variance extracted. From Table 8.13, it can be seen that both measures are satisfactory, since the AVE measures are greater than 50, and the correlation of constructs diagonal elements are greater than the corresponding figures off-diagonal. Using the same criterion for item retention (inter-item correlations > 0.60) of 92 items, 46 items were found to be unsatisfactory, and were removed. Six items for Neuroticism and Extraversion were used in the PLS analysis, one each for Openness and Agreeableness, and five for Conscientiousness, were retained. Again, this analysis used bootstrapping, which results in a more conservative estimate of the t-statistic (Chin, 2001).

Table 8.13.

Means, standard deviations, internal consistencies, correlations of constructs (hypothesised model) for Kronos.

				Internal Consistency		Correlation of Constructs									
	No Items	Mean	Std Dev.	Rel	CR	Attit	PU	PEU	SA	IntEx	N	Ex	Op	Ag	Csc
Attit	6	38.0	10.5	.88	.93	.83									
PU	4	10.7	4.8	.94	.96	.65	.92								
PEU	4	13.9	4.8	..92	.94	.52	.50	.90							
SA	10	39.3	11.8	.92	.93	.78	.66	.57	.76						
IntEx	3	6.5	3.6	.92	.95	-.07	-.15	.24	-.11	.93					
N	6	11.2	4.9	.82	.89	.01	-.25	-.35	.04	-.18	.76				
Ex	6	14.3	3.7	.69	.84	-.03	.25	.34	.10	.51	-.21	.69			
Op	1	1.4	1.0	-	1.00	-.14	.22	.39	-.17	.34	-.33	.58	1.00		
Ag	1	2.6	1.0	-	1.00	-.11	.22	-.05	-.24	.17	-.37	-.15	.10	1.00	
Csc	5	14.1	3.0	.69	.86	-.33	-.07	-.23	-.42	.16	-.18	.02	.06	.33	.74

Rel is Reliability measured by Cronbach's Alpha
CR is Composite Reliability (Fornell)
Composite reliabilities are calculated using factor loadings and residual variances: Consistency = $(\Sigma\lambda_{yi})^2/\{(\Sigma\lambda_{yi})^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$
Diagonal elements are the square root of Average Variance Extracted (AVE).
$AVE = \Sigma\lambda_{yi}^2/\{\Sigma\lambda_{yi}^2 + \Sigma Var(\varepsilon_i)\}$, $Var(\varepsilon_i) = 1 - \lambda_{yi}^2$

The results for PLS in Figure 8.4 show that, with decreasing influence, SA, Attit and PU contributed significantly to IntExp, which, combined with Openness ($\beta = 0.33$, $\underline{p} = 0.12$, $t = 1.58$), explained 12% of the variance. PEU ($\beta = 0.45$ $\underline{p} = 0.04$, $t = 2.07$)

influenced PU (26% of explained variance), but did not contribute to Attit (β = 0.26, p = 0.2, t = 1.3) or SA (β = 0.13, p = 0.85, t =.19).

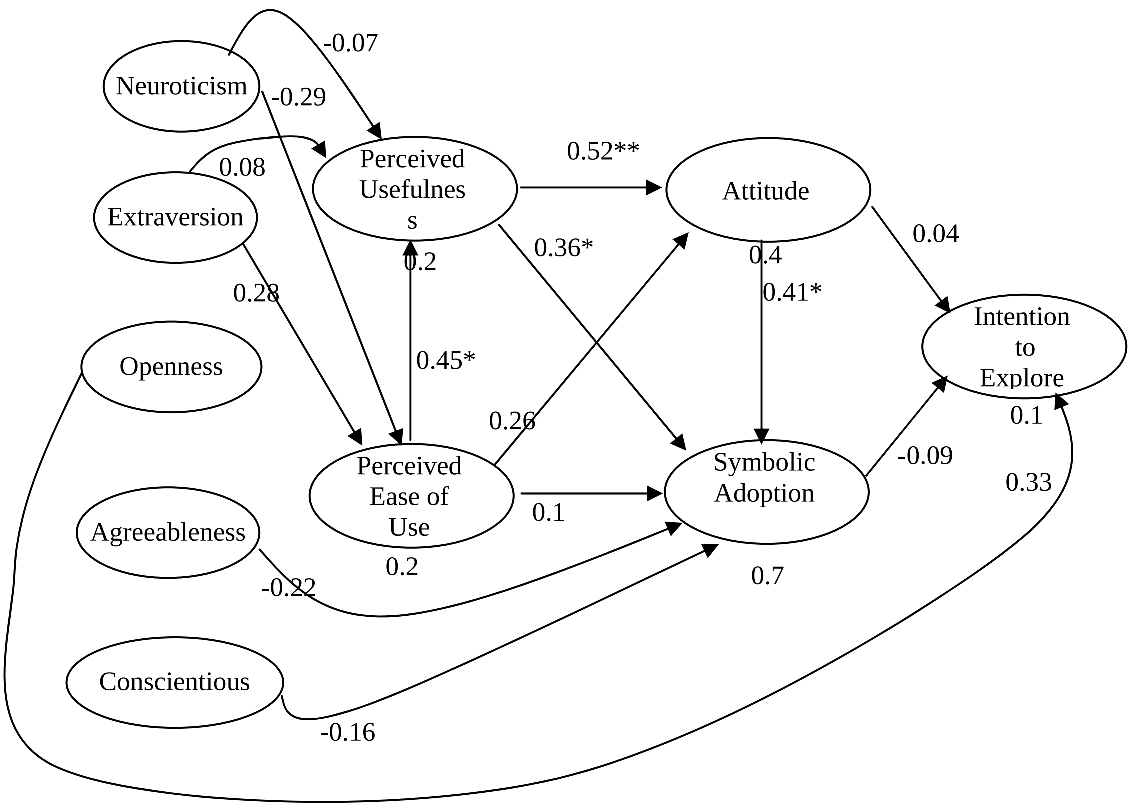

Figure 8.4. Exploratory PLS results for the TAM for Kronos, with all NEO variables.

Circles depict latent variables. The item measures are not depicted in these results. Numbers on arrows connecting constructs are path coefficients. R-square results are located below each construct (N = 25; bootstrap n = 100, df = 99). For details refer to Table8.13. *** indicates β is significant at the 0.01 level, ** indicates β is significant at the 0.05 level, * indicates β is significant at the 0.1 level.

In summary, Perceived Ease of Use influences Perceived Usefulness, which in turn influences Attitude and Symbolic Adoption, while Openness only marginally, and just outside of statistical significance, made any contribution to Intention to Explore. There is no significant contribution from either Attitude or Symbolic Adoption to Intention to

Explore. All the external variables failed to contribute to the model in this Kronos context.

The **Research Hypothesis 9.1** that high levels of Neuroticism will be associated with low levels of Perceived Ease of Use and Perceived Usefulness, was not supported. Neuroticism was found to have no influence on Perceived Ease of Use or Perceived Usefulness. Research **Hypothesis 9.2**, that high levels of Extraversion will be associated with high levels of Perceived Ease of Use and Perceived Usefulness was not supported. **Research Hypothesis 9.3**, that individuals with high scores in Openness will display high levels of Intention to Explore, was not supported in the Kronos context.

Research Hypothesis 9.4, that individuals with high levels of Agreeableness will display high levels of Symbolic Adoption, was not supported, with no significant influence from Agreeableness occurring for Symbolic Adoption. Likewise, the **Research Hypothesis 9.5**, that individuals with high levels of Conscientiousness will display high levels of Symbolic Adoption if the technology is congruous with their values, was not supported, as no significant influence of Conscientiousness was found.

Again within the Kronos context, the difficulty in having a high number of items that were removed reduces the generalisability of these results, especially for these NEO factors.

8.3.5.3 Comparison of TAM for Word and KRONOS

Comparison of the TAM and personalty variable results for the Word and Kronos are shown in Table 8.14, which indicates that individuals with high levels of Extraversion found Word easier to use, but had no influence when using Kronos. This outcome is related to the high level of Activity in Extraversion. Word is perceived as being more useful than Kronos (with PU variance of 63% compared with 27%). In addition, participants' attitudes to Word were more positive than to Kronos (with Attitude variance of 77% compared with 48%), and they had more interest in exploring Word (53.7% explained variance compared with 26.6%). The use of Kronos is mandated for management staff in NSW Health.

Table 8.14.
Comparison of PLS results for TAM $_{Word}$ and TAM $_{Kronos}$

	TAM Word		TAM Kronos	
	% Explained Variance	Path coefficient	% Explained Variance	Path coefficient
Openness	-	0.32** (to Intention)	-	0.33 (to Intention)-
Extraversion	-	0.41*** (to PEU); 0.18* (to PU)	-	0.28 (to PEU); 0.08 (to PU)
PEU	24.1	0.72*** (to PU); 0.30** (to Attitude); 0.07 (to SA)	.20	0.45* (to PU); 0.26 (to Attitude); 0.13 (to SA)
PU	64.6	0.62*** (to Attitude); 0.28* (to SA)	26.2	0.52** (to Attitude); 0.36** (to SA)
Attitude	76.6	0.54*** to SA; 0.37 (to Intention)	46.7	0.41* (to SA); 0.04 (to Intention)
Symbolic Adoption	81.1	0.21* (to Intention)	75.0	-0.09 (to Intention)
Intention to Explore	52.3	-	11.7	-

The personality factors of Extraversion and Openness are significantly different in the influence they have for the Word and Kronos contexts, on Perceived Ease of Use, Perceived Usefulness, and Intention to Explore, respectively. Comparing the two contexts of Word and Kronos, the two non-core variables have shown more variability in their effect than was shown by the core TAM variables.

The PLS results indicated that Extraversion and Openness (from the NEO-FFI) had shown influence in the TAM_{Word}. Therefore an exploration of their influence on technology and computer transference, rather than the TAM model, was undertaken. When these specific personality variables, Extraversion and Openness, were tested with a one-way MANOVA, there was a significant difference between low and high technology transference scores between them (F (2, 66) = 3.137, p = 0.050; Pillai's Trace = 0.087; and partial eta squared = 0.087). The independent variables were considered separately; Extraversion reached statistical significance of (F (1, 67.0) = 6.28, p = 0.015; and partial eta squared = 0.086). The mean scores demonstrated that high technology transference scorers reported higher scores in Extraversion (M = 54.98. SD = 9.70) than low transference scorers (M = 45.00, SD = 12.59).

8.3.6 Results for Technology Transference and Technology Acceptance and Use.

Research Question 10 addressed the association of technology transference and technology acceptance, and technology use. What are the consequences for individuals who show high levels of transference with technologies? This hypothesis proposed that technology transference is similar to Symbolic Adoption, that is, the mental acceptance of a technology. Further, it was proposed that high technology transference would be associated with high technology use. Technology transference reveals patterns of relating to technologies that share patterns of human-to-human relating.

To assess whether levels of technology transference enhances technology acceptance (based on the core TAM variables), a one-way multivariate analysis of variance (MANOVA) was performed. The method of determining the transference percentage was based on the Frequency Approach Method 2, as described in Section 5.2.3. Technology transference, as a percentage, ranged between 61-100%, because the majority of participants transferred most of their constructs; that is, they showed a construct range of convenience that included both human and technology elements. Using this method, two groups of participants were determined: those whose percentage of transference was ‘low’ (i.e. between 60% and 80%, n = 7), and those whose percentage of transference was ‘high’ (i.e. between 81% and 100%, n = 62). The ‘low’ group consisted of the participants with the lowest scores of transference in Study Three. This classification was made because their data represent the lowest scores, although they are participants who did transfer the majority of their constructs (i.e. had a minium score of 61%). Because the distribution of the transference ranged between 61.82 and 100%, and had a strong negative skew (-1.8), this methodology produced a very unequal distribution of participants for the two groups. Technology transference was the independent variable (low 60-80 and high >80-100). The five TAM variables (PU, PEU, Attitude, Symbolic Adoption and Intention to Explore) for Word and Kronos were used. Checks for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity were performed. Box's Test of Equality of Covariance Matrices is not computed, because there were fewer than two non-singular cell covariance matrices for the five dependent variables of the TAM for Word and Kronos contexts. Pearson product moment correlation coefficient of TAM $_{Word}$ revealed multicollinearity, with very strong correlations between Attit, and SA and PU. Box's Test and all other checks for the data, were satisfactory when Attitude was dropped from the analysis. There was no statistically significant difference between 'low' and 'high' technology transference scorers on the TAM Word variables (F (4, 41) = 1.03, p = 0.405; Pillai's Trace = 0.091; partial eta squared = 0.091).

A one-way analysis of variance (MANOVA) of TAM $_{Kronos}$ demonstrated no violations of the assumptions. The descriptives of these two groups, of low and high transference scorers is shown in Table 8.15.There was no significant difference between 'low' and 'high' technology transference scorers on the TAM for Kronos (F (5, 18) = 1.316 , p = 0.30; Pillai's Trace = 0.268; partial eta squared = 0.268). These results indicate that there were no significant differences between low and high transference scorers in their perceptions of usefulness, ease of use, symbolic adoption or intention to explore Word or Kronos.

Research Hypothesis 10.1 stated that high scorers of technology transference will show high TAM symbolic adoption. There was no significant difference between the high and low transference group mean scores for Symbolic Adoption. Therefore, Research Hypothesis 10.1 was not supported. Also, there was no significant difference between the mean scores for Perceived Ease of Use, Perceived Usefulness, Attitude and Intention to Explore.

Table 8.15.

TAM Means for Transference Groups for Word and Kronos.

		TAM Word		TAM Kronos	
	Transference Low- High Groups	Mean	SD	Mean	SD
PEU	60-80	15.00	1.58	14.75	6.85
	80-100	13.55	5.49	13.95	3.91
	Total	13.71	5.21	14.08	4.34
PU	60-80	15.20	3.42	8.00	2.45
	80-100	13.85	5.94	11.55	4.86
	Total	14.00	5.70	10.96	4.70
Attit	60-80	42.40	7.33	33.50	8.43
	80-100	38.65	14.68	39.60	10.44
	Total	39.07	14.05	38.58	10.23
SA	60-80	50.40	4.77	32.00	11.05
	80-100	40.33	14.94	41.15	10.99
	Total	41.44	14.50	39.63	11.31
IntEx	60-80	9.60	2.97	6.50	2.89
	80-100	8.73	4.24	6.65	3.76
	Total	8.82	4.10	6.63	3.57

Word Low n=5, high n = 40
Kronos Low n=4, high n=20
Transference Groups: Low 60-80%, High 81-100% of transference using Frequency Method 2

In order to test for computer use, a one-way multivariate analysis of variance (MANOVA) was performed. Again, technology transference was the independent variable (low 60-80 and high >80-100). The dependent variables were computer experience and frequency of use. Tests for the data normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity were performed, and found to have no serious violations. The number of participants exhibiting low transference was very small. The results for technology transference and computer experience means and standard deviations are shown in Table 8.16.

Table 8.16.

Transference Group Means for Computer Experience and Frequency of Use

	Transference Low- High Groups	Mean	SD	N
Computer Experience in Years	60-80	7.57	3.78	7
	80-100	12.36	5.37	61
	Total	11.87	5.41	68
Frequency in hours per week	60-80	11.21	10.38	7
	80-100	25.69	15.88	61
	Total	24.20	15.97	68

Transference Groups: Low 60-80%, High 81-100% of transference using Frequency Method 2

There was a significant difference between low and high technology transference scorers on the dependent variables: (F (2, 65) = 4.615, p = 0.013; Pillai's Trace = 0.124; and partial eta squared = 0.124), for both computer experience and frequency of use. The results for these dependent variables were examined singly, and both differences were statistically significant, with both computer experience in years (F (1, 66) = 5.24, p = 0.025; and partial eta squared = 0.074), and frequency of computer use: (F (1, 66) = 5.50, p = 0.022; and partial eta squared = 0.077). The mean scores demonstrated that high technology transference scorers had longer computer experience (M = 12.36, SD = 5.37) than low scorers (M = 7.57, SD = 3.8), and greater frequency of computer use (M = 25.69, SD = 15.88) than low scorers (M = 11.21, SD = 10.38). **Research Hypothesis 10.2** stated that high scorers of technology transference will show high computer use and frequency of use; this hypothesis was supported.

