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Technology as a scapegoat

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Technology As A Scapegoat
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Technology as a Scapegoat

Technology as a Scapegoat—the idea of scapegoating what is feared, misunderstood, or somewhat difficult is common. This practice is not limited to software or hardware. It is an issue that has been discussed since the beginning of the industrial revolution. However, in the last 20 years, the problem of having to adapt to changes in technology has become rampant as change occurs at an ever-increasing rate. With these changes come more complaints about the failures of software and the failures of the computer industry to meet the needs of users.

It may be, however, that technology is not the primary problem but rather, the problem lies in technophobic users who are afraid of learning new things or challenging themselves. The literature suggests that companies have learned from their mistakes and have acknowledged that some products were indeed unusable. Efforts have been made to correct this using Human-Computer Interaction Teams, Usability Teams, etc. Microsoft, long one of the most targeted scapegoats, has developed Inductive User Interface Guidelines designed to standardize all of their software interfaces in some manner and to ensure that ease of use is built into their products. Apple has also had a long standing set of requirements for their operating systems, which have ensured a common look and feel based on their research into human/computer interfaces.

There will always be detractors who are unwilling to examine the psychological aspect of this issue. Donald Norman, an expert in the HCIS field, would lead you to believe that technology is a pariah that has been thrust upon us all. It is interesting to note that he has made a living negating the very thing that has given him a career. He has gone as far to state, "technophobia is not people's fault, it is the designers fault. If you

are having trouble, remember, it's the fault of the technology for not understanding how you think and what you need (as cited in Swersey, 1997)." This is a simplistic explanation, which would seem to assume that all users have the same cognitive abilities and affective responses. However, the statements of the failures in technology as cited by Norman tend toward broad generalizations and almost suggest a more Luddite approach. This is not a scientific survey by any means and it would be interesting to see the reactions to his books by a non-technical audience.

Technophobia, although not delineated in the Diagnostic and Statistical Manual of Mental Disorders, DSM IV-R, is a recognized phobia. Some of the most common symptoms include (Gupta, 2001):

- Fear of computers and related technologies
- Resistance to automating processes
- Unwillingness to change from one system to another or one software to another.
- Highly critical of any technology changes or implementations
- Passive resistance to new technology initiatives
- Unwilling to attend training classes
- Slow to learn new technologies
- Providing excuses for not attending training sessions
- Relentlessly arguing the lack of need for technologies
- Pleading, "The old way is the best way!"
- Convincing colleagues that "I have made it this far without technology. Why now?"

The purpose of this study is to examine the relationship between technophobic users and their conceptualization of problems that they may experience in their computer interactions. Several previously established and validated surveys will be utilized as well as one designed specifically for this study. A brief review of calls entered into a helpdesk of a regional call response center will be examined to determine if the data gleaned from the user surveys are consistent with the calls entered into the system.

Hypotheses

The following hypotheses have been developed:

1. Those end users determined to be most technophobic will be those who consistently blamed technology (both hardware and software) for problems faced when utilizing technology.
2. Users who feel negatively towards technological advances will have more overall negative attitudes towards technological utilization.
3. Presentation of the same survey to IT staff is expected to produce opposite results. Although the survey presented will be exactly the same, it is expected that the IT staff would find that a large portion of calls will be related to user error.

Review of literature

Technophobia

Technophobia has been identified by a myriad of terms including computer anxiety, cyberphobia, negative computer attitudes, computerphobia and techno-stress. (Rosen & Maguire, 1990). Most generally, technophobia is described as negative psychological reactions towards technology as evidenced by anxiety about computers or computer-related technology, negative global attitudes about computers, and/or specific negative cognitions or self-critical internal dialogues during present computer interactions or anticipated computer interactions (Rosen & Weil, 1990; Anthony, et.al., 2000). Spresser (1998) went as far as to propose that technophobia is an acknowledged medical condition because it affects people mentally and physically. However, it should be noted that no corroborative evidence could be found to support this assertion.

Reynolds and Smith (1999) described the concept of techno-stressed individuals as those experiencing frustration, confusion and fear as a result of technology overload and lack of direction in navigating the immense amount of information available. The term "techno-stress" has also been frequently utilized by Rosen & Weil, (1995, 2000, 2001).

Jay (1981) was one of the first to coin the term "computer phobia", which was characterized by resistance to talking about computers or even thinking about computers; fear or anxiety about computers; and hostile or aggressive thoughts about computers (cited in Orr, et.al., 2001).

One term for technophobia quite often seen is "computer anxiety"; however, at times, computer anxiety is seen as a psychological variable within the realm of technophobia. It should be noted that while computer anxiety is often a synonym for technophobia, it is also recognized as a psychological correlate to technophobia also. Computer anxiety refers to negative emotions and cognitions evoked in actual or imaginary interaction with computer based technology. "It has the nature of a trait that predisposes towards the state of psychological distress in situations that involve encounters with computers" (Deane, Henderson, Barrelle, Saliba & Mahrar, 1995; Maurer & Simonson, 1984; as cited in Bozionelos, 2001). Bozionelos (2001), characterized computer anxiety as the emotional state "during interaction or impending interaction with a computer that reduces the potential benefits from the use of computers and discourages the necessary use of computers (p. 996)." Choi (2001) viewed computer anxiety as the fear or apprehension felt when using computers or in anticipation of computer use.

Raub (1981) defined computer anxiety as the "complex emotional reactions that are provoked in individuals who interpret computers as personally threatening" (p. 9), while Howard, Murphy, and Thomas (1987) explained computer anxiety as a "fear of impending interaction with a computer that is disproportionate to the actual threat presented by the computer" (p. 14). The same idea has been suggested by Anderson (1996). More recently McInerney and McInerney (1994) identified computer anxiety as "an affective response of apprehension or fear of computer technology accompanied by feelings of nervousness, intimidation and hostility." (p. 28, as cited in Choi, 2002). Heinssen, et.al. (1987) indicated that computer anxiety measures resistance to and avoidance of computer technology as a function of fear and apprehension, intimidation, hostility, and worries that one will be embarrassed, look stupid, or even damage the equipment. Other definitions remain consistent with these (Bohlin, 1999 as cited in Burkett, et.al., 2001; Henmby, 1998 as cited Beckers & Schmidt, 2001; Weil, et. al, 1990).

Three levels of technophobia have been delineated (Rosen, et. al, 1993; Orr, 2002; Bolletin, 1998):

- Anxious technophobes, who exhibit the classic signs of an anxiety reaction when using technology including physical symptoms of sweaty palms, heart palpitations and headaches.
- Cognitive technophobes, who externally appear calm and relaxed, yet bombard themselves with negative self statements (i.e., "everybody but me knows how to do this")
- Uncomfortable users, who may be slightly anxious or use some negative statements; however, the degree of intervention required may be fairly minimal. Access to information about computers and support may be enough to remedy the problem.

Others (Brosnan (1998)) break technophobes into two categories:

- The hesitant technophobes may be using some technology but would prefer not to learn something new and different. These individuals usually experience a steep

learning curve when utilizing technology and will become easily irritated and frustrated.

- Resistors go to extreme lengths to avoid technology. A resistor anticipates disastrous consequences for any action on the computer.

A review of literature over the past twenty years provides a clear set of symptomology. Maurer & Simonson, (1984), described behavioral manifestations of computer anxiety including avoidance of computers and the general areas where computers are located; excessive caution with computers; negative remarks about computers; and attempts to cut short the necessary use of computers. Other symptoms might include refusal to do assigned tasks; refusal to use technology or computers; refusal to back up computer programs, save documents; refusal to close programs; refusal to clean up hard drives (Anonymous, http://www.kdinc.com/MIS760.htm).

Beckers & Schmidt (2001) suggest other manifestations of computer anxiety or technophobia include the expression of low confidence in one's own ability to use computers, negative affective responses to computers, emotional arousal caused by use of or the thought of the use of technology and negative beliefs about the roles of computers in society. Davidson and Walley, (1985), describe several forms of resistance associated with the introduction of computers including passive resistance, active sabotage, oral defamation, complaints of inability to use the computers, and refusals to use the computers. (as cited in Martinko, et.al., 1996).

The reported prevalence of technophobia in the research is fairly consistent. In a meta-analysis by Rosen & Maguire (1990), anxiety and stress associated with computer use affected a low of 25% users in one study to a high of 46% users in another. Rosen & Weil, (1995) found that 52% of elementary school teachers are technophobic as compared with 45% of the secondary humanities teachers and 35% of secondary school

science teachers in the study. Orr, et.al. (2001) cited a study by Dell computers that concluded that 55% of Americans suffer some degree of technophobia.

Correlates

An extensive review of the literature points to a group of correlates such as gender, sex role, age, mathematics anxiety, and experience. Further, there are psychological variables that may be consistent with technophobia including self-efficacy, computer anxiety, computer attitudes, locus of control, playfulness, etc.

Rosen & Weil (1995) suggest that experience is the most prominent predictor of technophobia; further, other predictors include age, gender, computer availability, ethnicity, and socioeconomic status. "A large amount of empirical research has investigated the correlates of technophobia; this has included comparisons with mathematics anxiety, state and trait anxiety, experience, computer aptitude, literacy, interest, physiological responses, hemispericity and sex-role identity" (Rosen & Weil, 1992 as cited by North & Noyes, 2002). "Attitudes, anxiety and cognition are considered independent dimensions as they appear to be correlated with different variables (Rosen, et.al., 1987 as cited by North & Noyes, 2002, p. 136)."

The literature on gender provides an unclear picture with the only consensus seeming to be that there is no consensus. In a study examining the effects of learning group gender composition, Cooper & Stone (1996) came to the finding that the same level of anxiety in boys and girls has opposing effects. As Maurer (1994) states, there is a suggestion in the research that there may be some relationship between gender and technophobia but this area has not been sufficiently examined to provide a conclusive

answer. He further states that the research supporting correlation is problematic because males often have greater prior experience and greater access to computers.

