Master Thesis

Motivational Factors in Computer Training: The Influence of Promoting Factors on Preventing Factors

Harald Fardal and Henning Tollefsen

2004

Thesis submitted to the Department of Business Administration at the
University College of Buskerud in partial fulfillment of requirements for
the degree of Master of Science in Management Information Systems
Oktober 2004

Foreword

Our research project took place in Malawi, as a part of collaboration between Vestfold University College, Norwegian Church Aid (NCA) and the Christian Health Association of Malawi (CHAM). In the Third World, the influence of computers in society is fairy limited compared to the West. Our project will hopefully add to the knowledge of how IT-training for first-time users should be conducted in countries where computers are not yet integrated as an important tool in everyday work. It will also give computer know-how to the inhabitants of a Third World country. Hopefully it will also contribute to the domain of knowledge of IT-training in the industrialized world.

Working with this project has been a process of learning, hard work, discussions and a lot of fun. Numerous articles have been read and interpreted to enable us to do a well founded literature review within the computer training domain. We would like to thank our supervisor Øystein Sørebø for his clever guidance and ability to get us back on track whenever needed.

Abstract

In this master thesis we investigate how intrinsic motivation plays a part in computer training, and we introduce the terms motivational performance promoting and preventing factors. The concepts computer playfulness and personal innovativeness in IT have their origin in the theory of intrinsic motivation, and are considered to be performance promoting. How they affect the performance preventing factors computer anxiety and computer self-efficacy, that have their origin in the Social Cognitive Theory, has been the main focus in this project. We found that both computer playfulness and personal innovativeness in IT are negatively influencing computer anxiety, but we do not receive support for the positive hypothesized relationships between the performance promoting factors and computer self-efficacy. The measures used in this study are all developed and used in a Euro-American culture. We discuss whether the same measurements scales can be used cross-culturally as we have in this project.

Tønsberg 28.10.2004

Harald Fardal

Henning Tollefsen

Table of Content

1 Introduction

This project is conducted as the final part of the master's program at Buskerud University College. Our Master thesis is divided into seven chapters. First we describe the focus and background of our research project, and state the questions that we think need asking. Secondly we present our theoretical foundation. We include reviews of empirical findings that support our theories. In the third chapter we will develop hypotheses and a conceptual research model which we will later examine empirically. Chapter four to six describe the methods used and the results from our study. In the last chapter we discuss implications and limitations of the study and suggest some directions for future research.

1.1 Focus and Background

The focus of interest in this research project is what kind of personal traits make an individual more or less capable of learning and performing IT-specific tasks. The answer will enable us to develop training courses and techniques that in the end will result in a better learning outcome for individuals (Thatcher & Perrewè 2002).

In the last two or three decades, the technological development has been enormous. In almost every aspect of society (at least in the west), computers are used as tools in one way or another. This again means that there is a great need for individuals who know their way around a computer. In order to satisfy this need, successful IT-training must exist in all areas of society, especially in the educational system and as a part of in-service training. In Norway, for example, the worker's right to personal and professional development is established in the Act relating to worker protection and working environment §12.1:

> *"Conditions shall be arranged so that employees are afforded reasonable opportunity for professional and personal development through their work"*

Naturally this includes IT-competence. In the educational system, computers are widely used as a support tool for numerous subjects and to ensure the processes of learning using several technologies (spreadsheets, word processing, Internet etc.). IT-education where development and programming are in focus is also considered to be an important ingredient of our educational system. It is therefore of the greatest importance that we have knowledge about what type of IT training is best suited for each individual or group of individuals.

During the 1990's there was a growing interest in research on computer training and the diffusion of information technology. A great deal of research has been done on this areas, including work by Gist et al. (1989), Sein & Bostrom (1989), Bostrom et al. (1993), Compeau & Higgins (1995a), Sein et al. (1999), Shayo et al. (1999) and Thatcher & Perrewè (2002). Researchers have had different approaches to computer training. Many have focused on learners' personal traits and in particular the important area of self-efficacy beliefs e.g. Gist et al. (1989), Compeau & Higgins (1995a) and Thatcher & Perrewè (2002). Research shows us that personal traits have a major impact on learning outcomes and learners' ability (or perceived ability) to learn. Other researchers (e.g. Sein & Bostrom 1989; Bostrom et al. 1990; e.g. Olfman & Mandviwalla 1994; Sein et al. 1999; Shayo et al. 1999) have focused on different training methods and strategies. Learners have different needs and different training methods apply to different learner characteristics. This means that in order to gain the best possible training outcome, we must know the characteristics of our course participants so that the most effective training method can be applied. Although this research provides growing evidence that individual differences play an important part in computer training, IT-use and IT-acceptance, more research is needed to give us a better understanding of the processes and differences involved (Marakas et al. 2000).

Different theories have dominated computer training research, with Bandura's (1977aa; 1977bb) Social cognitive theory (also refereed to as Social Learning Theory) being the most widely applied. As mentioned above, there has been a focus on self-efficacy beliefs. The most commonly used IS-variables of social cognitive theory are computer self-efficacy and computer anxiety. Self-efficacy is defined as individuals' perceived ability to perform a specific task/perform specific tasks, in order to reach a certain goal (Bandura 1977b; 1997). Computer self-efficacy is based on self-efficacy and may be defined as individuals' perceived ability to perform IT-related tasks, in order to reach a certain goal. Both terms will be thoroughly discussed in sections 2.2.1 and 2.2.2.

While social cognitive theory is the most dominant theory base for this research field, there are, however, other theories that also contribute to knowledge of IS-specific variables common in computer training research. The theory of intrinsic motivation seems to have made an especial impact on computer training research, and IS-variables like computer playfulness, perceived ease of use and personal innovativeness in IT have their origin in this theory. Venkatesh (2000), for example, suggests in his study that learners with high intrinsic motivation for learning have a higher learning outcome than learners with lower intrinsic motivation. Deci & Ryan (1985) define individuals as intrinsically motivated when they are involved for their own sake – for the spontaneous feeling of satisfaction which can be associated with their effort. Intrinsically motivated persons are involved in activities that interest them, and they choose to do so, of their own free will.

As this brief discussion shows, there are many approaches to computer training research. In this project we will focus on factors in computer training that either can be thought of as motivational performance-preventing factors[1], or motivational performance-promoting factors. This categorization has, as far as we know, not previously been made. However, we believe that such a categorization is useful, and will enable both researchers and practitioners to more easily identify a trait as either performance-preventing or performance-promoting, which furthermore hopefully will simplify the process of choosing the right stimuli during computer training in order to increase learner performance. What we would like to do in this project is to investigate the interaction between the two types of factors. We raise the following question:

> **How do motivational performance promoting factors affect motivational performance preventing factors in computer-training?**

[1] By motivational-performance preventing factors we mean factors that hinder or reduce the effect of a computer-training program or the benefits of using IT. The performance can or will not be at a satisfactory level because of the preventing factors. The opposite factors, motivational performance-promoting factors, are factors that increase the effect of a course or use of IT. The performance can or will be better than expected because of the promoting factors.

2 Theory

As stressed in the introduction the purpose of this study is to investigate the relationship, interaction and influence between *motivational performance-promoting factors* and *motivational performance-preventing factors*. As far as the authors know the research on this topic is insufficient, both in IS-research and the various fields associated with IS-research (e.g. organizational behavior, social psychology). This makes it necessary to firstly review articles on computer training in order to get a general overview of the field, and then secondly review potential preventing and promoting factors, and after that decide which factors to examine further. To make it possible to do this, we have decided to mainly focus on

(a) factors that seems to be important in articles on training/learning in IS research, and
(b) studies from state of the art IS-journals like MISQ, JMIS (etc.)

The main theories supporting this project are, as pointed out in the introduction, the Social Cognitive Theory (Deci 1975; Bandura 1977a; 1986) and the theory of intrinsic motivation (Csikszentmihaly 1975; Deci 1975; Levy 1978). These theories give a good insight into which performance promoting factors and which performance preventing factors are important in learning, and should naturally be included in our discussion and further research.

This chapter is organized as follows: First, as mentioned, we review what we consider to be relevant articles on computer training and learning within the IS research domain[2]. Based upon that review we then extract variables we consider either to be performance preventing or performance promoting, and give a thorough presentation of those. Finally we discuss possible relationships between reviewed variables, which will be the foundation for the development of our conceptual model and hypothesis.

2.1 Computer training

In this section we will present a review of what we have found to be relevant computer training studies, which in our context means studies that focus on the learner and the learning

[2] In order to present an overview of reviewed articles, we have developed a table (Table 1, appendix 1) that summarizes the main findings in our review. The table is organized chronologically and contains articles that are reviewed in section 2.1.1.

process, remembering that our focus is on the learner's personal traits. The review is presenting the studies with focus on their approach and variables with connection to our problem formulation. If one's mission is to realize learners' potential, one way could be through using different training courses or how those are carried out. Another solution might be to know which variables and personal traits are present and how to stimulate these for the purpose of getting better performance or training outcomes. Through this review of computer training articles we hopefully will find some projects that suggest possible solutions to the challenge of getting even more out of the computers and the time spent on computer training. However, as already mentioned, our focus will be on the *motivational performance-preventing* and *motivational performance-promoting* factors and the interaction between and within these two groups of variables. As indicated above many computer training studies have focused on computer self-efficacy, and we acknowledge the importance of this concept. Since such a great focus has been placed on computer self-efficacy in the computer training literature we have decided to divide the following section into two parts. Firstly we first present a review of computer training studies where computer self-efficacy is either an independent or dependent variable. Secondly we review a selection of computer training articles that we find relevant to the particular questions we have raised. Computer self-efficacy is not a part of any of this second group of studies. At the end of the section we summarize the findings. This will provide a foundation for the next two sections, which are dedicated to variables we consider as *motivational performance-preventing factors* and *motivational performance-promoting factors*.

2.1.1 Studies focusing on computer training and Computer Self-Efficacy

The focus on computer self-efficacy has grown over the last decade, and numerous researchers have investigated this concept, regarding it as an important construct in looking at computer training and computer usage. We also consider this construct and the method of computer training as a very relevant and important one. To know how to exploit learners' different potential and style and to employ appropriate training can be of extreme importance when implementing an IS or conducting some computer related courses. We suppose that this is why so many researchers have conducted such research and we will use their and provide a foundation for our work.

Gist et al. conducted one of the earlier studies on self-efficacy in IT training (Gist et al. 1989). They found that when using behavioral modeling in training, subjects showed higher performance, higher self-efficacy, more positive work styles and less negative affect than when compared to more conventional training. The behavioral modeling technique is a method where the learner observes others performing a certain task before he repeats it himself. According to social cognitive theory the behavioral modeling will positively influence the observer's computer self-efficacy. The learners also reported greater satisfaction during the behavioral training program than during the traditional program. Gist et al. (1989) have received support for their findings in more recent studies.

Compeau & Higgins focused on different training strategies in order to gain more insight into the question of training method effectiveness and learning processes (Compeau & Higgins 1995a). They also compared two different training methods – behavioral modeling and a more traditional lecture-based training program. Two dimensions of social cognitive theory – outcome expectations and behavioral modeling – were hypothesized to positively influence performance. It was also suggested that behavioral modeling is an antecedent of computer self-efficacy (Gist et al. 1989) and outcome expectations. The influence will be stronger on subjects who are exposed to behavioral modeling than on the ones that receive lecture-based training.

In a study carried out by Compeau & Higgins, computer self-efficacy is considered as a forerunner to outcome expectations and performance, and outcome expectations as an antecedent to performance (Compeau & Higgins 1995a). The level of prior performance is hypothesized to influence computer self-efficacy, outcome expectations and performance in a positive way. They used an experimental research design with eight different experimental groups and two different software packages (Lotus 1-2-3 & WordPerfect). Their results indicated support for most of their hypotheses for training in Lotus. For training in WordPerfect, however, they did not find significant performance outcomes between the two training programs. This could, according to the authors, be explained by

(a) the possibility that the different training programs (two for each software package) were not similar enough, or
(b) that the subjects were more familiar with word processing (WordPerfect) than with spreadsheets.

In a recent study, Yi & Davis developed and tested a new model in order to trace the influence modeling-based training interventions have on training outcomes (Yi & Davis 2003). In doing so, they extended our knowledge of the importance of observational learning processes and training outcomes and the model also explains the causal relationship between three different training outcomes – declarative knowledge, post-training self-efficacy and task performance. The authors hypothesize that both declarative knowledge and post-training will positively influence task performance, and that immediate task performance along with both post training self-efficacy and declarative knowledge will have a positive influence on delayed task performance. Moreover the developed model indicates that observational learning processes will have a positive influence on both declarative knowledge and post-training software self-efficacy. A retention enhancement intervention is the process in which trainees

> *"organize and reduce the diverse elements of a modeled performance into a pattern of verbal symbols that can be easily stored, retained intact over time, quickly retrieved, and used to guide performance"(Decker 1980; 628).*

A retention enhancement intervention also consists of cognitive rehearsal – the process of imaging doing something one has observed (Decker 1980). In Yi and Davis (2003) model a retention enhancement intervention is considered to have a positive influence on the retention processes. While pre-training motivation to learn according to the model will positively influence the attention, retention, production and motivation processes of observational learning, pre-training software self-efficacy is also hypothesized to have a positive influence on post-training software self-efficacy. The model was tested through an experimental research design, and two different training programs were developed. All hypothesized relationships were significant, except for declarative knowledge, showed no significant influence on delayed task performance.

The authors say that further testing of the model is necessary, in order to empirically validate and explore possible weaknesses in it. In our view, the most interesting part of Yi & Davis' study is the use of pre- and post-training self-efficacy measure together with the direction of training method (Yi & Davis 2003). Introducing the pre- and post-training measures in a study gives a relatively clear indication of the effect training has on one's computer self-efficacy. These three studies have all indicated that a behavioral modeling training technique is more appropriate to computer training, than traditional lecture-based courses, as far as computer self-efficacy is concerned. It seems reasonable to suggest that using such an "untraditional" training strategy might also raise the performance.

Another approach is that of Gist and Mitchell, when they suggest that self-efficacy judgments are made more automatically when subjects are more familiar with a task, as opposed to when subjects are unfamiliar with jobs which require a more in-depth consideration of what the tasks require and whether they are capable of performing them (Gist & Mitchell 1992). Later Marakas et al. make a distinction between general computer self-efficacy and situation-specific computer self-efficacy (Marakas et al. 1998), and it is' possible that the different results between Lotus and WordPerfect in Compeau and Higgins study are a consequence of the subjects experiencing different situation-specific computer self-efficacy between spreadsheets and word processing (Compeau & Higgins 1995a). While some limitations concerning internal and external validity were discussed, the restrictions do not seem to have influenced the findings in this study. The overall conclusion indicated that self-efficacy has a large impact on performance, and for future research they suggest that more ways of encouraging the development of self-efficacy should be investigated. The lack of correspondence between outcome expectations and performance makes it necessary to measure this relationship over time.

Venkatesh and Davis (1996) chose another approach. They model computer self-efficacy as an antecedent to the perceived ease of use construct in the technology acceptance model (TAM) developed by Davis (1989). They hypothesize that general computer self-efficacy is a strong predictor of one's perceptions of how easy it is to use a system'. After hands-on experience subjects will report specific computer self-efficacy on that particular system, and hence it will vary across different platforms. They used an experimental research design where subjects received training in different packages and Compeau and Higgins' 10-item measurement scale for computer self-efficacy was employed (Compeau & Higgins 1995a). Venkatesh & Davis (1996) found that computer self-efficacy is a strong predictor of perceived ease of use, and after hands-on experience with a system one's perceived ease of use changes. Computer self-efficacy, however, is the main predictor of perceived ease of use both before and after hands-on experience. The authors imply that a path for future research could be to study what mechanisms yield computer self-efficacy, in order to develop better training interventions. This we consider to be a very sensible research direction. It is the mechanisms that influence computer self-efficacy that our project largely concerns itself with.

We have experienced that computer self-efficacy is a multifaceted and complex construct and research done by Agarwal et al. (2000), which builds on the work done by Marakas et al. (1998), investigates the relationship between general and specific computer self-efficacy. They make the distinction between general computer self-efficacy, which Marakas et al. defines:

> *"… an individual's judgment of efficacy across multiple computer application domains"(Marakas et al. 1998; 129)*

Task-specific computer self-efficacy, on the other hand, is defined as one's beliefs about one's ability to perform specific computer-related tasks within the computing domain. Their main hypothesis is that one can predict subjects' reported task-specific computer self-efficacy in post-training, by pre-training reported general computer self-efficacy. Two training programs on two different software packages were conducted simultaneously over a two semester period. To measure task-specific computer self-efficacy they, like Venkatesh and Davis (1996) used the 10-item measurement scale developed by Compeau & Higgins (1995b). The results strongly indicate that training in one software package is given, one's task-specific computer self-efficacy on other software packages increases as well (referred to as the "carryover" effect). On the other hand general computer self-efficacy does not necessarily indicate task-specific computer self-efficacy on a given software package. For further research the authors suggest that more determinants of task-specific computer self-efficacy should be investigated, and moreover which sources of general computer self-efficacy/ task-specific computer self-efficacy have the greatest impact on self-efficacy estimates.

A more recent study, that also uses computer self-efficacy as a key variable in the context of IT training, was conducted by Thatcher & Perrewé (2002). In accordance with Agarwal et al.'s (2000) and Compeau & Higgins' (1995a) suggestions for future research, they examined individual traits as antecedents to computer anxiety and computer self-efficacy, to better understand how individual differences influence the use of information technology. They developed a research model consisting of computer anxiety and computer self-efficacy, as functions of stable situation-specific broad traits represented by concepts like personal innovativeness in IT, negative affectivity and trait anxiety. Along with investigating the antecedents to computer anxiety and computer self-efficacy and their effects, they also investigated the relationship between computer anxiety and computer self-efficacy. Their sample consisted of students who were taking a compulsory introductory computing course. Their findings supported a positive, significant relationship between personal innovativeness in IT and computer self-efficacy, which means that individuals with a high level of personal innovativeness in IT, report a high level of computer self-efficacy. There was a negative personal innovativeness in IT correlation with computer anxiety. The relationship between computer anxiety and computer self-efficacy was found to be significantly negative, which was what they had hypothesized. They also made explicit the limitations of their study, such as the external validity, due to the group of respondents. Thatcher & Perrewé (2002) also pointed out that the gathering of information was carried out before the students had interacted with the technology.

Agarwal et al. (2000) suggested that a treatment would influence individuals' beliefs about their specific capabilities, and hence Thatcher & Perrewé (2002) consider this another limitation of their study. The path that Thatcher & Perrewé (2002) have laid for future research is in our view a right one. To understand how personal traits influence each other in computer training is to us of the greatest importance, and we hope to extend the work done by Thatcher & Perrewé (2002) in our project by putting our attention on the *motivational performance-preventing* and *motivational performance-promoting* variables and the interaction between them.

Although it is empirically validated that computer self-efficacy is one of the most important predictors of computer performance, the research on the antecedents of computer self-efficacy does not yet seem to be fully explored. In addition to the study done by Thatcher & Perrewé's (2002), Potosky (2002) conducted a study of computer efficacy as an outcome of training. The study examined the role of computer playfulness, prior knowledge and computer experience antecedents to computer efficacy. A training course in programming was conducted. In looking at the outcome of training, Potosky (2002) suggests that the post-training self-efficacy is related to performance, in other words – training increases self-efficacy. The study defines four hypotheses about the relationships between post-training efficacies and general computer knowledge, training performance and computer playfulness. It is hypothesized that playful and well-performing learners will have increased post-training software self-efficacy. Potosky (2002) adapted measuring scales from earlier research projects for all of the constructs. The results from this study indicated support for the relationship between computer efficacy beliefs and post-training, but not for computer experience and understanding. There were also found positive correlations between post-training efficacy and computer playfulness, but this relation was not significant. We feel that this and the other studies on the antecedents of computer self-efficacy underline the importance of understanding the factors that influence one's computer self-efficacy. If one can stimulate individuals' computer self-efficacy-development, the grounds for better computer performance are laid.

Computer self-efficacy is a concept that by its nature is relatively complex, a really multifaceted construct. The construct seems to be an important concept to understand in order to conduct successful computer training, as the results reviewed in this section have pointed out. The influence of computer self-efficacy beliefs on performance make the concept probably one of the strongest predictors of computer performance, and hence on organizational performance. Venkatesh & Davis (1996) showed that computer self-efficacy could be a predictor for the TAM-construct perceived ease of use. The training method has also been demonstrated to be an important tool in conducting courses to raise the computer self-efficacy, a more positive work style and less negative affect to computer usage (Gist et al. 1989; Compeau & Higgins 1995a; Thatcher & Perrewè 2002 among others). Although computer self-efficacy is quite thoroughly investigated, we find there is a need to further investigate the nature of this concept and we will come back to this construct in the section that deals with *motivational performance-preventing* variables as a part of social cognitive theory.

2.1.2 Computer training and non-computer Self-Efficacy studies

As mentioned above we have also directed our focus on articles about computer training which do not include the computer self-efficacy concept. The reason for doing this is to try to get a wider picture of experiences with different viewpoints of computer training. In one of the earlier studies on computer training, Nelson & Cheney (1987) investigated the relationship between training and what they refer to as computer-related ability, a concept analogous to what most recent studies refer to as performance or task performance (Compeau & Higgins 1995a; Potosky 2002; Thatcher & Perrewè 2002; Yi & Davis 2003 amongst others). Nelson & Cheney (1987) found empirical support that training; improves individuals' computer-related ability. They also found that individuals exposed to training report higher acceptance of the IS which the training program involved. These findings may not be very surprising, but provide important support for the view that appropriate training is necessary for successfully implementing IS's. The results are in accordance with more recent research (Compeau & Higgins 1995a; Potosky 2002; Thatcher & Perrewè 2002; Yi & Davis 2003 amongst others). Just as important as the knowledge that training enhances performance is to know what kind of training intervention is adequate in a given setting.

In the early days of graphical user interface (GUI) Olfman & Mandviwalla (1994) conducted a longitudinal study where the need for different training methods for command based interfaces and graphical user interfaces was investigated. Using one procedural and one conceptual training method on two different groups of learners, they found no significant difference in learning outcome for the two groups. However, over time the conceptual training method seems to produce better learning outcomes for GUI software. The results indicate that just as much effort should be put into training in GUI software as in command-based software, and this study also tells us that choosing the right training method is an important factor in computer training, as we discussed under 2.1.1.

As this review of the computer self-efficacy-studies shows, the differences between individuals' learning styles and capacities are great. There has, however, been conducted research on individual differences in computer training where learning styles and training methods have been focused on. The need for individual differences in training was investigated by Sein & Bostrom (1989). They found that while some learners benefit from abstract models that support training, others benefit more from analogous models, models that incorporate the use of comparable situations to the ones that training includes. These models are more concrete in their approach than the abstract models.

Bostrom et al. (1990) take Sein & Bostrom's (1989) work further and also emphasize the importance of acknowledging differences in learning style. Using Kolb's learning style inventory (KLSI) their results indicate that abstract learners perform better than concrete learners, and that active learners for the most part perform better than the reflective learner. However, their results also indicate that learning mode interacts with training methods. Training methods should hence be tailored for the individual to be assured the greatest possible learning outcome of training. Although being criticized by Ruble & Stout (1993) for using a framework (KLSI) which lacks internal consistency and validity, Bostrom et al. (1993) claim that their adjustment to the framework validated the use of it.

The concept of individual learner needs was further examined by Shayo et al. (1999). They interviewed half of a group of learners before training took place, expecting to register differences between those subjects and those not interviewed with regard to post-training performance. Although the results did not show significant difference in post-training performance, Shayo et al. (1999) found that pre-training participation can be used as a predictor of who will and who will not use a software application after formal training. Pre-training end-user participation can hence be used as a tool to increase the efficiency and long-term value of software training. This research shows us that training methods can make a difference when trying to influence personal traits in computer training, and that research on personal traits such as computer self-efficacy must be aware of this when a learning environment is a research area such as the one we are involved with.

Another approach was employed by Venkatesh (1999), who investigated how the use of an intrinsic motivation-enhancing factor can be used during training in order to create favorable user perceptions towards new technologies. It seems that this approach produced better long-term outcomes, and the work of Shayo el. al (1999) supports this. The study of Venkatesh (1999) suggests that using factors such as computer playfulness during training has a positive effect on learners' intrinsic motivation, and hence increases the value and effect of training. Understanding how intrinsic motivation can be stimulated by training is important knowledge for everyone who is involved in IT-training, whether it is for academic or commercial purposes.

Some research on intrinsic motivation variables has been done. Hackbart et al. (2003) studied computer playfulness and computer anxiety and their influence on perceived ease of use, a Technology Acceptance Model (TAM) construct. TAM was developed by Davis (1989), and is widely used as a model to understand technology acceptance and predict actual use of IT. Computer playfulness can be viewed both as a trait and a state. Hackbart et al. (2003) define playfulness as

> *"being a system specific trait that can change because the experience in using a specific technology increases over time"(Hackbarth et al. 2003; 223)*

First time users of an IS-system may feel intimidated and stressed, and their level of computer playfulness is low. As their experience grows their confidence rises (Wildstrom 1998) Therefore Hackbarth et al. (2003) hypothesize that playfulness mediates the effect of experience on perceived ease of use. Along with the definition of computer playfulness they define computer anxiety as

> *"the apprehension or fear that results when an individual is faced with the possibility of using an IS"(Hackbarth et al. 2003; 223)*

They also hypothesize that anxiety mediates the effect of system experience on perceived ease of use. Using earlier tested measurement tools they found that system experience has a positive significant effect on perceived ease of use. Playfulness also significantly mediated the system experience effect on perceived ease of use, but to a relatively small extent, compared to the direct effect of experience on perceived ease of use. Their last hypothesis was supported; computer anxiety significantly mediated the effect of system experience on perceived ease of use. The results of this study show that system experience might be an antecedent of ease of use. Some limitations to this study pointed out by the authors are that this study does not reflect user changes and reactions over time, and that it does not differentiate between users' anxiety at home and at work.

What we can learn from studies like Hackbarth et al. (2003) and Venkatesh (1999) is that intrinsic motivational factors play an important role in computer training and they must be considered when developing and executing training programs.

2.1.3 The essence of reviewed computer training studies

As this review of the literature shows, there are many different aspects to IT-training. It covers aspects such as deciding and knowing what kind of training intervention produces the highest learning outcomes, knowledge about individuals' ability to learn and the interaction of traits that play a part in IT-training. Taking into consideration the findings of Gist et al. (1989) Compeau & Higgins (1995a; 1995b) Marakas et al. (1998) and Thatcher & Perrewè (2002) it seems quite obvious that computer self-efficacy plays an extremely important part in IT-training. Computer self-efficacy can be used as a predictor of performance and as a predictor of individuals' capability to successfully complete a training program.

Even though computer self-efficacy plays this important and empirically validated role there are still uninvestigated areas. We believe there is a particular need to further investigate computer self-efficacy's relationship with other personal traits such as the constructs computer anxiety, personal innovativeness in IT and perceived ease of use. This study contributes to the clarification of some of these relationships. Just a few of the reviewed studies involved the concept of anxiety or computer anxiety (e.g. Thatcher & Perrewè 2002; e.g. Hackbarth et al. 2003).