8.4 Discussion

The research questions concerning technology transference and its effects were addressed within this chapter. The primary hypothesis, that technology transference was common, was supported. Study Three demonstrated that technology transference was a common phenomenon. The Frequency Approach described three methods of calculating technology transference, and each demonstrated high rates and high levels of transference. Method 1 resulted in a transference rate of 84.4%; Method 2 revealed a mean transference rate of 94.29%, and Method 3 showed that 26% of participants demonstrated high transference, 30% demonstrated moderate transference and 43.5% demonstrated low transference.

The nature of transference was explored using two qualitative approaches: two anthropomorphic questions, and construct themes. The results of the anthropomorphic questions found that participants' perceptions of computers were centred on computers' heightened abilities to store and organise information, their dominance, their lack of emotion, nerdiness, as well as their complexity and subsequent difficulty. The second anthropomorphic question asked about perceptions of computer gender. Participants viewed computers as masculine, at approximately twice the rate of their being female (at 42.2% in comparison to 23.5% female), in keeping with the identification of IT being a masculine domain (Smith, Morgan & White, 2005), despite increasingly accessible computer use. The nature of Transference Grid constructs were investigated using thematic analysis. The constructs were categorised successfully within an extended form of Schwartz's (1992, 1994) human values taxonomy. Because the power ratings were used across both human and technology constructs, comparisons between power and other values could be offered for examination. The constructs categorised into the ‘Power’ type were further analysed, to assess the power differential for the ‘Self’, and ‘Play computer’ and ‘Work computer’ elements. This analysis supported the hypothesis that power relations played a part of the computer-human interaction. However, since a relatively small percentage of constructs were categorised for ‘Power’ within taxonomy, the computer-self power relationship showed a limited effect.

The nature of transference was also illustrated by a stable set of super-constructs. The elements from the Transference Grids demonstrated a relatively stable framework, that included human and technology components. All the Transference Grids (individual, sub-samples and those combined into super-grids) produced a consistent pattern for Dimensions 1 and Dimension 2. The location of two elements in Dimension 1, those of an ‘Ideal self’ and ‘Disliked person’, supported a notion that a stable super-construct dimension overarches, or subsumes, the location and placement of ‘Ideal self’ and ‘Disliked person’. It was proposed that the super-ordinate construct for Dimension 1 was Affect, that which is liked, and the contrast disliked; and what is valued, and not valued. Liking means pleasant, enjoyable or preferable, and attracted to, and more satisfying and fulfilling, in contrast to dislike, which is distaste for, or an aversion. Dimension 1 is based on human elements.

Dimension 2 showed a consistent pattern of ‘High – Low effort’ or ‘Responsibility’ as the super-construct. The selection of this construct was based on the placement of the ‘Work’, ‘Play computer’ and ‘TV’ elements as parameters within which most other elements were located. Dimension 2 is based on the location of technology elements. This has implications for the value in using a ‘hybrid’ form of the Repertory Grid, in that it demonstrated a conceptual integration of human-technological features that functioned at a higher level of abstraction for these participants. This integration of

Affect and Effort / Responsibility applies to both human and technology elements. These results supported a notion that participants incorporated human and technological components into an integrated worldview, which has a higher level of abstraction that incorporates affect and effort.

In order to clarify the influence of individual difference characteristics on technology transference and components of technology acceptance, Chapter Eight also reported patterns of associations found for the individual difference measures of personality, occupational and learning style. Extraversion was associated with Social, Enterprising and Active as predicted, but not Verbal. An association between Intuitive and Extraversion, which was not predicted, was found. The hypothesised relationship between Openness and Artistic, as well as Intuitive, was found; but none was found for Investigative or Realistic; an unpredicted correlation for Social was also found. No relationship was found for Investigative and Reflective, but an unpredicted association was shown for Global. An unpredicted association was found between Realistic and Visual, although the predicted association for Realistic and Sensing was lacking. No predicted associations for Agreeableness were found, and its association with Enterprising was not predicted. Conscientiousness and Conventional were predicted to be related, this was found, but three unpredicted associations were found: those for Reflective, Sensing, and Sequential.

8.5 Conclusion

The effects that individual differences have on technology transference were shown in different transference rates for NEO, but not occupational groups. Multidimensional Scaling (MDS) solutions of the individual Transference grids were collected and analysed. The MDS solutions illustrated that different locations and clusters of the elements occur for different NEO and occupational groups. However, there is an invariant super-construct pattern of Affect and Effort for the two dimensions for all the MDS solutions in Study Three.

In order to explore the consequences of technology and computer transference, the well-known model of computer acceptance was added as a measure. Examining the components of the TAM models (with only its core constructs) revealed different effects for the two contexts, Word and Kronos; and different levels of variance examined for latent constructs. The analyses of ‘non-core variables’ of the TAM, in the two contexts, was also explored. Personality differences had different effects in the model. Whether this effect was the result of the system’s mandated use, the differences of the systems usefulness, or the difficulty in its use, was unknown.

An examination of the technology transference and technology acceptance indicated that no statistically significant outcomes were found between high and low transference scorers for components of the TAM for Word or Kronos. However, there were different high and low transferrers’ frequencies, and years of computer use, as well as their level of Extraversion.

The next chapter, Chapter Nine will discuss these findings and their implications. The frequency of these human-technology relationships, found in this study, suggests that these relationships are normal. Study Three may indicate that individuals make sense of the human and technological world at a high level of abstraction (or superordinacy), based on two relatively simple constructs. These constructs structure individuals’ cognitive and emotional processes, and allow them to predict many human and technology interactions and events, but may operate at low, or even below, any level of awareness.

CHAPTER NINE

CONCLUSION

Conclusion

Chapter Nine begins with a discussion of the findings for the three studies. Section 9.1 reviews the findings on the nature of transference. A discussion of the findings dealing with individual differences follows in Section 9.1.2. The consequences of technology and computer transference are described in Section 9.1.3. The theoretical implications for the findings of the three studies are considered in Section 9.2. Based primarily on the MDS solutions of the Transference Grid results, Section 9.2 outlines an overarching integrated structure which may form the basis of human-technology relations. It offers new insights on both the abstract notions and phenomenological accounts which people may use in making meaning of their interactions with other people and technologies. Section 9.3 describes the limitations of the studies, and Section 9.4 offers suggestions for future research in this field. The concluding remarks for the thesis occur in Section 9.5.

9.1 Discussion of the Findings

Technology and computer transference is the relationship that humans build from past interpersonal experiences and transfer to technologies. This thesis has explored this transference. The thesis also explored how transference and individual difference variables may influence the use of technologies and information systems and components of the TAM. Few empirical studies had examined transference previously. The Transference Grid methodology was tested, as a means of accessing the transference relationship. The associations that technology transference holds with established research areas, such as the individual difference variables of learning style, occupational style and personality, as well as components of the Technology Acceptance Model and technology use, were unknown.

The first aim of this thesis was to explore technology and computer transference, its frequency and its nature, making use primarily of the Transference Grid. Transference Grids provide qualitative as well as quantitative data, and this methodology enabled participants to articulate their views of a range of people and technologies, and to give a subjective account of their phenomenological experiences of people and technologies. This methodology also enabled participants to compare the similarities and dissimilarities between humans and technologies. The results showed that transference was common. Three methods were used in accessing the frequency of transference. Regardless of how it was measured, transference was found to be common. For Studies One, Two, and Three, respectively, the transference frequencies using Method 1 (across the Transference Grid construct rows) were 92.5, 89.9, and 84.4%, and for Method 2, transference frequencies were 93.8, 95.6 and 94.3%. The rates of transference across all three studies indicated that technology transference was not confined to the student samples, but also occurred for working professionals from different occupations and industries. Transference responses were, therefore, not likely to be an artefact created as a product of social desirability response. The transference measure showed external validity for work environments. The frequency and breadth of these transference occurrences implies that technology transference is a normal experience. This finding concurs with numerous writers, such as Norman (2004), Turkle (1984; 1997a, 1997b, 2007a), Nass et al (1997), Suler (1998), Barglow (1994) and Johnson et al.(2002a; 2002b).

Another aim of the research was to explore the outcomes and consequence of transference. There was a need for such exploration, because even within heavily computerised societies, poor IS and IT acceptance rates are not uncommon. This poor acceptance occurs as limited use, and high rejection rates of IS and IT. The inception of information systems has led to the development and testing of models, including the Technology Acceptance Model (TAM). There has been limited understanding of the human-computer interaction, and often the investment is based on utility. Such understanding leaves out the meaning-making and emotion that are part of the ordinary rapport that, as social agents, humans develop with computers and technologies (Nass et al. 1997). Norman (2004) discussed the highly interpretative rapport any individual must make with their external world, because individuals can only view their world from their own perspective.

There was a need to research the transference interaction that humans have with technologies and computers. This interaction has been theoretically discussed by workers such as Norman (2004), Turkle (1984; 1997a, 1997b, 2007a), Suler (1998) and Barglow (1994), but required verification and broadening beyond the empirical studies of Nass et al 1997, and Johnson et al. (2002b). Broadening the empirical research became the basis of the research aim: to explore the nature of transference.

9.1.1 The Nature of Transference Findings

For each of the current studies, the MDS solutions from all participants' Transference Grid analyses showed mixed clusters of human and technology elements. The Euclidean proximities derived from the MDS solutions were described as illustrating perceptual similarities between elements (Block & Block, 2005), and modelling psychological phenomena and space (Borg & Groenen, 2005). Different cluster patterns of element Euclidean distances therefore showed individual, and personality and occupational style variations. Hence, mixed clusters illustrated various psychological similarities between humans and technologies, and represent a perceptual blurring of boundaries between the animate and inanimate. These MDS solutions, therefore, demonstrated that technologies were integrated into participants' worldview, and that such integration was broader than the rational descriptions that participants may give. This process illustrated an integration of some of the meanings given by humans to technologies. The mixed clusters of animate and inanimate elements, which participants generally (and more rationally) would express as distinct and separate, may describe similarities, because both humans and technologies interactions are experienced as phenomenological, and spontaneously evoke emotions and cognitions, and draw on ideological perspectives. In doing so, animate-inanimate boundaries are blurred.

The nature of transference was explored using a qualitative approach. One method that these studies used to investigate computer transference was posing to participants the question: 'If the computer was a person, what sort of person would it be?' Participants' responses showed a number of themes that range from positive through ambiguous to negative valence. The themes were: beyond my capacities, undiscovered, energetic, clever, knowledgeable, helpful, useful, reliable, friend, ordered, predictable, methodical, analytic, rigid, pedantic, mechanical, semi-reliable, lacking understanding, frustrating, tool, cold, nerd, unpredictable, infuriating, unreliable, limited, withholding, empty, dull, nerd, geek, unemotional, introverted, needs help, a follower, slave. One participant commented that her computer has no name, because that "keeps it in its place"; i.e. computers require constraint. Such descriptions indicated a range of attributions about computer capabilities and involvement, from 'wizard-like', and 'beyond my capabilities', to 'empty'. These results indicated a considerable range, as well as ambiguity, toward computers, especially based on the emotional response people have to computer unreliability and limitations, as well as pejorative responses describing computers' emotional coldness, and mechanistic flatness. These demonstrate Suler's (1998) types of computer transference with computers as an authority, as friend, reliable or limited and subservient. These descriptions demonstrate an emotional response that ranges from engaged to disengaged.

The experiences of dealing with the world of people and technologies necessarily involve human values. Individuals judge their experiences with reference to their values, or guiding principles. In each of the current studies, the constructs elicited by participants were categorised using an extension of the human values taxonomy by Schwartz (1992, 1994). This framework revealed the pattern of human values that participants used most frequently. Since the constructs elicited by participants were free responses, the frequency of values for each category revealed its relative importance to those participants. In Study Three, these human values categories were found in decreasing percentage of frequency: Benevolence, Hedonism, Self-Direction, Utility, Stimulation, Achievement, Universalism, Power, Conformity, Security, Tradition, Uncategorised. This finding indicated that Benevolence was an important component in these participants' assessment of people and technologies, while Hedonism, Self - Direction and Utility, Stimulation, Achievement were human values shown to have medium to low importance for participants. Similar results were found for Study One, with the highest frequency of constructs categorised as Benevolence, Hedonism, and then Power and Conformity/ Tradition, demonstrating a higher frequency of Power and Conformity/ Tradition than was found in Study Three. Similar results also occurred in Study Two, although an even higher frequency of Conformity/ Tradition constructs than for Study Three was found. Collectively, the three studies indicate that Benevolence, Hedonism, Self Direction, Utility and Stimulation were the most frequent human values categorised from constructs describing humans and technologies. Combined, these values account for approximately 50 to 70 percent of constructs across the three studies.

Suler (1998) suggested that Power played an important part in the transference that people have with computers. Power relations described different forms of computer-human interactions. Suler (1998) described two power differentials in which humans are ascribed greater power than computers, two in which humans are ascribed less power than computers, and the fifth interaction described an equal partnership. In the current studies, participants varied in the frequency with which they described technologies and humans in terms of power, with some participants frequently eliciting constructs categorised as relating to Power, but for others there were no Power constructs. The frequency of participants who used any Power constructs was 5.6%, 27.8% and 37.7% in Study One, Study Two and Study Three, respectively, indicating that for the majority of these participants, Power was not their focus. Overall, in Study Three, only 35 Power constructs contributed 4.7% to the total percentage of 745 constructs, compared with 11.2% and 3.9% for Study One and Study Two, respectively. The low frequency of power constructs across all of the studies carries the implication that technologies must offer more than Power to successfully engage end-users. Power was not a dominant feature of these participants' ways of relating to the world, and the sense of power that a technology offers would hold little attraction. This finding runs counter to Suler's suggestion that power relations form an important part of the computer-human interaction.

In comparison to Power, Utility was a more important category of constructs, with 10.4% frequency of the total constructs in Study Three (10.3% and 4.5% for Study One and Two respectively) being categorised within this value. With such low frequencies, Utility remained a relatively small component of these participants' worldviews. Much technology acceptance and computer functionality research and development is based on Utility, and therefore may fail to engage end-users, because it is not congruent with end-users' main requirements for a technology. The results from the human values categorised constructs, imply that technologies must offer more than Power or Utility to fully engage participants and sustain them through the processes of learning, routinisation and infusion. IS and IT research needs more focus on what end-users deem relevant. Since the category of Benevolence demonstrated a higher frequency of constructs, perhaps computer-human interactions that involved Benevolence (such as loyalty, responsibility or spiritual life, Schwartz, 1994) would better engage end-users. ABIT uGuru offers to be a reliable partner or spiritual guide (ABIT, 2005) to the users of its motherboard, but this uses these notions of benevolence as a commercial marketing niche to focus the human-computer interaction for individual well-being rather than for universal good.

Multidimensional Scaling was the main analysis performed on the Transference Grids. The framework of these MDS solutions revealed a structure in which people and technologies were integrated. The outputs, both for each individual and aggregated MDS solutions, demonstrated a consistent two-dimensional super-ordinate structure which conceptually overarches the constructs and elements within that framework. Dimension 1 (the x axis) described elements that ranged from Ideal to Disliked. This super-construct was reasoned to describe 'Affect', because the dimension illustrated the array of elements arranged from what is liked to what is disliked. It is possible that rather than 'Affect', Dimension 1 describes 'Valued' or 'what is valued', because several participants indicated that their Disliked Person, while not being liked, was valuable to them as a counterpoint in their construing. They did not like this person, but yet their Disliked person was a valuable 'anti-model' resource as a readily available mental contrast for what they preferred, liked or respected. However, most participants were unambiguous, in that they disliked their Disliked Person element. Emotions are important components for rationality, and although often unconscious, they are inseparable from cognitions, and alter motives, decision-making, planning and mood, and act as appropriate guides (Damasio, 1994; Norman, 2004; Zajonc, 2000). Indeed, most behaviour, seemingly conscious and controlled, is governed by emotions of which people are unaware (Ramachandran, 2004).