King, et.al. (2002) in their review of literature cited conflicting reports on the effects of gender. Some studies proposed that males experience less computer anxiety while experiencing more positive attitudes. Conversely, other studies demonstrate that females have more positive attitudes and less anxiety than males. Furthermore, a significant number of studies find there to be only negligible difference between the genders.

Whitely's study (1997) suggests that men tend to rate themselves higher in areas of computer competence, gender-appropriateness and positive affect. This is hypothesized to be due to sex roles in that males are socialized to accept a stereotype that computing is a male domain and thus, they experience more positive attitudes. He further suggested that despite findings that females have more negative or less positive attitudes than males, regardless of sex role difference, the negative attitudes are not such that significant behavioral consequences will necessarily follow.

There are a small number of studies that find gender to be a significant correlate to technophobia. In a study of the prevalence of computer anxiety in British managers and professionals (Bozionelos, 1996), the incidence of computer anxiety was double for women as compared to men. Rozell, et.al. (1999) found that despite the fact that females expressed more positive attitudes than males, the actual utilization of computers caused greater anxiety among women than men. King, et.al. (2002) found males to be more anxious than females; however, they noted "a significant interaction between gender and grades with a reversal of anxiety interaction occurring at about the grade 9 level (pp. 69-70)." Durndell & Haag (in press) results indicated that males reported greater self-

efficacy, lower computer anxiety, and more positive attitudes in their computer interactions within the confines of their study on the role of gender on Internet usage.

To a larger degree a review of literature found there to be a negative correlation between gender and the phenomenon of technophobia. A study of 104 eleven and twelve year old children done to determine whether technophobia may be considered a transitory phenomenon (North & Noyes, 2002), "it was found that the impact of psychological gender (sex and sex roles) does not significantly impact attitudes or cognitions towards computers. Further, no significant difference was found between males and females in relation to technophobia groups (p. 135)." Cohen & Gordon (1989) found that men and women showed no significant difference in anxiety in a study of 152 psychology students designed to develop a scale for assessing computer anxiety.

Although sex could to be an insignificant factor in the differences between males and females in explaining different computer anxiety and attitudes, more careful examination of the data reviewed that females were "overrepresented in higher anxiety groups. This subgroup is characterized by low levels of experience and perceived knowledge of microcomputers and poor performance. Lack of knowledge and experience contribute to computer anxiety and appear to affect performance (Anderson, 1996, p. 71)." Other studies demonstrating no association between technophobia and gender were Anthony, et.al. (2002), Orr, et.al. (2001), Dyck & Smither (1994), and Jennings & Onwuegbuzie (2001).

Literature on sex role identity and technophobia indicates largely that computing activity is perceived as a masculine activity, although some such as Worthington & Zhao (1999) do refute this. Individuals that perceive themselves as feminine tend to experience greater computer anxiety and negative attitudes (Rosen, et.al., 1987). In this study, the

researchers examined the role between computer anxiety and gender role utilizing the Bem Sex Role Inventory (Bem, 1974 as cited by Rosen, et.al., 1987). Rosen & Maguire (1990) found a trend suggesting that women are more phobic and suggested that sex role identity should be considered rather than gender in studies on technophobia.

A study by North & Noyes (2002) found that "males attribute more significance to gender, mathematics background and nationality as influencing factors of computer ability, whereas females are less likely to attribute significance to these factors are prerequisites or obstacles preventing successful computer ability. Similarly, androgynous children place less emphasis on these variables than masculine, feminine and undifferentiated sex types (p. 145)." Maurer (2001) suggested that even under rigorous controls across a range of measures, factorial gender differences were found (p. 29).

As with gender, research on the correlate of age and the presence of technophobia is convoluted at best with no consensus. In particular, it was seen that age alone cannot be identified as the main correlate. Anthony, et.al. (2000) found age to be weakly correlated while Loyd & Gressard (1984) reported some significant age effects in their study of 354 high school and college students. In this study, older students were found to be more confident users; however, it was noted that within this study the age range is still limited. Chua, et.al. (1999) suggested that in studies with a wide age range, the relationship between computer anxiety and age may indicate some relationship; however, in studies with a more narrow age range, this relationship is not as readily seen.

In general, those studies that had a wider age range tended to report an age effect, with younger students being less anxious (Maurer, 1994). In Maurer's study, which examined levels of computer anxiety and computer experience, adults 55 years of age and older were compared with adults 30 years of age and younger. Older adults were found

to have less computer anxiety, to enjoy using computers more and to have more positive attitudes. Dyck & Smither (1994) point out that despite this, older subjects tend to have less computer confidence, although the reasons for this were not clearly elucidated. King, et.al. (2002) stated that the literature shows that while older students experience more computer anxiety, their attitudes do not differ significantly from those of younger students. In their study, they found that males were the high anxiety group in 11th grade while females were the high anxiety group in 7th grade. They concluded that there is a changeover period in 9th grade.

Jennings & Onwuegbuzie (2001) reported a main effect for age, in that the youngest group of students "reported less computer anxiety and higher level of confidence than did the other age groups. However, older students reported the highest level of computer liking and perceived usefulness of computers (p. 383)." Similar results were found in a study by Rosen & Weil (1995) of computer availability, computer experience and technophobia among public school teachers.

On the other hand, there is an equal amount of literature that suggests no significant age difference among the respondents (Anderson, 1996; Rosen & Maguire, 1990). Rosen, et.al. (1987) found that "older students were more computer anxious but did not have more negative attitudes than did younger students (p. 167)." These results were basically replicated by Orr, et.al. (2001). North & Noyes (2002) cited research that found older individuals expressed more positive attitudes while experiencing lower anxiety than did younger people. However, in their study of 104 eleven and twelve year olds, 77% of children had no technophobia as measured on the dimensions of computer attitude and cognition.

The literature on possible correlates of technophobia does seem to suggest that mathematics anxiety can increase computer anxiety, while Rosen & Maguire (1990) showed that computerphobia was not a manifestation math anxiety. Heinssen, et.al. (1987) found significant correlations between results on the Computer Anxiety Rating Scale (CARS) and measures of math and trait anxiety. This replicated the finding of Gressard & Loyd (1984), Maurer (1983), and Raub (1982) (as cited by Heinssen, 1987). They suggested that the computer anxiety may be associated with the perception of computers as mathematical tools.

Experience with computers has largely been examined as the most significant correlate to technophobia (Heinssen, Glass & Knight, 1987; Howard & Smith, 1986; Bozionelos, 2001); however, Weil, et.al. (1987) have disputed "the hypothesis that familiarity with computers reduced computer anxiety and argue that during repeated exposure to computers, the computerphobic is being reconditioned at increased levels of anxiety which, in turn, increase discomfort and anxiety (p. 180)." Anderson (1996) has suggested that research has faltered in its attempts to assert experience alone as a correlate, stating that "research on computer anxiety should focus on specific skills and knowledge and not just on whether the person has had experience with computers (p. 73)."

Choi (2002) has also pointed out that focusing on experience may be problematic as some individuals may be hesitant to attempt to gain experience due to computer anxiety and negative attitudes. More recent research has suggested that computer experience alone is not as important as the type and/or quality of the computer experience (King, et. al, 2002; Chua, et.al., 1999). Rosen & Weil (1995) found, in an analysis of studies of college students and business people, that past computer experience could be

inversely related to technophobia. Forced computer interaction may lead to increased anxiety and negative cognitions. In fact, poor early experience could perpetuate future avoidance of computers. Bozionelos (2001) found that highly anxious individuals would benefit from computer training that stressed gaining experience; however, those that expressed low anxiety on measuring tools may not benefit from this same type of training.

In a study of adults over the age of 55 and younger than the age of 30, Dyck & Smither (1994) found that higher levels of experience were associated with lower levels of computer anxiety and more positive attitudes towards computers. They did, however, suggest that the type of experience should be examined. Marcoulides (1988) found that experience was an important factor for predicting achievement in computer utilization but proposed that for some individuals computer anxiety can be present regardless of computer exposure. In a study of 75 assembly line workers in mid-sized manufacturing firm in the Midwest, Rozell, et.al. (1999) found that computer experience contributed strongly to favorable computer attitudes. "Importantly, experience also served as a major predictor of initial user performance and anxiety (p. 7)." Gressard & Loyd (1986) asserted that computer experience effects attitudes about computers but does not actually impact the level of computer anxiety experienced by an individual (as cited in Orr, 2002).

Some research has found there to be no relationship between technophobia and computer experience (Anthony, et.al., 2002). Anderson (1996) found that perceived knowledge of computers was a factor rather than actual experience. In a meta-analysis done by Rosen & Maguire (1990), it was shown that computer experience does not eliminate technophobia. Maurer (1994) stated that no cause and effect relationship can be demonstrated between previous computer experience and computer anxiety. McIlroy,

et.al. (2001) found, in a study of undergraduate social science students, that students with more access to computers developed more positive attitudes; however, this relationship was not found to be the case when measuring computer anxiety.

Psychological variables

Research on technophobia has also examined a number of psychological variables including self-efficacy, computer anxiety, computer attitudes, playfulness, locus of control, etc. Rosen & Maguire (1990) state based on their meta-analysis, that research has been unable to establish consistently any characteristics as comprising a computerphobic's personality style. "If any trait characterizes a computerphobic, it is their avoidance of computer technology (Rosen, 1990, p. 189)."

Self-efficacy describes the expectation a person has regarding their ability to master a task. Potosky (2002) defines self-efficacy as "the belief in one's capabilities to mobilize the motivation, cognitive resources, and courses of action need to meet given situation demands (p. 241)." Self-efficacy is also defined as a judgment of "how well one can execute courses of action required to deal with prospective situations (Bandura, 1982, p. 122)." Individuals with low self-efficacy expectations in a particular situation will experience unpleasant feelings, such as anxiety, and will behave in unproductive ways, such as avoiding work, and they may lack persistence (Bandura, 1977; as cited in Brosnan, 1999). Brosnan cites the following authors as supporting that self-efficacy is an important concept in that it mediates the effects of computer anxiety: Bandura (1977); Hill, Smith, and Mann (1987); Kernan and Howard (1990); Sadri and Robertson (1993); Rosen, Sears, and Weil (1987); and Marcoulides (1988).