As these studies show, computer anxiety has a considerable influence on computer self-efficacy and hence is an important factor in IT-training. While computer anxiety and computer self-efficacy are different concepts, they can both be thought of as motivational performance preventing factors. Computer anxiety and computer self-efficacy are showing a correspondence; when computer anxiety is high, the level of computer self-efficacy is low and vice versa**.** In other words, if a person has high levels of computer anxiety or low levels of computer self-efficacy, his/her ability to learn and perform are probably low. This is not because the person is intellectually incapable, His/her computer self-efficacy and/or computer anxiety levels influence the ability to judge his/her perceptions and chances of successfully completing a task.

Because of this joint action between these two variables and the strong support for their relationship through several studies, we will consider them both as preventing motivational performance in this project. Though computer self-efficacy alone naturally could be thought of as a variable that supports motivation, a promoter for performance, we have decided to discuss it as a preventing factor because of the strong correlation with computer anxiety. We will give a more thorough argumentation for this line of approach in the section dealing with motivational performance preventing factors.

The opposite of motivational performance preventing factors, we consider variables that are motivational performance promoting – factors that enhance the performance when the level of these variables increases. In this review we have found concepts like computer playfulness, personal innovativeness, user involvement and perceived ease of use, amongst others, as typically promoting factors. However, as our review shows, not that much work has been done regarding motivational performance promoting factors connected to computer-training as is the case for the preventing variables, in particular computer self-efficacy. Recent studies conducted by Thatcher & Perrewè (2002), Potosky (2002) and Hackbarth et al. (2003) indicate that this area within the domain of it-training is important to investigate further. Findings in these studies indicate that motivational performance promoting factors can reduce the effect of motivational performance preventing factors, and the interaction between these two categories of variables is interesting when we try to take another step in the direction of the “right” answer regarding computer training and personal traits. However, as this discussion shows, there are still important relationships that remain to be further investigated and hopefully our project can contribute to this research area.

Based on our literature review and the preceding discussion, we will in the next section first discuss and review the theoretical foundations of motivational performance preventing and promoting factors respectively, and the theories which these factors are founded on. Thereafter we finish this section with a brief summary of the *motivational performance-preventing* and *motivational performance-promoting* discussions.

2.2 Motivational performance preventing factors

As already mentioned, there are many factors that affect the performance of individuals in a learning environment. The teaching style and physical conditions such as equipment, literature and so forth will to some extent influence the performance, but are often beyond the control of the learner. Hence it is more interesting to investigate which individual traits affect learners’ performance, and how these traits influence each other. As mentioned, motivational performance preventing factors have negative effect on learners’ performances, and it is important to know which factors that can be thought of as such, in order for educators and others to be able to reduce the effect of these on learners’ performances.

Within the IS domain of research, studies on motivational performance preventing factors have been dominated by computer self-efficacy, (e.g. Thatcher & Perrewé, 2002; Compeau & Higgins, 2001; Compeau & Higgins, 1995; Agarwal et al., 2000; Marakas et al., 1998). Important in all of these studies is how computer self-efficacy in some way or another influences individuals’ computer performance. As stated earlier, we acknowledge computer self-efficacy to be a performance preventing factor and we feel the reason for this encourages a more accurate explanation. We have found through our literature review that when subjects report high self-efficacy levels, they are more likely to perform well, as opposed to when low computer self-efficacy levels are reported. It could, however, also be argued that computer self-efficacy is a motivational performance promoting factor. In doing so, one would argue that because higher levels of computer self-efficacy yield better performance, computer self-efficacy is a promoting factor in that performance enhancement.

However, the properties of the concept imply that individuals reporting high computer self-efficacy levels are more realistic about their actual ability, while individuals reporting low computer self-efficacy levels usually have the ability to perform better than they actually believe they can. To us this is a clear indication that computer self-efficacy is a preventing factor, because lack of computer self-efficacy prevents you from performing in accordance with your abilities, and high levels of computer self-efficacy do not really enhance performance, they just prevent you from performing at a lower level. In the literature we have seen strong evidence for the relationship and a strong negative correlation between computer self-efficacy and computer anxiety (Brosnan 1998; Thatcher & Perrewè 2000; 2002; Hackbarth et al. 2003). The level of computer self-efficacy can be quite well predicted from the reported computer anxiety reported and vice versa. This implies that when a high level of computer anxiety is reported it shows a lack of computer self-efficacy and the confidence that one can perform a certain task will decrease.

There is no doubt about the fact that computer anxiety can function as a preventing variable. The fact that a high level of computer anxiety and the corresponding low level of computer self-efficacy most likely will give a poor outcome of a training program indicates to us that when computer self-efficacy is seen in connection with computer anxiety it is appropriate to consider computer self-efficacy as a preventing variable as well. With these two perspectives in mind, we find it useful to consider computer self-efficacy as a motivational performance preventing factor in our preceding discussion.

While most of the research has focused on computer self-efficacy, some research has also been done where computer anxiety is a central independent or dependent variable, (e.g. Sievert et al. 1988; Thatcher & Perrewè 2002; Namlu 2003). One could possibly argue that anxiety as a phenomenon does not have its theoretical foundation in social cognitive theory, but in our context where anxiety of performing tasks is in question we find that social cognitive theory provides us with the theoretical base we need. As for computer self-efficacy, that concept without doubt is founded in social cognitive theory.

In this section our goal is to give thorough discussions of both computer self-efficacy and computer anxiety. In order to successfully do that, we find it appropriate to first introduce the core concept of social cognitive theory. Secondly we discuss computer self-efficacy based on previous research and social cognitive theory, before doing the same for computer anxiety. Finally we summarize the discussions before moving to the next section where motivational performance promoting factors will be presented.

2.2.1 Social Cognitive Theory

Social cognitive theory was developed by Bandura (1977a; 1982; 1986), and is based on the continuous reciprocal interaction between the environment, behavior and numerous cognitive factors. Social cognitive theory has been widely applied and empirically validated in both the academic and the industrial world, and has been applied to many different environments and training/learning domains. The two most important cognitive factors in social cognitive theory are self-efficacy and outcome expectations.

Self-Efficacy

In the last decades, self-efficacy has been successfully used to predict students'/pupils'/course participants' motivation and learning (Bandura 1986; Zimmermann 1995). Self-efficacy is a core component of social cognitive theory, and is the concept of individuals' perceived ability to perform a specific task/ perform specific tasks, in order to reach a certain goal (Bandura 1986; 1997). Self-efficacy thus focuses on the ability to perform, rather than any psychological or physical characteristics. An individual can report high levels of in one topic/area, and low levels in another. Self-efficacy is in other words a context sensitive concept, Zimmerman (2000).For example is it possible that an individual reports a high level of self-efficacy regarding a specific spreadsheet task, and a low level of self-efficacy when it comes to learning a programming language. Bandura (1977aa) found that individuals that distrust their own capabilities are more likely to fail, and be discouraged by this failure. On the other hand, individuals with great belief in their own capabilities are more likely to succeed and perform well. Bandura's original social cognitive theory framework suggested main antecedents to self-efficacy as

(a) enactive mastery
(b) vicarious experience
(c) verbal persuasion
(d) emotional arousal

Enactive mastery is considered to be the strongest source of self-efficacy-beliefs, because they are predicted on the outcomes of personal experiences. Vicarious experience, on the other hand, depends on an observer's self-comparison and outcomes obtained by a model. If a model is viewed as more talented or better than the observer, then he/she will not take into account the model's performance when judging their own ability. The third strongest antecedent, verbal persuasion, is when outcomes are described verbally and not shown. The credibility of the persuader is therefore a major factor in verbal persuasion. The weakest source of self-efficacy-beliefs is emotional arousal, which can be stress, fatigue or other emotions that can be considered as indicators of physical incapability.

There are also three dimensions of self-efficacy that need further presentation, as self-efficacy-beliefs differ according to these. The three dimensions are

(a) magnitude
(b) strength
(c) generalizability

Magnitude refers to task difficulty. Individuals with high-magnitude of self-efficacy, consider themselves capable of performing difficult tasks. The strength of self-efficacy refers to how convinced one is that one can perform a specific task – in other words how strong the self-efficacy-beliefs are. Individuals with strong self-efficacy-beliefs will be less likely affected by any obstacles that may occur in performing the task, and hence retain their level of self-efficacy, while individuals with weak self-efficacy-beliefs will be more likely to experience frustrations and thereby reduce their beliefs in their own capabilities when obstacles occur. The generalizability dimension of self-efficacy refers to whether the self-efficacy-beliefs are limited to certain situations. Some individuals believe they are capable of performing a given task under various conditions and situations, while others believe that a certain set of circumstances is required in order for them to perform a specific task. A definition of self-efficacy that captures the essence of the concept was developed by Bandura

> *"People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses." (Bandura 1986; 391)*

This means that in, for example, referring to computer self-efficacy, it is not one's ability to double-click an icon or start an application that is in focus, but one's judgment of the ability one has to perform a complete set of tasks like formatting a text document or creating a presentation.

Outcome expectations

Outcome expectations are different from self-efficacy, and are individuals' beliefs that performing a certain task will produce some kind of favorable outcome. The individual does not necessarily need to report a high level of self-efficacy in order to have high outcome expectations; one can believe that performing a certain task will have a favorable outcome, whether or not one has beliefs that one can successfully perform that task (Bandura 1977aa) In early IS-research, outcome expectations received more focus than self-efficacy, and the perceived usefulness construct in the Technology Acceptance Model (Davis 1989) can be considered an analogue to social cognitive theory's outcome expectations.

Anxiety

Anxiety is in social cognitive theory defined as individuals' beliefs about implications performing a specific task and the fear of performing that task due to believed negative outcome. Social cognitive theory also suggests that anxiety and efficacy influence each other. Individuals with high levels of anxiety are more likely to report lower levels of self-efficacy. If these individuals' levels of efficacy should rise, they will tend to report lower levels of anxiety (Bandura 1997). This suggestion from Bandura is indeed supported in our review and by several other research projects concerning both anxiety and self efficacy.

2.2.2 Computer Self-Efficacy

The focus on computer self-efficacy as a key factor in IT-learning and training has grown rapidly the last decade and a fair amount of research has already been conducted where computer self-efficacy either has been an independent or a dependent variable. Main researchers in the area are Davis, Venkatesh, Marakas, Compeau & Higgins, Gist, Webster & Martocchio amongst others. Computer self-efficacy is derived from the more general self-efficacy term discussed above, in comprehension with how Bandura (1977ab; 1986) believes that social cognitive theory can apply to different domains. In this section we will clarify how the concept computer self-efficacy has been developed and used in IS-research, and also how we understand the concept and intend to use it in this project.

Although self-efficacy is very well founded in social cognitive theory, early IS-research somehow struggled to develop a valid and reliable measure of computer self-efficacy and different measurement scales were developed by e.g. Hill et al. (1987) Murphy et al. (1989), Hollenbeck & Brief (1987), Compeau & Higgins (1991), Compeau & Higgins (1995b), Kinzie et al. (1994) and Gist et al. (1989). Even though many different measurement scales were used in early computer self-efficacy-research, the results from these studies are rather similar. An example of a relatively early computer self-efficacy-study is Kinzie et al. (1994) who used Delcourt & Kinzie's (1994) measurement scale for computer self-efficacy when they investigated attitudes and self-efficacy towards computer technologies across undergraduate disciplines. By attitudes the authors refer to attitudes towards computers (ACT), which is a conglomerate of two concepts that within the IS-domain usually are thought of as two distinct phenomena – perceived usefulness (i.e. Davis 1989) and computer anxiety (i.e. Igbaria & Iivari 1998).

Self-efficacy for computer technologies (social cognitive theory) is analogous to what most researchers would refer to as computer self-efficacy. ACT consisted of a 19-item measurement scale, while the measurement scale for social cognitive theory (a total of 46 items) is specific to each task social cognitive theory is measured for; hence the social cognitive theory concept is analogous to what Marakas et al. (1998) and Agarwal et al. (2000) refer to as task-specific computer self-efficacy. The measurement instrument turned out to be internally consistent and the results indicate a strong relationship between experience and self-efficacy. They also found strong support for using attitudes as a predictor of self-efficacy, when effects for experience and demographics are not taken into consideration. Although this measurement instrument together with others proved internally consistent, Compeau and Higgins (1995a) found that no measurement instrument yet captured all the facets of computer self-efficacy and contained essential limitations. They hence express the need for an instrument that is free of these limitations. Through twelve hypotheses and with seven different concepts (encouragement by others, others' use, support, outcome expectations, anxiety, affect and usage) they tried to make a new and better measure of computer self-efficacy. The subjects in their study were knowledge workers as target, which can be characterized as people that must handle large amounts of information.

The results showed that people with higher computer self-efficacy used computers more, experienced less computer anxiety and had more enjoyment from computer use. This study also contains limitations pointed out by the authors. The computer self-efficacy measure used hypothetical scenarios to get answers from the respondents. Scenarios like “if you had been given a new software package for use on job…” were used without referring to a specific kind of software package. Compeau and Higgins (1995a) approached this limitation from two different angles: “does the hypothetical scenario represent an actual situation?” and “the second concern relates to self-efficacy with respect to learning versus using computers” (Compeau & Higgins 1995b; 205). This measurement scale has later been empirically tested and validated in numerous studies (Compeau & Higgins 1995b; Venkatesh & Davis 1996; Thatcher & Perrewè 2002), and can be thought of as the de facto standard for computer self-efficacy measuring. In our project we will adopt and use Compeau & Higgins’ (1995b) scale for measuring computer self-efficacy.

The early problems of developing a measurement instrument for computer self-efficacy could be caused by the way self-efficacy was adopted to fit the IS-domain. In other words, does computer self-efficacy capture the same factors as self-efficacy does according to social cognitive theory? In a thorough review of existing literature, Marakas et al. (1998) found that previous research had mostly focused on general computer self-efficacy, and not the multifaceted nature of the construct. Hence they developed a model that makes a distinction between general computer self-efficacy and task-specific computer self-efficacy. They argue that general computer self-efficacy, which previously had been the way most IS-researchers had used Bandura’s Self-Efficacy concept, really wasn’t in contention with Bandura’s definition of the concept. Instead the authors claim that task-specific computer self-efficacy corresponds to Bandura’s concept of one’s belief that one can perform a certain task. Marakas et al. (1998) define task-specific computer self-efficacy (computer self-efficacy) as

> *“an individual’s perception of efficacy in performing specific computer-related tasks within the domain of general computing” (Marakas et al. 1998; 128)*

In practice all of the reviewed IS-articles contain computer self-efficacy as either an independent variable or a dependent variable, and on the bases of that a model for defining the multifaceted term of task-specific computer self-efficacy is developed. Due to the broad focus of the empirical work to date, the definition is a result of qualitative discussion and review of their findings. In our view this thorough review is just as much an effort to gather, sort and present known antecedents to computer self-efficacy as a definition of the concept. As model of antecedents to computer self-efficacy, however, the work done by Marakas et al. (1998) is very valuable and gives researchers a very comprehensive overview of the concept, as well as a clarification on the distinction between general computer self-efficacy and task-specific computer self-efficacy.

Compeau and Higgins (1995b) and Compeau et al. (1991) argue that computer self-efficacy has a direct influence on performance. These studies also show that outcome expectations influence performance. Self-efficacy also has an influence on computer performance through outcome expectations. In practice this means that learners with low self-efficacy beliefs will be less likely to demonstrate high computer performance. At the same time, if a learner does not believe that the outcome of computer performance is positive, he or she will be less likely to persist in training. Work done by Compeau et al. (1999) showed that computer self-efficacy beliefs amongst individuals can be used as a predictor of use a year later than the actual training took place.

Marakas et al. (1998), suggests that there are two dimensions of computer self-efficacy. Computer self-efficacy can be operationalized at two levels – the *general* computer behavioral level, and the *specific* computer application level. At the application level Marakas et al. (1998) also suggest that we find two dimensions of computer self-efficacy – both at the *application environment* level (A/E), and at the *application – specific* (A/S) level. Task-specific computer self-efficacy is individuals' perception of doing specific task (computer-related) (Marakas et al. 1998). This way of understanding computer self-efficacy is very closely aligned to how Bandura (1977a) conceptualized self-efficacy. On the other hand, the general dimension of computer self-efficacy (general computer self-efficacy) refers to an individual's perceived efficacy across multiple computer application domains (Marakas et al. 1998).

General computer self-efficacy is the accumulation of all task-specific computer self-efficacy of an individual. General computer self-efficacy is therefore not likely to change due to changes in short-term conditions, and will function more as a long-term predictor of computer performance within a broader domain of computer-related tasks. With the definitions of both general computer self-efficacy and computer self-efficacy in mind, we can deduce that computer self-efficacy is more suited for measurement, and therefore operationalizations of this theoretical construct will probably be the choice of most researchers.

Compeau & Higgins (1995b) presents the three dimensions – magnitude, strength and generalizability – of self-efficacy in their definition of computer self-efficacy. Magnitude reflects the level of capability perceived by individuals. In practice this means that individuals with high magnitude computer self-efficacy will be more likely to believe that they can perform a certain task with less support than individuals with low magnitude computer self-efficacy. Individuals with strong (high) computer self-efficacy will believe they can successfully perform more difficult tasks than ones with weak (low) computer self-efficacy.

The generalizability issue is the degree to which individuals' computer self-efficacy-judgment is limited to specific software packages or hardware; individuals with high computer self-efficacy are more likely to perceive few such limitations. The generalizability dimension presented in Compeau & Higgins (1995b) is, in our view, what Marakas et al. (1998) & Agarwal et al. (2000) theorize as general computer self-efficacy versus task specific computer self-efficacy. In our view, one can use the computer self-efficacy measurement scale developed by Compeau & Higgins (1995b) to measure both task specific computer self-efficacy and general computer self-efficacy.

The discussion and presentation of computer self-efficacy in this section clearly shows that this is a very complex concept. With such a multifaceted nature it is understandable that the development of a proper measurement instrument was an important contribution. As Marakas et al.'s (1998) review revealed, computer self-efficacy is such an important factor in understanding different IS-relevant perspectives such as computer training, performance and acceptance. Thatcher & Perrewé (2002) suggest that the antecedents of computer self-efficacy should be further examined, a point of view that we agree with. Hopefully we can make a small contribution to this area within the limits of our master thesis. Considering that computer anxiety and many of the motivational performance promoting factors can be thought of as antecedents to computer self-efficacy, as the review in sections 2.1.1 and 2.1.2 shows.

2.2.3 Computer Anxiety

In this section we will give a closer presentation of the computer anxiety-concept, aiming to show how the concept has been used in previous research and how it is related to computer self-efficacy.

Anxiety is a phenomena of modern times with rapid changes in and development of new technologies and social pressure for using this technology (Cambre & Cook 1985). Within the domain of computers, anxiety towards use has been studied since the early eighties (Raub 1981). Brosnan & Davidson (1989) found that about one third of all individuals experience some degree of computer anxiety, ranging from total refusal towards use to being skeptical about using a particular software package or program. Rosen & Maguire (1990) found that as many as 50% of the college students in their study experienced computer anxiety at some level. Marakas et al. (2000) made a review of the subject and identified more than 10 constructs which we can call antecedents of computer self-efficacy. One of these is computer anxiety. While computer self-efficacy is one’s belief in own capabilities, computer anxiety is one’s fear about the implications of using computers, hereby possible loss of data and other mistakes one can make when using a computer system (Sievert et al. 1988). Computer anxiety is therefore the product of combinations of psychological variables as neuroticism and locus of control (Marakas et al. 2000). Maurer (1983) defined computer anxiety as:

> *”The fear and apprehension felt by an individual when considering the implications of utilizing computer technology, or when actually using computer technology. The individual is in the state (of computer anxiety) because of the fear of interaction with the computer, even though the computer possesses no immediate or real threat.” (Sievert et al. 1988; 244)*

This definition has later been made more precise by Maurer and Simonson (Sievert et al. 1988). The fear of using computer technology can relate to both rational and irrational fear. In their study they suggest some behavioral indicators of irrational fear:

(a) Avoidance of computers and the general areas where computers are located
(b) Excessive caution with computers
(c) Negative remarks about computers
(d) Attempts to cut short the necessary use of computers
(Maurer & Simonson 1984)

Trying to understand computer anxiety in the broad picture, it is important to know the impact computer anxiety has on the computer user. In the context of computer training Bloom & Hautaluoma (1990) suggest that computer anxiety is a preventing factor of learning, hence individuals experiencing high levels of computer anxiety will have a harder time learning to use computers. Although a fair amount of research has been done on computer anxiety, many researchers have focused on the causes of computer anxiety, rather than the consequences (Torkzada & Angulo 1992). Concerning the consequences of computer anxiety, researchers have found that anxious individuals spend more time worrying about the tasks or their performance than on the tasks themselves (Darke 1988). This means that anxious individuals will need more time completing tasks, but they will not necessarily make more errors than non-anxious persons. How we consider the relationship between computer anxiety and performance is in other words dependent on how performance is measured. Although performance often is measured as a combination of time spent and errors made in completing tasks, Bloom & Hautaluoma (1990) found both these factors to be independent of computer anxiety.

Because of the shift in focus by anxious individuals, they will be less likely to perceive high usefulness of computer technology rather than low performance measured with time and errors made, (Brod 1982) As the discussion so far and in the following shows there is a variability in the relationship between computer anxiety and performance, and Szajna & Mackay (1995) argue that computer anxiety cannot be used as a predictor of computer learning performance, and anxious individuals may perform at the same level as non-anxious individuals. However, when confronted with something unexpected during interaction, individuals reporting high levels of computer anxiety will experience a deterioration of their performance.

Computer anxiety – an antecedent of computer self-efficacy?

How does an individual's computer self-efficacy develop? In the IS-literature there are numerous antecedents that have been empirically examined and suggested in theory, and computer anxiety has both been suggested to be an antecedent of computer self-efficacy as well as being in a reciprocal relationship with computer self-efficacy. In the following we will discuss these perspectives and also suggest which one we find most theoretical support for and hence use in our project.

The concept of computer anxiety is considered to be dynamic – both theory and research suggest that it may be influenced by environmental as well as dispositional factors. Factors such as beliefs in own capabilities (computer self-efficacy) influence the level of computer anxiety individuals tend to demonstrate (Marakas et al. 2000). The more confident one is in one's capabilities the lower the computer anxiety-level tends to be. A study conducted by

Kinzie et al. (1994), implies that when the level of computer anxiety grows, the level of computer self-efficacy falls and thereby the proclivity towards using computers is lower. computer anxiety and its relation to computer self-efficacy was the subject of the study conducted by Thatcher & Perrewé (2002). They also conclude that an individual's computer anxiety has a significant effect on that individual's computer self-efficacy. Individuals reporting low computer anxiety are more likely to have high self-efficacy beliefs; however they model computer anxiety as an antecedent of computer self-efficacy.

Marakas et al. (1998)have built on an earlier idea of the reciprocal relationship of social cognitive theory between anxiety and efficacy, hence they suggest that computer anxiety and computer self-efficacy also have this kind of relationship This relationship was also found by Brosnan (1998). This point of view could suggest that anxiety and efficacy are both equally important in influencing how individuals perceive their own skills in performing a task. However, self-efficacy is, as later social cognitive theory research shows (Bandura 1997; Brosnan 1998), the primary influence on performance. We thus agree with Bandura and Brosnan that efficacy beliefs are the primary determinant of behavior, and we therefore suggest that computer anxiety should be considered as an antecedent to computer self-efficacy, as have Thatcher & Perrewé (2000), although a reciprocal relationship between computer anxiety and computer self-efficacy seems to be present.

Computer anxiety is an important factor to consider in computer training. Practitioners and trainers need to acknowledge the influence computer anxiety has on learners' performance and outcome of training. The fact that we consider computer anxiety to be an antecedent of computer self-efficacy makes it even more relevant a concept. Although not a part of this project, understanding the antecedents of computer anxiety is a research task we would encourage. For our project, however, the main focus will remain on computer anxiety's influence on computer self-efficacy.

As the presentations made in this chapter thus far show there has been done a considerable amount of research on motivational performance preventing factors within the computer training domain, especially on computer self-efficacy. Computer self-efficacy has, through empirical research been pointed out as one of the most reliable predictors of performance and training outcome. Research has also shown that computer self-efficacy is an important antecedent to perceived ease of use, a relationship which will be discussed later in our paper.

The findings in the previous sections also give strong indications that computer anxiety should be considered as a relatively strong influencer on computer self-efficacy, with a high negative correlation. Some projects have even treated computer anxiety as an antecedent to computer self-efficacy. However, the research on this relationship is, although emerging, in our opinion fairly limited and we feel that it needs further investigation. We find it particularly relevant to test this relationship under the influence of some motivational performance promoting factors which will be discussed in the next section.

2.3 Motivational performance promoting factors

Thus far we have focused on performance preventing factors, like computer self-efficacy and computer anxiety. In this section we will focus on what we term motivational performance promoting factors. We will first present the theory of intrinsic motivation, and then we continue with factors that have been researched in earlier studies. The list of factors can not be characterized as exhaustive, but is founded on the literature we have been studying this far. The variables that will be presented are personal innovativeness in IT, user involvement, perceived ease of use and computer playfulness. These factors, that encourage performance and enhance the intrinsic motivation in the learners, seem to be important in computer training and in use of information technology. Such factors can be of a general character, but some have also a specific dimension directly related to IT. Two instances of such factors are innovativeness and playfulness, both having a general and a specific IT-dimension. According to what we have found in the IS-specific literature, these constructs have been widely used in different studies within the field of computer training (Venkatesh 1999; Thatcher & Perrewè 2002; Hackbarth et al. 2003). The findings regarding these concepts are rather interesting and show that the concepts have considerable influence on computer usage and performance. We therefore start this chapter by presenting the key aspects of the theory of intrinsic motivation, followed up by the concepts we consider to be important factors in computer training.

2.3.1 The theory of Intrinsic Motivation

As stressed in the introduction, we find it very interesting and useful to investigate to what extent motivational performance promoting concepts can influence the effect of motivational performance preventing concepts. As mentioned above, we have found that many of the motivational performance promoting factors have their roots in the theory of intrinsic motivation. In this section we will present this theory as a theoretical base for the concepts discussed thereafter.

According to Vallerand (1997), motivation is a concept consisting of intrinsic and extrinsic factors. Factors like computer anxiety, computer playfulness and computer self-efficacy are factors that have been referred to as intrinsic motivational factors, and will have the main focus in this paper. Extrinsic motivation, on the other hand, has been referred to as behaviors to achieve a specific goal (Venkatesh 1999). Deci et al. (1991) also divide motivation into extrinsic and intrinsic motivation. While extrinsic motivation refers to behaviors that are instrumental by nature, intrinsic motivation refers to behaviors that individuals do for their own sake. In other words – when individuals are intrinsically motivated they freely and with interest participate in activities and the necessity of a reward of some kind for engaging in a certain activity does not have to be present (Deci & Ryan 1985). The pensioner playing golf everyday just for the pleasure of it, is intrinsically motivated. Behaviors that are intrinsically motivated emerge from the self. Four categories of features that trigger intrinsic motivation have been suggested by Malone and Lepper (1987). The four categories are:

(a) challenge
(b) curiosity
(c) control
(d) fantasy

Challenge refers to the idea that intrinsic motivation will occur when there is an alignment between the task and the skills of the person performing it. The term has also been referred to as effectance, competence or mastery motivation (Deci 1975; Bandura 1977a; Harter 1978). This dimension of intrinsic motivation is within the IS-field of research captured by the TAM construct perceived ease of use, which will be reviewed closer later in this section.