Dimension 2 (the y axis) was determined to represent Effort / Responsibility. This super-construct was reasoned to describe Effort/ Responsibility, because the dimension was bounded by technologies of low and high effort or responsibility, usually TV and / or Play computer and Work Computer. For Dimension 2, the notion of ‘Salience’ was reasoned to be a possible alternative meaning. However, the positioning of the ‘Mother’ element in the positive quadrant for Dimension 1 Affect, and negative for Dimension 2, was seen to exclude Salience as a central meaning for Dimension 2. Generally, ‘Parent’ (but ‘Mother’ in particular) is seen as a significant other who has high salience in people’s lives (Pederson, Gleason. Moran, & Bento, 1998). This restores the more likely meaning of Dimension 2 to Effort / Responsibility, rather than Salience.

9.1.2 Individual Difference Findings

Individual differences were incorporated into this thesis, because they may add insights about the characteristic ways in which people respond to the world. This may clarify the characteristics which influence technology transference and technology acceptance. The associations between individual differences as measured by the NEO-FFI, SDS and ILS were investigated. There were relationships found between these variables. Some associations were as hypothesised, others were not. This implies variation in the stability of individual traits or characteristics and suggested as having implications for IT use (Thatcher & Perrewee, 2002).

Stability was measured as the difference between predicted and actual association outcomes. Therefore, predicted outcomes were compared to outcomes that were unexpected, or that failed to occur as predicted. This criterion was used to judge stability for each of the measures of individual differences, NEO, SDS and ILS. Overall, the associations between the NEO and the SDS were the most stable with an 83.33% proportion of correct to incorrect predictions, followed by the NEO and ILS associations (70%), and last by the SDS and ILS (66.67%). This supports previous research which has reported variation in the associations found for combinations of learning, occupational style and personality variables (Costa, McCrae & Holland, 1984; Gottfredson & Holland, 1990; Gottfredson, Jones & Holland 1993; Costa & McCrae, 1992; McCrae & Costa, 1997). Learning style (ILS), since it is a cognitive pattern, may be more flexible in its use, and present as a less stable measure. Such instability of associations between learning and occupational style has been found in previous research, and has been explained along the stable – dynamic continuum which is inherent in the innate nature of personality, rather than a malleability of learning style. The stable – dynamic difference was seen as an important influence to address (for example, in IT training, as described in Thatcher & Perrewe, 2002). Learning style is routinely described as being amenable to change, while personality is relatively stable. The levels of activity and energy, excitement-seeking, positive emotions and assertiveness, or need for withdrawal from threat and anxiety-provoking situations, for example, describe central features of personality (Davidson, 2003; Saucier & Ostendorf, 1999; Watson & Clark, 1997; Watson, Clark & Tellegen, 1988).

9.1.2.1 Individual Difference and its Consequences for Technology Transference and Technology Acceptance.

It was important to see the consequences of these individual differences for technology transference. In Study Three, two groups of participants were determined. One group had a low percentage of transference (i.e. between 60% and 80%), the other had a high percentage of transference (i.e. between 81% and 100%). There was a significant difference between low and high technology transference scorers for Extraversion. Low technology transference scorers, in comparison to high transference scorers, reported low scores in Extraversion. Although the results of the equivalent in Study Two had not found such differences, that sample was more restricted and homophilous, derived primarily a student psychology sample, with additional participants. The results of Study Three, because they are based on workers in diverse industry settings, are generalisable to other workers in many industry contexts.

Another research aim was to explore the antecedents of the components of the Technology Acceptance Model. Study Three examined an extension of the TAM, and reviewed the outcomes of individual differences and TAM. The results of the core TAM variables revealed partial replication of the results from the TAM (Symbolic Adoption) by Karahanna and Agarwal (1999). In Study Three, there was a significant influence from Perceived Ease of Use, Perceived Usefulness, Attitude to Symbolic Adoption, but did not flow on to Intention to Explore. This was different from the Karahanna and Agarwal (1999) study, where Attitude did not influence Symbolic Adoption, yet Symbolic Adoption had a significant effect on Intention to Explore. Symbolic Adoption added an important conceptual construct to the TAM, because it demonstrates the mental acceptance of an innovation or technology, separate from the use of an innovation or technology. For both contexts, Word and Kronos, high levels of explained variance occurred for Symbolic Adoption, although in neither case did it influence the intention component (Intention to Explore).

It was also important to see the consequences of these individual differences for the components of the TAM. The pattern of influence of the core variables TAM $_{Word}$ and TAM $_{Kronos}$ changed after the addition of personality variables as antecedents. There had been no significant contribution to Intention to Explore from either Attitude or Symbolic Adoption, prior to the addition of the NEO factors. For Word, Symbolic Adoption and Openness influenced Intention to Explore, in Word and (marginally for) Kronos; this had not been seen in the core measure model. In the Word and Kronos contexts, there were low levels of influence from the NEO variables. For Word, Neuroticism influenced Perceived Ease of Use but not Perceived Usefulness, Extraversion significantly influenced both Perceived Ease of Use and Perceived Usefulness, and Openness influenced Intention to Explore. The core variables demonstrated an instability in their results; similar outcomes occurred for the paths from Perceived Ease of Use to Attitude, and Perceived Usefulness to Symbolic Adoption for Word (with or without the addition of the NEO measures), and Karahanna and Agarwal's (1999) results. The instability of the core model was also shown for Kronos: Perceived Usefulness not significantly influencing Symbolic Adoption, became a significant contributor with the addition of the NEO measures.

The addition of the non-core variables of personality showed that difficulty with effort for Neuroticism, positive effect for the high level of activity in Extraversion, and interest in patterns in Openness, contributed to the model for Word. In Kronos, all the non-core variables (with, marginally, the exception of Openness), failed to contribute to the model, and Symbolic Adoption did not contribute to Intension to Explore. There were significant effects for Extraversion on Perceived Ease of Use, and Openness for Intention to Explore in a voluntary context with Microsoft Word. Although significant results were found, the size of the effect was small. There was no significant effect for

Extraversion on any TAM $_{Kronos}$ core variables, and marginal effect for Openness for Intention to Explore in a mandated context with Kronos. These findings imply that the IS and its context, as well as the personality of the user, is important.

The uptake of Word by individuals is relatively voluntary. The significant correlations between TAM $_{Word}$ and Neuroticism NEO items were the facets of Anxiety, Depression and Vulnerability, and the majority of these associations occurred in Symbolic Adoption. For Extraversion, the correlations with the TAM $_{Word}$ were the facets of Activity, Positive Emotion, Warmth and Excitement Seeking. The Activity sub-trait expressed as a correlation between Extraversion and the TAM occurred at the TAM's initial variable, Perceived Ease of Use. In non-mandated use, where acceptance of a technology depends on perceptions of how easy it is to use, there are flow-on effects for all the other TAM variables, that is, for its usefulness, the individual's attitude toward it, their symbolic adoption of it, and their intention to explore the software. Therefore, the Extraversion sub-trait Activity has implications for the energy levels these individuals apply in their lives, and their focusing of that energy to different activities. Those individuals who have vigorous active lives, therefore will carry such energy levels forward into their approach with technologies, and in the case of voluntary acceptance, such as with Word, perceive it as easy to use.

Also, these results indicated that participant end-users, who were vulnerable to worry, fear, anxiety and discouragement were more likely to find Word less easy to use. In comparison, users who are active and actively engaged, are looking for excitement, are cheerful and easily socialise, were very likely to perceive Word as easy to use, and more useful. The facets of Openness which correlate most strongly with the TAM $_{Word}$ were Ideas, Aesthetics and Values. Participants who were intellectually curious, reflective, playful and excited about abstract ideas, and moved emotionally by aesthetics, were likely to be exploratory with new features, and understand Word more fully. The pattern for Kronos was different, in that the Openness facet of Actions, for example, trying novel ways and food, was the most correlated with the TAM. Participants working with Kronos were less likely to wish to find alternative methods of performing ways of achieving their goals in Kronos, and more inclined to stay with one method.

An explanation as to why there is such variation between different TAM contexts is suggested. First, the use of Word is discretionary. Although in this study, participants used Word for general and report writing, required as a component of their job description as it comes from the stable of Microsoft Office products often provided on work place computers and networks, its use is not mandated, in that reports and communications using other word processing packages are acceptable, and specificity of the software has less critical impact. In contrast, the use of Kronos was mandated for supervisory staff in order for them to manage the staffing rosters, pay and leave management. The second explanation may lie in the level of difficulty ascribed to the programs. When introduced by NSW Health, the version of Kronos became notorious for its difficulty in use, and the difficulty encountered in its implementation and training schedule (Crittenden, Harper, O’Shea, Caputi, Rawstorne, & Jayasuriya, 1999). Indeed, news of the difficulty in using Kronos travelled across sites prior to its implementation or end-user training. Although workers make individual assessments concerning their Symbolic Adoption of information systems, those workers who stay in the field (rather than leave prior to enforced use of a strongly disliked information system) may have made a conceptual adjustment to the symbolic necessity of accepting the technology, rather than using a symbolic disengagement or rejection strategy along with mandated use. In addition, although this mandated IS was poorly accepted, one tactic negotiated by management to assist workers take on mandated responsibilities and work areas outside their previous expertise and their core job skills, was to see this expertise as an additional skill that was marketable, and made them more valuable (Cahill, 1999, personal communication). Therefore, while Kronos could have low levels of Perceived Usefulness, and Perceived Ease of Use, and have low Attitude measures for its use, it may still have a high measure of Symbolic Adoption. High Symbolic Adoption may occur, because the end-user can see the IS as important for their future, worthy of learning effort, give them a sense of mastery in conquering its complexity, but still be disliked and give disquiet about the growing disparity between their core values and preferred work practice, and the altered job description.

Overall, Symbolic Adoption was an important addition to the TAM. Adding the personality measure (NEO-FFI) contributed in understanding how individual differences presented different challenges for participant end-users, in the emotions felt, their curiosity, their variability in activity, and effort and ease in attending to a technology, their gregariousness in seeking help, and fit and difficulty of the tasks encountered for different information systems and the voluntariness of the systems' use. Further, the costs for individuals bowing to external control (such as mandated IS use) are their decreased sense of general satisfaction, as well as reduced openness to experiences (Sheldon & Kasser, 1995). Given that Kronos is a mandated IS, these results indicated that there was reduced intention to explore associated with Openness, when compared to the Word results.

9.1.3 Technology Transference Findings

Another aim of the research was to explore the consequences of technology transference. This research question addressed the outcome of Technology Transference on the TAM. There were two groups of participants determined: one group with a low percentage of transference (i.e. between 60% and 80%), the other had a high percentage of transference (i.e. between 81% and 100%). Using technology transference as the independent variable (low 60-80 and high >80-100) and the five TAM variables (Perceived Ease of Use, Perceived Usefulness, Attitude, Symbolic Adoption and Intention to Explore) as dependent measures for a one-way between-groups analysis of variance, no significant differences between low and high technology transference scorers on the TAM for Word or Kronos were found. However, there was a significant difference between low and high transference groups for computer use and the frequency of computer use. Participants with high technology transference scores, in comparison to low scorers, had longer computer experience and greater frequency of computer use. This result indicated that regardless of the type of software or technology used, participants who transferred constructs, i.e. those who saw commonality between humans and technologies, had longer, and more frequent, computer and technology use. This supports the theoretical contention that, for some users, the computer is their buddy (Suler, 1998), a trusted companion (Norman, 2004; Turkle, 2007a). However, this result could support an alternative perspective. It may be that the use of technology alters its perceived usefulness, which in turn may bring about transference. It is also possible that the flow of influence may be bi-directional.

With 24.8% of the 745 total number of constructs in Study Three (and 23.4% and 22.91% in Studies One and Two) categorised as describing Benevolence, this human value was of clear importance to these participants in their interactions with the world, occurring at almost double the rate of the next most frequent, Hedonism, which occurred at a frequency of 14.9%. This result for Benevolence indicated that participants' view of a person or technology as offering honesty, loyalty, responsibility, helpfulness, friendship, mature love, forgiveness, and meaningful or spiritual engagement, had a role to play in their human-technology interaction. There was a high rate of constructs in the present studies that described Benevolence, however, this role is not addressed in IS acceptance or use literature, creating a further important incongruity for workers in their use of technologies. Congruence of an innovation with adopters' beliefs is critical (Rogers, 2003). However, the current study's results imply that participants require a technology to be humanitarian, and socially or universally beneficial, rather than offering utility or power or achievement. The exploration of objects as "passionate life companions" (Turkle, 2007a, p. 51) is new.

9.2 Theoretical Implications Arising from the Findings

This thesis posed a research question "In what ways are humans and technologies similar?". From this research, a rich set of descriptions has resulted: for people, technologies and the mix of both. As described in Section 9.1.1, the theorised super-ordinate structure of the MDS solutions of the Transference Grids is shown in Figure 9.1.

The additional component of super-ordinate structure was two trendlines. One direction was located in the positive / positive quadrant. This quadrant may describe Engagement or Flow. The framework described in Figure 9.1 appears to have similarities with a channel of 'Flow' (Csikszentmihalyi, 1997). Flow is similar to Engagement, and occurs for individuals when there are goals and feedback for their action, their concentration is so focused that time perception is altered, their level of personal skills and competencies match the level of challenges, and contribute to positive cognitive, motivational and emotional outcomes (Csikszentmihalyi, 1997). The tasks need to be moderately difficult. Flow conditions offer positive emotions and increased sense of competency, and are "autotelic … an end in itself " (Csikszentmihalyi, 1997, p. 113). When high skills are under challenged, the resulting boredom fails to give enjoyment, likewise situations which over-tax competencies because they are overly difficult, produce anxiety and worry, and a fragile sense of competency. Understanding the process of flow helps people re-appraise error, failure, success and competence, as well as the attendant emotions, to understand their ability to deal with change (Ryan & Deci, 2000; Reeve, 2005). However, autonomy and the person's sense of agency are critical to the process of engagement (Ryan & Deci, 2000). A counterpart direction of the trendline was located in the negative / negative quadrant. This may describe Disengagement.

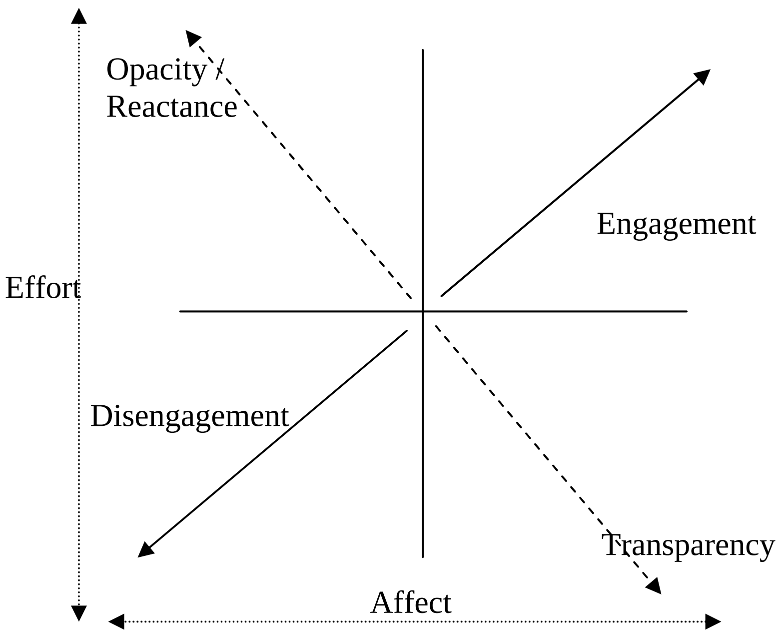

Figure 9.1. The proposed super-ordinate structure of the MDS solutions from all Transference Grids within Studies One, Two and Three.