Beckers & Schmidt (2001) found that high feelings of self-efficacy result in low feelings of anxiety regarding computers. In their research, they found a set of directional

influences, "computer literacy or lack of it and computer self-efficacy are independent contributors to the level of physical arousal that people experience while confronted with computers, and their affects towards the machine. These factors, in turn, influence beliefs about computers, both negative and positive (p. 39)." Brosnan (1999) found a linear chain of events in that self-efficacy predicted computer anxiety, which predicted computer usage. While self-efficacy theory postulates that anxiety should predict self-efficacy, Brosnan found that increasing levels of self-efficacy would reduce levels of anxiety. Rozell, et.al. (199) cited findings that individuals who are anxious about computers experience feelings of inefficacy. These perceptions of computer inefficacy contribute to computer anxiety, rather than vice versa.

Although computer anxiety is one name by which technophobia is referred, computer anxiety has frequently been researched in the literature as a psychological correlate to technophobia. Computer anxiety is sometimes subsumed under the more general definition of computer attitude (Simonson, et.al., 1987). Beckers & Schmidt (2001) state that "computer anxiety seems to be part of a process of accumulating experiences and it appears that its occurrence and its magnitude can be manipulated by altering the conditions under which these experiences are acquired and by guiding the perception of these experiences (p. 47)." Mawhinney and Saraswat (1991) defined computer anxiety as the inability of an individual to adapt to the requirements of an information society dominated by modern computer technology. Rosen et.al. (1987) conceptualized computer anxiety as an affective disorder with a range of anxiety from mild discomfort to severe phobia. High levels of computer anxiety have been shown to have detrimental effects on acquiring computer skills as well as increasing resistance to the use of computers (Dyck, et.al., 1998). Higher computer anxiety has been associated

with lower feelings of self-efficacy and poorer task performance as well as greater state anxiety, reported psychological arousal and debilitative thoughts (Heinssen, et.al., 1987).

Mawhinney and Saraswat (1991) studied the relationship between computer anxiety and personality type in undergraduate business students enrolled in computer courses and found a significant correlation between computer anxiety and personality type. They concluded that computer anxiety is more common in “feeling” type individuals than in the “thinking” types. Meirer (1985) considered computer anxiety from a social learning theory perspective and purports that computer anxiety is a learned experience stemming from a result of low competence in computer use and low expectation of outcome so that anxiety will gradually diminish through building computer skills and successful experiences.

Chua, et.al. (1999) provided four statements that they feel summarize and characterize the nature of computer anxiety (p. 614):

- Computer anxiety is a fear of computers when using the computer or considering the possibility of computer use.
- Computer anxiety is a kind of “state anxiety” which can be changed
- Computer anxiety is measurable in multiple dimension
    - Duration (temporary vs. permanent)
    - Intensity (normal vs. neurotic)
- Computer anxiety causes computer use avoidance.

The phenomenon of computer anxiety has been examined in the context of state and trait anxiety. King, et.al. (2002) described the differentiation between trait and state anxiety. “State anxiety refers to anxiety actually experienced in a particular situation. . . this is the type of anxiety that is most closely connected to computer anxiety which can generally be defined as the fear of apprehension felt by individuals when they use computers, or when they consider the possibility of computer utilization (p. 70).” Chua, et.al. (1999) considered computer anxiety to be of the state type as it can be changed and

measured along multiple dimensions. Beckers & Schmidt (2001) delineated a six-factor model of computer anxiety as a result of their study using two samples of university students. Four of the more specific dimensions they identified were computer literacy, self-efficacy, physical arousal caused by computers, and beliefs about dehumanizing aspects of computers.

Torkzadeh and Angulo (1992) suggested that computer use avoidance could be viewed from three perspectives of computer anxiety: psychological, sociological, and operational. The psychological perspective focuses on fear of damaging the computer system and files. The sociological perspective focuses on fear related to changes of social pattern, job demands and insecure job status due to computerization. The operational perspective is caused by operational problems when performing computer related-tasks. All three cause computer use avoidance (cited by Chua, et.al., 1999). Maurer (1994) suggests a model of the development of computer anxiety. In his model, computer experience is the element that interacts most directly with computer anxiety. Other personality characteristics are identified that have a relationship with computer anxiety (e.g., math anxiety, locus of control) (p. 374).

The concept of computer attitudes refers to an individual's beliefs about computers. These beliefs may be dependent upon affects and physical arousal (Beckers & Schmidt, 2001). Rozell, et.al. (1999) found gender, computer experience and attribution style to be predictive of computer attitudes. Computer attitudes, in turn, related to feelings of computer efficacy, task-specific performance expectations and post-performance anxiety. North & Noye (2002) suggest that it is well documented that a large percentage of the population possesses negative attitudes, further stating that

"typical findings indicated that up to one third of all people in the industrial world are uncomfortable with computer technology (p. 136)."

According to McIlroy, et.al. (2001), a previous successful computer experience is not necessarily reflected in computer attitudes; however, the characteristics of the initial instructor may significant in the development of computer attitudes. Orr (2002) indicated that if the computer anxious user has a positive attitude towards computers they can expect that continued computer use will reduce their anxiety. Thus, it is necessary that negative attitudes be changed if the outcome is to be more positive computer using experience. It may be hypothesized that continuation of negative attitudes might lead to a projection of negative attitudes and thoughts onto the technology itself.

Computer playfulness is defined by Webster & Martocchio (1992) as an individual's tendency to interact spontaneously, inventively and imaginatively with computers. They found that computer playfulness fosters a greater degree of cognitive spontaneity, inquisitiveness and creativity. Individuals that score high in computer playfulness "tend to be more spontaneous, inventive and imaginative (Bozionelos, 1997, p. 214)." Anderson (1996) found an inverse relationship between computer anxiety and playfulness.

Locus of control refers to a person's perspective on the world. Anderson (1996) described persons who are internally motivated to be very self-directed people who tend to attribute outcomes to their efforts. Hawk (1989) investigated the relationship between locus of control and computer attitudes. This study took place in a business setting and found that there was no difference between "internals" and "externals" with respect to computer attitudes (cited in Maurer, 1994).

Other less referenced issues have been found in the literature. Anthony, et.al. (2000) proposed that "technophobia has more to do with self-consciousness, self-confidence and self-efficacy than with anxiety (p. 41)." In their study, which examines levels of technophobia in 176 South African students, the levels of technophobia were correlated on five dimensions: "neuroticism, extroversion, openness, agreeableness, and conscientiousness. Neuroticism is assessed in terms of anxiety, anger, hostility, depression, self-consciousness, impulsiveness, and vulnerability to stress. It is an indication of one's susceptibility to psychological distress (p. 40)."

In research that has implications for the study of technophobia as scapegoat, Rozell, et.al. (1999) found that one's outlook towards computers serves as a self-fulfilling prophecy. Positive computer attitudes are correlated with higher levels of self-efficacy and less resultant anxiety following task completion. One's outlook toward life in general and one's experience with and attitudes towards computers foster the ultimate expectations regarding future computer interactions. If one expects to have a negative experience, one will ultimately find that this expectation fulfilled.

Markus (1983) offers three core explanations for people's negative reactions to computer systems (as cited in Martinko, 1996, p. 314):

- Internal attributes of an individual, such as the natural human tendency to resist change as well as certain personality characteristics and cognitive orientations
- Poor systems designs (functionality, interface designs, modes of presentation, accessibility of work stations, inadequate response times, etc.) which not only amplify negative reactions but can also frustrate those individuals who initially exhibit positive reactions
- The interaction of a system's design with attributes of its users.

Instruments

There are many instruments available to measure various aspects of the computer use experience and the range of affects that may be experienced. Examined here are the

most frequently utilized instruments. Chua, et.al. (1999) in a meta-analysis made a significant assertion that while separate instruments may be valid and generally reliable in and of themselves, they are often not compatible with one another. Studies by Weil & Rosen established that technophobia is best measured on three separate, yet overlapping dimensions of anxiety, negative cognitions, and negative attitudes (Rosen & Maguire, 1990; Rosen & Weil, 1992; Rosen, Sears & Weil, 1987, 1992; Weil & Rosen, 1995, 1997).

The most commonly referred to instrument is the Computer Anxiety Rating Scale (CARS), which was developed by Heinssen, Glass & Knight (1987). This is a 20 item scale in a 5 point Likert type format with 11 items designed to reflect anxiety laden statements about computers and 9 items reflecting non-anxiety statements. Respondents are asked to express how they feel "at this point in time": 1= "not at all", 2 = "a little", 3 = "a fair amount", 4 = "much" and 5 = "very much". Among the issues addressed in this questionnaire are anxiety related to the machines themselves; their role in society; computer programming; computer use; and problems with computers and technology. (McIlroy, 2001, p. 25)

Chu & Spires (1991) found the CARS to be valid. They report that significant differences of computer anxiety were found across cognitive styles with intuitive and thinking individuals exhibiting lower anxiety than individuals described as sensing or feeling types. Safford, et.al. (1999), assert that while the CARS is a valid measure of computer anxiety, no indication of what score constitutes a significantly high level of computer anxiety to warrant a problem. This suggests that while the CARS may in fact objectively indicate high levels of computer anxiety, the score that differentiates high anxiety from low anxiety is subjective.

The Computer Anxiety Index (CAIN), which was developed by Simonson, et.al. (1987), primarily measures "avoidance of computers and the general areas in which computers are located, excessive cautions with computers, negative remarks about computers, and attempts to shorten periods when computers are being used (Choi, et.al., 2002, p. 5-6)." The items also examine aspects of computer liking, computer achievement, computer confidence and necessity of computers (King, et.al., 2002). The score on this Likert scale can be calculated by summing the score for each item, after the scores of negatively worded questions have been reversed.

