



**CROSS-SECTIONAL STUDY ON THE FACTORS THAT INFLUENCE
E-LEARNING COURSE COMPLETION RATES**

THESIS

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AFIT/GIR/ENV/04M-05

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Abstract

Completion rates for web-based courses tend to lag behind their traditional classroom counterparts, sometimes as much as 40% (Carter, 1996; Phipps and Merisotis, 1999; Zielinski, 2000). Thurston and Reynolds (2002) employed motivational constructs to explain why some people persist while others drop out of web-based courses. Their analysis of eight web-based courses and responses from 497 active duty Air Force students indicated that completion goals, off-task distractions, availability of feedback for self-regulation, and continued confidence were important factors that distinguished those who completed their courses from those who did not. One limitation for the 2002 study was its inability to assess the combined effects of these factors.

This current study addresses this limitation by assessing the influence of motivational factors on transfer of learning to the work environment and intentions to pursue e-learning courses in the future. A survey was administered to 1,946 active duty and civilian students who had enrolled in one of the 20 courses offered by the Air Force Institute of Technology's Virtual Schoolhouse. Results were analyzed using the LISREL (Jöreskog and Sörbom, 1993) structural equation modeling program. Analysis of the 791 usable responses provided strong evidence for the hypothesized relationships. Practical and theoretical implications of this research are discussed.

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Christopher C. Earnhardt

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CROSS-SECTIONAL STUDY ON THE FACTORS THAT INFLUENCE E-LEARNING COURSE COMPLETION RATES

I. Introduction

“The next big killer application for the Internet is going to be education...so big it is going to make email usage look like a rounding error.”

John Chambers (1999)

What is e-learning? “E-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance” (Rosenburg, 2001:28). E-Learning can be thought of as education or training that is delivered via a computer network. A subset of distance learning, the roots of e-learning can be traced back to the 1970’s when computer-based training courses began in earnest and advents such as Windows 3.1 began to make the personal computer user-friendly (Rosenburg, 2001). The courses then were generally text-based and instructor interaction was limited in scope. Web based technologies now dominate the e-learning arena. Graphically enriched courses now dominate the landscape and offer more interaction with instructors and peers. The latest wave of e-learning format includes such innovations as streaming media and real-time mentoring from instructors (Carmen, 2002).

Such innovations have led to an explosion in e-learning course enrollments (Parker, 1999). Despite the infusion of technology in e-learning initiatives, course

completion rates still tend to lag behind their traditional classroom counterparts. Several studies report very high attrition rates, in many cases exceeding 40% (Carr, 2000; Carter, 1996; Flood, 2002). Carr's (2000) study indicated that the completion rate in traditional classroom setting was 71% and the identical course provided online had a completion rate of only 58%. Current research is lacking in providing understanding for this troublesome problem (Lewis, 2002; Phipps & Merisotis, 1999: 11). This study can be used to help build evidence as to why this phenomenon is occurring.

Background

E-Learning fills the niche for anytime, anywhere, flexible learning on-demand. With the promise of accessibility, e-learning has evolved as a cost effective and flexible method to train and educate today's workforce (Goodridge, 2002; Rosenberg, 2001). Businesses, academia, and government all have embraced this form of education and training, and will continue to exploit the benefits for the foreseeable future. The e-learning industry is expected to gross \$50 billion in revenues by the end of the decade and is the fastest growing segment of the U.S. corporate business market (E-Learning Gains Momentum, 2003). Private companies have enjoyed the cost benefits of teaching their employees in-house versus sending them on an expensive business trips or bringing in outside experts. More than 60% of all US companies are expected to incorporate some form of e-learning at their business for their employees (E-Learning: Adoption, 2003).

In academia, e-learning growth has risen just as dramatically. US universities have been pouring billions into educating students via e-learning across all disciplines and the enrollments are on the rise (Boser, 2003). A recent study by the U.S. Department

of Education revealed that there were over 2.9 million students enrolled in college-level distance learning programs (Department of Education, 2003). Students can enjoy the benefits of accessing their e-learning instruction whenever they want.