The quadrant of low Effort and positive Affect, in which liking / valuing a person or technology requires low effort. This may describe the Transparency pole of the trendline, where a transparent relationship is phenomenologically intuitive or non-technological (Ihde, 1983). The converse, when high Effort and low value or negative Affect occurs, perhaps described Opacity (Ihde, 1973), a highly visible and probably difficult interaction. User reactions to these environments will vary. In general, a person's sense of competency, and their expectation for control, will impact on their level of helplessness or reactance (Wortman & Brehm, 1975 as cited in Reeve, 2005, p. 253) for an IS and IT context, and increase the likelihood of IS rejection. Also, a person's sense of competency and their expectation for control will vary with individual difference, for example, their level of Extraversion, Openness (Costa & McCrae, 1997b) or Neuroticism (Costa, McCrae & Holland, 1984) will alter their ability to ask for assistance, or deal with uncertainty and emotions such as frustration. These expectations will impact in their human-human and human-technology interactions. This is especially so in mandated IS and IT environments.

The MDS solutions presented a framework of elements which included significant and non-significant self and others (human), and objects (technologies). This framework represented a portion of the participants' worldview, in which there is integration of humans and objects that is described by constructs. At a high level of awareness (a conscious level), this integration was difficult. Study Three posed the question about transference difficulty, and asked participants to rationally quantify the transference process, a process which is usually performed spontaneously and unconsciously. Participants indicated a mean rating score of 3.72 (of a possible score of 5) for constructs that were elicited on humans, and transferred to technologies, and a mean rating score of 3.06 for technology-to-human transferred constructs. This result indicated that participants found describing technologies as people more difficult than giving descriptions of people as technologies. The latter score suggests that people were more easily able to view humans as mechanistic; just a cognitive processing machine (the "*absent* subject", Barglow, 1994, p. 89). Barglow (1994) suggested that 'humans as processors' is a common analogy. Transference was more easily quantified by participants as they expressed the gender of computers. Participants appeared to search within themselves for the level that reflected an internally-known degree of masculinity or femininity of their notion of computers. In a similar fashion, giving the description of the computer as a person appeared to present an easy task of expressing a known, but perhaps previously not articulated, description.

This thesis has found clear evidence for technology and computer transference, and has examined its nature and influence in technology acceptance and use. This exploration may lead to an increased breadth of research into the human-technology interaction.

9.3 Limitations

One major limitation was the sample size of the study. This limitation was more pronounced in Study Three, where a small sample size limited the types of analyses that were performed, and the generalisability of the results. This limitation was a problem for some of the statistical analysis, because a small sample size limited the statistical power that was offered. This was an exploratory study, but a replication with more participants would be useful. A follow-up study, with more participants and measures of different information systems and work contexts, would address these issues.

Another limitation was the lack of an objective measure of systems use. 'Intention to Use' has been used as a surrogate measure of system use, because of the ease of its measurement, but is criticised when compared with an objective capture of use measurement. However, a screen capture or other measure of use would have added to the duration and complexity of data collection, as well as ethical and confidentiality requirements, especially since the study occurred in industry contexts. Although it was argued that the capture of a measure of intention is valid (Davis, 1989; Hendrickson & Collins, 1996; Legris et al. 2003), such a measure does not capture real use, but rather perceptions of frequency and use. Although Study Three was considerably improved by the addition of the TAM, the study continued to have limitations, such as that of not objectively measuring ‘Use’ of the technology in the TAM.

9.4 Future Research

The small sample size should not be considered as presenting validity problems to the technology transference part of this study, since Repertory Grids, because of their nature, present a great deal of material for examination (Bell, 1990; Tan and Hunter, 2002). However, if this limitation was addressed in follow-up studies, it may offer further variability with which to examine outcomes of technology transference.

There are four recommendations following the completion of the current study:

First, a replication study is required to confirm these findings.

Second, the replication study should include a change in measures. Learning style especially, but also occupational styles were shown to be least relevant, and could be dropped from a follow-up study. Human values (Schwartz, 1992; 1994) should be included as an additional measure in a follow-up study. This study has suggested that human values have important effects for technology acceptance and adoption. Human values offer important insights into the decision process and motivations entailed in human-technology interactions, IS and IT adoption, acceptance use and human-human interactions.

A third improvement that would add considerably to understanding the participants' meaning would be to incorporate a Personal Construct Psychology technique called "laddering". Laddering describes a process of enquiry, in which each construct answer given is at a higher level of abstraction than its previous stage. The line of upward abstraction results from enquiring "why" the pole of a construct is preferred, or "why it is important" (Fransella & Bannister, 1977, p. 16), resulting in increasingly abstract or overarching constructs. During the construct elicitation process, the use of a laddering process would ensure the capture of the super-ordinate content of each construct. The laddering process should be undertaken in future research, to articulate and reveal to both the participant and researcher the core meanings of the constructs the participants had elicited. This would explore the super-ordinate constructs which support the subsumed constructs. Such core constructs, and their linkages to less important constructs, can offer insights into individual's unique understanding and meaning-making, but also enable a researcher to understand group process when common super-ordinate constructs are found. The core meanings of the constructs would, therefore, be revealed, and their articulation with emotions, cognitions and human values shown. The associations between each construct and human values could also be explored. Overall, this addition could enable researcher to understand the priorities for end-users technology interactions.

A fourth change recommended would be that an audio record of the elicitation process should be retained, so it may be assessed during the analysis phase. This may allow a more finely-nuanced interpretation of the construct elicitation process to be assessed, as well as a more accurate review during the process of co-rating of construct human values taxonomy categories. This would be especially useful when laddering was employed.

How generalisable are the results? Do they describe normal subjects' responses to computers and technologies? Participants indicated that rationally 'bridging the gap' between conscious perceptions of animate technologies, or inanimate people, was difficult. Transference occurs, but occurs unconsciously, as evidenced by computers and cars which are named and gendered, and which are the focus of emotions. A second issue was the frequency, and hence importance, of construct categories. Is the level of Benevolence constructs high at 25% of normal transference constructs? Is this level of Benevolence of constructs an artefact of the Transference Grid or the sample? It is possible that it is a by-product of the ratio of elements used in the Transference Grid, in which six elements were human, and five were technological. It is less likely to be an artefact of the sample, as many occupations were represented.

9.5 Concluding Remarks

This study set out to examine technology transference. The study succeeded in illustrating the relationship that end-users form with technologies and computers. Those interactions, like the relationships people experience with other people, animals and events, are complex. Important parts of the relationships are unconscious, and occur at many levels of awareness, which leave the user unaware of the multiple levels of their interaction processes. The interaction is phenomenological, experiential, and involves emotional, cognitive and motivational effort in integrating the experience into the meanings the person makes of the world, and their view of the world. This relationship was called transference, because it describes a process of humanising, or animating the technology, of transferring human characteristics to technologies, of reducing the mechanistic characteristics, and substituting human traits. This relationship describes the meanings given to technologies, and the meaning will inevitably be informed by the emotions and visceral responses that humans innately and inevitably use to inform, understand, predict and guide their lives. In the current series of studies, technology and computer transference was common. The human-to-human relationships were built on, and informed by, affect and effort, similarly to human-to-technology, or technology-to-human relationships. Both transferred and non-transferred relationships also involve participants' human values. How much benevolence or power an interaction offers is included in the meanings by which a person evaluates their decisions in engaging or disengaging that interaction. A person also determines whether to view the technology or system as a symbol or tool, and whether it offers mental freedom and its illusionary promise, or pragmatic outcomes and productivity. In other words, the assessment of the interaction (human or technological) tests whether it is congruous with the individual's need for self-enhancement or self-transcendence; or, for openness to change or conservatism. Humans interpret their relationships with computers as they interpret other relationships; through a network of meanings. These meanings are rational and arational, and complex, because they describe sensory, cognitive, affective, motivational and conceptual understanding, which require attention and effort to become schematised intuitive, infused, and to made invisible.

In comparison to humans, computers were described in more mechanistic terms, at times, with respect for their organisational and information storage ability, but with flattened affect, such as 'nerd', and 'without emotion', and also 'difficult'. These descriptions indicate that computers were seen as competent, but difficult at times, and less than human. However, some were named (as were cars), and most were gendered. This describes a relationship which is based on individuals' perceptions. This is similar to relationships with another human, in that they are extrapolated and judged through inference.

The level of technology transference had no effect on the TAM variables. However, transference was shown to have an effect for different levels of computer use; in the length of a person’s experience, and their frequency of use. There was a positive association for the volume of a person’s computer use and technology transference. This implies that with increased computer experience, the human-computer boundaries become more blurred towards a relationship formed with an ‘Other’. Individuals who were high in Extraversion formed this relationship with a technological ‘Other’, at a level that was significantly different to other personality groups. Also, there were individual differences in how participants responded to the TAM, although their effects were small. These effects were different for the two contexts investigated in this current study, that of Word and Kronos. Extraversion and Openness were the two main personality variables which influenced the TAM for Word and Kronos. Word and Kronos are very different information systems, and present different challenges and outcomes, and used in different contexts.

The results of the current series of studies found that there was a positive association for a person’s computer use, and their level of technology transference. The relationship formed with a technological ‘Other’ and the blurring of the human-computer boundaries increased with greater computer experience and use. These results have implications for greater computer interactivity. Working with people, or working with things, have been seen as fundamental and important proclivities (Mount et al. 2005) that humans may feel, and respond to at various levels of awareness. However, technology and computer transference may offer a mid-point or blurring in engaging with technologies: working with things has similarities with working with people.

Such blurring or transference is mediated by some individual differences.

The relative instability of learning and occupational style offers it as a means of understanding people's proclivity for cognitions and actions. The malleability of style offers the possibility of change: through cognitive-emotional restructuring, and education and coaching programs offering alteration of the meanings that people make. This research has shown that different levels of effort and exploration occur because of personality differences. For adjustments to occur at the core levels involving innate tendencies of personality, deeper levels of change are required. Therefore, supporting individuals through acceptance, adoption, routinisation and infusion requires skilled procedural and conceptual education, and emotional support. It also requires understanding of people's boundaries, resistance and constrained adoption when IS and IT offer, in the users' view, little social or universal good.

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Appendices

Appendix A-1

Descriptive and Reliability Statistics for the sub-scales of ILS, SDS and NEO-FFI.

Scale	Mean	S.D.	Reliability (Items)
ILS			
Active (ILS)	5.94	2.7	.76 (11)
Reflective (ILS)	4.61	2.8	.76 (11)
Sensing (ILS)	4.72	2.6	.69 (11)
Intuitive (ILS	6.12	2.5	.69 (11)
Visual (ILS)	6.78	3.0	.81 (11)
Verbal (ILS)	4.22	3.0	.79 (11)
Sequential (ILS)	5.22	1.7	.10 (11)
Global (ILS)	5.72	1.8	.22 (11)
NEO-FFI (NEO)			.71 (60)
Neuroticism*	51.61	11.7	.85 (12)
Extraversion*	57.22	9.4	.73 (12)
Openness*	58.94	10.4	.78 (12)
Agreeableness*	44.67	13.0	.74 (12)
Conscientiousness*	35.11	10.4	.83 (12)
Self-Directed Search (SDS)			.72 (30)
Realistic	13.89	8.6	.83 (5)
Investigative	18.22	8.0	.71 (5)
Artistic	24.44	7.4	.67 (5)
Social	33.61	4.4	.20 (5)
Enterprising	24.78	8.8	.73 (5)
Conventional	17.61	10.1	.86 (5)

* Indicates that these figures are based on normed scores.

Appendix A-2

Correlations of sub-scales of NEO-FFI with ILS.

	Neurotic	Extravert	Openness	Agreeableness	Conscientiousness
Active LS	.104	0.61**	-.445	-.045	-.028
Reflective LS	-.100	-0.67**	.436	.031	.010
Sensing LS	-.020	.030	-.349	.084	.421
Intuitive LS	.085	-.106	.390	-.083	-0.57*
Visual LS	.051	.355	-0.50*	.091	-.059
Verbal LS	-.051	-.355	0.50*	-.091	.059
Sequent LS	.289	-.054	-.130	.278	.295
Global LS	-.295	.024	.134	-.285	-.293

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

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

Appendix A-3

Correlations of the sub-scales of NEO-FFI with SDS.

	Neurotic	Extravert	Openness	Agreeableness	Conscientiousness
Realistic SDS	.34	.08	.06	-.30	-.22
Investigative SDS	.39	-.03	.03	-.34	-.36
Artistic SDS	.28	.30	.26	.16	-.00
Social SDS	.19	.37	-.07	.08	-.16
Enterprising SDS	.11	.62**	-.08	-.11	.33
Conventional SDS	.43	.32	-.21	-.28	.17

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

Appendix A-4

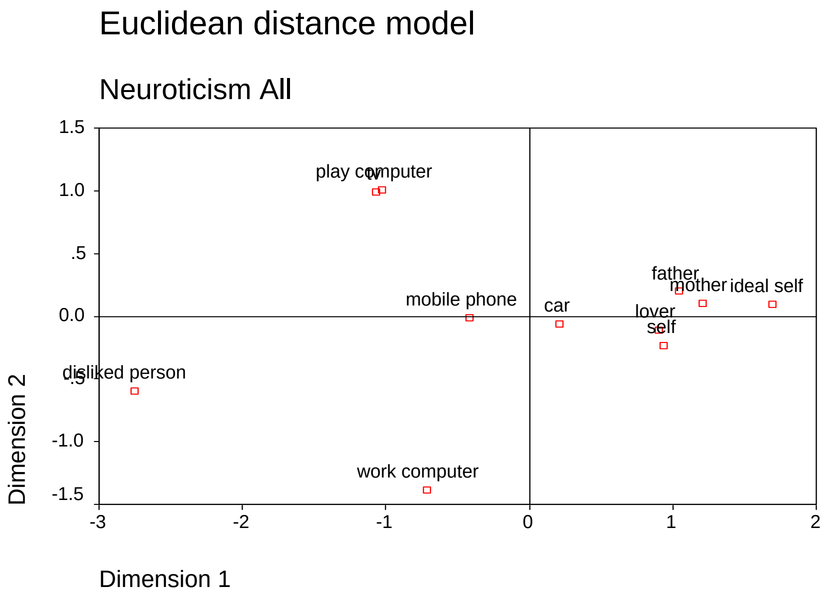
Correlations of the sub-scales of SDS with ILS.

	Realistic SDS	Investigative SDS	Artistic SDS	Social SDS	Enterprising SDS	Conventional SDS
Active LS	.33	-.01	.26	.57*	.42	.30
Reflective LS	-.24	.04	-.25	-.56*	-.47*	-.36
Sensing LS	-.11	-.09	.01	-.23	.21	.41
IntuitiveLS	.09	.13	.00	.15	-.34	-.43
Visual LS	.21	.20	.03	.39	-.04	-.06
Verbal LS	-.21	-.20	-.03	-.39	.04	.06
Sequent LS	-.21	-.21	.18	-.54*	-.21	-.26
Global LS	.20	.23	-.18	.55*	.16	.26

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

Appendix B

Appendices B-1 to B-10 are the Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness MDS and Cluster analysis results respectively

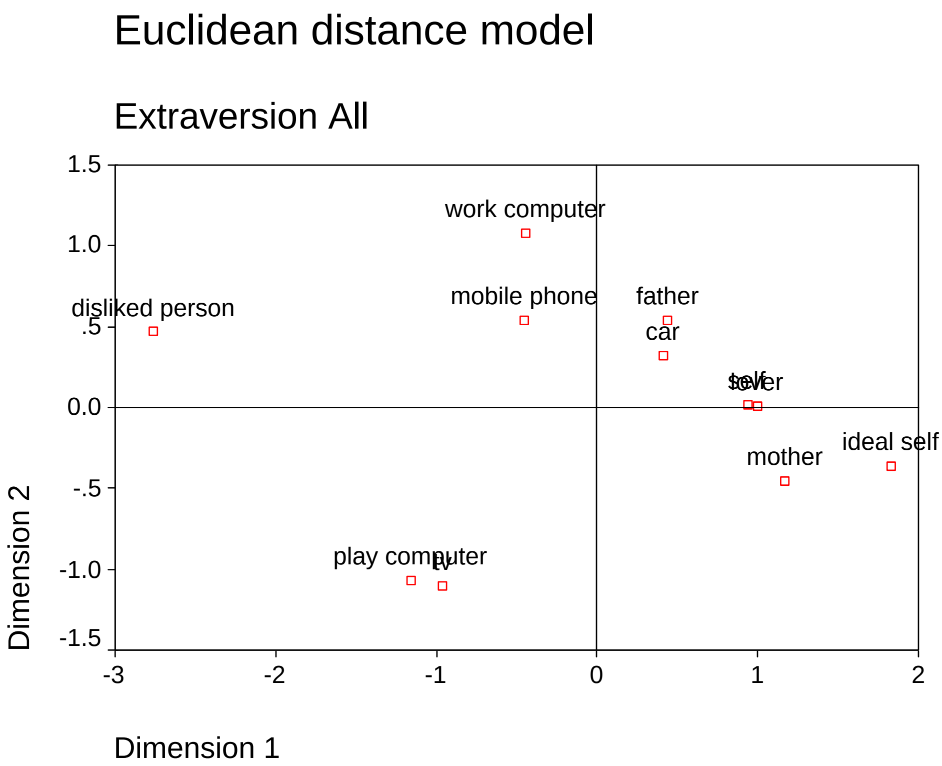


Appendix B-1. MDS Solution for participants with high levels of Neuroticism (n = 29).