The Computer Attitude Scale (CAS) was developed by Loyd & Gressard (1984). This scale assumes that there are three factors that underlie the concept of computer anxiety. The factors measured include anxiety towards computers, computer liking and computer confidence. Later studies have revised the original scale to focus on three factors of computer liking, computer confidence and computer achievement. Loyd and Loyd (1985) added an additional sub-scale labeled computer usefulness (cited in King, et.al., 2002).

The Computer Anxiety Scale was developed by Marcoulides (1989) and comprised of two factors: General Computer Anxiety and Equipment Anxiety. The General Computer Anxiety factor has variables that relate to anxiety produced from actual computer use, the role of computers in society and the impact of computers on working individuals. The second factor is an Equipment Anxiety factor with variables that relate to the operation of personal computers, watching others work on computers and observing printers and printout (cited in Dyck, et.al., 1998). Dyck, et.al. (1998) also delineated the additional factors of Direct and Indirect Involvement with computers.

The Computer Thoughts Survey (CTS) is a 20-item scale in a 5-point Likert format. This survey is similar to the CARS in that users indicate, via their responses on a questionnaire, how often they experience the thoughts indicated. Computer Self Efficacy Scale (CSE) developed by Torkzadeh and Koufteros (cited in Durndell & Haag (in press), is a five-point Likert type format (1=strongly disagree to 5=strongly agree) survey in which all items were positively worded statements that reflected a variety of computer related skills. High scores indicated a high degree of confidence in one's ability to use computers whereas low scores were meant to be indicative of a low degree of confidence in one's ability to utilize computers.

A more recent scale, the Computer Anxiety Trait Scale (CATS), has been developed by Guadron & Vignoli (2002). "This scale is based on an interaction model of anxiety that emphasizes the influential role of specific situations e.g. computer interaction situations. During a computer interaction, great computer anxiety was associated with greater state anxiety (p. 315)."

Training

Much has been written on the pros and cons of training and the various issues that need to be considered when developing a training program. Brosnan (1999) has suggested that in order to encourage technology usage, "the usefulness of the technology in facilitating the completion of the task should represent the primary emphasis for any program introducing technology (p. 116)." Computer training has been found to be effective in raising user efficacy levels and improving computer performance (Rozell, et.al., 1999).

The personality of the individual presenting the training is quite important. Weil, et.al. (1990) suggested "that computerphobia may be reduced if early computer experiences are introduced by a person who holds a positive attitude about technology and feels skilled and comfortable with computers (p. 377)." Maurer (2001) suggested that instructors should attempt to make the students' first exposure to computer as "user friendly" as possible and to present themselves as confident and competent while not ostentatious and intolerant (p. 31).

Beckers & Schmidt (2001) reported that training programs that enhance self-efficacy and computer literacy might reduce computer anxiety. When it comes to computer anxiety, Bozionelos (1996) suggests that self-training programs may not be effective and suggests a much more structured approach. Orr, et.al. (2001) examined the relationship between computer attitude and experience, demographic/education variables, personality type and learning style of 214 students enrolled in a university computer literacy course. Their study demonstrated that computer anxiety can be reduced through formal computer instruction. "They suggest that institutions of higher education as well as organizations must provide relevant, structured computer instruction for students and employees (p. 37)."

Anderson (1996) reported that cognitive behavior therapy has been shown to be effective in alleviating and/or eliminating computer anxiety. Two studies (Heinssen, 1987; Weil, et.al., 1987) inferred that psychological intervention techniques, rather than computer interaction, would be more successful in eliminating negative attitudes and reducing computer anxiety. A program that fits with these ideas is the Computer Reduction Program (Rosen, et. al, 1993), which was designed with the goal of reducing psychological reactions to computers and technology. The program includes two

individual treatment modules and one group treatment module to fit different types of computer phobia. In this study, results indicated decreased computer anxiety, improved computer cognitions, and enhanced computer attitudes. All treatment modules were equally successful in eliminating psychological reactions to computers.

Chua, et.al. (1999) proposed the idea that when computer anxiety reduction programs are planned, there should be consideration of the different dimensions of anxiety sources. Safford, et.al. (2002) cite one study of the effects of computer training course on anxiety reduction which suggested that certain types of computer experience are more likely to reduce computer anxiety than others. "Namely, software application training reduced anxiety significantly more than training that involved computer programming. These studies indicate that it may be the quality or type of the computer experience that is the determining factor, not simply the quantity of computer experience (p. 736)."

Fajou (2002) states that there are two different states of mind associated with the experience of computer anxiety. In one, the person is flooded with anxiety and has difficult separating thoughts while in the other state there is a sense of mental paralysis. This second type is purported to be more common and is best dealt with utilizing training methods that focus on problem solving methodologies. An early article by Chu & Spires (1991) also suggests that certain styles of training are appropriate for specific types of anxiety. A computer course may be appropriate for some cognitive styles, whereas other cognitive styles would benefit from individual instruction or specific counseling. A study by Chou (2001) compared the effects of training method and computer anxiety on an individual's computer self-efficacy and learning performance. Their results indicated

that the behavior-modeling training method resulted in superior performance and higher self-efficacy.

Other suggestions to reduce technophobia are readily found in the literature. Decker (1999) noted that frequency of computer use, home computer use and training responsibility were also noted to influence the transfer of the training process as it relates to computer self-efficacy. It was suggested that users in the workplace should be provided ample opportunity to expand their skill levels. Lefebvre (2000) suggested that training should ensure a low training curve and that use of peer training or training in teams or departments should be considered.

A number of training intervention ideas have been forwarded by Puetz (2000):

- Assess the attitudes of end users, and then place them in appropriate learning groups. Personalize the introduction of technology.
- Learn new technology from someone who's skilled in using it and can explain it without jargon.
- Make sure that technology instruction is hands-on for all users. Users need hands-on time to practice and play with the technology from the start because it reduces anxiety and builds confidence and motivation to learn.
- New technology is best learned together, using a sequence of skills geared to the new user's knowledge level and attitude. Small groups of matched-level learners working with an expert can also progress effectively when the instructor gives individual attention as needed and evaluates each group member's progress.
- Limit instruction time to what the new user can assimilate and retain. You'll find more effective retention and improved learning outcomes with short periods of instruction of no more than two hours. This is especially true when working with resisters.
- Don't move into new instruction areas until current information is clearly understood and mastered. A slow-paced, unhurried atmosphere will increase learner self-confidence by providing successful experiences--especially in the early stages. Don't assume that all is well when no one asks questions. Continue to assess new learners frequently and encourage questions.
- Prior to introducing new technology, staff responsible for its administration should become thoroughly familiar with its use and the organization's

implementation process. Prior to implementation, anticipate common questions and have answers ready. Provide detailed troubleshooting instruction to all administrators, help-desk personnel, and on-the-job experts. Expert support help should be available whenever new learners are working with new technology.

- Have specific instructional needs in mind. Assess ahead of time what users need to know to perform their jobs most effectively, and then provide examples that include those needs. Prove-its particularly like this approach because it shows them immediately how learning new technology will help them do their jobs better.
- Use the identical version of the new user's hardware and software programs for training.
- Whenever possible, hold training onsite at workers' job location.
- Create and maintain easy access to an expert user after training. The ideal situation is to have an expert close at hand in every work area to handle questions. On-the-job expert help demonstrates organizational commitment to the new technology.
- Employers need to value the technology and the people expected to use it.

Human Computer Interaction

There has been a strong trend in software engineering to design software that enhances "user-friendliness." As Bhaskar has suggested, software must adapt to the user. In addition to Microsoft's Inductive User Interface Model, other approaches to software design have been developed (Carlson, 2001):

- Intelligent User Interfaces—Uses artificial intelligence technology to develop intelligent interfaces that can understand the intentions of the user, communicate, advise and adapt.
- Performance-Centered Design—Emphasizes characteristics and behaviors that actively support performance development while permitting learning.
- User Centered Design—Focuses on the appropriate allocation of function between user and system, active involvement of users, iterations of design solutions and multidisciplinary design teams.

Method

This study measured the likelihood that participants tend to blame technological difficulties on the technologically itself, resulting in a decline in the utilization of

technology itself. Participants were recruited from two sectors: Non-IT users who work in the billing office for three hospitals (on site in one location) and IT professionals who were recruited from multiple locations within the same corporation. Many of the participants were familiar with the examiner and others were selected because they use technology on a regular basis. Little difficulty was experienced in retrieving surveys, in part because the request to participate was made by their supervisor. Each participant completed a survey in the form of a Likert Scale. The researcher compared differences between groups using Pearson's R and Regression Analysis.

Subjects

The end users completing the survey were voluntary subjects who work in the Central Billing Office for a not-for-profit Catholic hospital in New York State. It is recognized that this is an unscientific study; however, in order to build in some reliability the surveys will be completely anonymous and participation is voluntary. A majority of the subjects are women whose age range varies. The educational background is quite homogenous with only 2 out approximately 60 end-users having completed higher than a high school education.

The IT staff of the Data Center for a 5 hospital group of a larger corporation will also be given the survey with participation being voluntary. The Information Technology staff includes PC Technicians, Network Administrators, Systems Administrators, and Upper Management. This group contains both males and females; however, a majority of the more highly technical staff are males. The educational background of this group is also quite homogenous with 90 percent achieving no higher than a high school education.

Procedures

The surveys will be printed out and provided to the end users with brief instructions being provided in-person. A box will be left in the room for collection of these surveys and they will be collected at the end of the day. The surveys to be given to the IT staff will be emailed and options for returning these will be via email or fax (for anonymity). The difference in format for giving the survey is related to logistics. All the end-users are located in building. The IT staff is spread out over two states and implementing the survey in the same format (in person) is not feasible. All data will then be collated into a format for statistical analysis, which will be completed by a trained statistician.