Curiosity consists of sensory curiosity and cognitive curiosity, and is present in situations where there are complexity, incongruity and discrepancy(Piaget 1951; Berlyne 1960; Hunt 1961; Malone & Lepper 1987). Cognitive curiosity is triggered when there is a difference in what the learner is expecting and what actually happens in an activity. Thus the learner is motivated to explore the reasons for this (Malone & Lepper 1987). When attention-attracting features of a learning environment are present, such as video or audio, sensory curiosity arises (Malone & Lepper 1987). In an IT-setting this concept could relate to personal innovativeness in IT they way it is used by Agarwal & Prasad (1998) and Thatcher & Perrewé (2002), however it is also this dimension of intrinsic motivation that is the basis for the similar, but distinctly different concept of computer playfulness, a concept which has been investigated by different researchers, (Starbuck & Webster 1991; Webster & Martocchio 1992; Venkatesh 1999; Hackbarth et al. 2003). Both computer playfulness and personal innovativeness in IT will be looked at in more detail later.

Control, which is analogous to what Deci (1975) refers to as self-determination, is considered to promote intrinsic motivation because it gives learners a feeling of control over choices and actions they make. This means that learners are responsible for any kind of outcome regarding the choices and actions they have taken.

The fourth category is fantasy, understood as metaphor or analogy, and is the concept of the learner evoking images of situations not actually taking place. Learners use their existing cognitive patterns or knowledge and try to fit the information into what already exists, (Ausubel 1963; Singer 1973; Anderson & Pickett 1978; Malone & Lepper 1987). An example of a metaphor is the desktop on a pc-system, which is a metaphor of a real desktop, an object most learners know.

2.3.2 Computer Playfulness

As mentioned above, playfulness is a factor that we typically can describe as a dimension of intrinsic motivation, originating in personal traits. The concept of computer playfulness refers to individual users' tendency to explore and act spontaneously with computers (Hackbarth et al. 2003). It has earlier been referred to as Microcomputer playfulness (Webster & Martocchio 1992), computer playfulness (Hackbarth et al. 2003) and IT-playfulness. We prefer to use computer playfulness in this paper. 'Playful individuals' have been described by Barnett (Barnett 1991):

> *"Individuals with playful dispositions are said to be guided by internal motivation, an orientation toward process with self-imposed goals, a tendency to attribute their own meanings to objects or behaviors (that is, to not be dominated by a stimulus), a focus on pretense and nonliterality, a freedom from externally imposed rules, and active involvement"(Webster & Martocchio 1992; 52)*

Computer playfulness has as a personal trait received some, but arguably not enough attention in research on computer training. Webster and Martocchio (1992) focused on what they referred to as microcomputer playfulness and developed a measurement instrument of this construct. This construct is, in our view, analogous to what others have referred to as computer playfulness. They focused on the construct as a situation-specific and an individual characteristic presented as a type of intellectual or cognitive playfulness, a trait. Furthermore they described microcomputer playfulness as an individual's tendency to interact spontaneously, inventively and imaginatively with computers, one that has both negative and positive effects as far as workplace implications are concerned (Starbuck & Webster 1991).

They found that their measurement instrument Computer Playfulness Scale (CPS) was both reliable and valid. Altogether they found that CPS was positively related to computer attitude, computer competence, learning, involvement, satisfaction, positive mood and computer efficacy. The scale was related negatively to computer anxiety. Out of this Webster and Martocchio (1992) conclude that computer playfulness is an important construct that should be investigated carefully in future research on human-computer interactions. Webster & Martocchio (1992) also indicate that general playfulness can be viewed as a state, as well as a trait. They were examining general playfulness as an individual trait in their study, formed as a multifaceted construct consisting of cognitive spontaneity, social spontaneity, physical spontaneity, manifest joy and sense of humor. They used the factor of cognitive spontaneity as the most relevant one to describe computer playfulness and the interaction between computers and humans.

On the other hand, Venkatesh (1999) viewed playfulness as a state induced as an intrinsic motivation in a training process with the objective to enhance the perceived ease of use and intention to use (Venkatesh 1999). Computer playfulness might also have both negative and positive effects on organization's outcomes (Starbuck & Webster 1991).

A study that extends the concept of computer playfulness as an individual trait is Yager et al. (Yager et al. 1997). Using a longitudinal design and the Computer Playfulness Scale (CPS), they tested temporal stability and situational consistency of the playfulness construct. Computer playfulness was examined as a mediator between system experience and perceived ease of use, where they used Microsoft Excel as the target system. Undergraduate students participated in a four week voluntary computer course at a US university, receiving course credits for their participation. They found computer playfulness to be a stable trait. Hackbarth et al. (2003) defined playfulness as

> *"being a system specific trait that can change because the experience in using a specific technology increases over time" (Hackbarth et al. 2003; 223).*

According to this, the general playfulness in a person will vary depending on what kind of technology that is used (Hackbarth et al. 2003).

Thus far we have seen that computer playfulness has both positive and negative effects at work. These effects are mostly positive, due to training. Especially interesting to us are the findings of Webster and Martocchio (1992), who found positive support for the relationship with factors such as attitude, learning satisfaction and computer efficacy. Interesting are also the findings of Venkatesh (1999), that find that a game-based training, trigging individuals computer playfulness, gave higher technology acceptance than a traditional training method. This again made users more likely to perceive that the specific system was easier to use. The implications of these finding relate to how we will design our training-courses related to this project and how they may affect the performance of the participants.

2.3.3 Personal Innovativeness in IT

As well as computer playfulness, the concept of personal innovativeness in IT is connected to the dimension of intrinsic motivation which Malone and Lepper (1987) referred to curiosity. Personal innovativeness in IT has been investigated in several studies, and we find it interesting in our project because of the connection with curiosity, willingness to try out new technologies and experimenting with them. We also consider the concept not to be fully investigated, and we find it useful to conduct further research on personal innovativeness in IT in order to broaden the picture and our knowledge of the concept. According to Thatcher & Perrewè (2002), a person's willingness to adopt and experiment with unknown technology might give a higher learning outcome from a course and a more brief insight of that technology. The general term personal innovativeness refers to how willing a person is to change and how willing he or she is to take the risk of that change and uncertainty (Thatcher & Perrewè 2002). The IT-specific term personal innovativeness in IT has been defined as

> *"the willingness of an individual to try out any new information technology" (Agarwal & Prasad 1998b; 206).*

Thatcher and Perrewé (2002) examined the role of personal innovativeness in IT as an antecedent to computer self-efficacy and computer anxiety. According to earlier research, personal innovativeness acts like a positive stimulus for the self confidence to perform new and unknown tasks. More innovative people tend to seek out new and stimulating experiences (Venkatraman 1991). Thatcher and Perrewè formulated two research hypotheses in their study (2002), involving personal innovativeness in IT, computer self-efficacy and computer anxiety. They found a positive significant relationship between personal innovativeness in IT and computer self-efficacy, high personal innovativeness in IT subjects reporting high computer self-efficacy. Computer anxiety was related negatively to personal innovativeness in IT. Low personal innovativeness in IT subjects reported high computer anxiety and vice-versa. These finding are very interesting to researchers that are studying computer self-efficacy, user performance and training. Based on prior research we therefore consider personal innovativeness in IT to be a personal trait that is motivational performance promoting, and a highly relevant factor in computer training.

2.3.4 User Involvement

The next concept considered to be an intrinsic motivational concept is user involvement. User involvement has in earlier IS-research been used interchangeably with user participation (Barki & Hartwick 1994). Barki & Hartwick (1994) claims that these are separate concepts, and therefore need to be defined separately. Involvement in other areas of research has been used to describe a psychological state reflecting how individuals feel about the relevance/importance of an issue, job or advertisement or product (e.g. Sherif et al. 1965; e.g. Krugman 1967; Lawier & Hall 1970). Barki & Hartwick (1989) suggest that we refer to user involvement when we refer to a subjective psychological state reflecting the importance and personal relevance that a user attaches to a specific system. The distinction between user participation and user involvement has also gained empirical support in research done by Jarvenpaa and Ives (1991) and Kappelman and McLean (1991). In an IS-relation the concept of user involvement can be defined as a psychological state reflecting the importance and personal relevance of a new information system.

2.3.5 Perceived Ease of Use

As pointed out earlier in this paper, perceived ease of use has been a subject of research several times, involving different approaches. Perceived ease of use has been investigated as a factor influencing factors such as perceived usefulness and behavioral intention to use in several studies (e.g. Davis 1989; Adams et al. 1992; Venkatesh & Davis 1996; e.g. Agarwal & Karahanna 2000; Davis & Wiedenbeck 2001). The perceived ease of use concept has been described as

> *"the degree to which a person believes that using a particular system would be free of effort"(Davis 1989; 320).*

Davis (1989) found this construct to be similar to Bandura's self-efficacy concept, a suggest in later research ejected by other researchers (e.g. Igbaria & Iivari 1995; Venkatesh 1999). More precise self-efficacy has strong relationships to perceived ease of use, but is considered to be an antecedent of computer self-efficacy (Venkatesh & Davis 1996). We agree with Venkatesh & Davis (1996), and consider computer self-efficacy to be an antecedent of perceived ease of use. This view is also supported by Iivari & Igbaria (1995) who found that self-efficacy correlates positively and directly with perceived ease of use. According to Bandura's (1982) social cognitive theory and more recent research in this field, perceived ease of use has been found to be an important predictor of user behavior, influenced, as mentioned, by computer self-efficacy.

A study presented by Venkatesh & Davis (1996), investigated how perceived ease of use evolved over time with hands-on experience. They used the technology acceptance model (TAM), which involves perceived ease of use and perceived usefulness, to predict the user's intention to use a specific system in the workplace, and focused on understanding the determinants of perceived ease of use.

Research in the reference field of MIS, as the organizational and the psychological field, suggest that perceptions evolve and are more specific after direct experience (Fazio & Zanna 1981). In the context of the MIS-field, this means that users with experience in a specific domain will base their conclusions and perceptions on more specific and tangible properties of a given system. This is also supported by Iivari & Igbaria (1995). Venkatesh & Davis (1996) therefore hypothesized that perceived ease of use is affected by (amongst other antecedents) objective usability after hands-on experience, moderated by experience. As mentioned, computer self-efficacy is a strong predictor of user perceptions, and that means that these perceptions form the user's acceptance or rejection of a specific system (Venkatesh & Davis 1996). In a computer training context this is another consideration which also underlines that the first thing one should do when an IS-system or a program is introduced is to acknowledge the importance of stimulating the learners' computer self-efficacy. If one can successfully increase individuals' computer self-efficacy, that is very likely to cause a rise in the user's perception and perceived ease of use, making the chance of success more likely.

Perceived accessibility of IT, a multifaceted, multi-dimensional construct, was found by Karahanna and Straub to have positive significant direct effect on perceived ease of use (Karahanna & Straub 1999). This means that the amount of physical access and the ability to use the system successfully are important determinants and preconditions for using technology and form the users' perceived ease of use. They tested this hypothesis in a study with the intention of explaining the psychological origins of usefulness and ease-of-use. Additionally they tested the effect of perceived ease of use on perceived usefulness and found, not surprisingly when we consider other studies (i.e. Davis 1989; Venkatesh & Davis 1996), a significant influence from perceived ease of use on perceived usefulness (Karahanna & Straub 1999).

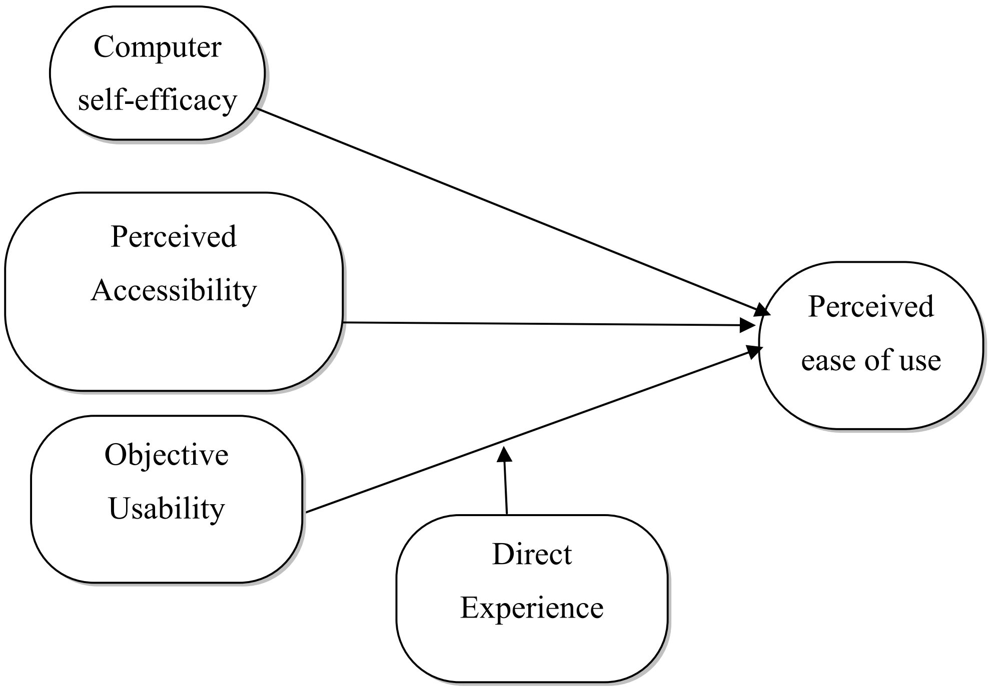

Figure 1: Constructs influencing perceived ease of use

This relationship has also been found by Igbaria & Iilvari (1995), to be even stronger. Together with these findings, they also found that perceived ease of use had an important role in mediating the relationship between experience, anxiety and perceived usefulness. But they found no support for a direct effect between perceived ease of use and usage. Other studies support the theory that perceived ease of use influences usage only through perceived usefulness, and not as a direct effect (Davis 1989; Venkatesh & Davis 1996; Venkatesh 1999). In the light of the strong empirical evidence supporting perceived ease of use being a predictor of actual IS use through perceived usefulness; we find it useful to focus on the antecedents of this construct.

In this section we have focused on motivational performance promoting factors, factors that according to several research projects have had a positive influence on individuals' performance related to outcome of training and different aspects of learning. At least three of these factors can be said to have a connection to the theory of intrinsic motivation and the four dimensions of this theory presented above. The perceived ease of use concept has appeared to have had little direct influence on computer usage, but influence on the actual use only through perceived usefulness. On the other side, the computer self-efficacy is a strong predictor of users' perceptions and can be used to both predict and affect the perceived ease of use concept. When it comes to the user involvement concept, we proposed to treat this as a psychological state reflecting the importance and personal relevance of a new information system. Regarding training this means an introduction of a new technology or new techniques. Computer playfulness was introduced and has appeared to have both negative and positive effects. However, mostly positive effects were found to influence learners' in training. The relationships to attitude, learning satisfaction and computer self-efficacy seem to be relevant, together with findings connected to game-based training. We have discussed personal innovativeness in IT, the variable describing a person's willingness to adopt and experiment with unknown technology. Connected to training it is possible that individuals with high personal innovativeness in IT, will have a higher learning outcome than those with lower levels of personal innovativeness in IT. Besides this there have been found positive, significant relationships between personal innovativeness in IT and computer self-efficacy. We have also seen that computer playfulness has been found to have positive relationships with to computer attitude, competence, involvement and satisfaction. Even more interesting for our purpose are the positive relationships between computer self-efficacy and learning outcome.

2.4 Theoretical summary

In this chapter we have built the theoretical framework of our research project. Firstly we conducted a thorough review of what we can refer to as performance preventing factors in computer training. The main theory supporting these factors we found to be the Social Cognitive Theory, initially developed by Bandura (1977a), where self-efficacy is an essential component. Self-efficacy is one's belief that one can perform a certain task. In the domain of computers we hence use the term computer self-efficacy, and it is the concept of one's belief that one can perform a certain computer-related task. Through reviewing previous research we have shown that computer self-efficacy is strongly related to performance and outcome of training.

In the theory of intrinsic motivation (Deci & Ryan 1985; 1991) we have found that intrinsic motivation increases learning performance, and that intrinsic motivation can be divided into different categories – challenge control, curiosity and fantasy. The IS-variable perceived ease of use refers to the challenge category, while computer playfulness and personal innovativeness in IT are based on the curiosity element of intrinsic motivation

In this project we have categorized personal traits as being either motivational performance preventing or motivational performance promoting factors. The reviews carried out in this chapter give, in our opinion, support for this. For example, given a student at a certain performance level participating in a computer course, and not including any performance promoting factors, what happens if this student has high computer anxiety and hence low computer self-efficacy? These two factors will influence the learning process in a negative way, and the learning outcome for that particular student will be little (of course unless computer anxiety and computer self-efficacy change dramatically during training). On the other hand, if the same student had low levels of for example personal innovativeness in IT and computer playfulness (not considering computer anxiety and computer self-efficacy levels at all), the student might lack an "inner glow" making the learning outcome great, but will probably experience a satisfactory learning outcome. The presence of motivational performance preventing factors may in other words have a destructive influence on learning, while the presence of motivational performance promoting factors can be thought of as factors enhancing learning.

It seems to be the case that factors with their origin in social cognitive theory (computer self-efficacy and computer anxiety) can be considered motivational performance preventing, and factors with their origin in the theory of intrinsic motivation can be considered motivational performance promoting factors. This interpretation will be a part of our discussion in the next chapter.

3 Hypotheses and conceptual model

In the previous chapters we have presented theories and research on performance preventing and performance promoting factors in computer training. In-depth presentations of variables that we consider central have been conducted, on variables such as computer self-efficacy, computer anxiety, personal innovativeness in IT and computer playfulness. In this chapter we will develop a conceptual research model and hypotheses based on this. In the first section our conceptual research model is developed and discussed, and in the section thereafter we present our hypotheses and discuss them. Lastly we summarize this chapter and lay the ground for future contributions to the domain of computer training.

As we have stated earlier we wish to ask two questions:

(a) To what extent do motivational performance promoting factors affect and modify the relationship between motivational performance preventing factors in computer-learning?

(b) How do motivational performance promoting factors affect and modify motivational performance motivation preventing factors in computer-learning?

Our conceptual research model will attempt to answer these questions.

3.1 Conceptual model

We have stated earlier that we with our project hope to contribute to existing knowledge on computer training, and we have in the previous chapter built up a theoretical framework which will serve as a foundation for our conceptual model. As our theory review shows, to categorize variables as either motivational performance preventing or motivational performance promoting seems adequate. We only found two major performance preventing factors, computer anxiety and computer self-efficacy, and we choose to include both in the continuation of this project. As many as four performance promoting factors have been presented in this project, and we find it useful to only include two of those factors in our model. Computer self-efficacy has been established as an antecedent to perceived ease of use and may be considered more as an outcome of training than an important factor for learning.

We choose hence to exclude that concept from our project. User involvement might also prove very valuable in the introduction of new technology in computer training, but we choose to focus on stable traits as personal innovativeness in IT and computer playfulness. They are both concepts which originate in the theory of intrinsic motivation and concepts that in various research settings have been found important in computer training. As far as we can tell, there has been little or no research where these motivational promoting factors are studied simultaneously, in order to measure the effects they might have on the performance preventing factors computer anxiety and computer self-efficacy.

In this section we will first present the development of our conceptual research model, and discuss the relationships in it. At the end of the section we present a summary of the discussions made.

3.1.1 Development of the conceptual model

As stated earlier we hope that this study can contribute to previous research on computer self-efficacy and computer training in general. computer self-efficacy has been treated both as a dependent variable (Torkzadeh & Koufteros 1994; Henry & Stone 1995; Compeau & Higgins 1995a; 1995b; Thatcher & Perrewè 2002 and more), as a independent variable (Marakas & Hornik 1996 and more; Venkatesh & Davis 1996) and also as both a dependent and independent variable at the same time (Gist et al. 1989; Henderson 1994). While there is strong empirical evidence that computer self-efficacy is a predictor of perceived ease of use and has a positive influence on performance, we find it useful to build on existing research on how individual traits influence or moderate one's computer self-efficacy. Figure 2 shows our conceptual model. We have chosen personal innovativeness in IT and computer playfulness our motivational performance promoting factors. As the model shows, we will investigate these variables' direct influence on computer anxiety and computer self-efficacy.

Thatcher & Perrewè (2002) found that personal innovativeness in IT influences computer anxiety negatively and computer self-efficacy positively, hence learners with high personal innovativeness in IT will experience lower levels of computer anxiety and higher computer self-efficacy than learners with low personal innovativeness in IT. We consider these findings to need further empirical validation. Venkatesh (1999) found that computer playfulness positively influences perceived ease of use. As computer self-efficacy is considered to be an antecedent of perceived ease of use, we find it interesting to investigate computer playfulness' direct influence on computer self-efficacy.

Although knowledge about the direct influence personal innovativeness in IT and computer playfulness have on respectively computer anxiety and computer self-efficacy is very valuable, as stated earlier, we also find it appropriate to investigate any possible moderating effects computer playfulness and/or personal innovativeness in IT can have on the relationship between computer anxiety and computer self-efficacy. We believe that our conceptual model also reflects this.
As figure2 shows, we have included performance in our model.

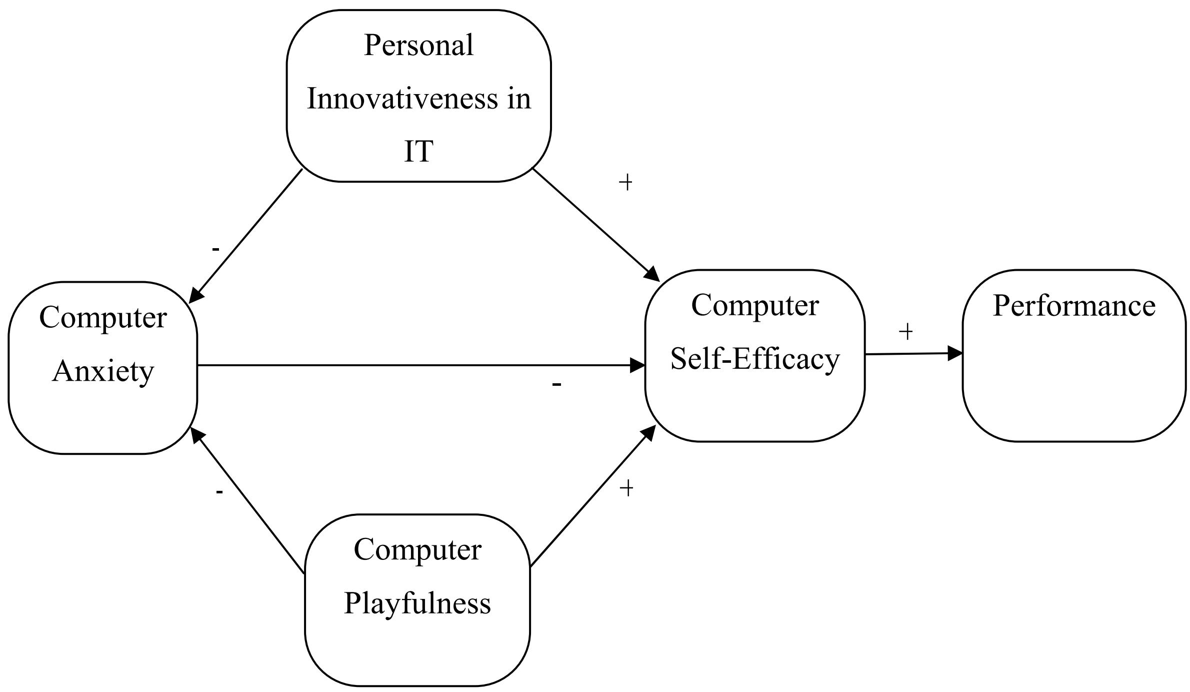

Figure 2 - Conceptual model

Performance in this context is thought of as post-training performance. There is strong empirical evidence that post-training performance is strongly influenced by computer self-efficacy. Performance is included in our project to further validate this relationship and we also find it interesting to experience if performance is higher on learners reporting same the level of computer self-efficacy, but different levels of computer playfulness or personal innovativeness in IT.

The relationships in our model will be further discussed in the next section where we develop our hypothesis.

3.2 Hypotheses

In this section we will present the development of our hypothesis based on the conceptual model presented in the previous section.

H1: *Computer anxiety will negatively influence computer self-efficacy.*

Previous research on computer anxiety has been divergent as to whether or not there is a reciprocal relationship between computer anxiety and computer self-efficacy, as discussed in Marakas et al. (1998). We do however, agree with Bandura (1997), and model computer anxiety as an antecedent to computer self-efficacy. In light of prior research on these variables (Thatcher & Perrewè 2002) we hypothesize that one's computer anxiety will influence one's computer self-efficacy in the way that the higher computer anxiety level is the lower one's computer self-efficacy will be.

H2: *Personal innovativeness in IT will positively influence computer self-efficacy.*

This personal trait has in previous research been shown to influence computer self-efficacy in a positive way, (Thatcher & Perrewè 2002). Persons with high personal innovativeness in IT will be more curious about new technology, and hence we hypothesize that this also increases these persons' perceived beliefs about mastering computer tasks.

H3: *Computer playfulness will positively influence computer self-efficacy.*

Computer playfulness is another personal trait that IS-research has focused on in the last decade, (Starbuck & Webster 1991; Webster 1991; Webster & Martocchio 1992; Venkatesh 1999; Hackbarth et al. 2003). Potosky (2002) found that there is a correlation between computer playfulness and computer self-efficacy, but it was not significant. Other research, however, has found a significant correlation between the two variables, indicating that persons with a high level of computer playfulness will report high levels of computer self-efficacy. In our model we also hypothesize this relationship.

H4: *Personal innovativeness in IT will negatively influence computer anxiety.*

This hypothesis is to be seen in the light of the results from Thatcher & Perrewé's (2002) study. Individuals who are curious about computer technologies are less likely to experience anxiety about computer use. The theoretical support for this relationship can be deduced from both the theories in our theoretical framework, i.e. (Bandura 1977a; Deci & Ryan 1985; Bandura 1997). If personal innovativeness in IT can reduce anxiety in learners, then theoretically the self-efficacy beliefs should raise and in the end performance enhanced.

H5: *Computer playfulness will negatively influence computer anxiety.*

We have found no previous research that has investigated the relationship between these two variables. However, based on the characteristics of the variables, we believe that the hypothesized relationship is very likely, and if we can find empirical support for it, there will be consequences for both academics and practitioners in the context of computer training. Computer playfulness has its origin in the same dimension of intrinsic motivation as personal innovativeness in IT, and hence the same theoretical support for it can be argued.

H6: *Computer self-efficacy will have a positive influence on performance*

This relationship is well empirically established (Gist et al. 1989; Compeau & Higgins 1995a; Marakas & Hornik 1996) and we include it in our model to hopefully further empirically establish this relationship.