Neuroticism All

```
 Dendrogram using Ward Method

                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  IDSELF      4   ⇩⇘
  LOVER       5   ⇩⇧⇩⇩⇩⇩⇘
  SELF        3   ⇩⇙    ▫⇩⇩⇩⇩⇘
  MOTHER      1   ⇩⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  FATHER      2   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙                                   ⇔
  TV          7   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘                              ⇔
  PLAYCOM     8   ⇩⇩⇩⇩⇙               ▫⇩⇩⇩⇩⇘                         ⇔
  CAR        10   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘        ⇔    ⇔                        ⇔
  MOBPHONE   11   ⇩⇩⇩⇩⇙          ▫⇩⇩⇩⇩⇩⇩⇙      ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  WORKCOM     9   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙             ⇔
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

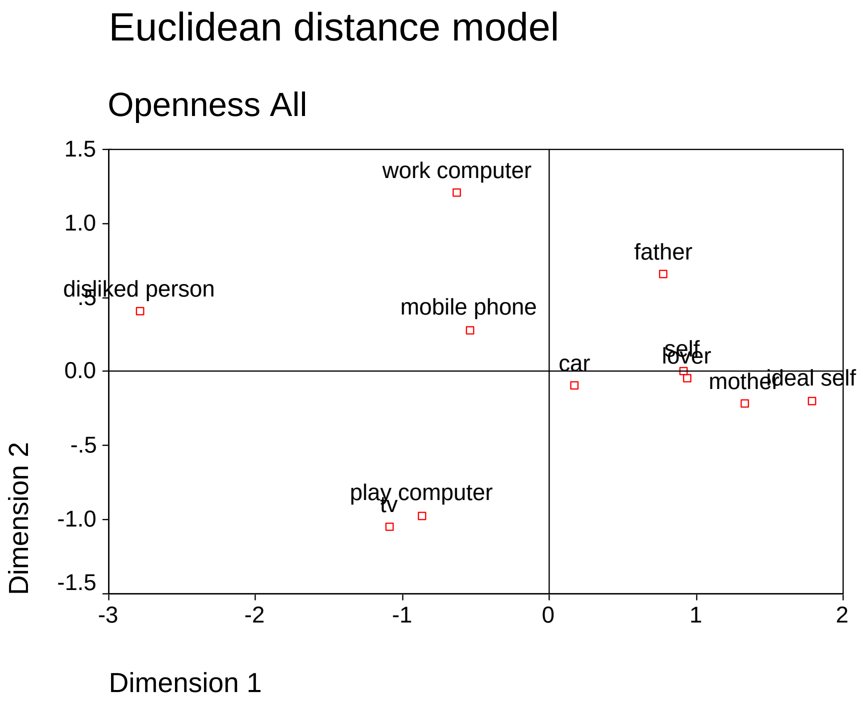
Appendix B-2. Cluster analysis for participants with high levels of Neuroticism (n = 29).



Appendix B-3. MDS Solution for participants with high levels of Extraversion (n = 27).

```
                         Extraversion All

 Dendrogram using Ward Method

                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  SELF        3   ⇩×⇩⇘
  IDSELF      4   ⇩⇙ ▫⇩⇩⇩⇘
  LOVER       5   ⇩⇩⇩⇙   ▫⇩⇩⇩⇘
  MOTHER      1   ⇩⇩⇩⇩⇩⇩⇩⇙  ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  FATHER      2   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘      CAR         10    ⇩⇩⇩⇩⇩×⇩⇘
⇔                  ⇔
  MOBPHONE   11   ⇩⇩⇩⇩⇩⇙ ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
⇔
  WORKCOM     9   ⇩⇩⇩⇩⇩⇩⇩⇙                                       ⇔
  TV          7   ⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
  PLAYCOM     8   ⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

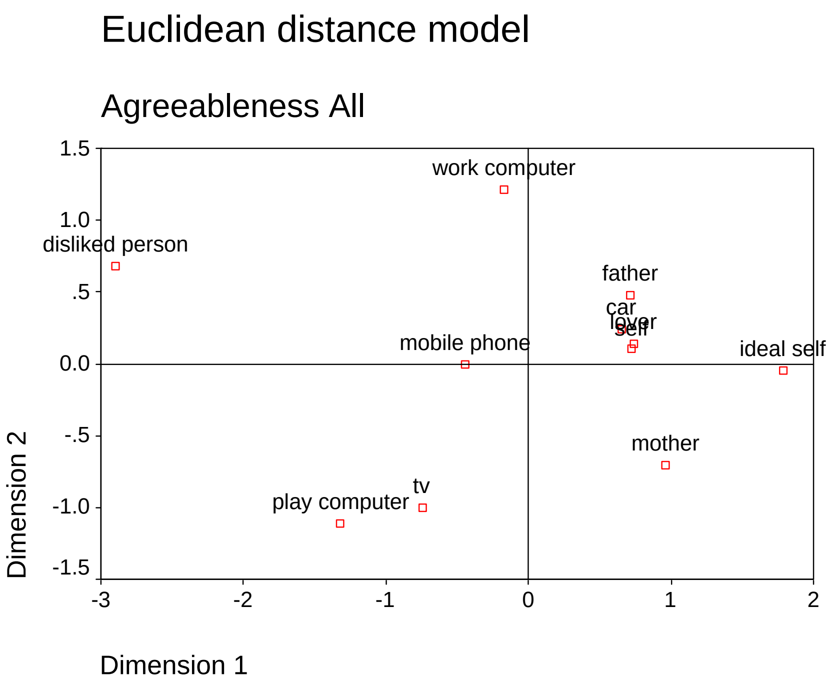
Appendix B-4. Cluster analysis for participants with high levels of Extraversion (n = 27).



Appendix B-5. MDS Solution for participants with high levels of Openness (n = 35).

```
                         Openness All

 Dendrogram using Ward Method

                        Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  SELF        3   ⇩⇘
  IDSELF      4   ⇩⇧⇩⇩⇩⇩⇩⇩⇩⇩⇘
  LOVER       5   ⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  MOTHER      1   ⇩⇩⇩⇩⇩⇩⇩×⇩⇙                                           ⇔
  FATHER      2   ⇩⇩⇩⇩⇩⇩⇩⇙                                             ⇔
  CAR        10   ⇩⇩⇩⇩⇩×⇩⇩⇘                                            ⇔
  MOBPHONE   11   ⇩⇩⇩⇩⇩⇙       ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
  WORKCOM     9   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  TV          7   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘ ⇔
  PLAYCOM     8   ⇩⇩⇩⇙              ▫⇩⇙
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

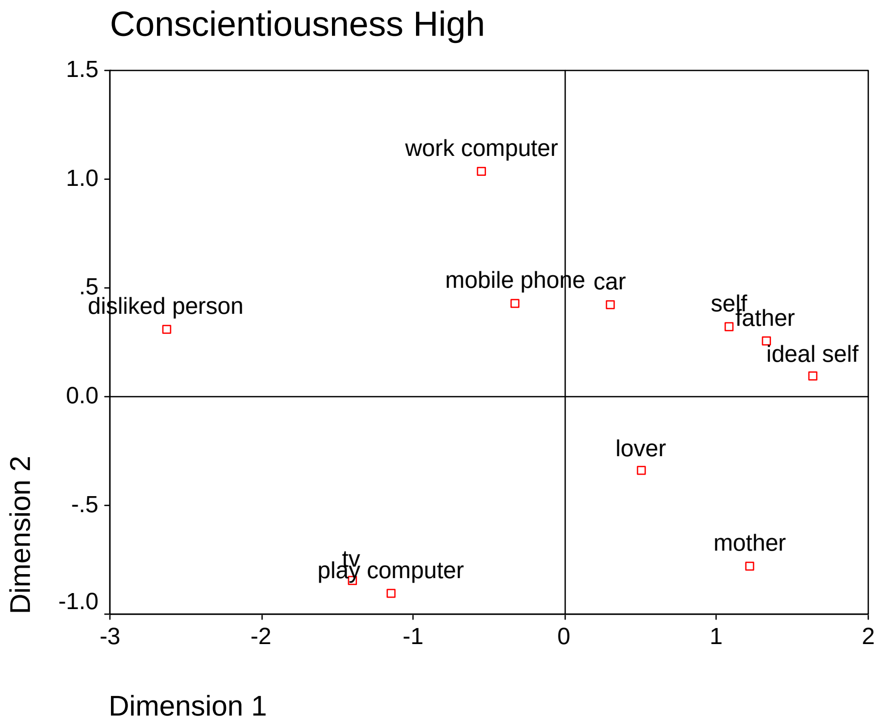
Appendix B-6. Cluster analysis for participants with high levels of Openness (n = 35).



Appendix B-7. MDS Solution for participants with high levels of Agreeableness (n = 18).

```
                         Agreeableness All

 Dendrogram using Ward Method

                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  SELF        3   ⇩×⇩⇩⇩⇩⇩⇘
  IDSELF      4   ⇩⇙     ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  LOVER       5   ⇩⇩⇩×⇩⇩⇩⇙           ⇔
  CAR        10   ⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  MOTHER      1   ⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇘      ⇔
⇔
  FATHER      2   ⇩⇩⇩⇩⇩⇙      ▫⇩⇩⇩⇩⇩⇙
⇔
  WORKCOM     9   ⇩⇩⇩⇩⇩⇩⇩⇩⇩×⇩⇩⇩⇙
⇔
  MOBPHONE   11   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙                             ⇔
  TV          7   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
  PLAYCOM     8   ⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

Appendix B-8. Cluster analysis for participants with high levels of Agreeableness (n = 18).



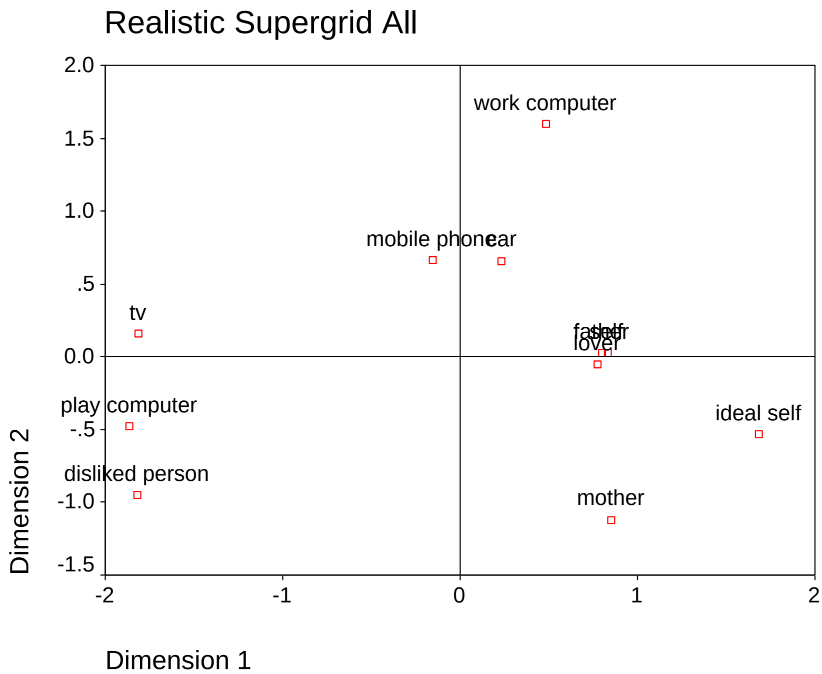
Appendix B-9. MDS Solution for participants with high levels of Conscientiousness (n = 19).

```
                 Conscientiousness High

 Dendrogram using Ward Method

                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  SELF        3   ⇩×⇩⇘
  IDSELF      4   ⇩⇙ ▫⇩⇩⇩⇘
  FATHER      2   ⇩⇩⇩⇙    ⇔
  LOVER       5
⇩⇩⇩⇩⇩⇩⇩✓⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  MOTHER      1   ⇩⇩⇩⇩⇩⇩⇩⇙                                        ⇔
  CAR        10   ⇩⇩⇩⇩⇩×⇩⇘                                        ⇔
  MOBPHONE   11   ⇩⇩⇩⇩⇩⇙ ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
  WORKCOM     9   ⇩⇩⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  TV          7   ⇩⇩⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇘        ⇔
  PLAYCOM     8   ⇩⇩⇩⇩⇩⇩⇩⇙          ▫⇩⇩⇩⇩⇩⇩⇩⇙
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

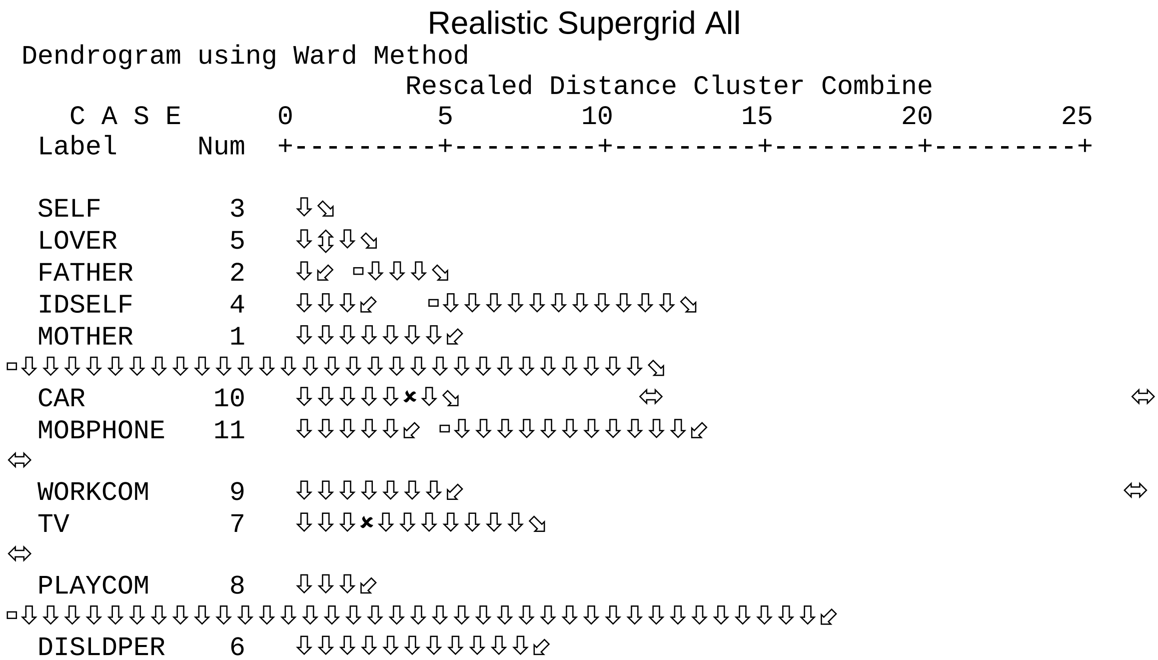
Appendix B-10. Cluster analysis for participants with high levels of Conscientiousness (n = 19).

Appendices B-11 to B-22

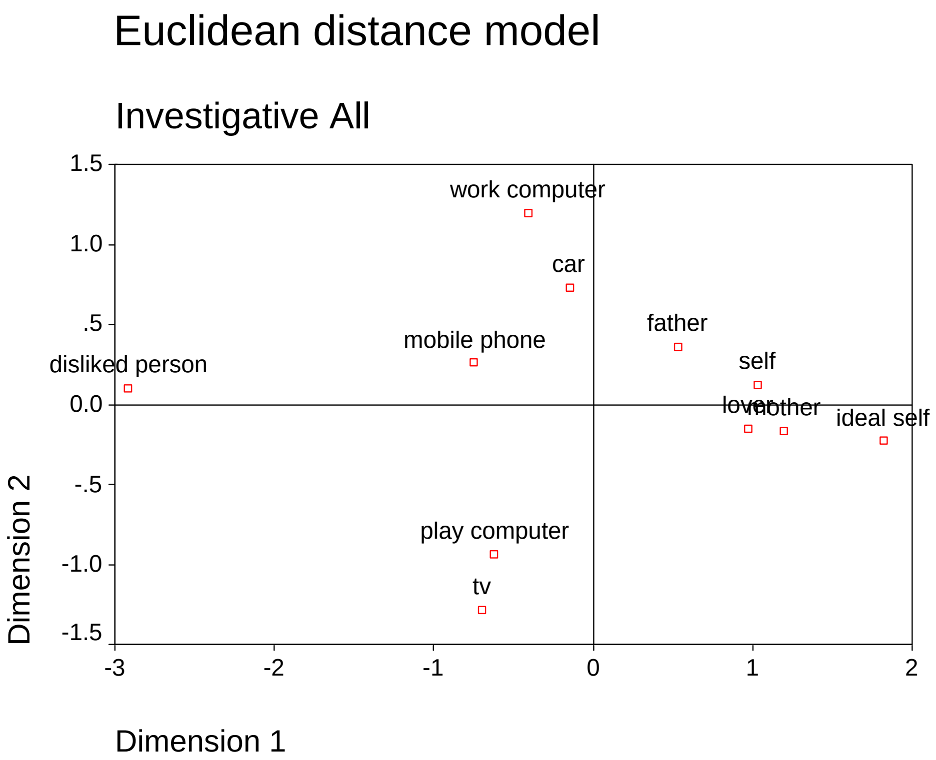
Appendices B-11 to B-22 are the Realistic, Investigative, Artistic, Social, Enterprising and Conventional MDS and Cluster analysis results respectively



Appendix B-11. MDS Solution for participants with high levels of Realistic (n = 5).



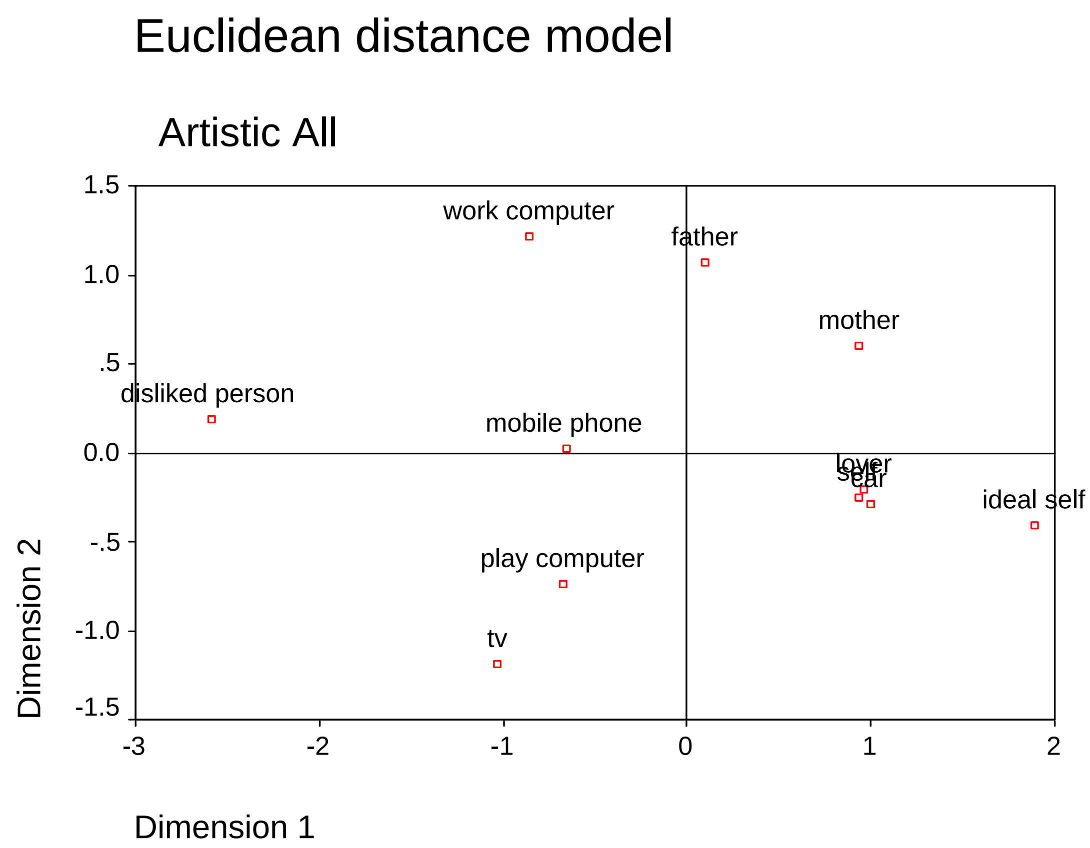
Appendix B-12. Cluster analysis for participants with high levels of Realistic (n = 5).



Appendix B-13. MDS Solution for participants with high levels of Investigative (n = 16).