An informal survey of help desk calls for a 12-month period will also be done. The procedure for this will be that all calls for only the PC technicians will be surveyed for each month. This is being limited to the PC technicians, as they are the staff members that have the most hands on experience with the end users. When the Network Administrators do interact with the end users it is most often cases when passwords have either been forgotten or the users have failed to change passwords. This would alter the results giving a false positive in regard to the degree of user error in the analysis of helpdesk calls.

Measures

The survey that is being utilized was developed from the Computer Anxiety Rating Scale, the Computer Anxiety Index and the Computer Attitude Scale. In addition, a few additional questions have been added that are specific to the hypotheses of this study (see Appendix A). Each of these measures have been shown to have cross validity, as discussed in the review of literature; however, the validity has not been tested when

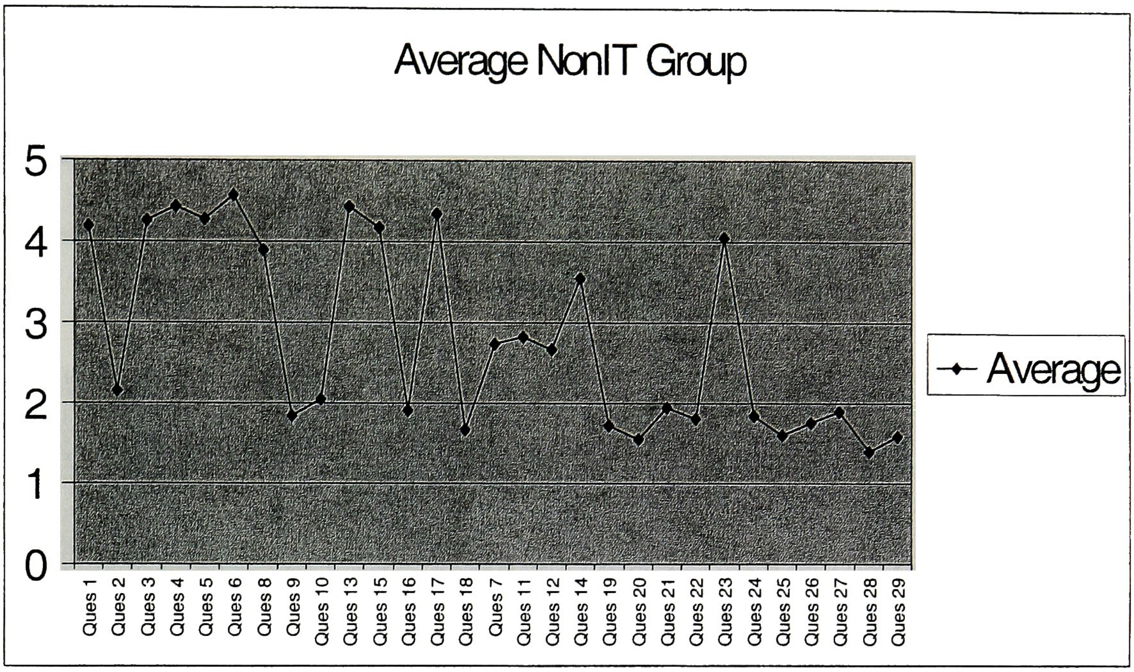
utilized in the manner in which it is being used in this study. Prior to the introduction of this survey to the subjects of this study, it was examined by a statistician to ensure that statistical analysis could be run based on the results from the survey as written.

Results

Initially, the data was examined on a question-by-question basis (Appendix B & C). However, this analysis did not address the hypotheses of this study in any measurable manner. Therefore, the analysis of the data had to be restructured to look at groups of questions as subsets of concepts that were being measured; thusly, technophobia and technology utilization. Previous to the implementation of the surveys, each question had been identified as to which concept it was measuring. By grouping the questions into subsets, total combined scores were then examined. At that point, it could be determined which users scored high on the technophobia scale and which scored low. These scores could then be examined against their technology utilization. The questions related to technophobia were 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 15, 16, 17, and 18. The questions related to technology utilization were 7, 11, 12, 14, and 19 – 29.

The first analysis performed was on the group of users. A comparison was made of the technophobia questions and the technology utilization questions. The data shown in the chart indicates that there is a low level of technophobia in the user group. There also appears to be a high level of technology utilization within this group. The set of questions measuring technophobia (1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 15, 16, 17, and 18) demonstrated an overall low level of technophobia for the Non-IT users groups. Furthermore, on the questions determining technology utilization (7, 11, 12, 14, and 19 – 29), it could be ascertained that the usage was high. This may be based on the fact that

these users work on computers all day as part of the employment responsibilities and this affected their responses to the questions.

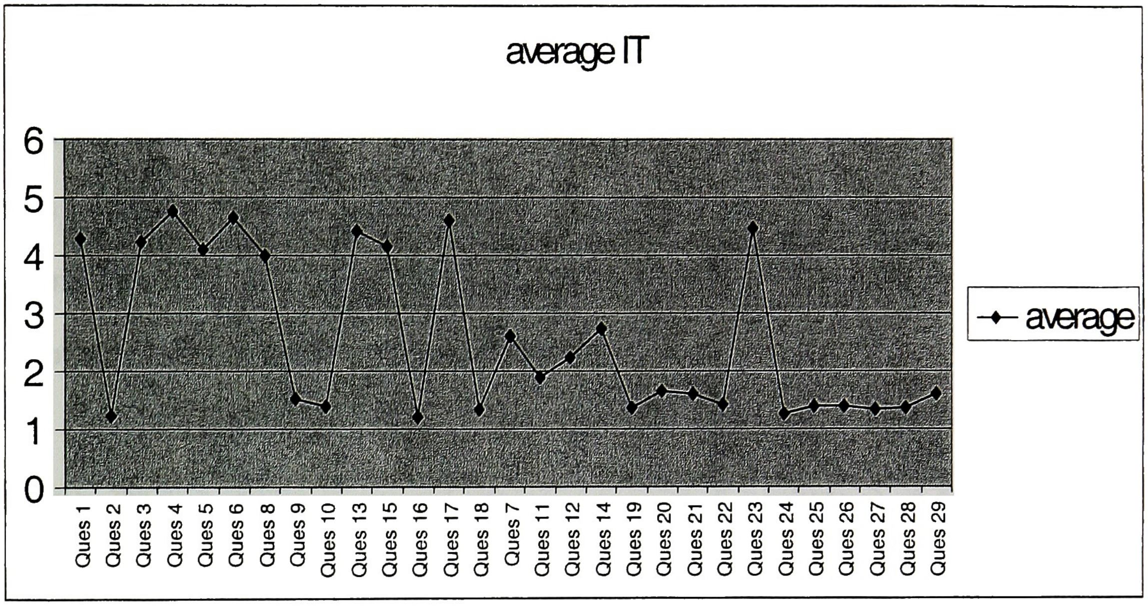


Technophobia | **Technology Utilization**

Further examined was the relationship in the responses to the questions on the survey to confirm that the responses were consistent with expectations, i.e., a highly technophobic user of technology. This relationship was confirmed as shown by the Pearson correlation analysis of Questions 10 and Questions 23 (see Appendix E, Correlation 1).

Based on the results of the Pearson correlation, it was then considered whether the results could be used as a predictor of the level of technology utilization based on the responses to technophobia related questions (see Appendix E, Analysis 1). This would help in determining training and support requirements for the user group. Given the results of this study, it would be hard to determine if such an assertion could be confidently made.

A second analysis was performed on a group of IT professionals. Their levels of technology utilization are higher than Non-IT users and technophobia is essentially non-existent. As seen in the graph, the response averages are at the extremes of 1 or 5 depending on the way the question was phrased whereas the user group range was primarily between 2 and 4.



Technophobia | **Technology Utilization**

Both graphs yielded the same shape. This group also confirmed the relationship between technology utilization and technophobia as shown by the correlation coefficient (see Appendix E, Correlation 2).

The regression equation shows a relationship but indicates that other variables not included in the study would be stronger predictors. Examples of these predictors might include math anxiety, gender, age, sex roles, cultural issues, experience, and setting. There are psychological variables that may be consistent with technophobia including self-efficacy, computer anxiety, computer attitudes, locus of control, and playfulness,

which were not tested individually (see Appendix E, Analysis 2). If each of these variables had been tested, the results of the study may have differed significantly.

The results indicate that both the IT user and the Non-IT user groups appear to be strong computer advocates, with the IT group showing lower levels of technophobia. There is some evidence to suggest that this may be an indicator of age. The average age of individuals participating in the survey is 40. To a large degree, people who are 40 and below have never been without a personal computer in their work lives. The PC was invented in the early 80's and its use in business began in 1983. Most people have always had to do their job on a computer in some form. It may be hypothesized that technophobia should be decreasing as the population ages, if indeed, age is a significant factor in identifying technophobic individuals.

An analysis was performed to determine if there is a statistical difference between the user and the IT populations (see Appendix E, Analysis 3). A comparison of the average response for each question was made between two populations. One population consisted of Information Technology personnel and the other population consisted of the user population. Based on a test for equal variances it was found that the two populations answered the questions equally. A significant difference in the population variances does not exist at a 95% confidence level, thus no statistically significant difference in the level of technophobia was evidenced between IT staff and non-IT users.

An additional analysis was performed to determine if the populations of the questions related to technophobia and the questions related to technology utilization are different. The expectation was that they would move in opposite directions, meaning that the two populations tested would produce widely differing results. Further, if an

individual showed up as being highly technophobic, the expected technology utilizations score would be reflected as being extremely low. (see Appendix E, Analysis 4).

The two populations above were combined for this analysis (IT and user). An average of the questions related to technophobia was compared to the average of the responses to questions related to technology utilization. Each survey's responses to questions 1, 2,3 4, 5 , 6, 8, 9, 10, 13, 15, 16, 17, and 18 were averaged together and compared to the survey responses to questions 7, 11, 12, 14, and 19 – 29.