The federal government has also taken an interest in e-learning. The White House issued Executive Order #13111, which specifically mandated the use of e-learning initiatives in order to train government employees (1999). Directing federal agencies to use technological advances to train their workforce is expected to drive down costs and provide a timelier acquisition in needed skill sets. The Department of Defense (DoD) has also focused efforts in training and educating its personnel through e-learning projects. Because military members are constantly moving all over the world, e-learning affords members the opportunity to acquire training and/or education that is required for their job. The DoD's Advanced Distributed Learning (ADL) initiative seeks to modernize education and training through the smart use of information technology (DUSD (R), 1999). The Army's online university allows soldiers to take courses wherever they are deployed (Seffers, 2001). So far, the project is wildly popular with over 35,000 soldiers enrolling since its inception in January of 2001; the Army expects the enrollments of over 80,000 soldiers by 2005 (Caterinicchia, 2003). On-demand instruction from e-learning will become an integral part of military life as technology and accessibility increase.

The Air Force Institute of Technology's School of Systems and Logistics, at Wright-Patterson Air Force Base, Ohio, has developed an e-learning continuing education center, nicknamed the Virtual Schoolhouse (VSH). The goal of the Virtual Schoolhouse is to fully train and educate Air Force acquisition personnel in the latest techniques and updates in the world of government acquisition (AFIT/LS, 2003). The

VSH offers Air Force students 20 different courses covering a wide array of disciplines. The courses are delivered via the Internet asynchronously. In other words, the students can access the courses at anytime in order to complete the course within the final deadline; there is no “live” component.

Problem Statement

E-Learning is a booming industry in academia, private business and government; however, completion rates for e-learning courses are shown to be less than in traditional classroom setting. The power of this application (e-learning) will not be fully realized if dropout rates remain at such high levels (Phipps & Merisotis, 1999: 31). The challenge then is to define the factors that lead to low completion rates and to provide researchers and course developers this understanding in order to build courses that positively influence student persistence. The seemingly high drop out rates observed in e-learning is a concern for all involved. The Air Force Institute of Technology’s School of Systems and Logistics has a similar concern with apparent low completion rates in their e-learning curriculum. Efforts from this study will be used to help design a motivationally sound curriculum in the hopes of increasing course completion rates. In particular, this study will attempt to shed light on why students fail to complete their VSH courses. If conclusions can be drawn from this study that point out specific factors that influence student’s behavior, then the hope is that course designers can integrate those lessons into developing a more accommodating curriculum.

Implications

So why bother studying certain factors that lead to low e-learning course completion rates? One reason is to produce a theoretical model that researchers may be able to use for future e-learning or other attrition studies. Any discovery that helps uncover why this new medium is experiencing completion difficulties would be beneficial. Subsequently, the information provided from this research should help VSH administrators and designers address some of their unique concerns in order to provide a more useful product to their customers, the U.S. Air Force personnel and contractors.

It makes sense that e-learning programs in government, business and academia will continue to grow. The potential benefits to all involved makes e-learning a valuable resource for consumers and a potential goldmine for suppliers. As society becomes more mobile, e-learning programs will accommodate the demand for affordable, flexible, continuous learning.

Research Questions

This study answers three primary research questions. What factors distinguish those who complete their e-learning activities without difficulty from those who have difficulty completing or do not complete their e-learning courses? What are the relationships of those factors to reported transfer of learning to the workplace? What are the outcomes of those factors and transfer of knowledge on intentions to continue and advocate e-learning in the future?

This study has built upon the work of Thurston and Reynolds (2002) in trying to identify factors that lead to low course completion rates. As in the previous study, motivational theory was used to help determine the factors that influence a student to complete or drop out from an e-learning course. Simply put, motivation can be explained as “the forces acting on or within an individual to initiate and direct behavior” (Gibson and others, 2003:126). This study used various constructs of motivation to determine why some students persist towards completion and why an apparently high number of e-learning students terminate their efforts prior to course completion.

This first research question is largely a replication of the work conducted by Thurston and Reynolds (2002) which investigated the differences in reported distraction, facilitation, and self-regulation factors between those students who completed without difficulty and those who had some trouble completing their coursework. Completing a course without difficulty means that students were able to finish their course in the allotted time without having to ask for an extension or having to retake the course. Experienced difficulty refers to the fact that a student failed to complete the course, for whatever the reason, needed a time extension, or opted to retake the course. Thurston and Reynolds (2002) analysis of responses from 497 e-learning students indicated that completion goals, off-task distractions, availability of feedback for self-regulation, and continued confidence were important factors that distinguished those who completed their courses from those who did not.