4 Methods

In this chapter the study's methods will be presented and discussed. The conceptual model and hypotheses presented in the previous chapter will naturally influence the methods used in this study. The research design will be influenced by the conceptual model and the hypotheses, due to the fact that the research design must contribute with information that makes it possible to conduct hypotheses testing. Not only does the choice of research design influence on the choice of research setting, but it also gives implications for how this study's variables may be measured and how to collect data. First in this chapter we discuss and describe research design, and then setting is discussed. Thereafter measures for the constructs and the procedures for data collection in this study are presented.

4.1 Design

Choosing a research design means choosing a guideline for how to conduct the study. The design will make it possible for the researcher to reach certain explanations and explore possible causality between variables (Frankfort-Nachmias & Nachmias 1996). A decisive factor when choosing design is what kind of theory one wants to test. Both experiment and survey are common designs, and longitudinal designs are also widely applied. We have chosen a survey design and in the following we will present different criteria for making decisions about research design.

Our research proposal was to study effects between motivational performance promoting and preventing factors. In order to study these effects and interactions, we have to predict causality between computer anxiety and computer self-efficacy, between computer playfulness, computer anxiety, respectively, and computer self-efficacy. The relationships between personal innovativeness in IT and computer anxiety/computer self-efficacy are also a matter of interest in this study, and all of these relationships are formulated in our hypotheses. In order to draw conclusions that causality exists between two variables, three different conditions must be fulfilled – isolation, co variation and direction (Bollen 1989; Frankfort-Nachmias & Nachmias 1996).

The isolation condition means that the two variables one predicts causality between (i.e. X and Y) are under no influence from other factors. In other words, no other variable than X, leads to Y. Isolation is very important for internal validity (Mitchell 1985), hence one will try develop a model where all X's that possibly can influence Y is included. In this study this means that computer anxiety, personal innovativeness in IT and computer playfulness, that are independent variables, should be the only ones influencing computer self-efficacy. That being the case, determining causality between them would be a quite straightforward matter. However, true isolation of two or more variables is impossible to achieve when measuring social phenomena. Bollen therefore recommends that researchers strive to achieve "pseudo-isolation", where an error term that represents all other factors that influence Y is added. Pseudo-isolation entails that $\mathrm{COV}(x, \xi) = 0$ (Bollen 1989). What this really means is that the effect of relevant variables are controlled for, and that the relationship between X and Y still is accounted for. We can also assume that any spurious or masked relationships through this test will be disclosed. A masked relationship entails that a "true" correlation between X and Y are present but not disclosed, and a spurious effect means that there is an unknown intervening variable that leads to the relationship between X and Y (Mitchell 1985; Frankfort-Nachmias & Nachmias 1996). One can through different designs seek to achieve pseudo-isolation in different ways.

In a survey study it is through the introduction of control variables and a homogeneous setting, masked and spurious relationships are controlled for, and hence how the isolation condition is satisfied (Bollen 1989). If the effect of relevant control variables can be eliminated, this strengthens the support that the isolation condition is satisfied, and the relationship between X and Y is by all probability not spurious. In an experimental design the subjects in the experiment group will be exposed to stimuli on X, where X is isolated from all other explaining variables. By having a control group not exposed to stimuli on X, one can determine X's effect on Y. The main difference between a survey study and an experiment in how the isolation condition is satisfied lies in how different explanation variables are controlled for. In a survey study a homogeneous setting is secured by making sure that the sample has one or more common features, based on the belief that individuals in a homogeneous setting have more common causal models than in a heterogeneous setting. The experimental design secures this through the selection of an experimental group and a control group. The selection is often based on randomization. Experimental design satisfies the isolation condition better than a survey study due to the fact that this design makes randomization, control with other explanation variables and homogeneousity possible. A survey study can at best satisfy the last two conditions. In our setting and with the sample we obtained the most common feature was their education and that they all were at their first year of nursing school. The three groups we taught, was exposed to the exact same training program, same number of lessons, same computer programs and with the mission to give them the same skills. Along with this all of the computers were set up equally, with same desktop, features and programs. Their subjective meaning about their prior experience was measured and they grouped within different groups, most inexperienced but a few also reported that they were very experienced. This control variable indicates a heterogeneous sample, based on their subjective prior experience opinion.

The direction (or sequenciality) condition means that X must appear before Y in time. In a survey study every variable is measured at the same time, which means that it is through logic and theoretical discussions in the study this condition is satisfied. For latent variables this can be a difficult task (Bollen 1989). Chapters 2 and 3 in this study build the theoretical foundation for satisfying the direction criteria. This means that one can not in a survey study empirically explain sequenciality, based on the survey alone. To ensure the sequenciality, a longitudinal study might be a better choice in that regard. For an experiment, the experiment group will be exposed to stimuli before measures are made, and are sequential by nature. However, if the control group has the same response as the experiment group, one can assume that causality is not present.

The covariation condition is an important factor in the statistical conclusion validity (Mitchell 1985). Covariation means that if there is a change in X there must also be a change in Y, if X is a variable that causes Y. By measuring the correlation between independent and dependent variable this condition is tested. Correlation will give any answers about causality between X and Y. By using data on an interval so much information is provided that correlation is sufficient enough. In an experimental design the covariation condition is satisfied by comparing the experiment group(s) and the control group(s). Only the experiment group is exposed to stimuli on X, and by comparing changes in Y from pre-test to post-test in both groups one can determine an effect. The effect must be significantly higher in the experiment group than in the control group (Frankfort-Nachmias & Nachmias 1996). Although experimental design is the best for satisfying the isolation condition, the covariation condition is best satisfied in a survey study. In our study, all of the items in the survey are measured with Likert scales with seven or ten different values (except for age and gender). This means that the X and the Y in the equation $X \rightarrow Y$ are possibly represented by different values.

All hypotheses in this study indicates causality and the discussion above draws a picture of conditions that must be met in order to give a valid measure of the study's hypotheses. Based on this discussion we have chosen a survey in this study. Sequenciality is probably the condition which is the most difficult one to satisfy in a survey design. We designed our study as a panel design, which is a type of longitudinal design using the same sample at two or more occasions (Skog 1998; Zikmund 2000). With this design implemented in our study together with the previously made theoretical foundations of the variables and relationships among these (see chapter 3), we believe that the sequenciality condition is secured at a reasonable level.

One could argue that an experiment would be adequate in this study, by e.g. stimulating personal innovativeness in IT and computer playfulness in one group and not in another, and then measure differences between the two groups. However, choosing the right stimuli would be a difficult task and also the randomization part of the isolation condition would not be fulfilled. The isolation condition is tried satisfied by including the control variables age, prior experience and gender. In social science it is convenient to use demographical variables as control variables. Another way of securing isolation is to achieve a certain level of homogeneity in the sample group. We have used nursing students as sample in our research project. These nursing students were at the same level in their educational program, and we consider this common property of the sample to contribute to satisfy homogeneity. Although, as discussed above, some research designs can make the isolation problem smaller, one will never be able to isolate two variables to the extent that no other disturbance will influence them (Bollen 1989). This is also the case for our study, though we have taken our precautions in regards to isolation.

4.2 Setting

When choosing setting it is important with homogeneousity to preserve the isolation condition in order to reduce the number of alternative explanation variables. At the same time it is crucial to have a setting that provides variation in the independent variables. We will in this section present the study's setting and discuss the implementation of this.

To secure homogeneity, nursing students in Malawi where chosen as subjects. These students have mainly the same background and the same goals – become nurses. They are also all citizens of a poor country (rated 163 of 173 by the United Nations). Two different nursing schools were selected, St. John's Nursing School in Mzuzu and St. Josephs School of Nursing near Blantyre. In Malawi computers and information technology are not a property of John Doe as in the industrial world, but are rather rare. However, the understanding of IT as important for the country's development is widely applied. Additionally, increasing these students' understanding of IT and IT skills might give them some advantages in further studies and when graduated.

We believe that testing our research model under these conditions is highly relevant to get more knowledge about the motivational performance promoting and preventing variables in computer training. First of all, most of the research conducted on computer learning and training has been done in the US or in Europe, and as our review of relevant theory made in chapter 2 shows, we have not found any prior research within the IS field concerning itself with similar problem formulations or computer training at all in the Southern region of Africa. This fact does, in our view, make our project interesting in itself. Secondly, since dealing with psychological variables in the context of learning, we believe a classroom environment is ideal for the purpose.

At St. John's Nursing School there were two different groups, which each completed a three day long training program. Exactly the same training program was completed at St. Josephs School of Nursing. At this school only one group completed this training program. The goal of the training program was to teach the student basic skills in computer use. In this setting this meant the understanding of the interaction and use of input devices such as the mouse and the keyboard, basic file management and basic word processing skills. The operating system used was Red Hat Linux 9.0, and the word processing software chosen were OpenOffice Text Document 1.1.2.

The choice of setting was also highly influenced by a collaboration project between our employer, the Norwegian Church Aid and Christian Health Association of Malawi. We were through that project given the opportunity to teach nursing students at two different nursing schools basic computer skills, and collect data for our research project.

4.3 Control Variables

In this section we will present the control variables used in this study. When two ore more variables are present and we want to test the causation between them, there are mainly two ways to declare if the correlation is caused by a causal relation or not (Skog 1998). One alternative is already discussed above, to use an experimental design. On the other hand, when it is impossible to implement an experimental design, the way of checking for spurious or masked correlations are done by using different statistical methods. One way of doing this is to create different groups/subgroups of the sample, and check for confounding variables. In other words, it is appropriate to use demographical variables as control variables when the setting gives the opportunity to do this. Another way to find relevant control variables is to do a literature study, looking for variables that in the literature are shown to influence the hypothesized relations in our study. Since earlier articles and studies we have seen are rather scarce on control variables, we have decided to use prior experience as a control variable, together with gender and age.

4.3.1 Demographical control variables

In social sciences involving quantitative data analysis it is common to use demographical variables as control variables, and we have, as mentioned, included such ones in our study. This is done so that conclusions about homogeneity in the sample easier can be made, and we have therefore included variables where potential differences between the subjects may be reviled. This potential variation is important for the statistical conclusion validity (Skog 1998). Gender will give us the opportunity to check whether there are any differences between male and female respondents. The control variable age was, as described, divided in four groups, with a span of five years. The groups range from 16 to 35 years, a quite big span considering that these respondents were at the same level in their studies. Our data analysis and test of differences between the different ages will answer us if any of the age groupings show significant difference from the whole model or the other age groupings. The last demographical control variable, and maybe the most interesting is prior experience. For this variable the scale is a Likert scale, with seven possibilities to rate ones prior experience with computers, ranging from absolutely nothing to very experienced.

These control variables are only chosen to ensure us that we have homogeneity within our sample. We will in section 6.3.2 present any possible influence of the control variables.

4.4 Data collection

In this section we first discuss the sample and then present the sample extraction method used, within the setting and project we had chosen to participate in. In the end of this section we will present the data collection procedure used.

4.4.1 Sample frame and sample

The sample frame in this study is nursing students in a Southern African country, and nursing students at two different nursing schools in Malawi makes out the sample. The sample should reflect a representative collection of the sample frame (Bollen 1989). In our sample the age variation is between 16 and 35 years, with a majority being between 26 and 30 years old. Most of the sample were female (37).

		Frequency	Percent
Gender			
0	Female	37	78,7
1	Male	10	21,3
Age			
1	16-20	7	14,9
2	21-25	9	19,1
3	26-30	11	23,4
4	31-35	20	42,6
Prior experience			
0	No prior experience	20	42,6
1	Little prior experience	16	34,0
2	…	3	6,4
3	…	1	2,1
4	…	3	6,4
5	…	3	6,4
6	…	0	0
7	Very experienced	1	2,1

Table 1: Descriptive statistics of sample.

The group did not have very high experience on computers, reporting a mean of little more than 1 (exactly 1,20), using a scale from 0 representing absolutely no prior experience, 1 equals very little experience, up to 7, which represents very experienced. This means that the group had very little experience with computer use, and most of them had not used a computer before at all

A total of 47 respondents completed the survey. According to Bollen (1989) there are no exact rules concerning the sample size. The sample size is a function of the model's complexity (should be at least 5 pr. parameter), parameter precision (reduced utility when n > 120), the study's importance (p-level demands) and the number of groups. There are two types of error concerning sample size, referred to as type 1 and type 2 errors respectively. Type 1 error refers to that a too small sample might lead to that a false model attains support. A to large sample might lead to that a correct hypothesis not will attain sufficient support, this phenomena is referred to as type 2 errors. Hence both a too small and a too large sample may lead to errors. When using multivariate regression for data analysis, it is suggested that the sample size should be no less than 100.

The above discussion might imply that our sample size of 50 is too small for a generalizable data analysis. However, structural equation method (SEM) implemented with partial least squares (PLS), is adequate for sample sizes as small as 50 and even less than that (Chin & Newsted 1999), but it depends on the model of the study. According to Chin and Newsted (1999) there are different methods for estimating the needed sample size. One of the methods suggests that the sample size should be ten times the number of paths pointing at the dependent latent variable. When there are different dependent latent variables in a model the dependent latent variable with highest number of paths pointing at it should set the terms for number of respondents used. This method is also suggested by Esteves et al. (2002). In our model the dependent latent variable with most paths pointing at it, is computer self-efficacy. This construct depends on three other variables in our model, computer anxiety, personal innovativeness in IT and computer playfulness. According to the rule of thumb of Chin and Newsted (1999) we therefore need a minimum size of sample above 30. As mentioned our original sample size was 50, but three of the respondents did not complete the post-questionnaire. Anyhow, our sample size is above the recommended level according to the number of paths to our dependent latent variable with most paths pointing at it.

4.4.2 Data collection procedure

Before the actual data collection took place, we pre-tested the questionnaires on 5 subjects with approximately the same background as the sample. This was done to test that the wording and semantics of the questionnaire was understandable and clear to the respondents. Churchill (1979) recommends pre-testing the questionnaire to find and sort out any questions the respondents might have. The data was collected through a questionnaire both before and after training, using the same questionnaire. This means that we collected both pre-training and post-training data for all our variables, in order to make it possible to measure our variables both before and after training. We conducted the same training program at two different locations, however the procedures for collecting data where the same, and are in the following described as if data collection only took place at one location.

The pre-training questionnaire was filled out by all of the respondents right after we had introduced ourselves. In regards to the why the had to fill out the questionnaire, they were told that we were collecting data for a research project, which hopefully could contribute to create a better computer learning environment in the future. At this point in time we did not inform the subjects that they also would have to fill out the same questionnaire after training had taken place.

With the post-training questionnaire, we immediately after the last training session took place, kindly asked the course participants if they would please fill out the same questionnaire once again, for the same reasons as for the pre-training data collection. At both points of time the respondents' attitude towards filling out the questionnaire seemed positive. For both schools participating in the sample, the training period lasted for three days. In other words, this means that the pre- and post-questionnaire were filled out with three whole working days in between.

Low response rate may be viewed as an Achilles heel of questionnaire. Because of our relatively low sample size, it was crucial for us to achieve a high response rate. For the pre-training questionnaire we actually achieved a 100% response rate, but 3 respondents did not fill out the post-training questionnaire. How we treat these responses will be discussed in section 6.2.1. We also gathered data for post-training performance. The subjects completed an assignment consisting of a set of tasks that had been taught during the training sessions.

We have in this chapter discussed, problemized and presented the choices regarding design, the data collection procedure, setting, sample frame and sample. The control variables and demographical statistics were also presented.

5 Measurement development

We will in this chapter present the differences between formative and reflective measures and the measurement development procedure, and then present measures used in this study, together with the different control variables. To successfully measure what we want to measure, valid and reliable measure must be developed. In section 3.1.1 we presented a conceptual model with five variables. These variables have this far only been presented with theoretical definitions, and in order to successfully measure them, they need to be operationalized. All our measurements scales are based on previous work done by other researchers, and have been validated and found reliable in several studies.

5.1 Formative versus Reflective measures

In regards to developing research models one refers to different types of measures, the main groups being reflective measures and formative measures. Reflective measures are defined as measures where all of the indicators[3] reflect the value of other variables. If one indicator changes, this will directly influence the other connected variables (Bollen 1989). Formative indicators, first introduced by Blalock (1964), are measures that form or cause the creation or change in a latent variable (Chin 1998). Formative measures are built from several indicators that all together build the measure. The typical example used is the social economic status measure (SES). SES can be described by indicators like education, occupation, income, friends and place of living. These indicators all together will form the level of SES. Opposite, it would be difficult to state the place of living or income just out of an individuals SES. This means that if the income rises the other indicators will not necessarily change momentarily, in the same direction, in the same speed or at the same time as the social economic status (Bollen & Lennox 1991). Another example of formative measures would be the amount of beer, wine, and other forms of hard liquor consumed as indicators of *mental inebriation*. Potential reflective measures might be blood alcohol level, driving ability, brain scan, and performance on mental calculations. If truly reflective, an improvement in the blood alcohol level measure for an individual would also imply an improvement in the brain scan activity and other measures since they are all meant to tap into the same concept or phenomenon. Conversely, for formative measures, an increase in beer consumption does not imply similar increases in wine or hard liquor consumption (Chin 1998). Thus, while it may occur,

[3] The terms indicators and items are used interchangeably in this document

formative indicators need not be correlated nor have high internal consistency such as high levels of Cronbach's alpha (Bollen 1984; Bollen & Lennox 1991).

As these two examples indicate formative measures are often used to describe social relations, behaviours, cultural conditions and so on. When using formative measures it is really important to include all facets that are a part of the construct. If the construct is not described with all of its indicators, the validity of the latent variable will suffer from one or more missing indicators. This again means that the validity of the construct measured will be enfeeble. The validity of the construct will also suffer if one or more of the items are excluded in a factor analysis test. This means that if one is doubtful to some items or facets one has to do a thorough assessment of the items, and the next step is to do a nomological validation of the facets. If the item still is doubtful, one should conduct a thorough examination of present research and literature to find out what the earlier experience with these items are. This is performing a face validity test (Churchill 1979).

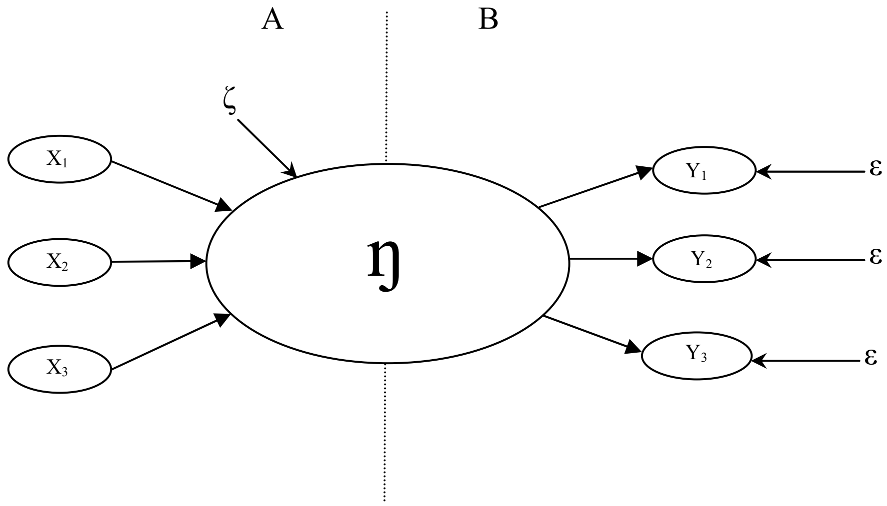

Figure 3 - Reflective vs formative measures. At the A side of the construct the formative measures are illustrated. While on the B side, the reflective measures of a construct is illustrated.

We consider our latent variables as reflective variables. This is in accordance with previous studies where these measures have been used, and also in other research projects referred in the literature review/theory section. Reflective measures entails that each item reflects the construct, and that for every item there is an error term (Reve 1985). For our data analysis this means that we will be able to exclude items that either show low item reliability, what that is considered as to low convergent validity or to high divergent validity. According to Bollen

(1989) each effect item will reflect the construct and this can be illustrated with the following equation $Y_i = \lambda_{i1}\eta_1 + \varepsilon_{i.}$ On the other side, if our measures had been cause indicators we could not exclude every item not passing the convergent or divergent validity test, because every item was reflected in the construct. Each principal component would represent a facet of the construct. If some of the indicators had been crystallizing on more than one facet, the facets should be weighted equally to secure that none of the facets are dominating more than anyone else; according to how many items that are represented in every facet (Sandvik 1998).

5.2 Steps for developing measures

Although we use measures developed by other researchers, we find it appropriate to describe the steps that must be taken in order to develop measures, using the procedures presented by (Churchill 1979; Reve 1985). According to Churchill (1979) a very important goal when developing measures is to achieve validity. By following four steps this can be achieved:

1. Use meaningful and precise theoretical definitions of your concept.
2. Find latent variables or dimensions of the concept that can represent it.
3. Develop or find indicators that can measure the concept
4. Specify relationships between latent variables and measures.

The first two steps in Churchill’s procedure have already been completed during the theory review in chapter 2.

In step 3 indicators for the latent variable must be found. There are two ways of doing that, one can either use measures developed by others, or develop your own measures. If the concept you are investigating has been the subject of prior research and measures for that concept have been validated and found to be reliable measures, Churchill recommends that uses these. On the other hand, if no good measures for your concept have been developed, you will have to identify indicators that measure your concept yourself. However, new measurement instruments must be thoroughly tested to secure quality and validity of them. The approach to step 3 will be different depending on whether the measure is formative or reflective (see section 5.1).

In step 4 one has to decide whether the measures are reflective or formative, as this influences how convergent and divergent construct validity are dealt with (Bollen & Lennox 1991).

5.3 Measures in this study

Developing measures are done to ensure conformity between theory level and measuring level and that the concept or phenomena one intends to measure, actually is being measured (Mitchell 1985), in other words we are talking about construct validity. To ensure this in the measuring process one have to specify a measuring model and specify the relationship between the measures and the latent variables (Churchill 1979; Bollen 1989). There are four kinds of construct validity: Face validity, convergent validity, divergent validity and nomological validity (Reve 1985). In the following section we will only discuss face validity. The other forms of construct validity will be discussed in section 6.3.1.

Churchill (1979) recommends adoption of measures that other researchers have developed and tested, and adjust these to the study in question. In this study all measures have been adopted from previous research, and they will be presented in this section.

Computer Self-Efficacy

For measuring computer self-efficacy we have used the measurement scale developed by Compeau & Higgins (1995a). This is a 10-item scale that has been empirically tested numerous times (Compeau & Higgins 1995a; 1995b; Thatcher & Perrewè 2002). It consists of 10 statements which the respondents either agree to or not. If they agree, they will have to choose to what extent they agree on a 10-item scale. The responds where given on the questionnaire (see Appendix II). The statements are:

I could complete the job using the software package...

1. …if there were no one around to tell me what to do as I go.
2. …if I had never used a package like it before.
3. …if I had only the software manuals for reference.
4. …if I had seen someone else using it before trying it myself.
5. …if I could call someone for help if I got stuck.
6. …if someone else had helped me get started.
7. …if I had a lot of time to complete the job for which the software was provided.
8. …if I had just the built-in help facility for assistance.
9. …if someone showed me how to do it first.

10. …if I had used similar packages before this one to do the same job.

Before this measure was developed, computer self-efficacy was measured in different ways by different researchers. Compeau & Higgins (1995a) argue that these measures where inaccurate and did not catch the essence of the concept. Their computer self-efficacy measurement scale has after its development been widely accepted among researchers as the scale that reflects the meaning of the concept.

Computer Anxiety

Computer anxiety was measured using four items from the Computer Anxiety Rating Scale developed by Heinssen et al. (1987). Respondents answered whether or not computers felt intimidating or gave apprehensive feelings to them on a 1 – 7 Likert scale. Compeau & Higgins (1995a) argues that these four items capture anxiety associated with computer use best. In Compeau & Higgins' (1995a; 1999) studies reliability measures ranges from respectively 0,92 to 0,87. Thatcher & Perrewé (2002) reports a composite reliability measure of 0,94. The four items used are:

1. I feel apprehensive about using computers
2. It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key
3. I hesitate to use a computer for fear of making mistakes that I cannot correct
4. Computers are somewhat intimidating to me

Personal Innovativeness in IT

Personal innovativeness in IT was measured using four items developed by (Agarwal & Prasad 1998). This was used by Agarwal et al. (2000), who reported comparable values for the mean (4,87 – std. Dev. = 1,07) and proved reliable (composite reliability = 0,87). The items capture the intrinsic motivational mechanisms that individuals experience when exposed to new technology, and reflects individuals' propensity to experiment with existing and new information technologies. The responses where given on a 1-7 Likert scale. The four items are:

1. If I heard about a new information technology, I would look for ways to experiment with it.
2. Among my peers, I am usually the first to try out new information technology.

3. In general, I am hesitant to try out new information technologies
4. I like to experiment with new information technologies.

Computer Playfulness

Computer playfulness was measured using the 7-items Computer Playfulness Scale developed by Martocchio & Webster (1992). Yager et al. (1997) did also use the Computer Playfulness Scale and found it to be valid and reliable. When Martocchi & Webster developed the scale they used 22-items. We decided to use all of these 22-items in our questionnaire too, but only the 7-items identified by Martocchio & Webster as a valid operationalization of computer playfulness are used in our data analysis. This is discussed further in section 7.1.2. The scale consists of 7 one-word- items, all capturing elements of how one feels when interacting with a computer. On a 1-7 Likert scale, the respondents where asked to what extent they agree that the items reflects their feelings when interacting with computers. The items are:

1. Spontaneous (item 1 in the questionnaire)
2. Unimaginative (item 3 in the questionnaire)
3. Flexible (item 7 in the questionnaire)
4. Creative (item 9 in the questionnaire)
5. Playful (item 15 in the questionnaire)
6. Unoriginal (item 18 in the questionnaire)
7. Uninventive (item 20 in the questionnaire)

Performance

Performance was measured using a self developed performance test. The test consists of different task taught during training. The relationship between post-training performance and our dependent variable computer self-efficacy has been well established empirically (Compeau & Higgins 1995a). Each successfully completed task qualified for a certain amount of points. The performance test can be viewed in Appendix III.

Comment on the scales used (Likert)

Most of the measures in this study use Likert-scales. A Likert-scale is developed by different assertions that altogether describe a phenomena or property, and respondents answer to what extent they agree with the assertions (Churchill 1979). The scales may vary in length, but seven-point scales, as used in this study, are very common. Each value in the scale corresponds to a semantic expression. In this study only the semantic meaning of 1 and 7 where given, where 1 = strongly disagree and 7 = strongly agree. For computer self-efficacy where a 1 to 10 scale is used and there also is an option to answer no (0), the semantic meaning of 1 = not at all confident, 5 = moderately confident and 10 = totally confident were given. The questionnaire can be viewed in Appendix II.

5.4 Control variables

Control variables are often included in studies to secure the isolation condition, and in this project we have chosen two demographical variables to fill that role. In this section we will present these.

Gender

We have asked the respondents for gender to collect information about how many of each gender participated in the survey. If the sample had divided into approximately the same number of males and females, comparisons between the genders could have been made.