```
 Dendrogram using Ward Method
                        Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label      Num  +---------+---------+---------+---------+---------+

  MOTHER       1   ⇩×⇩⬂
  SELF         3   ⇩⬃ ▭⇩⬂
  LOVER        5   ⇩⇩⇩⬃ ▭⇩⬂
  IDSELF       4   ⇩⇩⇩⇩⇩⬃
▭⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⬂
  FATHER       2   ⇩⇩⇩⇩⇩⇩⇩⬃                                            ⇔
  WORKCOM      9   ⇩⇩⇩×⇩⬂                                             ⇔
  CAR         10   ⇩⇩⇩⬃ ▭⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⬂
⇔
  MOBPHONE    11   ⇩⇩⇩⇩⇩⬃
▭⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⬃
  TV           7   ⇩⇩⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⬂    ⇔
  PLAYCOM      8   ⇩⇩⇩⇩⇩⇩⇩⬃           ▭⇩⇩⇩⬃
  DISLDPER     6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⬃
```

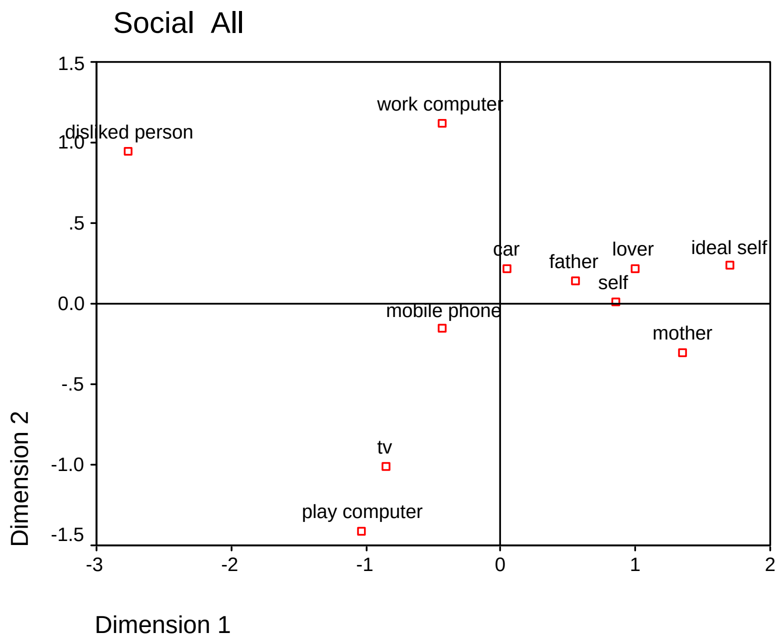
Appendix B-14. Cluster analysis for participants with high levels of Investigative (n = 16).



Appendix B-15. MDS Solution for participants with high levels of Artistic (n = 7).

```
Dendrogram using Ward Method

                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label      Num  +---------+---------+---------+---------+---------+

  IDSELF       4   ⇩⇘
  LOVER        5   ⇩⇧⇩⇩⇩⇘
  SELF         3   ⇩⇙   ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  CAR         10   ⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  MOTHER       1   ⇩⇩⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
⇔
  FATHER       2   ⇩⇩⇩⇩⇩⇩⇩⇙                                    ⇔
  TV           7   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
  PLAYCOM      8   ⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  WORKCOM      9   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇘ ⇔
  MOBPHONE    11   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙     ▫⇩⇙
  DISLDPER     6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

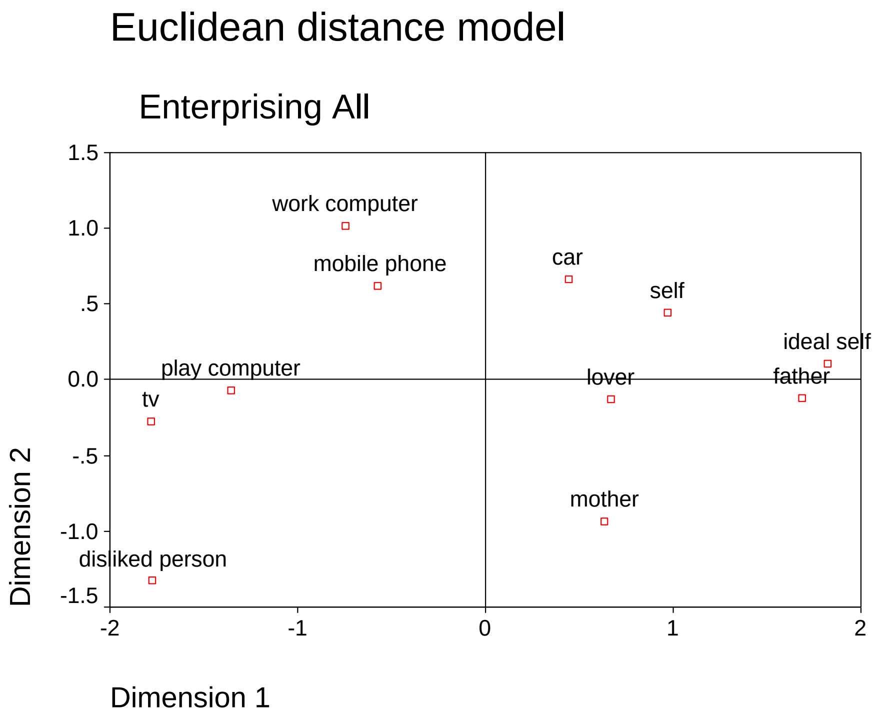
Appendix B-16. Cluster analysis for participants with high levels of Artistic (n = 7).



Appendix B-17. MDS Solution for participants with high levels of Social (n = 22).

```
 Dendrogram using Ward Method
                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  SELF        3   ⇩×⇩⇩⇩⇘
  IDSELF      4   ⇩⇙    ▫⇩⇩⇩⇘
  LOVER       5   ⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  MOTHER      1   ⇩⇩⇩⇩⇩⇩⇩×⇩⇙                                          ⇔
  FATHER      2   ⇩⇩⇩⇩⇩⇩⇩⇙                                           ⇔
  TV          7   ⇩⇩⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
  PLAYCOM     8   ⇩⇩⇩⇩⇩⇙                  ▫⇩⇩⇩⇘                        ⇔
  CAR        10   ⇩⇩⇩⇩⇩×⇩⇩⇩⇘                 ⇔   ⇔
⇔
  MOBPHONE   11   ⇩⇩⇩⇩⇩⇙    ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  WORKCOM     9   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙                     ⇔
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

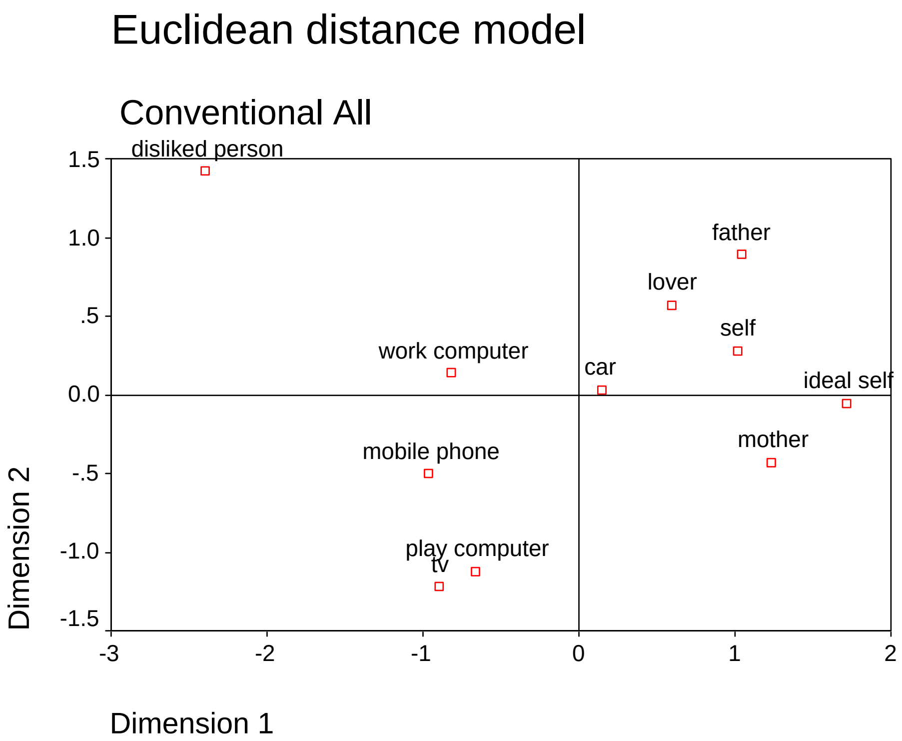
Appendix B-18. Cluster analysis for participants with high levels of Social (n = 22).



Appendix B-19. MDS Solution for participants with high levels of Enterprising (n = 4)

```
 Dendrogram using Ward Method
                         Rescaled Distance Cluster Combine
    C A S E      0         5        10        15        20        25
   Label     Num  +---------+---------+---------+---------+---------+

   SELF        3   ⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇘
   IDSELF      4   ⇩⇙         ⇔
   FATHER      2   ⇩×⇩⇩⇩⇘
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
   LOVER       5   ⇩⇙    ▫⇩⇩⇩⇘                                  ⇔
   CAR        10   ⇩⇩⇩⇩⇩⇙     ⇔                                  ⇔
   MOTHER      1   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙                                     ⇔
   WORKCOM     9   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
⇔
   MOBPHONE   11   ⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
   TV          7   ⇩⇩⇩⇩⇩×⇩⇩⇩⇘     ⇔
   PLAYCOM     8   ⇩⇩⇩⇩⇩⇙    ▫⇩⇩⇩⇩⇩⇙
   DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
```

Appendix B-20. Cluster analysis for participants with high levels of Enterprising (n = 4).



Appendix B-21. MDS Solution for participants with high levels of Conventional (n = 15)

```
 Dendrogram using Ward Method

                         Rescaled Distance Cluster Combine

    C A S E      0         5        10        15        20        25
  Label     Num  +---------+---------+---------+---------+---------+