Using a 95% confidence level a statistically significant difference is found in the variances of technophobia and technology utilization. The average of the technophobia is 2.0754 and the average of technology utilization is 3.3806. The results indicated that the population is, in general, not technophobic and there is a demonstrated result of high technology utilization. In this study, 3 people were found to be technophobic and they were neutral in their level of technology utilization. In other words, they were not adverse to the use of technology. The statistical analysis revealed that a majority of the respondents showed low levels of technophobia and high levels of technology utilization.

Although with this data set, we cannot show that technophobic people blame technology for problems due to the low level of technophobic people in our random sample, we can show that people who are not technophobic do utilize the technology and do not tend to blame it for the problems they face when utilizing the technology.

"A relationship can be established for predicting the level of technology utilization based on the level of phobia expressed by the respondent: Avg util = 3.20 + 0.0872 avgphobia. The statistics related to this regression function indicates that there are other factors that will drive technology utilization and a recommendation of further

study into other potential factors that contribute to the result is in order (M.R. Smith, 2003)."

An overall regression equation was considered as a predictor of technology utilization. As indicated in Appendix E (see Analysis 5), technophobia is not a significant predictor of technology utilization.

Analysis of Helpdesk Calls

Analyses on one year's worth of helpdesk calls were also performed. As with the surveys, it was difficult to establish strong trends in this data. The breakdown of calls into categories such as user error, hardware failure, software failure, etc. was subjective by nature (Appendix D). The scoring was further hampered by poor recording by technicians who did not adequately document either the nature of the problem that resulted in the initial call or the steps taken towards resolution. Thus, no conclusions in regards to the hypotheses of this thesis can be drawn based upon the data collected (see Appendix E, Analysis 6 for results of the analysis).

"Upon review of the collected data there is a significant relationship between the month and the number of calls. Further research is required to determine the cause of the decrease in calls throughout the year. The trend analysis as shown in Appendix E (Analysis 6) confirms the trend. The relationship between the month and number of calls is cubic in nature, i.e. there is an increase until April then a steady decrease. Collection of data for the following year will determine if this is a seasonal trend or a continuing decrease (M.R. Smith, 2003)."

Conclusions

The initial hypothesis of this study was that there would be a large number of technophobic users who blame technology for difficulties encountered in using technology. Further, the users who felt negatively regarding technological advances would have poorer attitudes towards technology utilization. Lastly, it was hypothesized that there would be a difference in the survey results between Information Technology professionals and non-Information Technology users. The three hypotheses could not be proven by the statistical analysis of the data collected. Only three people were found to be technophobic to some degree, which is not enough to make conclusions for the entire population of technophobic users.

Upon initial consideration of this thesis and development of the hypotheses, subjective experience was considered to a large degree. Personal experience suggested that most users tended to blame the equipment or the software when experiencing problems when often user error was the more evident culprit. It was assumed that this behavior might be indicative of a person who could be considered technophobic. The causal survey of help desk calls did show a large number of calls to be due to user error; however, other factors as previously discussed limited the inferential quality of the data from this source.

The surveys utilized in the study demonstrated a low occurrence of technophobia in the population that personal experience might strongly indicate otherwise. This might suggest either less than honest answers to the questions, self-assessment that does not match personal presentation, poor measurement criteria, or other factors or reasons. The non-IT population rarely finds user error to be an acceptable explanation for computer problems and as such, they might be less likely to respond in a manner that would be

indicative of this on a survey despite the anonymous nature of the survey. Poor measurement criteria does not seem to be likely as the survey has been repeatedly cross-validated in a number of studies as discussed in the review of literature. The fact that little difference was found in the responses of Information Technology professionals as compared to non-Information Technology users was curious and warrants further examination as some degree of differentiation would be expected. The sample sizes might have also altered the findings to some degree. Further study with a much larger *N* and using a random sample might show varying trends.

The study was able to prove that technology utilization is higher for people who are not technophobic; however, the inverse was not shown to be true to a statistically significant degree. Due to the lack of respondents who could be identified as technophobic, it could not be shown that technophobic people do not effectively utilize technology. It might also be considered that other factors may be driving technology utilization for technophobic users, which were not revealed by the questions asked in the survey. Regression analysis indicated a low R-squared value that suggests that other factors not identified would better explain the level of technology utilization.

Despite the fact that the hypotheses of this study were not proven, it is concluded that while human computer interaction issues remain of primary importance for technology companies; the responsibility for all problematic issues cannot be placed solely on the technology itself. It is imperative that further research be performed to examine how the psychological "make-up" of users affects their responsiveness to the use of technologies. The required utilization of computers is only going to increase and examination of all issues related to computer use can only improve the experience of the user.

Appendix A

Computer Attitude Survey

Please complete this short survey. Your responses are completely confidential. They will not be released in any form that allows the responses to be linked to any individual.

What is your sex? M / F

What is your age?
20 - 30
31 - 40
41 - 50
51 - 60
60 +

Do you own a personal computer? Y / N
How many years of computer experience do you have? ____

*************Please answer the following questions with: *******************

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I look forward to using a computer on my job	1	2	3	4	5
2. I do not think I would be able to learn a computer programming language	1	2	3	4	5
3. The challenge of learning computers is exciting	1	2	3	4	5
4. I am confident that I can learn computer skills	1	2	3	4	5
5. Anyone can learn to use a computer if they are patient and motivated	1	2	3	4	5
6. Learning to operate computers is like learning any new skill, the more you practice, the better you become	1	2	3	4	5
7. I am afraid that if I begin to use computers more I will be as comfortable working with computers as I am in working by hand	1	2	3	4	5
8. I feel that I will be able to keep up with the advances happening in the computer field	1	2	3	4	5
9. I would dislike working with machines that are smarter than I am	1	2	3	4	5
10. I feel apprehensive about using computers	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11. I have difficulty in understanding the technical aspects of computers	1	2	3	4	5
12. It scares me to think I could cause the computer to destroy a large amount of information by hitting the wrong key	1	2	3	4	5
13. Learning about computers is worthwhile	1	2	3	4	5
14. Most computer problems are because of problems with either the computer or the software	1	2	3	4	5
15. If given the opportunity, I would like to learn more about and use computers more	1	2	3	4	5
16. I have avoided computers because they are unfamiliar and somewhat intimidating to me	1	2	3	4	5
17. I feel computers are necessary tools in both education and work settings	1	2	3	4	5
18. I avoid using computers whenever possible	1	2	3	4	5
19. I sometimes get nervous just thinking about computers	1	2	3	4	5
20. I feel very negative about computers in general	1	2	3	4	5
21. I am usually uncomfortable when I have to use computers	1	2	3	4	5
22. I sometimes feel intimidated when I have to use a computer	1	2	3	4	5
23. Computers do not scare me at all	1	2	3	4	5
24. Working with computers makes me very nervous	1	2	3	4	5
25. I feel aggressive and hostile towards computers	1	2	3	4	5
26. Computers make me feel uneasy and confused	1	2	3	4	5
27. I hesitate to use a computer for fear of making mistakes that I cannot correct	1	2	3	4	5
28. Learning about computers is a waste of time	1	2	3	4	5
29. Advances in technology have made it more difficult to do my job	1	2	3	4	5

ID code: EU

Appendix B

Information Technology professionals sample descriptive statistics

Variable	Number of observations	Mean	Median	Standard Deviation
Age	30	33.80	31.00	9.08
Years Experience	30	13.80	15.00	6.70
Question 1	30	4.300	5.000	0.877
Question 2	30	1.2333	1.000	0.504
Question 3	30	4.233	4.000	0.858
Question 4	30	4.767	5.000	0.626
Question 5	30	4.100	4.500	1.155
Question 6	30	4.6667	5.000	0.4795
Question 7	30	2.600	2.000	1.453
Question 8	30	4.000	4.000	0.910
Question 9	30	1.533	1.000	0.860
Question 10	30	1.400	1.000	0.814
Question 11	30	1.900	2.000	1.029
Question 12	30	2.233	2.000	1.073
Question 13	30	4.433	5.000	0.898
Question 14	30	2.733	3.000	1.081
Question 15	30	4.167	4.000	1.020
Question 16	30	1.200	1.000	0.4068
Question 17	30	4.600	5.000	0.621
Question 18	30	1.333	1.000	0.606
Question 19	30	1.367	1.000	0.669
Question 20	30	1.667	1.000	1.213
Question 21	30	1.600	1.000	1.163
Question 22	30	1.433	1.000	0.817
Question 23	30	4.467	5.000	0.776
Question 24	30	1.2667	1.000	0.4498
Question 25	30	1.400	1.000	1.770
Question 26	30	1.400	1.000	0.814
Question 27	30	1.333	1.000	0.4795
Question 28	30	1.367	1.000	0.850
Question 29	30	1.600	1.000	1.003

Appendix C

Non-Information Technology users sample descriptive statistics

Variables	Number of Observations	Mean	Median	Standard Deviation
Age	46	39.02	41.000	12.25
Years of experience	46	11.163	10.000	6.039
Question 1	46	4.196	4.000	0.687
Question 2	46	2.152	2.000	0.894
Question 3	46	4.2609	4.000	0.5748
Question 4	46	4.4348	4.000	0.5832
Question 5	46	4.283	4.000	0.720
Question 6	46	4.5652	5.000	0.5437
Question 7	46	2.739	2.000	1.497
Question 8	46	3.891	4.000	0.795
Question 9	46	1.848	2.000	0.842
Question 10	46	2.043	2.000	0.942
Question 11	46	2.826	3.000	0.996
Question 12	46	2.674	2.000	1.117
Question 13	46	4.4348	4.000	0.5832
Question 14	46	3.543	4.000	0.912
Question 15	46	4.174	4.000	0.973
Question 16	46	1.913	2.000	1.071
Question 17	46	4.348	5.000	0.900
Question 18	46	1.674	2.000	0.762
Question 19	46	1.717	2.000	0.911
Question 20	46	1.5435	1.000	0.6568
Question 21	46	1.957	2.000	1.134
Question 22	46	1.804	2.000	0.934
Question 23	46	4.043	4.000	0.918
Question 24	46	1.848	2.000	0.942
Question 25	46	1.609	1.500	0.745
Question 26	46	1.761	2.000	0.766
Question 27	46	1.891	2.000	0.924
Question 28	46	1.3913	1.000	0.5366
Question 29	46	1.587	1.000	0.832