Age

The control variable age are divided in groups, 16-20, 21-25, 26-30 and 31-35. We consider this to be an appropriate grouping of this variable, though we could have asked for the respondents exactly age. The last method would have given us some more possibilities to group the respondents in different ways in the analysis phase, but we found our choice of grouping sufficient in considering our research model and the intention to use this variable.

Prior Experience

To measure this control variable, we used a tool where ‘no’ was the right answer if the respondents never had used computers before. If they had any experience they were supposed to rate this in a Likert scale. The yes scale was rated from 1, being very little experienced to 7, being very experienced. We decided to use this scale instead of asking about exactly how many years they had been using computers. The reason for this was to avoid bias in the responses. Malawi is, as mentioned, a very poor country, and just a tiny part of the population can afford to buy computers, and we therefore assumed that using the exact number of years would tell us little about the amount of computer use in those years. Another alternative we could have considered is to use the number of times they had used computers, or approximately how many hours they had been using computers. We found that these methods would give the respondents difficulties in giving an approximation of the value and therefore we used a Likert scale to measure their experience. It is very likely that respondents reporting for example 4 years of experience, may only have used computers once or twice a year in that period due to the lack of computers in the country.

We have in this chapter presented the measures relevant to our constructs and the different control variables we have decided to use. The purpose for this chapter was to give sufficient foundation for the data analysis and the further treatment of the data.

6 Data analysis

In this chapter we will present different methods of analyzing the data discuss different ways of treating missing values, and naturally also treat missing values in the data gathered, Further we will, show how we validate the data in different ways to ensure that our concepts have sufficient validity and reliability In the end of this chapter we will discuss if some items should be excluded from the rest of the analysis with foundation in the reliability and validity tests.

6.1 Data analysis method

When data is collected one have to choose how to analyze them. There are several approaches to this, with the main approaches being what we refer to as Traditional Multivariat Regression (TMA) and Structural Equation Method (SEM). In this project we have chosen to use SEM as the analysis method and PLS Graph 3.0 as the analysis tool, and this section we will present the methods used for our data analysis and discuss why we find the method chosen preferable in our context as opposed to using another.

6.1.1 TMA versus SEM

TMA is a widely applied method for data analysis and the method incorporates the use of multiple regression analysis as the main method. However, to be able to perform complete validation and reliability tests of the constructs, factor analysis and testing of alpha values must be done in addition to the regression analysis. When using TMA for testing a model, the results indicate to which the amount of explanation power the independent variables have on the dependent variable(s).

SEM on the other hand is considered to be a general model and includes factor analysis, regression analysis, path analysis and classical simultaneous equation models and ANOVA amongst others. As opposed to TMA, SEM is considered to be a non-explorative (confirming) technique, which means that the method is appropriate whenever a researcher wants to confirm a model, rather than finding a model that fits (Rigdon 1998). In SEM one differs between a structural model and a measurement model. The structural model analyzes the relationships between the latent variables, while the measurement model shows the relationships between the indicators and the latent variables.

Both analyzing techniques are based on linear statistical models, which mean that they can only be accepted as valid when the observed data is found to be in order. None of the techniques can test for causality. Predictions of causality must be made with base in theory, research done by others and logic. This is in accordance with the choice of design and the precautions made when developing causal models together with measurement development and validation, as we have discussed in chapter 4 and 5.

One can argue that using SEM provides one with several advantages compared to TMA. First of all, SEM makes it possible to test the whole model at a time because it combines both a structural model and a measurement model. By doing that, error estimates that can emerge in a regression analysis are avoided in SEM, because the regression coefficients that are measured between the latent variables are controlled for systematic and random errors. Secondly, one could argue that because using SEM makes it possible to test the whole model at the same time it gives a more realistic test of hypotheses than TMA does. Most SEM techniques are only able to treat the reflective measures (Rigdon 1998).

6.1.2 Partial Least Squares (PLS)

PLS is a SEM technique that is especially adequate to use on small samples. The technique handles both formative and reflective measurement scales equally good along with residual distribution (Chin 1998). In PLS there are no specific demands for normal distributed data and the method is very explorative in the sense that the need for a strong theory is not present. Theory can actually be weak or not present at all. PLS is considered to be even more flexible than other SEM techniques and is very suited for predictive models and theory confirmation, it has become a widely used method within the IS field during the 1990's. PLS was originally developed of Herman Wold. The method have been tested against SEM, both techniques having different strengths and weaknesses (Rigdon 1998). As our sample size is very small we find appropriate to use PLS in this project. PLS Graph 3.0 developed by Wynne Chin is chosen as the application used for the data analysis.

6.2 Descriptive statistics

In this section we will analyze the data, check for level of missing values and check the distribution of the data for skewness and kurtosis. For missing values we will argue for a proper way of treating them. The tests of skewness and kurtosis are a check of how the data is distributed. Since we have chosen to use the PLS method, and as mentioned this method does not require strongly normalized data, this is more like a check for extreme values of the distribution. If any such ones occur we might consider excluding the item from the rest of the analysis, but are not required to do this.

6.2.1 The missing data analysis

An important issue relating to the data and analysis of them is the handling of missing values. In a questionnaire trying to cover several constructs with a large number of measures, there could be many reasons why data are missing, that the response is incomplete. The reasons for this can vary, from the respondent not knowing the answer to the question to just overlooking it i.e. There are several ways of handling missing values, and the most brutal one is to either exclude a case or an item. If conducting a list wise deletion, the cases including a missing value will totally be deleted. This is a fairly brutal way of treating the missing value-cases, and it might have a tremendous effect on the sample size. Pair wise deletion can lead to input matrices that behave inconsistent with some of the SEM estimation methods.

As mention earlier, our data contains information from both a pre- and a post-test. A result of the fact that the participants were asked to fill out the questionnaire at two different point of time, was that a total of three respondents did not complete the post-test section. As a consequence of this, we first of all want to exclude these cases (list wise deletion) before we conduct the rest of the missing value analysis. This means that we will have 47 useful respondents in our sample from both pre- and post-test.

After this list wise deletion the data still contains some items with missing values, without any specific patterns to neither any of the items or to the respondents. For both the pre- and post-test every item with missing values has a lower missing value level than the recommended 10 percent limit used by Kline (1998). The table below represents the missing values for each item.

Item	Missing	
	Count	Percent
CSE4	1	2,1
CSE9	1	2,1
PLAY1	3	6,4
PLAY9	1	2,1
PLAY15	1	2,1
PLAY18	1	2,1
PLAY20	2	4,3
Post_Play9	1	2,1
Post_Play18	1	2,1
Post_Play20	2	4,3

Table 2: Missing value analysis

We consider these items to have rather low degree of missing values, and that they all are so far below the recommended level that we consider it appropriate to use simple-mean method for replacing these missing values. This means that we will replace the missing values with the mean of the items results. In accordance to Klein (1998) this is the most sensible way to treat the missing data when the missing values are lower than 10%. The consequence of excluding items or cases because of the missing value test might be much higher than using the simple-mean replacing method (Rigdon 1998), and since we now already have excluded a total of three cases we find this method useful to avoid even more reduction of our data material.

6.2.2 Normality of the measured items

Both the mean and the standard deviation can provide information about the normality of the data. The mean represents the central tendency of the items' distribution, and most desirable state is when most of the answers are close to the items' mean. Standard deviation is the difference between the observed value and the mean. In a normally distributed item the standard deviation is one. To get an observed standard distribution close to one is therefore preferable. Next step in the procedure will be investigating the distribution of the measured data items, checking for skewness and kurtosis. Extreme levels of skewness and kurtosis may bias the results from a SEM analysis (Rigdon 1998).

Skewness

The skewness test describes how the data is distributed within the items. Values lower than 0 indicates that most of the answers are in the lower part of the scale, and the opposite when the value is above 0. There are some dissent about which level of skewness is acceptable, with someone referring to |3| (Kline 1998) others to |2| (Bollen 1989).

After removing three cases, because these respondents did not participate in the post-test, and the simple-mean replacement of the other missing values, we find that we have collected relatively good normalized data. Within the data material we found that some of the items show a level of skewness a little above both of the recommended levels. As the Table 3 and Table 4 below show, PIIT1 indicates that the answers are grouped at the lower part of the scale. PIIT4 indicates that the respondents have answered at the upper part of the scale. For CP9 the results have also grouped themselves at the upper part of the scale. In the post-test it is only Post_PIIT1 that have a skewness level above the recommended, at the lower part of the scale.

Pre-training values:

Variable	Mean	Std. Deviation	Skewness	Kurtosis
CSE1	3,170	3,024	0,707	-0,091
CSE2	1,532	2,292	1,150	-0,089
CSE3	4,170	3,067	0,356	-0,534
CSE4	3,589	3,111	0,475	-0,628
CSE5	5,106	3,031	0,031	-0,875
CSE6	6,043	3,050	-0,249	-0,841
CSE7	5,681	3,251	-0,316	-1,040
CSE8	5,043	3,671	0,083	-1,397
CSE9	6,329	3,065	-0,496	-0,666
CSE10	5,340	3,795	-0,111	-1,430
CA1	4,000	2,629	0,045	-1,810
CA2	4,043	2,686	-0,075	-1,846
CA3	2,851	2,502	0,881	-1,006
CA4	2,596	2,482	1,111	-0,591
PIIT1	6,511	1,487	-3,438	10,814
PIIT2	4,106	2,352	-0,217	-1,533
PIIT3	2,660	2,239	1,079	-0,381
PIIT4	6,362	1,276	-2,433	6,516
PLAY1	5,343	1,955	-1,148	0,350
PLAY3	2,830	2,278	0,923	-0,768
PLAY7	5,872	1,541	-1,229	0,739

PLAY9	6,195	1,227	-2,163	5,983
PLAY15	2,759	2,406	0,972	-0,763
PLAY18	2,610	2,101	1,088	-0,203
PLAY20	2,442	1,962	1,272	0,458

Table 3: Descriptive statistics table with mean, std. deviation, skewness and kurtosis for the pre-training test.

Post-training values:

Variable	Mean	Std. Deviation	Skewness	Kurtosis
Post_CSE1	5,319	2,580	-0,203	0,118
Post_CSE2	3,234	2,868	0,361	-0,689
Post_CSE3	5,915	3,348	-0,453	-0,832
Post_CSE4	5,723	3,360	-0,453	-0,903
Post_CSE5	7,106	3,009	-0,982	0,156
Post_CSE6	7,277	2,924	-1,086	0,571
Post_CSE7	7,787	2,553	-0,939	0,155
Post_CSE8	6,745	3,047	-0,821	0,010
Post_CSE9	7,638	2,649	-1,195	1,146
Post_CSE10	7,468	3,078	-1,337	0,982
Post_CA1	3,702	2,686	0,206	-1,831
Post_CA2	2,702	2,293	1,050	-0,495
Post_CA3	2,255	2,048	1,590	1,218
Post_CA4	2,000	2,075	1,876	1,920
Post_PIIT1	6,277	1,470	-2,391	5,170
Post_PIIT2	4,596	2,184	-0,488	-1,118
Post_PIIT3	2,957	2,368	0,771	-1,072
Post_PIIT4	5,872	1,825	-1,595	1,278
Post_Play1	2,957	2,368	0,771	-1,072
Post_Play3	5,553	1,920	-1,172	0,191
Post_Play7	6,085	1,501	-1,561	1,236
Post_Play9	6,022	1,525	-1,959	3,669
Post_Play15	4,936	2,201	-0,644	-0,917
Post_Play18	3,130	2,290	0,547	-1,276
Post_Play20	4,956	2,177	-0,760	-0,758

Table 4: Descriptive statistics table with mean, std. deviation, skewness and kurtosis for the post-training test.

As we can see in Table 3 and Table 4, none of the items are highly skewed, although some of the values are above the recommended level. Since the PLS method does not require normalized items to the same degree as a traditional regression analysis, we consider it appropriate to let these items pass the test along with the items that are normally skewed.

Kurtosis

According to (Rigdon 1998) high levels of kurtosis might bias the data more in a SEM analysis than high levels of skewness. The kurtosis measure indicates how steep or maybe more precisely how high the curve of the collected answers are distributed within an item. As for skewness, there is also some dissent on how to treat or where to set the limit for the kurtosis of an item (Sørebø 2000).Values of the univariate kurtosis between |8| to |20| seems to be described as extreme of (Kline 1998).

As Table 3 and Table 4 shows, some of our indicators have high levels of kurtosis. Especially PIIT1[4] is high with a value of 10,814. The other items with a kurtosis over the recommendation of |3|, are all grouped between 3,669 and 6,516.

We consider the results of the kurtosis test the same way as we did with the results of the skewness test. As long as the PLS do not require so strongly normalized data as the other SEM methods, and the fact that our respondents are rather few, we will not proceed with any further treatment of the data to normalize the items.

6.3 Test of model

In this section we will test or model. Firs we will test our measurement model which needs to be appropriately adjusted to the data before the structural model can be tested. PLS actually tests both models at the same time, but we analyze the measurement model first.

6.3.1 Measurement model

The measurement model shows the relationships between the indicators and the latent variables, and from the statistics computed in regards to the measurement model we will in the following discuss convergent and divergent validity and reliability of our latent variables. We will present the test of both the pre-training and the post-training measurement models. This is because the pre- and post-training measurement instruments were the same, and since we will compare the results from the pre- and post-training data, we believe that the same indicators should reflect the latent variables in both the pre- and the post-training results.

[4] The structure model has been tested both with and without PIIT1, because of the high kurtosis. No significant difference in the structure model was observed

Hence any exclusion of indicators in either of the models must also be done in the other one.

Item reliability

Item reliability is measured by calculating the square of the factor loadings for each item. This value should be >0,5 to be able draw conclusions about item reliability. If values are higher than 0,5 and the t-statistics show significance on the 5% level or better, or at least at the 10% level, then one have strong indications that item reliability is present. In our case the t-value should be 1,676 or higher to be within the 5% level and above 1,3 to be within the 10% level (46 degrees of freedom 1-tailed test). As Table 5 and Table 6 shows, several of our items fail to satisfy these conditions. We will wait to draw conclude about how to treat these items until we have conducted the convergent validity test[5].

Variable	Loading	Item reliability	T-statistics
CSE	(Composite Reliability = 0,879 , AVE = 0,426)		
CSE1	0,6680	0,4462	0,4738
CSE2	0,6122	0,3748	1,7088
CSE3	0,6365	0,4051	3,7503
CSE4	0,6895	0,4754	6,8950
CSE5	0,7417	0,5501	7,0613
CSE6	0,4372	0,1911	4,5988
CSE7	0,6968	0,4855	6,1514
CSE8	0,6717	0,4512	6,2472
CSE9	0,7270	0,5285	10,2188
CSE10	0,5838	0,3408	0,1248
PIIT	(Composite Reliability = 0,533 , AVE = 0,303)		
PIIT1	-0,6927	0,4798	3,5585
PIIT2	0,8352	0,6976	0,4511
PIIT3	-0,2430	0,0590	4,4868
PIIT4	-0,0719	0,0052	1,4431
CP	(Composite Reliability = 0,529 , AVE = 0,186)		
PLAY1	0,4845	0,2347	0,2394
PLAY2	0,2579	0,0665	0,6833
PLAY3	0,6344	0,4025	2,4044
PLAY4	0,6427	0,4131	0,0470
PLAY5	-0,5024	0,2524	4,6429
PLAY6	0,1070	0,0114	3,0502
PLAY7	-0,0099	0,0001	5,0158

[5] All t-statistics have been calculated using jackknife.

CA	(Composite Reliability = 0,728 , AVE = 0,420)		
CA1	0,6770	0,4583	3,8988
CA2	0,7211	0,5200	5,2983
CA3	0,7998	0,6397	10,5799
CA4	0,2832	0,0802	1,1823

Table 5: Factor loadings, item reliability, t-static, composite reliability and AVE-scores for the pre-training measures.

Variable	Loading	Item reliability	T-statistics
Post_CSE:	(Composite Reliability = 0.834 , AVE = 0,339)		
Post_CSE1	0,4043	0,1635	2,3695
Post_CSE2	0,4738	0,2245	2,2326
Post_CSE3	0,6209	0,3855	4,3896
Post_CSE4	0,6771	0,4585	7,4682
Post_CSE5	0,5025	0,2525	3,3458
Post_CSE6	0,5169	0,2672	3,4087
Post_CSE7	0,6458	0,4171	4,4592
Post_CSE8	0,6473	0,4190	4,4946
Post_CSE9	0,6692	0,4478	6,9012
Post_CSE10	0,5971	0,3565	3,7239
Post_CP :	(Composite Reliability = 0.601 , AVE = 0,240)		
Post_Play1	0,4290	0,1840	0,9118
Post_Play2	0,8130	0,6610	5,8255
Post_Play3	0,0864	0,0075	0,3120
Post_Play4	-0,1631	0,0266	0,7111
Post_Play5	0,6320	0,3994	4,7825
Post_Play6	0,0726	0,0053	0,2583
Post_Play7	0,6314	0,3987	4,4990
Post_PIIT:	(Composite Reliability = 0.579 , AVE = 0,332)		
Post_PIIT1	0,8734	0,7628	3,0856
Post_PIIT2	0,2173	0,0472	0,9603
Post_PIIT3	-0,1152	0,0133	0,0643
Post_PIIT4	0,7110	0,5055	2,4602
Post_CA :	(Composite Reliability = 0.674 , AVE = 0,362)		
Post_CA1	0,8490	0,7208	3,7714
Post_CA2	0,5810	0,3376	1,8033
Post_CA3	0,5084	0,2585	1,8534
Post_CA4	0,3612	0,1305	0,9088

Table 6: Factor loadings, item reliability, t-static, composite reliability and AVE-scores for the post-training measures.

Convergent validity

Items measuring the same latent variable should have intercorrelations, (Reve 1985; Bollen 1989). The analysis will reveal if all items load on the latent variable – in other words that all items related to a latent variable actually measures what it is intended to measure, (Reve 1985; Bollen 1989). The factor loadings should be >0,5 and at least >0,3 in order to conclude about convergent validity. Table 5 and Table 6 show that several factor loadings that are below 0,3 for both the pre-training and post-training data.

In the pre-training data PIIT3, PIIT4, PLAY2, PLAY6, PLAY7 and CA4 all have factor loadings <3, and the post-training measures reveal that Post_Play3, Post_Play4, Post_Play6, Post_PIIT2 and Post_PIIT3 have factor loadings below 0,3.

Average Variance Extracted (AVE) is another measure suitable for making convergent validity assumptions (Chin 1998), and scores should in that matter be >0,5. As Table 5 and Table 6 show, none of our latent variables have AVE-scores >0,5.

Exclusion of indicators based on item reliability and convergent validity measures

Baring in mind that we believe it is adequate to let the same indicators measure the latent variables in both the pre- and post-training measures, we need to identify a reasonable strategy for indicator exclusion.

Literature, e.g. (Bollen 1989), suggests different "cut-off"[6] values in regards to validation and reliability tests. By that we mean minimum values the tests at least should produce in order to satisfy the condition tested for. As clarified earlier, all our measures are reflective, and it is suggested by Bollen and Lennox (1991) that the number of indicators for a latent variable is not the main issue for reflective measures. It is more important that the indicators actually loads on the latent variable that are being measured, meaning that we could exclude which ever indicator that does not satisfy the conditions suggested for the test. However, all of these statistical tests will be less accurate with a small sample size as in our case, and hence we can not follow these recommendations rigidly. Since all our measures have been empirically validated by other researcher, we prioritize on using a strategy where we only consider excluding indicators showing extreme values on one or more tests.

[6] By "cut-off" values we mean the values that should be the minimum for each statistical test. In example the "cut-off" value for convergent validity is 0,3 for the factor loading.

First we identify indicators for the post-training measures that have both an item reliability problem and a convergent validity problem. The items are Post_PIIT2, Post_PIIT3, Post_Play2, Post_Play3 and Post_Play6. Next we, for the latent variables these indicators are meant to measure, post-training personal innovativeness in IT and computer playfulness, exclude the item which shows lowest levels of both convergent validity and item reliability. The exclusion will be done in both data sets. We then run a new analysis. This process will be continued until the post-training measures show satisfactory item reliability and convergent validity. This means that in the first iteration of this process PIIT3, PLAY6, Post_PIIT3 and Post_Play6 will be excluded. After three iterations, and the exclusion of PIIT2, PIIT3, PLAY4, PLAY6 and PLAY7, Post_PIIT2, Post_PIIT3, Post_Play4, Post_Play6 and Post_Play7, we believe that our post-training measures show satisfactory values in regards to item reliability and convergent validity. As for the pre-test measures we experience that PLAY3 has a factor loading of 0,0. We therefore exclude this item from further analysis in both data sets (PLAY3 and Post_Play3). After this last exclusion we consider both measurement models to satisfy the convergent validity and item reliability conditions. The results of this analysis can be viewed in Table 7 below.

	Factor loadings	**Item reliability**	**T-Statistic**
CSE:	(Composite Reliability = 0.879 , AVE = 0,424)		
CSE1	0,6744	0,4548	4,9716
CSE2	0,6212	0,3859	4,7522
CSE3	0,6308	0,3979	5,5721
CSE4	0,6996	0,4894	8,2829
CSE5	0,7058	0,4982	6,0274
CSE6	0,4581	0,2099	2,4369
CSE7	0,6704	0,4494	6,2928
CSE8	0,6768	0,4581	5,8517
CSE9	0,7083	0,5017	8,3969
CSE10	0,6312	0,3984	4,2627
PIIT:	(Composite Reliability = 0.625 , AVE = 0,530)		
PIIT1	0,9981	0,9962	16,9222
PIIT4	0,2532	0,0641	0,4923
CP:	(Composite Reliability = 0.627 , AVE = 0,414)		
PLAY1	0,6705	0,4496	1,5763
PLAY2	0,1745	0,0305	0,2180
PLAY5	0,8734	0,7628	3,1737
CA:	(Composite Reliability = 0.796 , AVE = 0,567)		
CA1	0,6844	0,4684	4,0933
CA2	0,7363	0,5421	5,3491
CA3	0,8301	0,6891	12,0117

	Factor loadings	Item reliability	T-Statistic
Post_CSE	(Composite Reliability = 0.833 , AVE = 0.338)		
Post_CSE1	0,4107	0,1687	2,3745
Post_CSE2	0,4820	0,2323	2,8166
Post_CSE3	0,6170	0,3807	4,0520
Post_CSE4	0,6715	0,4509	6,8571
Post_CSE5	0,4973	0,2473	3,1715
Post_CSE6	0,5887	0,3466	3,5567
Post_CSE7	0,5189	0,2693	3,8030
Post_CSE8	0,6429	0,4133	4,3116
Post_CSE9	0,6429	0,4133	4,1693
Post_CSE10	0,6775	0,4590	7,5181
Post_CP	(Composite Reliability = 0.673 , AVE = 0.440)		
Post_Play1	0,3440	0,1183	0,1481
Post_Play2	0,5934	0,3521	2,4704
Post_Play5	0,9214	0,8490	4,7442
Post_PIIT	(Composite Reliability = 0.883 , AVE = 0.793)		
Post_PIIT1	0,9763	0,9532	25,5195
Post_PIIT4	0,7955	0,6328	4,5058
Post_CA	(Composite Reliability = 0.673 , AVE = 0.432)		
Post_CA1	0,9129	0,8334	5,7387
Post_CA2	0,4803	0,2307	1,0847
Post_CA3	0,4801	0,2305	1,3466

Table 7: Validation and reliability scores after exclusion of items.

Divergent Validity

Divergent validity concerns itself with the intercorrelations between items measuring different latent variables. What we want to test is if there are any high correlations between measures measuring different latent variables. In other words, we will test to what extent the measures differs from other measures. If to high intercorrelations are revealed, the validity of the measure must be considered (Bollen 1989).

In SEM one can use the square root of the AVE-score and compare that to the correlations between the latent variables to test for divergent validity. The square root of AVE should be higher than the correlation between the latent variables. If the AVE-score in itself is higher than the correlation, there is no need to calculate the square root of AVE, as that will be higher than AVE anyway (Chin 1998). AVE is calculated like this[7]:

[7] AVE-scores are automatically calculated when running a bootstrap in PLS Graph.

$$\sum \text{factor loadings}^2 / (\sum \text{factor loadings}^2 + \sum \text{residual variance})$$

In the following tables the square root of AVE and the correlation between the latent variables are presented.

Pre-training values:

	Personal Innovativeness in IT	Computer Playfulness	Computer Anxiety	Computer Self-efficacy
Personal Innovativeness in IT	0,728			
Computer Playfulness	0,126	0,643		
Computer Anxiety	-0,324	0,132	0,753	
Computer Self-efficacy	-0,043	-0,187	-0,388	0,651

Table 8: The correlations between the latent variables and the square root of AVE. AVE-scores are on the diagonal.

Post-training values:

	Personal Innovativeness in IT	Computer Playfulness	Computer Anxiety	Computer Self-efficacy
Personal Innovativeness in IT	0,891			
Computer Playfulness	-0,060	0,663		
Computer Anxiety	-0,322	0, 344	0,657	
Computer Self-efficacy	0,051	0,112	-0,451	0,581

Table 9: The correlations between the latent variables and the square root of AVE. AVE-scores are on the diagonal.

The square roots of AVE-scores are on the diagonal in the table, and all of them are higher than the correlation between the latent variables. Hence we can conclude that our measures are divergently valid.

Construct reliability

Construct reliability provides information about how dependable or solid the measure is (Reve 1985). In SEM we use the Composite Reliability score to decide about construct reliability. Ideally this score should be >0,7. The Composite reliability score is calculated as follows:

$$(\sum \text{factor loadings})^2 / (\sum \text{factor loadings})^2 + \sum \text{residual variance}$$

From Table 7 we can see that computer self-efficacy and computer anxiety are well above 0,7 both ex ante and ex post. Computer playfulness and personal innovativeness in IT are at both pre- and post-training a little below 0,7. However, due to our small sample size and the problems of achieving adequate statistics in that matter, we consider this to be acceptable enough to indicate that they also are reliable measures.

6.3.2 Structure model

In this section we will present the results of the structure model test. This test includes estimating the path coefficients[8] which indicates the strength of the relationship between the independent and dependent latent variables. It also includes analyzing the R^2 values which indicates the variance that is explained by the independent variables. The combination of these to values tells us how good the model is. R^2 can also indicate to what extent the model is predicative, and the value is treated the same way as in traditional regression analysis.