  TV          7   ⇩×⇩⇩⇩⇩⇩⇘
  PLAYCOM     8   ⇩⇙     ▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  MOBPHONE   11   ⇩⇩⇩⇩⇩⇩⇩⇙              ▫⇩⇩⇩⇩⇩⇩⇩⇘
  WORKCOM     9   ⇩⇩⇩×⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
▫⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇘
  CAR        10   ⇩⇩⇩⇙                    ⇔                  ⇔
  DISLDPER    6   ⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
⇔
  SELF        3   ⇩×⇩⇩⇩⇘                                         ⇔
  IDSELF      4   ⇩⇙   ▫⇩⇘                                      ⇔
  MOTHER      1   ⇩⇩⇩⇩⇩⇙ ⇔                                        ⇔
  FATHER      2
⇩⇩⇩⇩⇩⇩⇩✓⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇙
  LOVER       5   ⇩⇩⇩⇩⇩⇩⇩⇙
```

Appendix B-22. Cluster analysis for participants with high levels of Conventional (n = 15).

Appendix B-23

Factor Loading Results for TAM Word with Reduced Number of Items.

Item	Attitude	PU	PEU	SA	IntEx	N	Ex	Op	Ag	Csc
WORDATT1	**0.88**	0.75	0.72	0.73	0.52	-0.04	0.38	0.23	0.14	0.
WORDATT2	**0.88**	0.73	0.76	0.76	0.56	-0.18	0.44	0.32	-0.01	0.
WORDATT3	**0.90**	0.74	0.72	0.82	0.52	-0.30	0.32	0.24	0.06	0.
WORDATT4	**0.93**	0.83	0.76	0.79	0.68	-0.15	0.39	0.21	0.06	0.
WORDATT5	**0.80**	0.68	0.60	0.67	0.60	-0.22	0.25	0.02	0.09	0.
WORDATT6	**0.85**	0.74	0.63	0.80	0.51	-0.15	0.48	0.34	0.11	0.
WORDATT7	**0.93**	0.82	0.75	0.75	0.62	-0.15	0.47	0.18	-0.03	0.
WORDATT8	**0.86**	0.78	0.67	0.69	0.52	-0.31	0.50	0.30	-0.13	0.
WORDATT9	**0.84**	0.65	0.58	0.76	0.45	-0.15	0.41	0.21	0.08	0.
WORDPU1	0.82	**0.95**	0.77	0.81	0.67	-0.19	0.52	0.37	0.04	0.
WORDPU2	0.78	**0.92**	0.71	0.71	0.65	-0.07	0.39	0.22	0.13	0.
WORDPU3	0.81	**0.94**	0.78	0.83	0.62	-0.29	0.45	0.39	0.04	0.
WORDPU4	0.80	**0.94**	0.70	0.76	0.56	-0.25	0.49	0.24	0.02	0.
WORDPEU1	0.76	0.76	**0.96**	0.72	0.74	-0.35	0.51	0.48	0.16	0.
WORDPEU2	0.79	0.74	**0.94**	0.75	0.72	-0.30	0.43	0.40	0.20	0.
WORDPEU3	0.72	0.73	**0.96**	0.66	0.74	-0.27	0.41	0.41	0.07	0.
WORDPEU4	0.74	0.77	**0.95**	0.74	0.69	-0.20	0.38	0.34	0.10	0.
WOSYMAD1	0.75	0.65	0.62	**0.78**	0.56	-0.13	0.32	0.13	0.17	0.
WOSYMAD2	0.75	0.65	0.60	**0.78**	0.57	-0.12	0.31	0.17	0.25	0.
WOSYMAD3	0.81	0.78	0.75	**0.92**	0.64	-0.25	0.47	0.42	0.21	0.
WOSYMAD4	0.78	0.76	0.69	**0.85**	0.66	-0.27	0.50	0.36	0.25	0.
WOSYMAD5	0.78	0.78	0.65	**0.92**	0.46	-0.21	0.49	0.23	0.11	0.
WOSYMAD6	0.73	0.77	0.62	**0.93**	0.49	-0.21	0.47	0.24	0.27	0.
WOSYMAD7	0.61	0.61	0.52	**0.79**	0.46	-0.22	0.30	0.38	0.09	0.
WOSYMAD8	0.71	0.66	0.66	**0.86**	0.55	-0.35	0.37	0.29	0.34	0.
WOSYMAD9	0.69	0.73	0.63	**0.87**	0.50	-0.15	0.38	0.23	0.13	0.
WSYMAD10	0.81	0.78	0.71	**0.91**	0.54	-0.16	0.47	0.33	0.15	0.
WSYMAD11	0.71	0.67	0.62	**0.86**	0.48	-0.23	0.39	0.25	0.23	0.
WSYMAD12	0.82	0.78	0.74	**0.91**	0.59	-0.27	0.45	0.30	0.18	0.
WINEXP1	0.64	0.66	0.77	0.65	**0.94**	-0.23	0.32	0.50	0.37	0.
WINEXP2	0.60	0.63	0.70	0.60	**0.98**	-0.16	0.32	0.47	0.32	0.
WINEXP3	0.59	0.63	0.69	0.56	**0.95**	-0.07	0.24	0.42	0.32	0.
Q6	-0.12	-0.17	-0.11	-0.05	0.09	**0.68**	-0.30	-0.22	0.12	-0.
Q31	-0.25	-0.17	-0.20	-0.32	-0.15	**0.70**	-0.16	-0.11	-0.02	0.
Q41	-0.16	-0.12	-0.24	-0.18	-0.20	**0.76**	-0.14	-0.42	-0.17	-0.
Q51	-0.10	-0.18	-0.27	-0.16	-0.15	**0.78**	-0.18	-0.24	-0.15	-0.
Q17	0.23	0.30	0.22	0.21	0.20	-0.34	**0.71**	0.40	0.05	0.
Q37	0.19	0.18	0.27	0.11	0.19	-0.19	**0.60**	0.27	0.09	0.
Q47	0.47	0.49	0.42	0.53	0.26	-0.11	**0.84**	0.11	0.08	0.
Q13	0.11	0.26	0.33	0.15	0.39	-0.20	0.09	**0.67**	0.10	0.
Q23	0.19	0.17	0.26	0.24	0.33	-0.07	0.23	**0.67**	0.23	-0.
Q33	0.15	0.21	0.15	0.20	0.28	-0.23	0.24	**0.68**	0.17	0.
Q43	0.18	0.24	0.28	0.26	0.42	-0.26	0.19	**0.83**	0.25	0.
Q48	0.29	0.31	0.40	0.27	0.32	-0.28	0.22	**0.70**	0.21	0.
Q58	0.23	0.24	0.45	0.29	0.38	-0.38	0.32	**0.68**	0.18	0.
Q49	0.05	0.06	0.14	0.23	0.35	-0.10	0.09	0.27	**1.00**	0.
Q35	0.27	0.37	0.30	0.40	0.32	-0.19	0.26	0.18	0.29	**0.**
Q60	0.10	0.26	0.15	0.21	0.23	-0.07	0.16	0.06	0.20	**0.**

Factor loading results for TAM Word with reduced number of items.
(Items with loadings <.60 were removed – see Chapter 8 Table 8.12).

Attitude, PU – Perceived Usefulness; PEU – Perceived Ease of Use; SA – Symbolic Adoption; IntEx- Intention to Explore; N- Neuroticism; Ex-Extraversion; Op-Openness; Ag- Agreeableness; Csc-Conscientiousness.

Appendix B-24

Factor Loading Results for TAM Kronos with Reduced Number of Items.

	Attitude	PU	PEU	SA	IntEx	N	Ex	Op	Ag	Csc
KRATT1	**0.86**	0.54	0.58	0.73	-0.12	-0.09	0.10	-0.11	-0.23	-0.37
KRATT2	**0.90**	0.75	0.56	0.70	0.06	-0.25	0.19	0.02	0.04	-0.11
KRATT3	**0.78**	0.63	0.30	0.68	-0.10	-0.09	-0.09	-0.30	0.12	-0.34
KRATT4	**0.82**	0.34	0.39	0.53	-0.07	0.01	-0.24	-0.10	-0.13	-0.30
KRATT7	**0.81**	0.36	0.21	0.56	-0.20	0.39	-0.28	-0.33	-0.18	-0.30
KRATT8	**0.82**	0.49	0.46	0.66	0.03	0.22	0.03	0.05	-0.22	-0.25
KRPU1	0.54	**0.88**	0.39	0.53	-0.13	-0.29	0.17	0.17	0.19	0.12
KRPU2	0.72	**0.94**	0.46	0.62	-0.07	-0.21	0.23	0.24	0.17	-0.05
KRPU3	0.51	**0.90**	0.53	0.59	-0.11	-0.28	0.27	0.24	0.32	-0.20
KRPU4	0.58	**0.95**	0.46	0.67	-0.24	-0.14	0.23	0.15	0.12	-0.11
KRPEU1	0.63	0.52	**0.93**	0.65	0.13	-0.19	0.25	0.21	-0.12	-0.26
KRPEU2	0.24	0.25	**0.83**	0.31	0.30	-0.39	0.34	0.42	-0.02	-0.02
KRPEU3	0.41	0.42	**0.93**	0.54	0.31	-0.29	0.40	0.41	-0.13	-0.19
KRPEU4	0.49	0.54	**0.90**	0.48	0.18	-0.44	0.26	0.42	0.09	-0.29
KRSYMAD1	0.68	0.46	0.40	**0.76**	0.07	0.02	0.00	-0.21	-0.02	-0.04
KRSYMAD2	0.83	0.61	0.56	**0.82**	-0.03	0.06	0.08	-0.17	-0.16	-0.32
KRSYMAD3	0.72	0.56	0.53	**0.84**	0.06	0.08	0.08	-0.08	-0.04	-0.27
KRSYMAD4	0.84	0.73	0.65	**0.86**	-0.01	-0.14	0.15	-0.05	0.02	-0.37
KRSYMAD5	0.51	0.63	0.21	**0.71**	-0.31	-0.06	0.04	-0.17	-0.13	-0.32
KRSYMAD6	0.64	0.73	0.55	**0.89**	-0.10	0.00	0.21	-0.02	-0.23	-0.44
KRSYMAD8	0.21	0.03	0.23	**0.53**	-0.19	0.22	-0.04	-0.26	-0.39	-0.58
KRSYMAD9	0.33	0.35	0.40	**0.68**	-0.24	0.01	0.00	-0.14	-0.39	-0.18
KSYMAD10	0.42	0.12	0.35	**0.73**	-0.10	0.22	0.07	-0.29	-0.61	-0.55
KSYMAD11	0.49	0.40	0.30	**0.74**	-0.10	0.10	0.07	-0.04	-0.17	-0.23
KRINEXP1	-0.07	-0.31	0.18	-0.14	**0.89**	-0.07	0.46	0.26	0.02	0.20
KRINEXP2	-0.13	-0.12	0.22	-0.14	**0.96**	-0.25	0.45	0.28	0.25	0.27
KRINEXP3	-0.01	-0.02	0.27	-0.04	**0.94**	-0.17	0.50	0.38	0.18	0.01
Q1	0.02	-0.10	-0.27	-0.06	-0.10	**0.68**	0.03	-0.03	-0.45	0.04
Q6	0.16	-0.19	-0.23	0.14	-0.17	**0.75**	-0.46	-0.30	-0.10	-0.14
Q26	0.02	-0.21	-0.04	0.17	-0.29	**0.61**	-0.42	-0.48	-0.32	-0.36
Q31	0.08	-0.03	-0.37	0.04	-0.08	**0.83**	0.01	-0.24	-0.22	-0.04
Q36	-0.13	-0.39	-0.33	-0.08	0.01	**0.90**	-0.09	-0.28	-0.34	-0.17
Q56	-0.02	-0.13	-0.25	0.13	-0.39	**0.79**	-0.26	-0.30	-0.31	-0.27
Q2	0.13	0.26	0.17	0.25	0.20	0.00	**0.76**	0.37	-0.28	-0.13
Q17	-0.13	0.27	0.17	0.22	0.44	-0.18	**0.74**	0.37	-0.11	0.14
Q22	-0.10	-0.04	0.27	0.01	0.35	0.01	**0.64**	0.38	-0.28	-0.03
Q27	0.07	0.13	0.28	-0.04	0.21	-0.18	**0.64**	0.49	-0.04	-0.09
Q52	-0.14	0.03	0.21	-0.09	0.52	-0.31	**0.57**	0.41	0.01	0.41
Q57	0.00	0.24	0.30	0.02	0.44	-0.21	**0.74**	0.38	0.03	-0.05
Q8	-0.14	0.22	0.39	-0.17	0.34	-0.33	0.58	**1.00**	0.10	0.06
Q9	-0.11	0.22	-0.05	-0.24	0.17	-0.37	-0.15	0.10	**1.00**	0.33
Q5	-0.42	-0.35	-0.16	-0.45	0.19	-0.06	-0.16	-0.02	0.26	**0.84**
Q40	-0.35	-0.13	-0.17	-0.18	0.07	-0.03	0.12	0.06	0.04	**0.61**
Q45	-0.19	0.09	-0.18	-0.33	0.11	-0.28	0.03	0.08	0.34	**0.80**
Q55	-0.06	0.26	-0.17	-0.28	0.01	-0.26	0.18	0.15	0.35	**0.73**
Q60	-0.15	0.00	-0.26	-0.15	0.22	0.06	0.07	-0.08	0.14	**0.70**

Appendix Study3 Table 8.13a Factor loading results for TAM Kronos with reduced number of items.
(Items with loadings <.60 were removed – see Chapter 8 Table 8.13).

Attitude, PU – Perceived Usefulness; PEU – Perceived Ease of Use; SA – Symbolic Adoption; IntEx- Intention to Explore; N- Neuroticism; Ex-Extraversion; Op-Openness; Ag- Agreeableness; Csc-Conscientiousness.

Appendix B-25

Description of computer as person, and computer gender attribution for all participants in Study Three.

Participant		Description of computer	% Male	% Female
li.nm0444	m	normally dependable, but subject to occasional irrational behaviour	50	50
li.rs0350	f	well organised, tidy	50	50
li.vh0146	m	not applicable	0	0
li.ea0249	m	infuriating	50	50
li.at0163	m	knows a lot about a few things, can't communicate well with others	95	5
li.em0643	f	methodical	50	50
li.ai0449	f	difficult, hard to understand	0	0
li.hl0954	f	An un-intuitive one	75	25
li.zs0730	m	business	50	50
cs.ds1163	f	computer nerd, socially rigid, potential to assist, low humour	100	0
cs.af0755	m	person not devoid of fallibility	0	0
cs.ke0845	f	source of info, impersonal especially with email, sometimes good, not good person	0	0
cs.mw0660	f	certainly not a friend because it's not a friendly system	90	10
cs.mm0249	f	rigid & infuriating, I suppose, not friendly at all	0	0
cs.te0354	f	cold, hard & cynical because it gives nothing	100	0
cs.br0473	m	flat, annoying (home computer drops out of Net) non-responsive	70	30
cs.lm0445	f	very black & white person, though flexible, depends on user	80	20
cs.mb1170	f	organised person	50	50
cs.pc1061	f	nerd	0	0
cs.hl0160	f	helpful but frustrating, don't know enough (yet) to make full use	0	0
cs.br0853	f	very clever person, can store & process lots of info quickly, temper	0	0
cs.al0266	m	itss a tool, (like a pen or a phone)	0	0
cs.lb0842	f	friend because it helps me, it's reliable	30	70
cs.ed0732	f	robot, mechanical, only capable of giving back what's put in	100	0
cs.db0952	f	brilliant, but only as good as what they've learnt	0	100
cs.bi0568	f	very inflexible, DOS-based illogical, WINDOWS is ok	0	0
cs.eg0447	f	awesome-so much to offer me, not yet discovered	0	0
cs.es1262	f	a resource person, frustrating, slow or very hard taskmaster	0	0
cs.mg1148	m	smart but not intelligent, without emotion, just black & white	80	20
cs.bs0950	m	bitch	0	0
cs.as0339	m	helpful	0	0
cs.km1175	f	intelligent but frustrating, crashes, unreliable person	100	0
cs.nj0553	f	just a machine/computer	0	0
cs.md1155	m	cantankerous, misbehaves, moody	0	0
s.ml0443	f	frustrating if not working, challenge, effort in-results out	75	25
s.jb0871	m	like car salesman, good & bad, there to do job, it has a purpose	90	10
s.kf1051	f	Hosrep: friendly & not lose things; Word: things get lost	0	0
s.je0254	f	great when working, but not infallible	0	0
s.jj0578	f	just a machine that you use	0	0

s.jf0161	f	unknown, a lot they withhold	0	0
s.jh0980	f	one that needs guiding through everything (a bit like me)	0	0
s.vw1078	f	fickle person-unpredictable, jams in system are irritating	0	0
s.kg1178	m	tough quest: can't relate computer as a person	0	0
s.mr0356	m	a librarian - way of accessing the knowledge	0	100
s.ac0060	m	same age as self, felt presence of other in emailing friends	50	50
s.dr0471	f	dull, very dull, only gives the info you ask for	70	30
l.cs1079	m	science oriented; associated with geeks (maths & science related) vs. sporty	70	30
l.ly1179	f	intelligent, kind of introverted, antisocial vibe, info enclosed &?	70	30
l.mk1172	f	logical, not spend time with, but entrust with tasks	60	40
l.hf1179	f	temperamental & unpredictable, sometimes reliable, can breakdown & lose data	60	40
l.sw0979	f	smart-can do so much & different things, very complicated, bit scary	90	10
l.mm0480	m	useful because I can manipulate it to achieve my goals	80	20
l.rj0379	f	frustrating, useful, not friendly, not good interact, hate them,	60	40
l.jw0478	f	analytic, introvert, no emotion or feeling, friendly reflects your experience	60	40
l.pc0180	f	organised, unemotional, empty	70	30
l.mt0679	f	efficient, neat, ordered	30	70
com.sf0277	m	energetic & friendly	40	60
b.bl0961	m	semi-reliable, innovative	40	60
b.aa57	m	a newsreader, journalist	40	60
b.as0468		0	.	.
b.c1051	m	follower, contrary	50	50
b.kb1043	m	helpful	0	0
b.jed64	m	a slave	30	70
b.bw0747	m	cold, calculating, impersonal	80	20
b.et0059	m	pedantic	50	50
b.bs0761	m	thinking, analytical, creative	50	50
b.ls0175	f	insensitive & moody	90	10
b.es2154	m	can't see computer as a person	100	0
b.sb1170	m	0	60	40
b.ka0373	m	0	80	20
b.rb0772	m	organised - hardworking	90	10
		Average gender attribution	42.21	23.5

Sex of participant: m = male, f = female.

Appendix B-26.

Descriptive Statistics and reliability coefficients for the TAM components for Hosrep and Austlii. Due to the low sample sizes, these contexts for the TAM were removed from the Study Three.

Construct	Mean	S.D.	Reliability*
TAM Response for Hosrep. (TAM $_{Hosrep}$) (n=12)			
Perceived Ease of Use (PEU)	16.17	2.82	.94