Appendix D

Help Desk Call Analysis

	January	February	March	April	May	June	July	August	September	October	November
User-Error	55 14.6%	47 16.85%	67 18.92%	75 17.86%	46 10.31%	60 18.57%	45 12.43%	29 10.98%	37 17.45%	28 12.17%	41 18.22%
Unable to replicate reported problem	19 5.05%	18 6.45%	17 4.80%	22 5.24%	16 3.59%	8 2.48%	23 6.35%	19 7.19%	10 4.72%	23 10.00%	15 6.67%
Software Failure	21 5.59%	17 6.09%	20 5.64%	26 6.19%	35 7.85%	24 7.43%	21 5.80%	19 7.19%	13 6.13%	18 7.83%	14 6.22%
Hardware Failure	34 9.04%	12 4.30%	32 9.03%	30 7.14%	24 5.38%	35 10.84%	37 10.22%	26 9.85%	10 4.72%	24 10.43%	17 7.56%
Hardware setup call	49 13.03%	37 13.26%	42 11.86%	47 11.12%	72 16.14%	38 11.76%	48 13.26%	37 14.02%	27 12.74%	30 13.04%	23 10.22%
Software setup call	85 22.61%	63 22.58%	76 20.62%	107 25.48%	125 28.03%	72 22.29%	83 22.93%	63 23.86%	46 21.70%	26 11.30%	50 22.22%
Unable to ascertain nature of problem	56 14.89%	38 13.62%	52 14.69%	63 15.00%	67 15.02%	41 12.69%	50 13.81%	35 13.26%	31 14.62%	34 14.78%	23 10.22%
User training or user assistance required	26 6.91%	22 7.88%	19 5.36%	12 2.86%	29 6.50%	17 5.26%	25 6.90%	13 4.92%	21 9.91%	26 11.30%	25 11.11%
Normal Maintenance	31 8.24%	25 8.96%	29 8.19%	38 9.05%	32 7.17%	28 8.67%	30 8.29%	23 8.71%	17 8.02%	21 9.13%	19 8.44%
Total	**376**	**279**	**354**	**420**	**446**	**323**	**362**	**264**	**212**	**230**	**227**
Ratio of equipment related	**58.51%**	**55.20%**	**56.21%**	**59.05%**	**64.57%**	**60.99%**	**60.50%**	**63.64%**	**53.30%**	**51.74%**	**54.19%**
User Error	**41.49%**	**44.80%**	**43.79%**	**40.95%**	**35.43%**	**39.01%**	**39.50%**	**36.36%**	**46.70%**	**48.26%**	**45.81%**

****as PC techs don't notate resolution of calls with user error, judgment calls had to be made in determining which categories each calls went into. Generally, poor tech notation was found. Hardware failure calls include PC, printers and monitors.

Appendix E

Statistical Results

Correlation 1:

Relationship between Technology Utilization and Technophobia.

Pearson correlation of Question 10 and Question 23 = -0.593
P-Value = 0.000

Question 10 is "I feel apprehensive about using computers"
Question 23 is "Computers do not scare me at all"

These two questions have a strong inverse correlation as expected. The P-value is significant at 0.000.

Appendix E

Statistical Results

Analysis 1:

Regression Analysis: Question 10 versus Question 23

The regression equation is
Question 10 = 4.51 - 0.609 Question 23

Predictor	Coef	SE Coef	T	P
Constant	4.5057	0.5159	8.73	0.000
Question 23	-0.6089	0.1245	-4.89	0.000

S = 0.7666   R-Sq = 35.2%   R-Sq(adj) = 33.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	14.059	14.059	23.94	0.000
Residual Error	44	25.854	0.588		
Total	45	39.913			

Question 23 can be used as a predictor of question 10 with a significant regression F value of 23.93.

Appendix E

Statistical Results

Correlation 2:

Relationship between Technology Utilization and Technophobia.

Pearson correlation of Question 10 and Question 23 = -0.415
P-Value = 0.023

Question 10 is "I feel apprehensive about using computers"
Question 23 is "Computers do not scare me at all"

These two questions have a strong inverse correlation as expected. The P-value is significant at 0.023.

Appendix E

Statistical Results

<u>Analysis 2:</u>

The regression equation is
Question 10 = 3.34 - 0.435 Question 23

Predictor	Coef	SE Coef	T	P
Constant	3.3435	0.8169	4.09	0.000
Question 23	-0.4351	0.1803	-2.41	0.023

S = 0.7534 R-Sq = 17.2% R-Sq(adj) = 14.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	3.3069	3.3069	5.83	0.023
Residual Error	28	15.8931	0.5676		
Total	29	19.2000			

Question 23 can be used as a predictor of question 10 with a significant regression F value of 5.83.

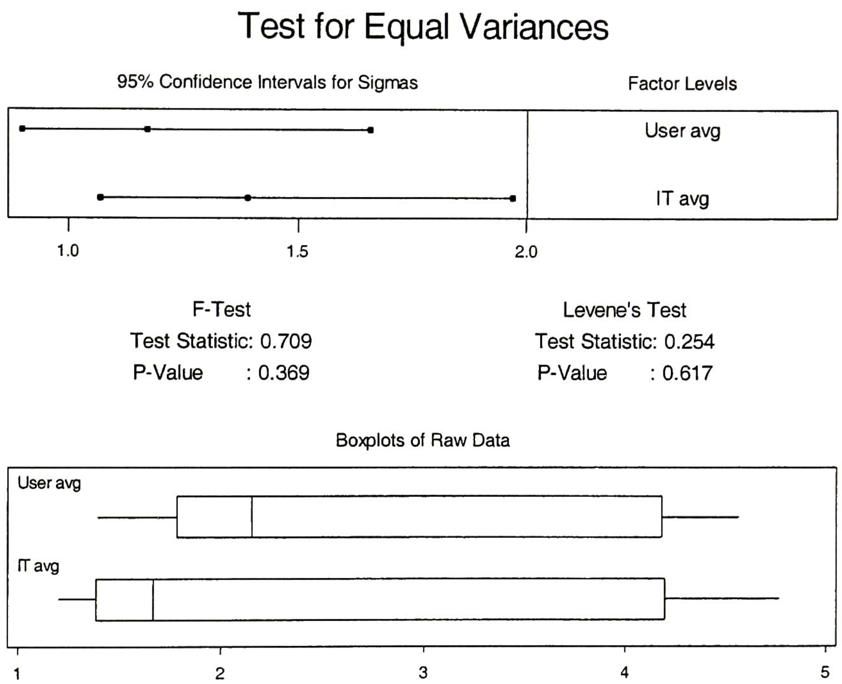
Appendix E

Statistical Results

<u>Analysis 3:</u>

Comparison of the two populations: IT and User

H_0: Population variances are the same
H_a: Population variances are different



Test for Equal Variances

Level1 User avg
Level2 IT avg
ConfLvl 95.0000

Bonferroni confidence intervals for standard deviations

Lower	Sigma	Upper	N	Factor Levels
0.90065	1.17152	1.65941	29	User avg
1.06944	1.39108	1.97041	29	IT avg

F-Test (normal distribution)

Test Statistic: 0.709
P-Value : 0.369

Levene's Test (any continuous distribution)

Test Statistic: 0.254
P-Value : 0.617

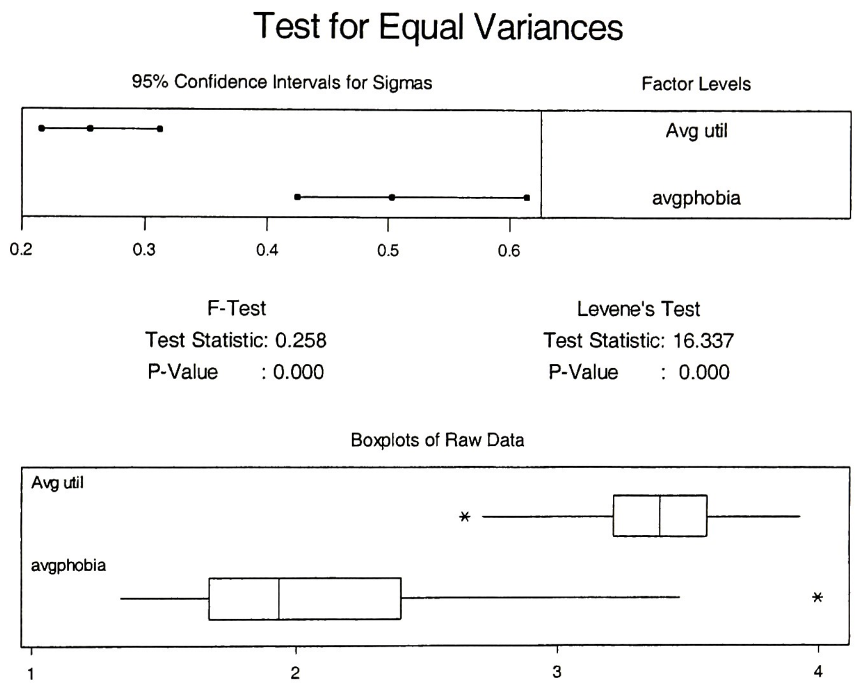
Appendix E

Statistical Results

<u>Analysis 4:</u>

Comparison of the two populations: Average level of Techno-phobia versus Average level of Technology Utilization