Pre-training and post-training structure models

Running the pre-training model in PLS Graph gives us the following results:

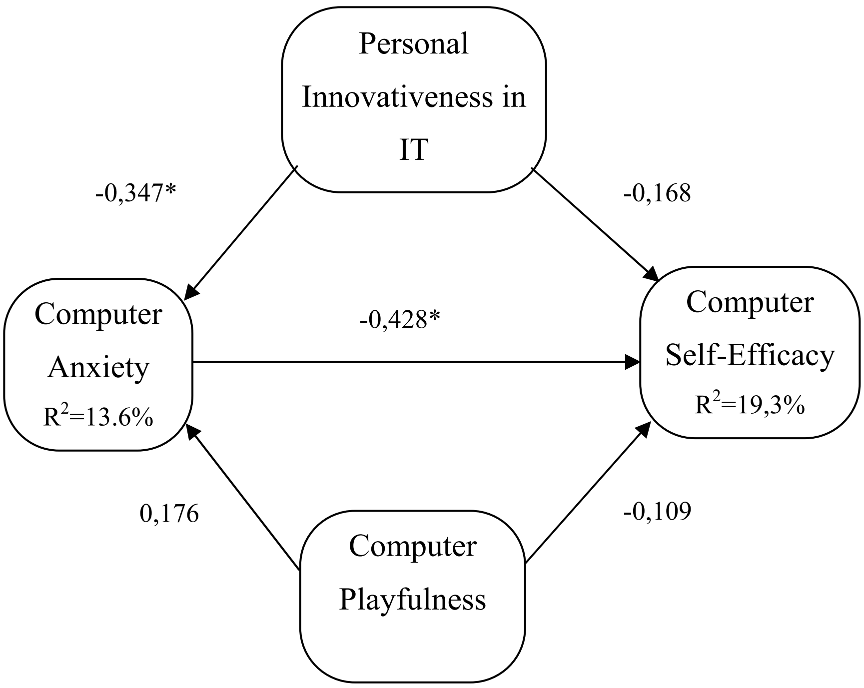

Figure 4 - Structure model with the pre-training data.
***Significant at the 2,5% level.**

[8] Path coefficients are the same as standardized regression coefficients.

The post-training model results:

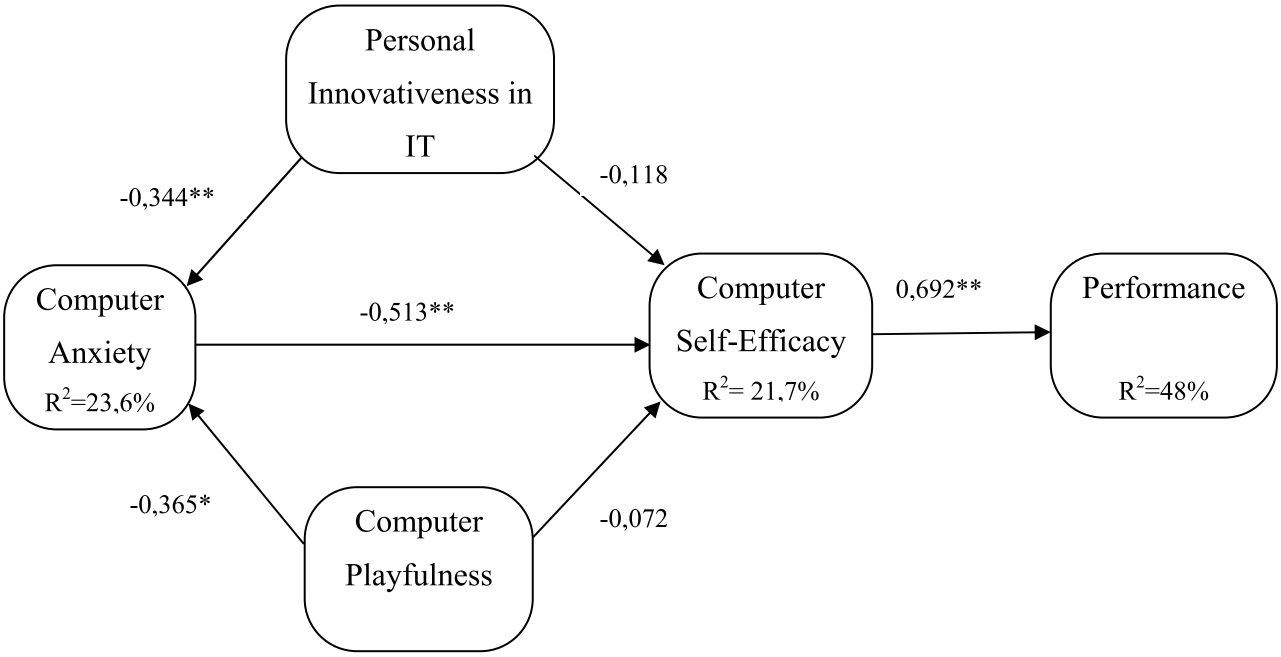

Figure 5 - Structure model with the post-training data.
***Significant at the 5% level.**
****Significant at the 2,5% level or better.**

Viewed in table form and combined with t-statistics the results look like this:

Pre-training		
Path	**Path coefficient**	**T-statistic**
Computer Anxiety → Computer Self-Efficacy	-0,428	2,0618
Computer Playfulness → Computer Anxiety	0,176	0,1371
Computer Playfulness → Computer Self Efficacy	-0,109	0,2344
Personal Innovativeness in IT → Computer Anxiety	-0,347	2,0339
Personal Innovativeness in IT → Computer Self-Efficacy	-0,168	0,4606
Post-training		
Computer Anxiety → Computer Self-Efficacy	-0,513	3,8879
Computer Playfulness → Computer Anxiety	-0,365	1,8633
Computer Playfulness → Computer Self Efficacy	-0,072	0,2108
Personal Innovativeness in IT → Computer Anxiety	-0,344	3,0822
Personal Innovativeness in IT → Computer Self-Efficacy	-0,118	0,5939
Computer Self-efficacy → Performance	0,692	6,6518

Table 10 - Overview of the path coefficients and t-statistic for both of the structure models.

Findings

Figure 1 shows that as far as pre-training is concerned, we receive support for two of our hypotheses. The hypothesized relationships supported in the model are:

H1: *Computer anxiety will negatively influence computer self-efficacy*
H4: *Personal innovativeness in IT will negatively influence computer anxiety*

Both these hypothesized relationships are significant within the 5%-level, and the path coefficients in both of these relationships are placed in what Chin (1998) refers to as the medium level. He refers to J.Cohen (1988) who uses the term effect size. Effect size refers to the strength of the association between variables and/or the strength (size) of the difference found. Cohen has defined three effect-size conventions based on general psychological research (small = .20, medium = .50, and large = .80). The other relationships in the pre-training model show now significance, and the path coefficients are all in the low effect size group. Although not being significant relationships, it is worth noticing that all of the path coefficients have opposite directions of what we hypothesized.

Four of the relationships in the post-training structural model are significant within the 5% level, and in these relationships we also receive support for our hypotheses:

H1: *Computer anxiety will negatively influence computer self-efficacy*
H4: *Personal innovativeness in IT will negatively influence computer anxiety*
H5: *Computer playfulness will negatively influence computer anxiety.*
H6: *Computer self-efficacy will have a positive influence on performance*

The relationship between computer anxiety and computer self-efficacy is a little stronger in the post model than in the pre-training model (0,428 in the pre model and 0,513 in the post model), and the effect size of this relationship can be considered to be large referring to the above discussion. The relationship between computer playfulness and computer anxiety is much stronger in the post model than in the pre model (0,176 in the pre model and 0,365 in the post model). Between computer self-efficacy and performance the relationship is very strong.

R^2 – Explained variance

The explained variances (R^2) for our latent variables were reported as follows for the pre-model: computer anxiety: 13,6%, computer self-efficacy: 19,3%. For the post model the explained variances were a little higher for both computer anxiety (23,6%) and computer self-efficacy (21,7%). The performance variable was only measured post treatment, and had a R^2-level of 0,480. These values describe the total variance for each of the latent variables. This interpretation is the same as that for the traditional regression (Chin 1998). The changes in R^2 values can be used to discover an impact of a particular independent variable on the dependent variables. For our model this means to exclude paths one by one to predict each independent variables impact to the dependent variable. This effect size are calculated as follows (Chin 1998):

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

The values in our model and the dependent latent variables are presented in Table 11. The effect size analysis is only conducted on the post-treatment test.

Path removed	f^2 for dependent LV's
PIIT-> CA	0,103
CP -> CA	0,164
CP-> CSE	0,015
PIIT -> CSE	0,011
CA -> CSE	0,273

Table 11: f^2-values for dependent latent variables

Chin (1998) refers to J. Cohen's operational definitions, where 0,02 is referred as small effect size, 0,15 as medium and 0,35 as large effect size. This means that the independent latent variables personal innovativeness in IT and computer playfulness have a rather small effect for the dependent variable computer self-efficacy. The computer self-efficacy is mainly being influenced by the computer anxiety construct, with a moderately to strong effect size. Computer anxiety as a dependent latent variable is influenced by personal innovativeness in IT with a small effect size, and influenced by computer playfulness at a medium level.

Control variables

We have also tested the model for possible effects of the control variables, which is important to do in order to as far as possible satisfy the isolation condition in regards to causality. By doing these tests we hope to reveal any spurious or masked effects in the model. Our control variables are all demographic, and to measure possible effects the might have on the model, we add the control variables to the model, one at a time, and create paths from them to the two dependent variables computer anxiety and computer self-efficacy. In the post-training model performance is a third dependent variable, but we have not tested for effects of the control variables on performance as we want to be able to compare potential effects between the pre- training and post-training models, and hence want to run the exact same tests on both models. We will investigate differences in both the path coefficients and in the explained variance (R^2) of the dependent latent variables.

In the following table the differences in the path coefficients with or without the control variables are presented:

Pre-training							
Path	**Original path coefficients**	**Path coefficients with Prior Experience**	**Difference**	**Path coefficients with Age**	**Difference**	**Path coefficients with Gender**	**Difference**
CA → CSE	-0,428	-0,325	-32 %	-0,436	2 %	-0,424	-1 %
CP → CA	0,176	0,204	-14 %	0,194	-9 %	0,184	-4 %
CP → CSE	-0,109	-0,096	-14 %	-0,072	-51 %	-0,001	-10800 %
PI IT → CA	-0,347	-0,361	4 %	-0,366	5 %	-0,353	2 %
PI IT → CSE	-0,168	-0,130	-29 %	-0,094	-79 %	-0,180	7 %
Post-training							
CA → CSE	-0,513	-0,508	-1 %	-0,510	-1 %	-0,518	1 %
CP → CA	-0,365	-0,300	-22 %	-0,350	-4 %	-0,352	-4 %
CP → CSE	-0,072	-0,063	-14 %	-0,022	-227 %	-0,042	-71 %
PI IT → CA	-0,344	-0,310	-11 %	-0,336	-2 %	-0,348	1 %
PI IT → CSE	-0,118	-0,105	-12 %	-0,003	-3833 %	-0,223	47 %
CSE → Performance	0,692	0,689	0 %	0,688	1 %	0,693	0 %

Table 12 - Differences in path coefficients when the control variables are added to the models.

As the table shows, there are some extremely high relative differences in the path coefficients when including the control variables in the models, with the most extreme being the difference between computer playfulness and computer self-efficacy in the pre-training model

(-10800%). However, most of these extremes are present in relationships where we no significance where experienced (se section 6.3.2), and hence we do not take these into consideration. The 22% difference between post-training computer playfulness and computer self-efficacy that we experience is in our view acceptable, due the relatively small path coefficients in question. When they are as low as here, the relative difference measured in % will become large even if the absolute values of the path coefficients themselves are not to far apart.

We do also experience some changes in R^2 for the dependent latent variables, especially in the pre-training model. The highest difference do we find when including prior experience in the model, and explained variance for computer anxiety then increases from 13,6% to 22,9%. In the pre-training model all demographic variables increases the explained variance for computer self-efficacy. In the post-model we only experience minor differences in R^2 when the control variables are included in the model. The complete results of the control variable tests can be viewed in Appendix V.

We have in this chapter conducted the data analysis, meaning the technical analysis in regards to the measurement model and the structural model. PLS Graph has been used as a tool to use the partial least square method to conduct these analyses, together with SPSS for some of the descriptive analysis required. The indicators used in the questionnaire was tested through different validity and reliability tests, and the ones that did not satisfy the conditions were discussed and some of them suffered exclusion from further treatment. With this data analysis and the present results in mind we are ready to start the discussion of the implications of these results.

7 Discussions and implications

In this chapter we will in the first section discuss our choice of methods and implications of those. Secondly we will discuss the results of our hypotheses analysis and discuss implications of those. Then we suggest some possible reasons for the differences in the pre-training and post-training models. Lastly we discuss limitations and implications of this study and suggest some directions for future research

7.1 Methodical choices and implications

Throughout the process this research project has been we have made a lot of decisions regarding the methods used, both at the analytical level and in deciding research design and data collection procedure. In this section we will discuss the methodological choices we made and the implications of those choices.

7.1.1 Design and data collection

As described in chapter 4, our study is a based on a survey. However, we had long and challenging discussions about whether or not this was a right choice. The main challenge for us was that we knew relatively little about the sample size we would have before traveling to Malawi. This uncertainty, combined with other factors, led us to strongly consider an experimental design. There are several arguments that can support an experimental design in this project. First of all, since the setting of this project was class room environment, the isolation condition is very well attained. Secondly, since we were to conduct the training program in two different nursing schools and with a total of three different groups of students, the opportunity manipulate the hypothesized motivational performance promoting variables personal innovativeness in IT and computer playfulness in at least one of the groups was present. The main reason why we did not choose an experimental research design after all, is the fact that we did not have the proper time or resources available to pre-test the manipulation. This could jeopardize the whole project, because we would not know that the manipulation techniques we would have used actually influenced the variables we wanted to influence, nor would we know if any influence on the variables would be the kind of influence intended for.

As a cause of the above discussion we excluded experimental design as an alterative, and we finally ended up choosing a survey. In our view we have maintained the isolation condition very well. This also goes for the homogeneousity condition. Since measuring our variables at points in time, both pre- and post-training we also believe that we to some extent satisfy the sequenciality condition, although not to the extent it would have been satisfied through a longitudinal study.

Time and language was issues that we faced in the data collection process. Since we had limited time available to conduct the training program, we wanted as less time as possible to be spent on filling out questionnaires. However, gave the respondents the time they needed to fill out the questionnaire. The official language of Malawi is Chichewa but English is taught in school. Although we pre-tested the questionnaire on five subjects comparable to the sample, we were aware of the possibility that some language difficulties could appear. To prevent that, we encouraged the respondents to ask us if they experienced any problems in understanding anything in the questionnaire.

7.1.2 Construct validity

As mentioned in the previous chapter the construct validity is divided in four categories, being face validity, convergent validity, divergent validity and lastly nomological validity (Reve 1985). All of our measures have been validated according certain rules, and while most of the items showed satisfactory reliability and validity, not every item passed these tests. Why is that? There are probably several reasons why some items failed the validation tests, which we now try will to uncover.

For most of our respondents this was the first time they were exposed to information technology, and particularly the first time they had been participating in a computer training course. Malawi is, as mentioned, a very poor country and most people struggle to get enough food to eat, and the technological infrastructure is rather poorly developed, especially in comparison to the West. It is a fact that the respondents not have been exposed to information technology to the same amount as citizens in our part of the world. They not are used to this as an every day artefact like we are in the Western cultures, where IT has become a part of everyday life. The different measures used in this study have on several occasions showed both reliability and validity in our culture. When tested in a Southern African country the different items might be understood and interpreted differently. This might show that these measurement tools need a local interpretation to be just as powerful as in the West. Face validity is concerned with the alignment between the operational and theoretical definition of a variable. This means that one should be aware of others interpretations of words and constructs to reflect what is actually meant (Reve 1985), and the local explanation of the items might differ a little from where the measures have been made.

In other words, the measures in this study have been developed and used in the US and in Europe the items have been adjusted to support certain specifics of both language and setting when used here. This was not possible to do for us before we came to Malawi and got to know the local circumstances. When we made our measurement tool we were told from people with specific knowledge about the country, that they were taught English at school and that almost everyone understood English very well, which we also experienced when we arrived. Even though they understood every day English very well, some of the respondents indicated that they not were familiar with the words in some of the items of the measurement tool. Some of them asked about the meaning of some of these words, but even though we told them to ask if any difficulties with language or understanding of the questions occurred, there might have been too few questions about the questionnaire, Us being experienced teachers, we know that many students for different reasons do not ask for help when they need it. This may have led to some different statistical problems. First of all, this could be related to the missing values we experienced, and secondly, it is possible that lingual problems may have given us random or systemic errors.

In regards to reliability and validity we might have experienced some language problems. As mentioned, the standard of the respondents' English skills, both oral and writing, was not as high as we had been given the impression of. Especially we believe that our independent latent variable computer playfulness could have suffered from these problems. The main reason for this is that we chose to include all of the 22 items Martocchio & Webster (1992) used when they developed the Computer Playfulness Measurement Scale. We did that because we believed that cultural differences could affect the way people express a phenomena like playfulness, and we wanted to make sure that all possible understandings of the concept was covered. However, we found, as did Martocchio & Webster, that 7 of the items are sufficient enough to capture the meaning of the concept. Among the 22 items, which all are adjectives, there are some that we believe were not a part of our subjects' vocabulary. Some examples are the adjectives erratic, inquiring, scrutinizing and inquisitive that we had to explain the meaning of to many of the respondents. By conducting this study we have also experienced that 22 items to measure one construct could be too much. The respondents spent a lot of time filling out this particular part of the questionnaire, both ex ante and ex post training, leading us to believe that they might have experienced some sort of information overload as the language problems should be less the second time they filled out the questionnaire. The combination of these factors may have influenced the construct validity for computer playfulness, which proved fairly unstable when we conducted the validity and reliability tests (see section 6.3.1).

Some of the respondents did not answer every question, and hypothetically these missing values might be caused by lingual difficulties. These missing values have been replaced using the simple-mean method, but with our rather low number of respondents this might have given reliability problems. Thus far the reliability test has showed us that only computer playfulness indicates a value below the limit, though just a little below. Reliability is about if the data is free of errors, and if some of the respondents did not understand every item this might have given either missing values, random or systemic errors. In connection with this it is appropriate to mention that all of the missing values found in the data are grouped within this construct and this might give an indication in direction of some lingual problems.

7.2 Results

We will in this chapter discuss and present our findings more thoroughly. Every hypothesis will be discussed in light of the circumstances where the data were gathered, why unexpected values occurred and the reason for these unexpected results. We will discuss all of these findings with the literature presented earlier in mind. In this assessment we will use the t-statistics to guide us whether our paths is significant or not. In social sciences it is a 10% significance level is considered acceptable, (Skog 1998), however, we believe that the at least 5% level of significance should be the obtainable level (values above 1,68 for 5% one-tailed test, 46 degrees of freedom).

Before moving on to the next section we believe it is adequate recall the theoretical definitions of our latent variables, so it is easier to meaningfully follow the discussions. In sections 2.2.2 and 2.2.3, respectively, we defined computer self-efficacy and computer anxiety. Our definition of computer self-efficacy is based on what Marakas et al. (1998) refers to as task-specific computer self-efficacy and is as follows:

> *"an individual's perception of efficacy in performing specific computer-related tasks within the domain of general computing" (Marakas et al. 1998; 128)*

In other words, the belief one has in him/her self that one can complete a specific computer related task. Computer anxiety is defined as:

> *"The fear and apprehension felt by an individual when considering the implications of utilizing computer technology, or when actually using computer technology. The individual is in the state (of computer anxiety) because of the fear of interaction with the computer, even though the computer possesses no immediate or real threat." (Sievert et al. 1988; 244)*

The fear of destroying important data is an example in that regard. Computer playfulness and personal innovativeness in IT both relates to the curiosity dimension of intrinsic motivation. The concept of computer playfulness refers to individual users' tendency to explore and act spontaneously with computers (Hackbarth et al. 2003), and personal innovativeness in IT is a person's willingness to adopt and experiment with unknown technology might give a higher learning outcome from a course and a more brief insight of that technology (Thatcher & Perrewè 2002).

7.2.1 Computer Anxiety will negatively influence Computer Self-Efficacy

We receive support for hypothesis number one: *Computer anxiety will negatively influence computer self-efficacy* both in the pre- and the post-test. The results showed a little stronger influence in the post-test than the results from the ex ante test, and pre-test is significant on 2,5 % level, while the post-test significance is even stronger. Table 13 summarizes the results for this hypothesis. These results are in accordance with the results of Igbaria et al. (1995) and Thatcher & Perrewé (2002).

That we in this study experience this strong relationship between computer anxiety and computer self-efficacy, only underlines the importance of acknowledging the importance of this is, as have other researchers (Igbaria et al. 1995; Thatcher & Perrewè 2002). Although we have modeled computer anxiety as an antecedent of computer self-efficacy, both IS research and Social Cognitive Theory research have shown that there probably is a reciprocal relationship between the two (Bandura 1977b; Brosnan 1998; Marakas et al. 1998). But since self-efficacy beliefs are the most important promoter of behaviour of the two, Bandura (1997) considers anxiety as an antecedent of self-efficacy beliefs. Connecting this to our findings, one could argue that since both computer anxiety and computer self-efficacy are strong factors influencing individuals in computer training, finding ways to enhance the influence of these in training must be a priority in computer training. Furthermore, and in our context even more interesting, is that these concepts play just as an important role in a poor Southern African country as in the West, despite of possible cultural differences that might produce invariance of measures cross-culturally (Poortinga 1989). This was one of only two hypotheses supported in a relatively weakly supported pre-training model, and that leads us to put even more faith in the importance of this relationship.

Computer Anxiety will negatively influence Computer Self-Efficacy	**Path coefficient**	**P-value**
Pre-test	-0,428	P < 0,025
Post-test	-0,513	P < 0,01

Table 13 - Path coefficients and p-value for hypothesis 1.

7.2.2 Personal Innovativeness in IT will positively influence Computer Self-Efficacy

The next hypothesis tested was *Personal innovativeness in IT will positively influence computer self-efficacy,* which we do not receive support for in neither the pre- nor the post-test. Both the pre-test and the post-test path coefficients indicate a negative correlation. This is in sharp contrast with the findings of Thatcher & Perrewè (2002) who found this relationship to be significantly positive, and their results suggests that individuals with high levels of personal innovativeness in IT are more likely to believe they can perform a certain task than individuals reporting low personal innovativeness in IT.

There could be several reasons for the post-test result. Malone & Lepper (1987) indicate that the nature of individuals with high intrinsic motivation are more likely to challenge themselves with more difficult tasks than others. Based on that, it can be argued that individuals with an investigative and curious nature might be more likely to adapt this type of behaviour. This may lead these investigative and curious individuals to believe that they will not necessarily master the tasks they investigate. Secondly, since this result is not in accordance with Thatcher & Perrewè's (2002) findings, it could be that different settings can produce different relationships between personal innovativeness in IT and computer self-efficacy. Mainly we imply that cultural differences may play a part. It could be that individuals in the West and individuals in a Southern African country have different perceptions about innovativeness. Cross-cultural differences and effects of intrinsic motivation will be discussed in section 7.3.1.

Personal Innovativeness in IT will positively influence Computer Self-Efficacy	**Path coefficient**	**P-value**
Pre-test	-0,168	P > 0,1
Post-test	-0,118	P > 0,1

Table 14 – Path coefficients and p-value for hypothesis 2.

7.2.3 Computer Playfulness will positively influence Computer Self-Efficacy

As Table 15 shows, the hypothesis *Computer playfulness will positively influence computer self-efficacy* is not supported in neither the pre- nor the post-test, and the relationships are not significant either. In our literature review we found that Potosky (2002) had investigated the relationship between computer playfulness and post-training self-efficacy. She had found, as opposed to us, a positive correlation between these two concepts, but her result was not significant. Martocchio & Webster (1992) however, found a significant positive relationship between computer playfulness and self-efficacy beliefs.

We believe that this result is not in alignment with Social Cognitive Theory, where it is suggested that high intrinsic motivation is a positive influencer on self-efficacy beliefs (Bandura 1977a; 1977b; 1997). In practice this implies that the results in our study are either spurious, or one could argue the same for this relationship as for the personal innovativeness in IT to computer self-efficacy relationship. Could it be that playful individuals that have a tendency to do things that they really do not master, because they have this intrinsic motivation that drives them? And as a cause of that they report lower self-efficacy beliefs than less playful individuals? The results in this study could indicate that, but further research is needed to increase the knowledge on the topic. Poortinga (1989) suggest that measurement scales developed in one culture, not necessarily is adequate to measure the same concept in another culture. Validating computer playfulness statistically proved difficult, and this could be the reason of that.

Computer Playfulness will positively influence Computer Self-Efficacy	**Path coefficient**	**P-value**
Pre-test	-0,109	P > 0,1
Post-test	-0,072	P > 0,1

Table 15 - Path coefficients and p-value for hypothesis 3.

7.2.4 Personal Innovativeness in IT will negatively influence Computer Anxiety

The fourth of our hypotheses, *Personal innovativeness in IT will negatively influence computer anxiety,* is supported in both the pre- and the post-test. As Table 16 shows, both ex ante and ex post results have p-values well within the 5% level. Corresponding support of this hypothesis are found in Thatcher & Perrewè (2002), both for the direction and approximately also the strength of the relationship.

This is the other of just two hypotheses that is supported in both the pre- and the post-test. The support for this relationship is well founded in theory, both in the theory of intrinsic motivation and in the Social Cognitive Theory (Deci 1975; Bandura 1977b; Deci & Ryan 1985; Bandura 1997), and since this relationship has been empirically established in previous research we believe it is important for practitioners to take this into consideration in computer training. Using pedagogical tools to enhance intrinsic motivation one can maybe contribute to stimulate the innovativeness in regards to IT in learners, and hence help to reduce computer anxiety. For researchers, our results suggest that the antecedents of personal innovativeness in IT should be the object for closer investigation. Directions for future research is thoroughly discussed and presented in section 7.3.2.

Personal Innovativeness in IT will negatively influence Computer Anxiety	**Path coefficient**	**P-value**
Pre-test	-0,347	P < 0,025
Post-test	-0,344	P < 0,005

Table 16 - Path coefficients and p-value for hypothesis 4.

7.2.5 Computer Playfulness will negatively influence Computer Anxiety

Computer playfulness will negatively influence computer anxiety, our fifth hypothesis, was supported in the post-test but not in the pre-test. Although not a significant relationship, the path coefficient in the pre-test surprisingly indicates a positive relationship between the two variables. The construct computer playfulness can be compared with the construct cognitive spontaneity (Bozionelos 1997), and our results is indicating the same relation between the computer playfulness to computer anxiety, as found by Bozionelos (1997) between cognitive spontaneity and computer anxiety. Bozionelos and Bozionelos (1997) found the same results between computer playfulness and computer anxiety.

The post-test support for this relationship receives support in the theoretical framework supporting this study (see sections 2.2.1 & 2.3.1). Origination in the curiosity dimension of intrinsic motivation, it is theoretically a trait that should lead to less anxiety in individuals. To give an explanation to why only the post-training results support the hypothesis, we believe it is requisite to acknowledge the fact that when filling out the pre-training questionnaire, the respondents may well have lacked the basic knowledge needed to completely understand the contents of it. Poortinga (1989) refers to a study conducted by Poortinga & Van der Flier (1988) in an Eastern African country, where language problems and subject terminology produced bias in the responses. It is possible that we experienced the same phenomenon in regards to the pre-test. This does not, however, explain the support for the post-test. It is possible that after interacting with computers for three days and filling at the questionnaire for the second time, the respondents had a better understanding of content. Hence the result is less biased. Another approach to the same problem could be to suggest that at the time of the pre-test, the respondents did not know exactly what to have anxiety about, and after they had been exposed to training, they were able to give more precise responses in that matter.

Computer playfulness will negatively influence Computer Anxiety	**Path coefficient**	**P-level**
Pre-test	0,176	P > 0,1
Post-test	-0,373	P < 0,05

Table 17 - Path coefficients and p-value for hypothesis 5.