Perceived Usefulness (PU)	12.91	4.08	.81
Attitude (Attit)	38.83	10.18	.94
Symbolic Adoption (SymAd)	39.18	11.05	.92
Intention to Explore (IntExp)	6.50	3.42	.91
TAM Response for Austlii. (TAM $_{Austlii}$) (n=11)			
Perceived Ease of Use (PEU)	11.55	3.53	.85
Perceived Usefulness (PU)	15.18	3.57	.90
Attitude (Attit)	41.09	8.65	.85
Symbolic Adoption (SymAd)	44.18	10.44	.92
Intention to Explore (IntExp)	9.00	3.87	.95

* Cronbach’s alpha coefficient.

Appendix C (The Instruments)

Appendix C (The Instruments)

Self-Directed Search Assessment Booklet

Please see print copy for Appendix C

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Additional Transfer grid Instructions

1) Now, I'm going to ask you something different, or odd, I'm going to ask you to think of this (construct) in a different way, in view of the technological stuff. How would you put a television set along this construct?

How would you put your play computer along this construct?
How would you put your work computer along this construct?
How would you put your car along this construct?
How would you put your mobile phone along this construct?

2) How easy was it for you to rate the non human constructs with the human constructs?

On a scale of 1 to 5,
a) I found it easy using the technology constructs with people

(Strongly agree)				(Strongly disagree)	
1	2	3	4	5	N/A

b) I found it easy using the people constructs with technology

(Strongly agree)				(Strongly disagree)	
1	2	3	4	5	N/A
Easy				Difficult	

Index of Learning Styles

Please see print copy for Index of Learning Styles

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Participant Information Sheet

University of Wollongong

Participant Information Sheet

RESEARCH TITLE: COMPUTER ACCEPTANCE IN UNDERGRADUATE STUDENTS WITH REGARD TO LEARNING STYLES, PERSONALITY AND CAREER ORIENTATION.

Researcher: Jocelyn Harper

This study will explore the acceptance and use of computers within a heterogeneous student population. Students have divergent career aspirations and orientations. It has been noted that different professions have different levels of computer acceptance, which can have implications for technology adoption within workforce populations. Personality traits and learning styles as well as career orientations have been implicated in computer use limitations. This research aims to look at those factors.

If you agree to participate in the study you will be asked to take part in an interview of about one hour and one half. This will take the form of three questionnaires. A member of the research team will be available to assist you when you require it, during the interview process.

All aspects of the research, including the results will be confidential and only the investigators will have access to information on participants. An academic report will be submitted for presentation as a conference paper and/or journal publication but no participant's information will be identifiable.

Participation in this study is entirely voluntary, and you are not obliged to participate, and may withdraw at any time.

When you have read this information, Jocelyn Harper from the University will discuss it with you further, if you require clarification. If you would like to know more at any stage, please feel free to contact her at the Department of Psychology, University of Wollongong, ph: 02 42 214164 (email: jrh02@psyc.uow.edu.au). This information sheet is for you to keep. If you decide to participate then please sign the separate Consent Form and give it to the researcher.

The Ethics Review Committee of the University of Wollongong has considered this study. Any concerns or complaints that you have about the conduct of the study please contact Dr Nadia Crittenden on 42 214515 or Peter Caputi on 42 213717or the Secretary of the University of Wollongong Human Research Ethics Committee on (02) 42 214457.

UNIVERSITY OF WOLLONGONG

PARTICIPANT CONSENT FORM

RESEARCH TITLE: COMPUTER ACCEPTANCE IN UNDERGRADUATE STUDENTS WITH REGARD TO LEARNING STYLES, PERSONALITY AND CAREER ORIENTATION.

Researcher: Jocelyn Harper

This research project is being conducted as part of a PhD supervised by Dr Nadia Crittenden and Mr Peter Caputi in the Department of Psychology at the University of Wollongong.

This study explores people's acceptance of technology. The interview is composed of four questionnaires. Their completion may take up to an hour and a half. Your participation in this research is voluntary, you may refuse to participate in this study and can withdraw at any time, without penalty. Your refusal to participate or withdrawal of consent will not affect your relationship with the University of Wollongong.

The purpose, method and demands involved in the study, including any inconvenience have been explained by a member of the research team from the University of Wollongong.

....

I understand that the research is strictly confidential and I will not be identified in any way. I understand that although it is possible that demographic features may possibly allow identification, my anonymity will be safeguarded by careful use of identifying code.

I am advised that the University of Wollongong Ethics Committee has approved the study.

I, ... consent to participate in the research conducted by Jocelyn Harper as it has been described to me in the information sheet. I understand that the data collected will be used to investigate the acceptance of computers and I consent for the data to be used in that manner.

Signed .... Date ....../...../......

To ensure the confidentiality of your data, you will be identified only by a code known only to the research team.

Please provide in the spaces below the initials of your mother's maiden name, and the month and year of your birthdate.

NEO Five-Factor Inventory

See print copy for NEO Five-Factor Inventory

See print copy for NEO Five-Factor Inventory

See print copy for NEO Five-Factor Inventory

See print copy for NEO Five-Factor Inventory

Work-Group and TAMsa

COMPUTER ACCEPTANCE IN WORKGROUPS WITH REGARD TO LEARNING STYLES, PERSONALITY AND CAREER ORIENTATION

Instruction Sheet

- What is your age? ....
- What is your gender? ....
- What has been the length of your computer experience? ....years ....months
- Location of computer experience.........% work ....% home
- Type of computer experience ....% PC ....% Mac
- Purpose of computer use ....% entertainment ....% assignments

.... % work .... % communication

- Usage of computers ....% word processing ....% spreadsheets
- ....% database .... % stats package ....% internet

  ....% intranet

- Of time spent on internet ....% chat rooms, ...% e-mail friends,

.........% e-mail work/uni related, ...% information searching, ... % other

- Frequency of use .... hours/ per week
- Duration of use .... hours/ per day
- If you thought of a computer as a person, what sort of person would it be?
- ....

  Degree of maleness ? ....% femaleness...............%

- What is your computer's name? ....

REPERTORY GRID

I want you to think of specific people or machines from your experience, either past or present, that typify for you the following characteristics.

- Your mother MOTHER
- Your father FATHER
- Person you are SELF
- Person you would like to be IDEAL SELF
- Your girlfriend/boyfriend or lover or spouse LOVER/SPOUSE
- Someone you dislike intensely DISLIKED PERSON
- Your television TV
- Computer you use for playing PLAY COMPUTER
- Computer you use for work WORK COMPUTER
- Your Car CAR
- Your mobile phone M.PHONE

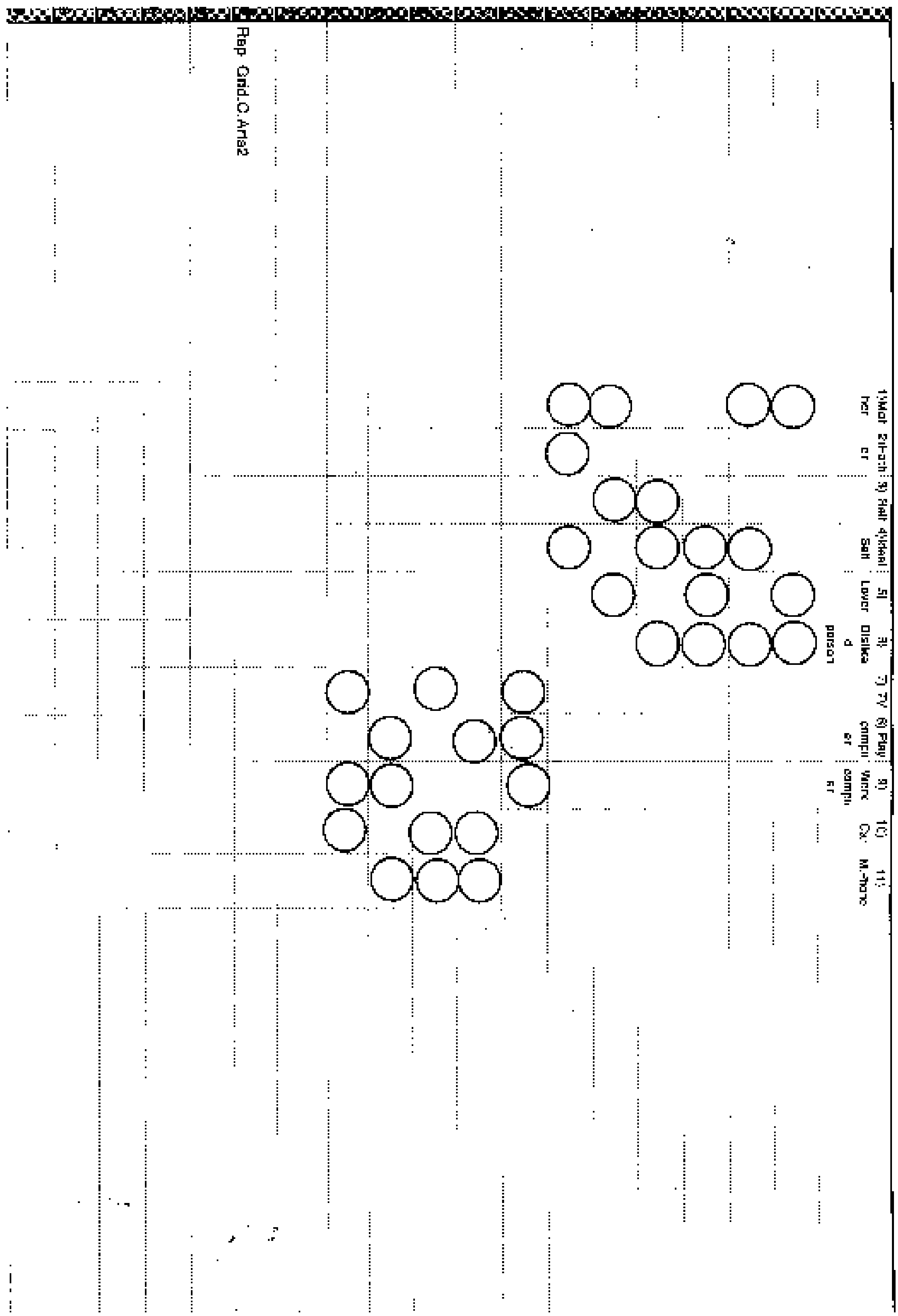
I will ask you to contrast two of these against one another, in a random selection. I want you to describe ways in which the two that I give you are similar, but dissimilar from the third. In effect I am asking you 'What do two of these have in common with each other which is different to the third?' Which do you prefer?

I will ask you to write your answers onto a special grid sheet, placing an asterisk near the pole of the construct that you prefer.

Having completed that task, on the grid, I now ask you to rate how much alike that person or object is, on a scale of 1 to 6. It is important that you rank a high similarity to your preferred pole of the construct (marked with an asterisk) as a 1. If it is highly similar to its opposite pole then rank it as 6.

Most similar to*					Least similar to*
1	2	3	4	5	6

Least similar to*					Most similar to*
6	5	4	3	2	1


1)Mother
2)Father
3) Self
4)Ideal Self
5) Lover
6) Disliked person
7) TV
8) Play computer
9) Work computer
10) Car
11) M-Phone
Rep Grid.C.Aria2

Measure of Technology Usage for Microsoft Office 'Word'.

Below is a list of statements that describe perceptions that people have towards computers and their use, in particular the software package Microsoft 'Word'. Please read each question or statement carefully and then circle the number that indicates the extent to which you think the statement represents you. There are no right or wrong answers.

Perceived Ease of Use.

1. Learning to operate 'WORD' is easy for me.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

2. I find it easy to get 'WORD' to do what I want it to do.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

3. It is easy for me to become skilful at using 'WORD'.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

4. I find 'WORD' easy to use.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

Perceived Usefulness

1 Using 'WORD' enhances my effectiveness in completing my work.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

2. Using 'WORD' enhances my productivity in completing my work.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

3. I find 'WORD' useful in my work projects.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

4. Using 'WORD' improves my performance in work
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

Attitude

1. All things considered, using 'WORD' during the next six months will be

Fun	1	2	3	4	5	6	7	Frustrating
Pleasant	1	2	3	4	5	6	7	Unpleasant
Negative	1	2	3	4	5	6	7	Positive
Pleasurable	1	2	3	4	5	6	7	Painful
Exciting	1	2	3	4	5	6	7	Dull
Foolish	1	2	3	4	5	6	7	Wise
Enjoyable	1	2	3	4	5	6	7	Not enjoyable
Good	1	2	3	4	5	6	7	Bad
Harmful	1	2	3	4	5	6	7	Beneficial

Symbolic Adoption

1. I am excited that I am able to use 'WORD'.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

2. I am always looking forward to using 'WORD'.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

3. I am pleased that I am able to use 'WORD'.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

4. I view the use of 'WORD' with enthusiasm.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

5. I have mentally accepted 'WORD' as an important technology
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

6. In my mind I am convinced that 'WORD' is an important technology.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

7. I personally can't view 'WORD' as an important concept.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

8. The only way I will use 'WORD' is if it is mandated.
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

9. If I can a choose what I use, I will not choose 'WORD'
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

10. If I have a choice, I do not use 'WORD'
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

11. Learning to use 'WORD' was worth the effort I put in
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

12. My investment in learning 'WORD' was worthwhile
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

Intentions to Explore

1. I often experiment with new features of 'WORD'
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

2. I try to find new uses of 'WORD'
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

3. I try to use 'WORD' in novel ways
(Strongly disagree) 1 2 3 4 5 (strongly agree) N/A

What Version of Microsoft Office 'WORD' do you use? ....
Please indicate how often you use Word ....
Several times a day Once a day Few times a week Few times a month Rarely
Approximately how many hours per semester do you spend on 'Word' ....

Which of the following 'Word' features do you regularly use (check all that apply)
Spelling & grammar .... Macros ....
Table Design ....
Wizards ....