H_0: Population variances are the same
H_a: Population variances are different



Test for Equal Variances

Level1 Avg util
Level2 avgphobia
ConfLvl 95.0000

Bonferroni confidence intervals for standard deviations

Lower	Sigma	Upper	N	Factor Levels
0.215972	0.255648	0.312279	76	Avg util
0.424994	0.503071	0.614510	76	avgphobia

F-Test (normal distribution)

Test Statistic: 0.258
P-Value : 0.000

Levene's Test (any continuous distribution)

Test Statistic: 16.337
P-Value : 0.000

Test for Equal Variances: Avg util vs avgphobia

Descriptive Statistics: Avg util, avgphobia

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Avg util	76	3.3806	3.3929	3.3866	0.2556	0.0293
avgphobi	76	2.0754	1.9333	2.0343	0.5031	0.0577

Variable	Minimum	Maximum	Q1	Q3
Avg util	2.6429	3.9286	3.2143	3.5714
avgphobi	1.3333	4.0000	1.6667	2.4000

Appendix E

Statistical Results

Analysis 5:

The regression equation is
Avg util = 3.20 + 0.0872 avgphobia

Predictor	Coef	SE Coef	T	P
Constant	3.1996	0.1242	25.75	0.000
avgphobi	0.08723	0.05820	1.50	0.138

S = 0.2535   R-Sq = 2.9%   R-Sq(adj) = 1.6%

Analysis of Variance

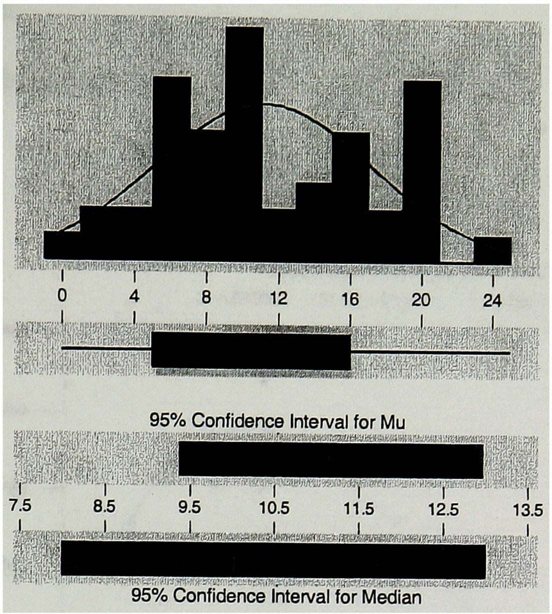
Source	DF	SS	MS	F	P
Regression	1	0.14444	0.14444	2.25	0.138
Residual Error	74	4.75726	0.06429		
Total	75	4.90170			

Unusual Observations

Obs	avgphobi	Avg util	Fit	SE Fit	Residual	St Resid
1	4.00	3.3571	3.5485	0.1157	-0.1914	-0.85 X
2	3.47	3.7143	3.5020	0.0860	0.2123	0.89 X
3	3.47	3.6429	3.5020	0.0860	0.1409	0.59 X
7	2.67	2.7143	3.4322	0.0451	-0.7179	-2.88R
24	2.27	3.9286	3.3973	0.0311	0.5313	2.11R
72	1.47	2.6429	3.3275	0.0458	-0.6846	-2.75R

R denotes an observation with a large standardized residual

Descriptive Statistics



Variable: yrs exp

Anderson-Darling Normality Test

A-Squared:	0.710
P-Value:	0.060
Mean	11.1630
StDev	6.0388
Variance	36.4673
Skewness	0.277561
Kurtosis	-7.6E-01
N	46
Minimum	0.0000
1st Quartile	5.0000
Median	10.0000
3rd Quartile	16.0000
Maximum	25.0000

95% Confidence Interval for Mu

9.3697 12.9563

95% Confidence Interval for Sigma

5.0088 7.6060

95% Confidence Interval for Median

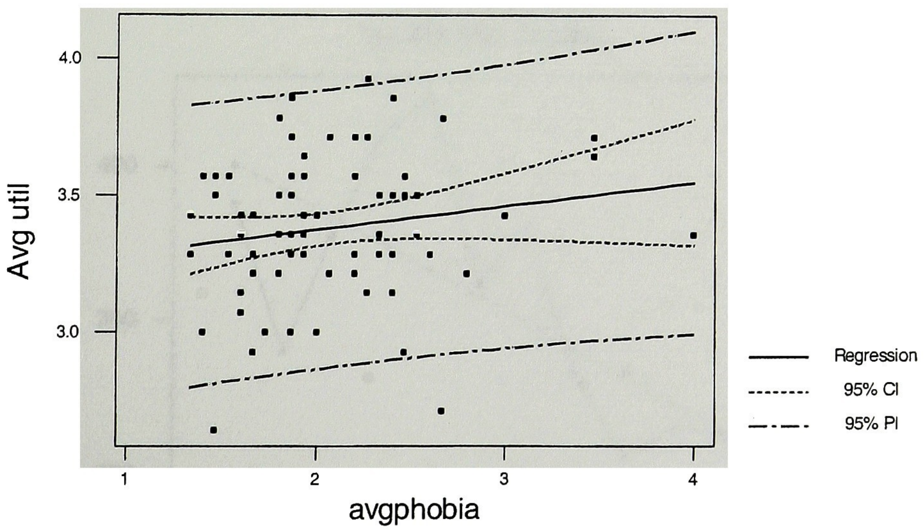
8.0000 13.0000

X denotes an observation whose X value gives it large influence.

Regression Plot

Avg util = 3.19959 + 0.0872343 avgphobia

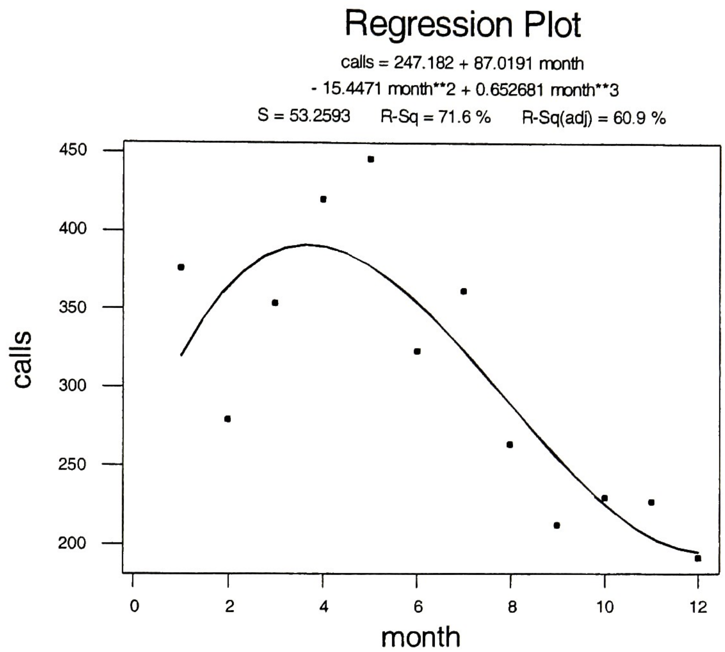
S = 0.253549 R-Sq = 2.9 % R-Sq(adj) = 1.6 %

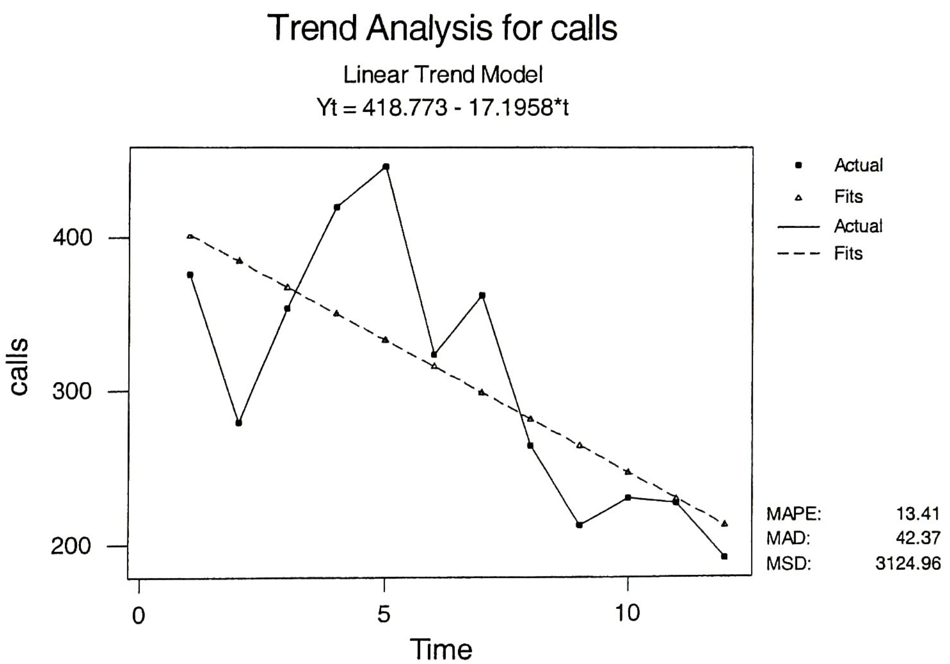


Appendix E

Statistical Results

Analysis 6:





The regression equation is
calls = 247.182 + 87.0191 month
- 15.4471 month**2 + 0.652681 month**3

S = 53.2593   R-Sq = 71.6 %   R-Sq(adj) = 60.9 %

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	3	57091.6	19030.5	6.70902	0.014
Error	8	22692.4	2836.6		
Total	11	79784.0			

Source	DF	Seq SS	F	P
Linear	1	42284.5	11.2760	0.007
Quadratic	1	9872.8	3.2163	0.106
Cubic	1	4934.3	1.7395	0.224

H_0 : Regression is not significant
H_a : Regression is significant

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