7.2.6 Computer Self-Efficacy will have a positive influence on Performance

Our last hypothesis was only had only relevance after the computer training, because the course ended with a skill test to give us data of how the training had influenced the students skills and how they managed the different techniques they had been taught during the training program. The hypothesis *Computer self-efficacy will have a positive influence on performance* was supported with a rather strong prediction, 0,7. This hypothesis was significant on one percent level.

This relationship has been well established by other researchers e.g. (Gist et al. 1989; Compeau & Higgins 1995a; Marakas & Hornik 1996), and just how the importance of focusing on individuals' computer self-efficacy in a computer training perspective.

Computer Self-Efficacy will have a positive influence on Performance	**Path coefficient**	**P-level**
Post-test	0,700	P < 0,001

Table 18 - Path coefficient and p-value for hypothesis 6.

7.2.7 Comments on the hypotheses testing

As the results of the hypotheses testing shows, we have a relatively we pre-training model, with only two hypotheses supported. The post training model proves to be a little stronger and four of our hypotheses are supported in this. However, only the relationships between computer anxiety and computer self-efficacy and computer self-efficacy and performance, respectively, can be considered to be strong (Chin 1998). In our view the most interesting results are the lack of support for hypothesized relationships between personal innovativeness in IT and computer playfulness to computer self-efficacy. We have pointed on some possible reasons for the lack of hypotheses support in both of the models, suggesting that cultural differences, language problems and lack of knowledge about computer interaction could lead to biased responses. In the next section we will more thoroughly discuss implications and limitations of this study, and suggest some directions for future research.

7.3 Implications of the study and future research

The goals of this study was to find out if the presence of motivational performance promoting factors in learners will affect and modify performance preventing factors in computer training. In this section we discuss implications of the study as a whole, and we also try to suggest some directions for future research. First we discuss our findings in relation to our problem formulation, and we will also compare this with previous research. Then we address

7.3.1 Implications and limitations

In section 2.3 we theorized what we refer to as motivational performance promoting factors and we conducted this study to examine to what extent such factors can reduce the effect of factors like computer anxiety and computer self-efficacy, referred to as motivational performance preventing factors.

The most interesting results in our study are that we did not receive support any of our hypotheses that the promoting factors have a direct positive effect on computer self-efficacy. This is not in contention with previous research, and we feel the need to discuss this further. Thatcher and Perrewé (2002) found a positive correlation between personal innovativeness in IT and computer self-efficacy, and Webster and Martocchio (1992) found a positive relationship between computer playfulness and what they at the time referred to as computer efficacy. Bandura (1977a; 1997) also suggests that self-efficacy beliefs will be positively influenced by intrinsic motivation. We therefore ask ourselves; why do the results of our study suggest otherwise? When we discussed the results of these hypotheses in sections 7.2.2 and 7.2.3 we suggested some possibilities. In the following we will present some possible explanations to the divergence in our findings compared to previous research. First we discuss potential cultural differences between the cultural domain where our measures have been developed and the domain where they where used in this study. Then we discuss if the lack of previous exposure to computers could be a factor creating bias in the data. Lastly we look at different possible effects of intrinsic motivation.

Cultural differences

Poortinga (1989) addresses the issue of interpretation and comparison of data between different cultures. There are several issues in his work that we believe is necessary to clarify and discuss in this section.

To able decide whether data is comparable between cultures, Pootinga introduces three different levels of generalizations. In our study level 2, measurement as index, is the level appropriate to use. This concerns itself with generalizations of unobservable psychological attributes of individuals. Personal traits, social traits and cognitive abilities are examples given. An important question raised by Poortinga is whether measurements procedures can be constructed in different cultures that form an invariant scale with equal metric and origin for the intended trait. An example is emotions where he, referring to Ekman (1982), argues that there exists a universal identity of basic emotions. However, these emotions often express themselves differently in different cultures, which mean that they often must be measured differently in order to measure the theoretical concept one wants to measure. Failing to do so could lead to substantial bias in the data.

Poortinga suggests that one can use statistics to determine comparability of data between cultures. First of all one have to decide if there is identity of the content in the instrument. Cross-cultural invariance of a measurement scale requires identity of the underlying concept or domain of generalization. However, identity of item content is not necessary. By identity Poortinga means that the concept in question is a phenomenon actually experienced in the specific culture. One can use factor analysis to decide whether the variables reflect corresponding aspects of behaviour cross-culturally. If differences in factor structures are found, there are two possible interpretations. The differences can be explained as due to lack of equivalence, or as evidence of the non-identity of the underlying concept (Poortinga 1989). Lack of equivalence implies that although the concepts exits in both cultures, it needs to be measured differently. Non-identity means that the concept is not identified in one of the cultures.

Four ways of considering inequivalent data is suggested by Poortinga, *precluding comparison, reduction of inequivalence, interpreting equivalence and ignoring equivalence.* He suggests that reduction of inequivalence is the most customary strategy, where one eliminates those items that are found to be biased or invalid and treat the rest of the items as equivalent. He states:

> *"In the case of low level generalizations for which the content validity of the instrument cannon be questioned, the elimination of items is probably a sound strategy to improve equivalence of scores." (Poortinga 1989, p. 750).*

There are two views at this level in how to consider equivalence. The first is to establish whether there is identity or non-identity of a concept in a culture, which requires that one generates empirical evidence that makes one of the two more plausible. Another view is to accept that any meaningful psychological concept by definition has to refer to a universal aspect of behaviour. Whatever view one has, finding a way to measure concepts for cross-cultural equivalence is the main goal. The problem of cross-cultural differences is also addressed by Bandura (2002), and he states:

> *"Cross-ethnic comparisons, such as Latinos, African-Americans, and Orientals, can be highly misinformative because of the diverse nature of ethnicity. For example, to lump Puerto Ricans, Cubans, Chicanos and Spanish, who have quite different cultural origins, into a Latino category imposes homogeneity in intra-ethnic diversity. Hence, cultural contrasts, in which members of a single collectivist culture is compared to those of a single individualist one, can spawn a lot of misleading generalizations." (Bandura 2002 p.275)*

Based on this information, let us consider the two concepts in our study that have their origin in the theory of intrinsic motivation, computer playfulness and personal innovativeness in IT. These are personal traits that in theory should give individuals higher intrinsic motivation, and influence positively on self-efficacy beliefs among learners. Empirical evidence has been produced in Euro-American cultures that support this. However, in our study conducted in a Southern African country, the results suggests that these relationships do not exist in significant matter. As our validation tests showed, we had to exclude four out of seven items from the computer playfulness measure and two out of four items from the personal innovativeness in IT measure, and even then the validations tests relatively low, although acceptable, scores. Our view is that there are that any meaningful psychological concept refers to a universal aspect of behaviour. The results in our study could in that sense suggest that there are cultural differences in how computer playfulness and personal innovativeness in IT are expressed, and that the concepts should be measured differently in a Southern African country than in the Euro-American culture. We are, however, careful to conclude that this is the matter, we just imply this as a possible explanation for the relatively low validation scores and the fact that two of our hypotheses were not supported.

Previous exposure to IT

Very few of our respondents reported any prior experience with computers, and those who did mostly reported very low experience. For those who actually reported any experience at all, we are not sure if those responds about this experience should be too seriously considered. To get access to computers in Malawi is very difficult. Only a few institutions and companies use computers in everyday work. This means that their interpretation of experience might be very different from ours. Talking to the respondents enhances our view towards this. This means that in our terms, almost all of our respondents had very little previous exposure to information technology. This could very well have affected the respondents' interpretation of the questionnaire. We dare not to conclude that this is so, but the very weak results of the pre-training model could give indications in that direction. Although three days of training is not much, the respondents had more fresh exposure to computers when they filled out the post-training questionnaire, and the results of the post-training model are also stronger than the results of the pre-test. Of course this could just be a result of the fact that the questionnaire was easier to understand the second time, but it could also indicate that the respondents had better prerequisites to understand the contents of it.

Whether or not this is a valid explanation or not is hard to say, but we believe this matter should be taken into consideration. Every skill and areas of knowledge we humans have are attached to some kind of domain vocabulary that one needs to understand to successfully intercommunicate precisely. In regards to computers, it could be argued that to be able to report if you for example believe you are playful in your interaction with computers, you need to have some basic knowledge of what interacting with a computer really is, and the words in a questionnaire might seem meaningless if you do not possess this knowledge. Maybe measuring such traits are of little value if the respondents have very little or no prior experience with computer use, or maybe they should be measured differently on such respondents. Development of other/new measures for concepts in this study will be discussed in section 7.3.2.

Effects of intrinsic motivation

The main surprise to us in the regard of the results in this study is that we did not receive support for our hypothesized relationship between the motivational performance promoting factors and the preventing factors. We have already raised and discussed two possible reasons for this. A third reason we would like to suggest concerns itself with the behaviour of highly intrinsically motivated individuals. We would like to suggest the possibility that such individuals are more likely to seek more challenges than individuals with lower levels of intrinsic motivation. This is a view supported in the theory of intrinsic motivation, in which challenge is considered a dimension of (Deci 1975). Connecting this with self-efficacy beliefs, one could argue that seeking new challenges leads individuals into unknown territories, which in the next turn could lead to lower self-efficacy in the area where those challenges are made. In our context that would imply that high levels of computer playfulness and personal innovativeness in IT respectively will not produce high levels of computer self-efficacy, because the individuals experiencing this will challenge themselves with more complex computer related tasks. In other words, they might not believe that they will master the task they challenge themselves with, but they do it anyway because of their playful and innovative nature. The results in our study suggests that, in relation to computers, playful and innovative individuals experience lower levels of anxiety than those with lower scores on these traits. This indicates that although not anxious they belief that one can complete a specific computer related task not necessarily is present, due to the specifics of the task that might be in an area where playful and innovative individuals have no knowledge of how to solve.

The fact that high levels of both computer playfulness and personal innovativeness in IT gives lower levels of computer anxiety, but not higher computer self-efficacy, could indicate an interaction effect of these variables on the relationship between computer anxiety and computer self-efficacy. This will be discussed in section 7.3.2. Our study alone is by far enough to consider the outcome of this discussion as facts, but we introduce it as a possible explanation of the relationship between motivational performance promoting and preventing factors in computer training.

7.3.2 Suggestions for future research

In this section we will focus on what we believe would be reasonable directions for future research, based on the results of this study. As indicated in the previous section, there could be many reasons for the relatively low support for our model and the validation problems we experienced. Based on that, we will suggest five directions of future research that builds on the work conducted in this study. First discuss the possibility that there might be interaction effects on the relationship between computer anxiety and computer self-efficacy caused by either personal innovativeness in IT, computer playfulness or both of them. Then we recognize the need for longitudinal data to establish some empirical evidence of the validity of the measurement scales when used in a Southern African culture, and then we suggest the possibility of developing new cultural specific measurement scales to measure the same theoretical concepts. We also indicate the need to know more about the antecedents of both the performance promoting and preventing factors.

Interaction effects

Because of the fact that the support for our model is rather low, we are looking for alternative explanations or other information that might give us alternative explanations for the structure model. There might be several other possibilities to explain our dependent latent variables. This was indicated in one of our earliest problem formulations we developed in this project, where we suggested that there might be some interaction effects between the variables in the structural model. More specifically we suggested that the performance promoting factors might moderate the relationship between the performance preventing factors. In the present problem formulation the suggested interaction between the motivational promoting and preventing variables is not included, because, to our knowledge, this seems to be a rather big issue, which should be treated thoroughly and favoured as a whole study in itself. This requires theoretical foundations and a sufficient causal framework to be developed.

However, in despite the lack of the theoretical and causal foundations required, we dare to test whether there are interaction effects in our model or not. To get a hint if there might be some moderator variables in our model, we find it appropriate to test for such in the post treatment model only. Of course if our model will be used in future research it might be interesting to test for interaction effects in both the pre- and post-treatment models, but our intention now is only to get an indication if any such ones exist. To find such interaction effects there are different methods one can apply, one suggested by Sharma et. al (1981) another by Chin et. al (1996). We have chosen to apply the one suggested of Chin et. al, because this method is conducted within the PLS framework as we have used for our data analysis, and tested for interaction of the variables we considered for motivational performance promoting to the dependent latent variable – computer self-efficacy. This method uses a product indicator which is added to the original model. Changes in the R^2 of the dependent variable and the strengths of the paths from the predictor and suggested moderator variable are used to predict the effect of the interaction effect.

Based on our early problem formulation there are two possible moderator variables in our model, personal innovativeness in IT and computer playfulness. Both of them we have earlier categorized as motivational performance promoting variables. The most interesting results, which are presented in Table 19, we consider to be the path between the product indicators and the computer self efficacy construct, though only one of them showed to give significant t-values (computer anxiety x computer playfulness).

Path towards CSE	Path coefficient with CAxPIIT	t-value	Path coefficient with CAxCP	t-value
CP	-0,056	0,250	0,062	0,731
PIIT	-0,069	0,055	-0,072	0,276
CA	-0,418	1,536	0,087	0,049
CAxPIIT	-0,116	0,228	N/A	N/A
CAxCP	N/A	N/A	-0,486	2,2115

Table 19: The interaction effects in the post-model

The explained variance R^2 changes from 0,217 to 0,218 when the CAxPIIT product variable are implemented, and to 0,3 when the CAxCP is included in the model. The results shows that there might be some impact from both of the moderator variables, with computer playfulness as the one that moderates path between computer anxiety and computer self-efficacy most (see Table 20). The effect sizes of each variable are also predicted, and computer playfulness shows an interaction effect size of 0,118, which is considered as little less than a medium effect (Chin 1998).

Moderator variable	Change in path coefficient between Computer Anxiety and Computer Self-efficacy	Effect size F^2
Computer playfulness	0,573*	0,118
Personal innovativeness in IT	-0,349*	0,001

Table 20: The interaction effect paths and effect size of the moderator variable on the computer self-efficacy construct.
*** Less negative**

As discussed above, these tests have only been carried out superficial and briefly to give a foundation for and a suggestion for further research. The results can not be adopted as neither significant nor causal, but if found interesting one should model and theorize these interaction effects in accordance with both the demand for causality and statistical validity.

Longitudinal studies, panel studies

As mentioned we used a panel design, using the same group of respondents for the ex-ante and ex-post. The panel groups were answering the same questionnaire with three days between. After we finished our training course, the groups were able to do basic computer tasks as simple word-processing and the most essential file management procedures. They should be able to manage the computers as a tool to support their studies. What we would find interesting is to follow these groups and to follow them trough their three years of studies, look at the advantages the computers might give them in their studies. On the other hand, another topic we consider as interesting is the changes in our respondents' attitude to computers, changes that might be in the motivational performance promoting and preventing variables and the relation between them. Of course our model and measures used, might be applied in future studies in Southern African, but the effect of implementing information technology at a nursing school in the Southern African might differ much from doing the same at a school in country where IT is one of every day artefacts. To increase our knowledge about implementing computers and introduce computer training in such a poor country, it is most likely to consider following up the groups that already have been exposed to this project. The variables used in our study are considered as important variables in predicting adoption, training and further use of computers in Euro-American studies (Davis 1989; Davis & Wiedenbeck 2001; Thatcher & Perrewè 2002), and as important trigger points to get a successful implementation. As already indicated the cultural differences might demand more knowledge about trigger points to get a successful implementation in a Southern African country and to get this we consider it as very interesting and important to follow up such a group over a longer time, maybe for several years.

A call for cross-cultural measurement equivalence

Another question that might be interesting in this context is the measures used for operationalizations of the constructs. There are probably some challenges connected to uncover and explore if the measures used are adequate to use in this or other cultures. Our measures are adopted from other previous studies conducted mostly in the US. As mentioned in section 4.3.1 the culture and the language can give some other interpretations of the measurement tool than intended when it was developed, and that the measures should either be rebuild from scratch or refined to match the local interpretation, and to give the indented answers. In other words this is a matter of construct validity, especially face validity, which is the immediate conformity between the theoretical and operational definition (Reve 1985). We experienced some lack of sufficient factor loadings in the convergent validity test and also some of the items cross loaded, reasons unknown but possible explanations discussed above. Anyway, the challenge should be to make more robust measures that will fit cultural differences. Even if this generalizability of measures seems insuperable, the domain of IS research should strain for better measures and a proposal for future research might therefore be to struggle to find cross-cultural measures.

Other intrinsic motivational factors

We have focused on the variables personal innovativeness in IT and computer playfulness. We have categorized this to be a part of the curiosity facet of the theory of intrinsic motivation. The theory of intrinsic motivation which were discussed in section 2.3.1, suggests four main facets of the intrinsic motivation concept. To totally understand the theory of intrinsic motivation and its influence in computer training it can be interesting to know more about other variables that can be deduced from this theory and the impact they will have on computer training. Along with this it is interesting to get knowledge about other variables' impact and influence between motivational performance promoting and preventing variables. We have taken a step in the direction of knowing the influence of computer playfulness and personal innovativeness in IT in this study, but other variables from the theory of intrinsic motivation facets like fantasy, control or challenge will probably also make sense in the domain of computer training.

Antecedents of motivational performance preventing variables

The promoting variables used were considered to have their origin in the theory of intrinsic motivation. Our motivational performance preventing variables, computer anxiety and computer self-efficacy are deduced from the social cognitive theory. We have in our model seen a negative influence from computer anxiety to the computer self-efficacy construct. There are probably other variables that also have their impact on computer anxiety and computer self-efficacy. Thatcher and Perrewé (2002) found in their study that trait anxiety along with personal innovativeness in IT had an impact on computer anxiety, and through this construct an influence on computer self-efficacy as well. There are probably several other variables that also have an impact to motivational performance preventing variables as well, and it would be interesting to gain more knowledge about. As the knowledge about the motivational performance promoting and preventing constructs increases, one will probably be able to find ways to reduce the effects of the preventing factors, and therefore be able to increase the effect of a computer training program and in the end enhance the performance.

We have in this section tried to draw some lines for further research which we consider as interesting in the setting of computer training. Further research is needed to get more knowledge and to further enhance the effects of the motivational performance promoting variables and to provide more effective computer training.

7.4 Concluding remarks

In this study we have built a theoretical framework where the theory of intrinsic motivation and Social Cognitive Theory have been the foundations. We have sought to build on research conducted by others, especially Thatcher & Perrewè (2002) when we developed our conceptual model and hypotheses. We have, however, only experienced results that partially give further empirical evidence of their findings. The most interesting results of this study are that the relationships between the motivational performance promoting factors and computer self-efficacy proved insignificant and opposite to what that we had hypothesized, and the validation problems we experienced with the same variables. As pointed out, we believe that cross-cultural differences could contribute to explain these results and that perhaps the lack of understanding of the concepts of computer interaction also could be a cause. Though, these lacks of support for some relationships in our model, other hypotheses got support and were significant. Anyway we believe that our project can give some directions for other researchers which find this field interesting. To get more knowledge of probable causes, we have suggested some guidelines for future research.

References:

Adams, D. A., Nelson, R. R. and Todd, P. A. (1992). "Perceived Usefulness, Ease Of Use, And Usage Of Information Technology - A Replication." *MIS Quarterly* 16(2): 227-247.

Agarwal, R. and Karahanna, E. (2000). "Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage." *MIS Quarterly* 24(4): 665-694.

Agarwal, R. and Prasad, J. (1998). "The antecedents and consequents of user perceptions in information technology adoption." *Decision Support Systems* 22(1): 15-29.

Agarwal, R. and Prasad, J. (1998). "A conceptual an operational Definition of Personal Innovativeness in the Domain of Information Technology." *Information Systems Research* 9:2: 204-215.

Agarwal, R., Sambamurthy, V. and Stair, R. M. (2000). "Research report: The evolving relationship between general and specific computer self-efficacy - An empirical assessment." *Information Systems Research* 11(4): 418-430.

Anderson, R. C. and Pickett, J. W. (1978). "Recall of previously unrecallable information following a shift in perspective." *Journal of Verbal Learning and Verbal Behavior* 17: 1-12.

Ausubel, D. P. (1963). "The psychology of meaningful verbal learning". New York, *Grune and Stratton*.

Bandura, A. (1977a). "Self-Efficacy: Towards a Unifying Theory of Behavioral Change." *Psychological Review* 84: 191-215.

Bandura, A. (1977b). "Social learning theory". Englewood Cliffs, NJ, *Prentice-Hall*.

Bandura, A. (1982). "Self-efficacy mechanism in human agency." *American Psychologist* 37: 122-147.

Bandura, A. (1986). "Social Foundations of Thought and Action: A Social Cognitive Theory". Englewood Cliffs, NJ, *Prentice Hall*.

Bandura, A. (1997). "Self Efficacy: The Exercise of Control". New York, *Freeman*.

Bandura, A. (2002). "Social cognitive theory in cultural context." *Applied Psychology -An International Review* 51(2): 269-290.

Barki, H. and Hartwick, J. (1989). "Rethinking the concept of user involvement." *MIS Quarterly* 13(1): 53-63.

Barki, H. and Hartwick, J. (1994). "Measuring user participation, user involvement and user attitude." *MIS Quarterly* 18(1): 59-82.

Barnett, L. A. (1991). "The Playful Child: Measurement of a Disposition to Play." *Play and Culture* 4(1): 51-74.

Berlyne, D. E. (1960). "Conflict, arousal, and curiosity". New York, *McGraw-Hill*.

Bloom, A. and Hautaluoma, J. (1990). "Anxiety management-training as a strategy for enhancing computer user performance." *Computers in Human Behavior* 6(4): 337-349.

Bollen, K. (1989). "Structural Equations with Latent Variables", *Wiley*.

Bollen, K. and Lennox, R. (1991). "Conventional Wisdom on Measurement - a Structural Equation Perspective." *Psychological Bulletin* 110(2): 305-314.

Bollen, K. A. (1984). "Multiple Indicators: Internal Consistency or No Necessary Relationship?" *Quality & Quantity* 18: 377-385.

Bollen, K. A. (1989). "Structural Equations with Latent Variables", *Structural Equations with Latent Variables*.

Bostrom, R. P., Olfman, L. and Sein, M. K. (1990). "The Importance of Learning Style in End-User Training." *MIS Quarterly*.

Bostrom, R. P., Olfman, L. and Sein, M. K. (1993). "Learning Styles and End-User Training: A First Step." *MIS Quarterly*.

Bozionelos, N. (1997). "Psychology of computer use: XLV: Cognitive spontanity as a correlate of computer anxiety and attitudes toward computer use." *Psychological Reports* 80: 395-402.

Bozionelos, N. and Bozionelos, G. (1997). "Psychology of computer use: XLVIII: Cognitive spontanity as a correlate of computer anxiety and attitudes toward computer use." *Psychological Reports* 81: 956-958.

Brod, C. (1982). "Managing Technostress: Optimising the Use of Computer Technology." *Personnel Journal* 61(10): 753-757.

Brosnan, M. J. (1998). "The impact of computer anxiety and self-efficacy upon performance." *J Comp Assist Learn* 14(3): 223-234.

Cambre, M. A. and Cook, D. L. (1985). "Computer anxiety: definition, measurement and correlates." *Journal of Educational Computing Research*: 37-54.

Chin, W. W. (1998). "Issues and Opinion on Structural Equation Modeling." *MIS Quarterly* Volume 22.

Chin, W. W. (1998). "The Partial Least Squares Approach to Structural Equation Modeling". Quantitative Methodology Series. Marcoulides, G. A. E. New Jersey, *Lawrence Elbaum Associates*: 295-336.

Chin, W. W., Marcolin, B. L. and Newsted, P. R. (1996). "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and Voice Mail Emotion/Adoption Study". International Conference on Information Systems, Cleveland, Ohio.

Chin, W. W. and Newsted, P. R. (1999). "Structural Equation Modeling analysis with Small Samples Using Partial Least Squares". Statistical Strategies for Small Sample Research.

Hoyle, R., *Sage Publications*: 307-341.

Churchill, G. (1979). "A paradigm for Developing Better Measures of Marketing Constructs." *Journal of Marketing* XVI: 64-73.

Compeau, D., Higgins, C. A. and Huff, S. (1999). "Social cognitive theory and individual reactions to computing technology: A longitudinal study." *MIS Quarterly* 23(2): 145-158.

Compeau, D. R. and Higgins, C. A. (1991). "A Social Cognitive Theory Perspective on Individual Reactions to Computing Technology". International Conference on Information Systems (ICIS), New York.

Compeau, D. R. and Higgins, C. A. (1995a). "Application of Social Cognitive Theory to Training for Computer Skills." *Information Systems Research* 6(2): 118-143.

Compeau, D. R. and Higgins, C. A. (1995b). "Computer Self-Efficacy - Development of a Measure and Initial Test." *MIS Quarterly* 19(2): 189-211.

Csikszentmihaly, M. (1975). "Beyond Boredom and Anxiety". San Francisco, *Jossey Bass*.

Darke, S. (1988). "Effects of anxiety on inferential reasoning task performance." *Journal of Personality and Social Psychology* 55(3): 449-505.

Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease Of Use, And User Acceptance Of Information Technology." *MIS Quarterly* 13(3): 319-340.

Davis, S. and Wiedenbeck, S. (2001). "The mediating effects of intrinsic motivation, ease of use and usefulness perceptions on performance in first-time and subsequent computer users." *Interacting With Computers* 13(5): 549-580.

Deci, E. L. (1975). "Intrinsic Motivation". New York, *Plenum Press*.

Deci, E. L. and Ryan, R. M. (1985). "Intrinsic Motivation and self-determination in human behavior". New York, *Plenum Press*.

Deci, E. L. and Ryan, R. M., Eds. (1991). " Intrinsic motivation and self-determination in human behavior". Motivation and Work Behavior. New York, *McGraw-Hill, Inc*.

Decker, P. J. (1980). "Effects of symbolic coding and rehearsal in behavior-modeling training." *Journal of Applied Psychology* 65: 627-634.

Esteves, J., Pastor, J. A. and Casanovas, J. (2002). "Using the Partial Least Squares (PLS) Method to Establish Critical Success Factors Interdependenve in ERP Implementation Projects".

Fazio, R. H. and Zanna, M. P. (1981). "Direct Experience and Attitude-Bhavior Consistency". San Diego, CA, *Academic Press*.

Frankfort-Nachmias, C. and Nachmias, D. (1996). "Research in the Social Sciences". London, *Edward Arnold*.

Gist, M. and Mitchell, T. (1992). "Self-efficacy - A Theoretical-analysis of its Determinants and Malleability." *Academy of Management Review* 17(2): 183-211.

Gist, M., Scwoerer, C. and Rosen, B. (1989). "The effects of alternative training methods on self-efficacy and performance in computer software training." *Journal of Applied Psychology* 74(6): 884-891.

Hackbarth, G., Grover, V. and Yi, M. Y. (2003). "Computer playfulness and anxiety: positive and negative mediators of the system experience effect on perceived ease of use." *Information & Management* 40(3): 221-232.

Harter, S. (1978). "Effectance motivation reconsidered: Toward a developmental model." *Human Development* 21: 34-64.

Henderson, W. (1994). "Animated Models for Teaching aspects of computer-systems organization." *IEEE Transactions on Education* 37(3): 247-256.

Henry, J. and Stone, R. (1995). "A Structural Equation Model of Job-performance Using a Computer-Based Order Entry System." *Behavour & Information Technology* 14(3): 163-173.

Hill, T., Smith, N. D. and Mann, M. F. (1987). "Role of Efficacy Expectations In Predicting The Decision To Use Advanced Technologies - The Case Of Computers." *Journal of Applied Psychology* 72(2): 307-313.

Hollenbeck, J. and Brief, A. P. (1987). "The Effects of Indiviual-Differences and Goal Origin on Goal-Setting and Performance." *Organizational Behavior and Human Decision Processes* 40(3): 392-414.

Hunt, J. M. (1961). "Intelligence and experience". New York, *Ronald Press*.

Igbaria, M. and Iivari, J. (1995). "Effects of self-efficacy on computer usage." *Omega-International Journal Of Management Science* 23(6): 587-605.

Igbaria, M. and Iivari, J. (1998). "Microcomputer utilization patterns among managers and professionals: The case in Finland." *Journal of Computer Information Systems* 38(3): 28-43.

Igbaria, M., Iivari, J. and Maragahh, H. (1995). "Why do Individuals Use Computer-Technology - A Finnish Case-Study." *Information & Management* 29(5): 227-238.

Jarvenpaa, S. and Ives, B. (1991). "Executive involvement and participation in the management of information technology." *MIS Quarterly* 15(2): 205-227.

Kappelman, L. and Mclean, E. (1991). "The Respective Roles of User Participation and User Involvement in Information Systems Implementation Success". International Conference on Information Systems, New York.

Karahanna, E. and Straub, D. (1999). "The psychological origins of perceived usefulness and ease-of-use." *Information & Management* 35(4): 237-250.

Kinzie, M. B., Delcourt, M. A. B. and Powers, S. M. (1994). "Computer Technologies - Attitudes And Self-Efficacy Across Undergraduate Disciplines." *Research in Higher*

Education 35(6): 745-768.

Kline, R. B. (1998). "Principles and practice of structural equation modeling". New York, *Guilford Press*.

Krugman, H. E. (1967). "The Measurement of Advertising Involvement." *Public Opinion Quarterly* 30: 583-596.

Lawier, E. E. and Hall, D. T. (1970). "Relationship of Job Characteristics to Job Involvement. Satisfaction, and Intrinsic Motivation." *Journal of Applied Psychology* 54(4): 305-312.

Levy, J. (1978). "Play Behavior". New York, *Wiley*.

Malone and Lepper (1987). "Making Learning Fun: a taxonomy of intrinsic motivations for learning". Hillsdale, NJ, *Lawrence Erlbaum*.

Marakas, G. and Hornik, S. (1996). "Passive resistance misuse: Overt support and covert recalcitrance in IS implementation." *European Journal of Information Systems* 5(3): 208-219.

Marakas, G., Johnson, R. and Palmer, J. (2000). "A theoretical model of differential social attributions toward computing technology: when the metaphor becomes the model." *International Journal of Human-Computer Studies* 52(4): 719-750.

Marakas, G., Yi, M. and Johnson, R. (1998). "The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research." *Information Systems Research* 9(2): 126-163.

Martocchio, W. (1992). "Microcomputer Playfulness - Development of a measure with Workplace Implications." *MIS Quartely* 16(2): 201-227.

Maurer, M. M. (1983). "Development and Validation of Measure of Computer Anxiety". Iowa State University. Iowa, *Iowa State University*.

Maurer, M. M. and Simonson, M. R. (1984). "Development and Validation of a Measure of Computer Anxiety." *ERIC Document Reproduction Services* ED 243.

Mitchell, T. R. (1985). "An Evaluation of the Validity of Correlational Research Conducted in Organizations." *Academy of Management Science* vol.11: 397-417.

Murphy, C. A., Coover, D. and Owen, S. V. (1989). "Development And Validation Of The Computer Self-Efficacy Scale." *Educational And Psychological Measurement* 49(4): 893-899.

Namlu, A. (2003). "The effect of learning strategy on computer anxiety." *Computers in Human Behavior* 19(5): 565-578.

Nelson, R. R. and Cheney, P. H. (1987). "Training End Users: An Exploratory Study." *MIS Quarterly*.

Olfman, L. and Mandviwalla, M. (1994). "Conceptual versus Procedural Software Training for Graphical User Interfaces: A Longitudinal Field Experiment." *MIS Quarterly*.

Piaget, J. (1951). "Play, dreams and imitation in childhood". London, *Routledge & Keagan Paul*.

Poortinga, Y. H. (1989). "Equivalence of Cross-Cultural Data: An Overview of Basic Issues." *International Journal of Psychology* 24: 737-756.

Potosky, D. (2002). "A field study of computer efficacy beliefs as an outcome of training: the role of computer playfulness, computer knowledge, and performance during training." *Computers in Human Behavior* 18(3): 241-255.

Raub, A. C. (1981). "Correlates in computer anxiety and college students". University of Pennsylvania. Philadelphia, P A.

Reve, T. (1985). "Validitet i økonomisk administrativ forskning ". Metoder og perspektiver i økonomisk administrativ forskning. Oslo, *Universitetsforlaget*: 52-72.

Rigdon, E. E. (1998). "Structural Equation Modeling", *Lawrence Erlbaum*.

Rosen, B. and Maguire, P. (1990). "Myths and Realities of Computerphobia: A Meta-Analysis." *Anxiety Research* 3(1): 175-191.

Ruble, T. L. and Stout, D. E. (1993). "Learning Styles and End-User Training: An Unwarranted Leap of Faith." *MIS Quartely*.

Sandvik, K. (1998). "The Effects of Market Orientation."

Sein, M. K. and Bostrom, R. P. (1989). "Individual Differences and Conceptual Models in Training Novice Users." *Human-Computer Interaction* 4: 197-229.

Sein, M. K., Bostrom, R. P. and Olfman, L. (1999). "Rethinking End-User Training Strategy: Applying a Hierarchical Knowledge-Level Model." *Journal of End-User Computing* 11.

Sharma, S., Durand, R. M. and Gur Arie, O. (1981). "Identification and Analysis of Moderator Variables." *Journal of Marketing Research* 18: 291-300.

Shayo, C., Olfman, L. and Teitelroit, R. (1999). "An exploratory study of the value of pretraining end-user participation." *Information Systems Journal* 9: 55-79.

Sherif, C. W., Sherif, M. and Nebergall, R. E. (1965). "Attitude and Attitude Change ". Philidelphia, *Saunders*.

Sievert, M. E., Albritton, R. L., Roper, P. and Clayton, N. (1988). "Investigating Computer Anxiety in an Academic-Library." *Information Technology and Libraries* 7(3): 243-252.

Singer, J. L. (1973). "The Child's World of Make-Believe". New York, *Academic Press*.

Skog, O.-J. (1998). "Å forklare sosiale fenomener. En regresjonsbasert tilnærming". Oslo, *Ad Notam Gyldendal*.

Starbuck, W. H. and Webster, J. (1991). ""When is Play Productive?"" *J. Accounting, Management, and Information Technology* (1:1): pp. 71 -90.

Szajna, B. and Mackay, J. M. (1995). "Predictors of Learing-Performance in a Computer-User Training Environment - A Path-Analytic Study." *International Journal of Human-Computer Interaction* 7(2): 167-185.

Sørebø, Ø. (2000). "Involvement and end-user computing: an empirical investigation of the influence of involvement in the context of end-user computing". Begen, Norway, *Norges Handelshøyskole*.

Thatcher, J. B. and Perrewè, P. L. (2000). "An Empirical Examination of Computer Self-Efficacy: The Role of Personality and Anxiety". In the Proceedings of the Annual Meeting of the Southern Management Association, Orland FL.

Thatcher, J. B. and Perrewè, P. L. (2002). "An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy." *MIS Quarterly* 26(4): 381-396.

Torkzada, G. and Angulo, I. E. (1992). "The concept of correlates of computer anxiety." *Behavior and Information Technology* 11(2): 99-108.

Torkzadeh, G. and Koufteros, X. (1994). "Fatorial Validity of a computer self-efficacy scale and the impact og computer-training." *Educational and Psycological Measurement* 54(3): 813-821.

Vallerand, R. J. (1997). "Toward a Hierarchical model of Intrinsic and Extrinsic Motivation." *Advances in Experimental Psychology* 29: 271-361.

Venkatesh, V. (1999). "Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation." *MIS Quartely*.

Venkatesh, V. (2000). "Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model." *Information Systems Research* 11(4): 342-365.

Venkatesh, V. and Davis, F. D. (1996). "A Model of the Antecedents of Perceived Ease of Use: Developement and Test." *Descision Sciences* 27(3): 451-479.

Venkatraman, M. (1991). "The Impact of Innovativeness ans Innovation Type on Adoption." *Journal of Retailing* 67 (1): 51-67.

Webster, J. and Martocchio, J. J. (1992). "Microcomputer Playfulness - Development of a Measure with Workplace Implications." *Mis Quarterly* 16(2): 201-226.

Webster, S. (1991). "When is Play Productive?" *Accounting, Management and Information Technology* 1(1): 71-90.

Wildstrom, S. H. (1998). "They're mad as hell out there." *Business Week 3600*: 32-33.

Yager, S. E., Kappelman, L. A., Maples, G. A. and Prybutok, V. R. (1997). "Microcomputer playfulness: Stable or dynamic trait?" *Data Base for Advances in Information Systems* 28(2): 43-52.

Yi, M. Y. and Davis, F. D. (2003). "Developing and Validating an Observational Learning Model of Computer Software Traing an Skill Acquisition." *Information Systems Research* 14(2): 146-169.

Zikmund, W. G. (2000). "Business Research Methods". Orlando, US, *Harcourt College Publishers*.

Zimmermann, B. J. (1995). "Self-efficacy and Educational Development ". Melbourne, Australia, *Cambridge University Press*.

Appendix I - Overview of articles reviewed in section 2.1.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1987	Nelson & Cheney	100	Top and mid-level managers	Computer-related training, computer-related ability	Computer-related ability, IS-acceptance, utilization of IS, IS-satisfaction	Collected data from managers to investigate if investment in training had effect on DVs	Computer-related training is positively related to computer-related ability. Computer related ability is positively related to use of computer resources.
1989	Gist et al.	108	University managers and administrators	computer self-efficacy, Video vs. interactive training	computer self-efficacy, performance, response to training, work style	Experimental design – two treatment groups with either behavioral modeling or tutorial training program. Conducted a three our training course in a software package.	Behavioral modeling had significant correlations with high performance, Subjects reported higher computer self-efficacy, more positive work styles, less negative affect and greater satisfaction than subjects in the tutorial treatment group.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1989	Sein & Bostrom	104	Under-graduate students	Conceptual model, visual ability, learning mode	Performance, score in comprehension test.	Divided subject into analogical and abstract learners. Investigated differences between the groups.	Abstract learners learn better from abstract models. Concrete learners learn better from analogical models. The differences are larger in far-transfer tasks.
1990	Bostrom et al.	19, 29, 102, 81	Study 1 – under-graduates, study 2 – MBA-students, study 3 – under-graduates study 4 – full-time employees	N/A	N/A	Comparing four studies using Kolb's Learning Style Inventory.	Abstract learners perform better than concrete learners, and that active learners for the most part perform better than the reflective learner. However their results also indicates that learning mode interacts with training methods
1992	Webster & Martocchio		Students			Develop a measure for microcomputer playfulness.	Developed Computer Playfulness Measurement scale

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1994	Kinzie et al.	359	Students	Computer attitudes, computer use, course experiences, demographics	computer self-efficacy for word processing, e-mail, data retrieval, spreadsheets, statistics software and DBMS	investigated attitudes and self-efficacy towards computer technologies across undergraduate disciplines	The results indicates a strong relationship between experience and self-efficacy They also found strong support for using attitudes as a predictor of self -efficacy that is when effects for experience and demographics are not counted for.
1994	Olfman & Mandviwalla	82	University employees	Concept-based training, procedure-based training	Performance scores and tests	Conducted two separate training programs. One concept-based and one procedure-based	No significant difference in learning outcome for the two groups.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1995a	Compeau & Higgins	1020	Knowledge workers	Encouragement, use by others, organizational support	computer self-efficacy, outcome expectations, affect, computer use, computer anxiety	Developed a measure for computer self-efficacy.	Found significant positive relationships between computer self-efficacy use, outcome expectations, training, affect, frequency of use, use at home and familiarity. Computer self-efficacy was negatively related to anxiety.
1995b	Compeau & Higgins	88	Managers and professionals	Training method, prior performance	Computer self-efficacy, outcome expectations, performance	Laboratory experiment including a 2-day training course and task testing.	Computer self-efficacy was positively related to outcome expectations across all groups. To performance in some groups but not all.
1996	Venkatesh & Davis	36, 32	Students	computer self-efficacy, objective usability	Ease of use	Experimental design – Training programs and survey used.	Experience did not make computer self-efficacy to change over time. Computer self-efficacy is considered an antecedent to ease of use.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1998	Agarwal et al.	175	Part-time MBA students	Information about new IT, Perceptions on about new IT, personal innovativeness in IT	Intentions to use a new IT	Developed a measure for personal innovativeness in IT. Tested the construct as a moderator between ease of use, usefulness, compatibility and intention to use.	Found that their scale on personal innovativeness in IT measures what it's supposed to. Did on find support for personal innovativeness in IT as a moderator on other than the compatibility perception. Could be due to the web as research domain.
1998	Marakas et al.	N/A	N/A	N/A	N/A	Review of the computer self-efficacy construct	Found a distinction between task-specific and general computer self-efficacy. Task specific computer self-efficacy is efficacy on one specific system or task. General computer self-efficacy is self-efficacy on computers in general.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1999	Shayo et al.	24	Employees in the business office of a medium sized manufacturing company	Pre-training participation, training strategies	Training outcomes	4 case study. 2 with pre-training end-user participation, and 2 without. Application-based and construct-based training was used. Investigated if training strategy and pre-training participation gives better training outcomes.	Pre-training indicates who will use or not use software after training. Adoption of software based on other factors than training (organizational, managerial).
1999	Sein et al.	N/A	N/A	N/A	N/A	Developed a hierarchical framework for IT-training, based on prior research and experience.	Identified following content hierarchy: - command-based - tool procedural - business procedural - tool conceptual - business motivational - meta-cognition

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
1999	Venkatesh	69, 212	Variety of employees in different businesses	Perceived ease of use, perceived usefulness, computer playfulness.	Behavioral intention to use	Two identical studies were conducted. Subjects were divided into two different training programs.	Subjects in the game-based training intervention reported higher ease of use, and behavioral intention based on ease of use rather than usefulness. Acceptance seemed closer for subjects in the game-based training intervention.
2000	Agarwal et al.	186	Students	General computer self-efficacy, Prior experience, specific self-efficacy	Perceived ease of use, specific self-efficacy	Training courses in two different software packages.	When given training in one software package, one's task-specific computer self-efficacy on other software packages increases (referred to as "carryover" effect). On the other hand general computer self-efficacy does not necessarily indicate task-specific computer self-efficacy on a given software package.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
2001	Piccoli et al.	146	Under-graduate students	Learning role	Training outcomes	Longitudinal experiment. One group exposed to VLE, one to traditional learning environment	No significant differences in performance. VLE students report higher computer self-efficacy, but lower satisfaction.
2002	Thatcher & Perrewé	211	Students	Negative affect, trait anxiety, computer anxiety, personal innovativeness in IT	Computer self-efficacy	Self-reporting questionnaire.	Personal innovativeness in IT had a significant effect on both computer anxiety and computer self-efficacy. Computer anxiety had significant influence on computer self-efficacy. Negative affect did not influence computer anxiety significantly, but trait anxiety did.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
2002	Pototsky	52	Newly hired employees in a mid-sized software development firm	Computer experience, computer playfulness, training performance	Post training computer self-efficacy,	A 3-day company orientation and 6-week training program. Self-efficacy was measured post-training, while the other constructs was measured after the 3-day orientation.	Support for the relationship between computer efficacy beliefs and post-training, but not to computer experience and understanding. There were also found positive correlations between post-training efficacy and computer playfulness, but this relation was not significant.
2003	Yi & Davis	95	Under-graduate students	Modeling-based training interventions, pre-training individual differences, observational learning processes.	Training outcomes	Experimental design – two training programs. Performance measured at end of training program, and ten days later.	All iv's have significant influence on dv. Exception is the declarative knowledge part of training outcome, which have no significant influence on delayed task performance.

Year	Author(s)	N	Sample	IVs	DVs	Task	Findings
2003	Hackbart et al.	116	Graduate students	System experience, Playfulness, Anxiety	Ease of use	Investigate if Playfulness and anxiety mediates the relationship between system experience an ease of use	Both computer playfulness and computer anxiety mediates the relationship between system experience and ease of use.

Appendix II – Questionnaire

The questionnaire was identical in both pre-training and post-training:

Please answer the the questions and statements under. Draw a circle around the appropriate answer and/or number. The questionnaire is divided into sections. Please answer all sections.

Section 1

Student number (given by IT-teachers): _____

Which gender are you?
Female Male

What is your age?

16-20 21-25 26-30 31-35

Do you have any prior experience with computers? If your answer is yes, rate your experience from 1-7, with 1 being a little experienced and 7 being very experienced
No Yes, 1 2 3 4 5 6 7

Section 2

In this section you will answer if you believe you can use the technology presented in training under various conditions. If you answer YES for any of the conditions, please rate how confident you would feel under that condition.

1 = Not at all confident
5 = Moderately confident
10 = Totally confident

I could complete the job using the technology if...

Q1	... if there were no one around to tell mewhat to do as I go.	YES NO	1 2 3 4 5 6 7 8 9 10
Q2	... if I had never used a package like it before.	YES NO	1 2 3 4 5 6 7 8 9 10

Q3	...	if I had only the software manuals for reference.	YES NO	1 2 3 4 5 6 7 8 9 10
Q4	...	if I had seen someone else using it before trying it myself.	YES NO	1 2 3 4 5 6 7 8 9 10
Q5	...	if I could call someone for help if I got stuck.	YES NO	1 2 3 4 5 6 7 8 9 10
Q6	...	if someone else had helped me get started.	YES NO	1 2 3 4 5 6 7 8 9 10
Q7	...	if I had a lot of time to complete the job for which the software was provided.	YES NO	1 2 3 4 5 6 7 8 9 10
Q8	...	if I had just the built-in help facility for assistance.	YES NO	1 2 3 4 5 6 7 8 9 10
Q9	...	if someone showed me how to do it first.	YES NO	1 2 3 4 5 6 7 8 9 10
Q10	...	if I had used similar packages before this one to do the same job.	YES NO	1 2 3 4 5 6 7 8 9 10

Section 3

In this section you will answer to what extent you agree with the following statements

1 = Strongly agree
7 = Strongly disagree

S1	I feel apprehensive about using computers	1 2 3 4 5 6 7
S2	It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key	1 2 3 4 5 6 7
S3	I hesitate to use a computer for fear of making mistakes that I cannot correct	1 2 3 4 5 6 7
S4	Computers are somewhat intimidating to me	1 2 3 4 5 6 7

Section 4

In this section you will answer to what extent you agree with the following statements

1 = Strongly agree
7 = Strongly disagree

S1	If I heard about a new information technology, I would look for ways to experiment with it.	1 2 3 4 5 6 7
S2	Among my peers, I am usually the first to try out new information technology.	1 2 3 4 5 6 7
S3	In general, I am hesitant to try out new information technologies.	1 2 3 4 5 6 7
S4	I like to experiment with new information technologies.	1 2 3 4 5 6 7

Section 5

The following questions ask you how you would characterize yourself when using computers. For each adjective below, please circle a number on the answer sheet that best matches a description of yourself when you interact with a computer.

1 = Strongly agree
7 = Strongly disagree

S1	Spontaneous	1 2 3 4 5 6 7
S2	Conscientious	1 2 3 4 5 6 7
S3	Unimaginative	1 2 3 4 5 6 7
S4	Experimenting	1 2 3 4 5 6 7
S5	Serious	1 2 3 4 5 6 7
S6	Bored	1 2 3 4 5 6 7
S7	Flexible	1 2 3 4 5 6 7
S8	Mechanical	1 2 3 4 5 6 7
S9	Creative	1 2 3 4 5 6 7
S10	Erratic	1 2 3 4 5 6 7
S11	Curious	1 2 3 4 5 6 7
S12	Intellectually Stagnant	1 2 3 4 5 6 7
S13	Inquiring	1 2 3 4 5 6 7
S14	Routine	1 2 3 4 5 6 7
S15	Playful	1 2 3 4 5 6 7
S16	Investigative	1 2 3 4 5 6 7
S17	Constrained	1 2 3 4 5 6 7
S18	Unoriginal	1 2 3 4 5 6 7
S19	Scrutinizing	1 2 3 4 5 6 7
S20	Uninventive	1 2 3 4 5 6 7
S21	Inquistive	1 2 3 4 5 6 7
S22	Questioning	1 2 3 4 5 6 7

Section 6

In this section you will answer to what extent you agree with the following statements

1 = Strongly agree
7 = Strongly disagree

S1	My interaction with a computer is clear and understandable.	1 2 3 4 5 6 7
S2	Interacting with a computer does not require a lot of my mental effort.	1 2 3 4 5 6 7
S3	I find a computer easy to use.	1 2 3 4 5 6 7
S4	I find it easy to get a computer to do what I want it to do	1 2 3 4 5 6 7

Section 7

In this section you will answer to what extent you agree with the following statements

1 = Strongly agree
7 = Strongly disagree

S1	My interaction with a OpenOffice would be clear and understandable.	1 2 3 4 5 6 7
S2	Interacting with a OpenOffice would not require a lot of my mental effort.	1 2 3 4 5 6 7
S3	I find OpenOffice would be easy to use.	1 2 3 4 5 6 7
S4	I find it easy to get OpenOffice to do what I want it to do	1 2 3 4 5 6 7

Section 8

In this section you will answer to what extent you agree with the following statements

1 = Strongly agree
7 = Strongly disagree

S1	Assuming I had access to OpenOffice, I intend to use it.	1 2 3 4 5 6 7
S2	Given that I had access to OpenOffice, I predict that I would use it.	1 2 3 4 5 6 7

Section 9

In this section you will answer to what extent you agree with the following statements

1 = Strongly agree
7 = Strongly disagree

S1	Using OpenOffice would improve my performance in my degree program.	1 2 3 4 5 6 7
S2	Using OpenOffice in my degree program would increase my productivity.	1 2 3 4 5 6 7
S3	Using OpenOffice would enhance my effectiveness in my degree program.	1 2 3 4 5 6 7
S3	I fin OpenOffice would be useful in my degree program.	1 2 3 4 5 6 7

Appendix III – Performance test

Assignment

In this assignment you shall create a new document named "assignment". In this document you shall make a presentation of what you have learned during this computer training course. However, there are some tasks that you must perform:

All headlines used must be one of the pre-formatted ones.
The document must contain at least one table summarizing the content of your document. The tabel headlines should be highlighted with red color. The font color should be blue
Make a folder named **it-training** within the **student** folder. Save your document in this folder
Make a bulleted or numbered list
Insert page number (automatically) in your document
Insert date (automatically) in your document
Save your document with the Microsoft Word 97/2000/XP file type

IMPORTANT – Please write your names at the top of the document.

You will have approximately 30 minutes to complete your assignment.

Appendix IV – The Missing Value Analysis

Overview of the missing value analysis for all items:

Univariate Statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes(a,b)	
				Count	Percent	Low	High
CSE1	50	3,00	3,010	0	,0	0	0
CSE2	50	1,44	2,251	0	,0	0	0
CSE3	50	4,22	3,145	0	,0	0	0
CSE4	49	3,67	3,230	1	2,0	0	0
CSE5	50	5,40	3,162	0	,0	0	0
CSE6	50	6,16	3,073	0	,0	0	0
CSE7	50	5,80	3,289	0	,0	0	0
CSE8	50	5,18	3,635	0	,0	0	0
CSE9	49	6,47	3,090	1	2,0	0	0
CSE10	50	5,22	3,888	0	,0	0	0
CA1	50	3,84	2,629	0	,0	0	0
CA2	50	4,14	2,703	0	,0	0	0
CA3	50	5,14	2,523	0	,0	0	0
CA4	50	5,26	2,570	0	,0	0	0
PIIT1	50	1,48	1,446	0	,0	.	.
PIIT2	50	3,84	2,394	0	,0	0	0
PIIT3	50	5,20	2,347	0	,0	0	0
PIIT4	50	1,60	1,245	0	,0	0	4
PLAY1	47	2,62	1,995	3	6,0	0	0
PLAY3	50	5,04	2,373	0	,0	0	0
PLAY7	50	2,06	1,517	0	,0	0	1
PLAY9	49	1,82	1,253	1	2,0	0	6
PLAY15	49	5,35	2,394	1	2,0	0	0
PLAY18	49	5,31	2,172	1	2,0	0	0
PLAY20	48	5,63	1,964	2	4,0	0	0
Post_CSE1	47	5,32	2,580	3	6,0	0	0
Post_CSE2	47	3,23	2,868	3	6,0	0	0
Post_CSE3	47	5,91	3,348	3	6,0	0	0
Post_CSE4	47	5,72	3,360	3	6,0	0	0
Post_CSE5	47	7,11	3,009	3	6,0	0	0
Post_CSE6	47	7,28	2,924	3	6,0	0	0
Post_CSE7	47	7,79	2,553	3	6,0	0	0
Post_CSE8	47	6,74	3,047	3	6,0	0	0
Post_CSE9	47	7,64	2,649	3	6,0	2	0
Post_CSE10	47	7,47	3,078	3	6,0	4	0
Post_CA1	47	4,30	2,686	3	6,0	0	0
Post_CA2	47	5,30	2,293	3	6,0	0	0
Post_CA3	47	5,74	2,048	3	6,0	6	0
Post_CA4	47	6,00	2,075	3	6,0	.	.
Post_PIIT1	47	1,72	1,470	3	6,0	0	4

Post_PIIT2	47	3,40	2,184	3	6,0	0	0
POST_PIIT3	47	5,04	2,368	3	6,0	0	0
POST_PIIT4	47	2,13	1,825	3	6,0	0	9
Post_Play1	47	5,04	2,368	3	6,0	0	0
Post_Play3	47	2,45	1,920	3	6,0	0	0
Post_Play7	47	1,91	1,501	3	6,0	0	8
Post_Play9	46	1,98	1,542	4	8,0	0	6
Post_Play15	47	3,06	2,201	3	6,0	0	0
Post_Play18	46	4,87	2,315	4	8,0	0	0
Post_Play20	45	3,04	2,225	5	10,0	0	0

a Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).
b . indicates that the inter-quartile range (IQR) is zero.

Appendix V – Control Variable Analysis

	R Square			
CV* LV**	Original	With prior experience	With Age	With Gender
CSE	19,3 %	27,6 %	27,1 %	25,5 %
CA	13,6 %	23,0 %	14,8 %	14,6 %
Post_CSE	21,7 %	19,9 %	29,0 %	25,7 %
Post_CA	23,6 %	26,9 %	23,5 %	23,6 %
Performance	48,0 %	47,5 %	47,3 %	48,1 %

Table 21 - R squares of latent variables when influenced by control variables.
***Control variable**
’’Latent variable