One limitation for the 2002 study was its view of the independent effects of these factors. The second research question focused on this limitation and investigated the combined effects of these factors on reported transfer of learning to the workplace. If

there were considerable network problems when a student tried to connect to the network, then the frustrations of such a problem may lead to a decrease in his/her motivation. Accordingly, if students encountered competing demands at work or at home while they tried to concentrate at e-learning then these distractions could also lead to decreased motivational levels. The negative effect of distractions may be countered by strong completion goals and the presence of timely feedback from the course and the instructor. Goal setting and feedback can be powerful forces that operate independently from the negative influences of distractions on persistence and reported ease-of-use of the e-learning course. All of these factors should have an influence on the extent that the student can learn the required material and then transfer that knowledge to their job.

The third research question went beyond transfer of learning to the work environment and looked at the relationship between these factors and intentions to pursue e-learning courses in the future. The research question investigated the extent that the presence of positive motivational factors translated to stronger intentions to take or advocate e-learning courses in the future.

Thesis Overview

Chapter I provided a brief introduction into the current low completion rate issues facing e-learner course administrators. A possible explanation for this growing dilemma could be motivation theory. Building upon the previous work conducted by Thurston and Reynolds (2002), this study was conducted to provide further insight to researchers in an effort to build motivationally sound courses.

Chapter II supplies a review of related investigations on this topic in building the case for this research. Chapter III then delves into the methodology used to test the research questions. Chapter IV provides the results of the research and the analysis performed on the data. Finally, in chapter V, the conclusions of this research effort are presented and recommendations are made based on the results gathered from this project.

II. Literature Review

“There are three things to remember about education. The first is motivation. The second one is motivation. The third one is motivation.”

Maehr & Meyer (1997)

Introduction

This chapter presents a review of literature that leads to a revised integrative motivational model of e-learning. The chapter was organized based on the three research questions of this thesis. In the first section, I discuss the motivational factors that Thurston and Reynolds (2002) found different between categories of e-learners – those who finish without difficulty, those who finish with some difficulty, and those who do not finish at all. Thurston and Reynolds (2002) described the second category as those people who had to ask for one or more extensions while taking the course or had to withdraw from the course and then re-enroll before they successfully completed the course. The final section completes the integrative model by investigating the relationships between the motivational factors on transfer of knowledge and intentions to continue e-learning in the future.

Motivational Factors Distinguishing Those Who Complete E-Learning

This next section summarizes the factors analyzed by Thurston and Reynolds (2002) and Reynolds (2002) as to what distracts, facilitates, and supports self-regulation of e-learning. Lewin (1951) conceptualized that motivation in humans can be explained as a competition of sorts between forces that impel actions “push” and forces that in turn

repel actions “pull.” The push-pull theory was then first applied to education by Miller (1967) and since then countless others have followed suit. More recently, researchers have keyed in on how these constructs could be affecting today’s e-learner.

Phipps and Merisotis (1999) pointed out that the outcomes of traditional classroom teaching were no different from the outcomes realized from distance learners. If the graduates of distance learning receive the same quality education as their peers in a traditional setting, then why are course completion rates lower? One of the intriguing factors that “push” an individual to enroll and persist in e-learning may also be a “pulling” factor that causes them to desist from their goal attainment. The promise of anytime, anywhere learning is realized by the robustness of the technology that carries it to the student. In the future, e-learners are promised that they will be allowed to access their information from a variety of platforms without the encumbrance of wires, keyboards, or location (Wentling, 2000). In order to experience this promise, the technological problems need to be at a minimum; otherwise, the “pull” of this frustrating dilemma could persuade an e-learner to not complete the coursework. Research suggests that as this “pull” is minimized course completion rates do tend to increase (Reynolds, 2002).

The premise of Reynolds (2002) study was that e-learning completion is affected by distractions, facilitators, and self-regulators. The findings of that research led to the model depicted in Figure 1 below. The following sections describe the replication of Reynolds’ study that provided the first three hypotheses of this research effort.

The arrows point from completion status to reported distractions, persistence facilitators, and self-regulation facilitators because of the method of analysis. Reynolds

identified groups of students based on their completion status and then compared relative frequencies and means of measures of the three constructs. The analysis provides a method to identify potential motivating and demotivating factors, but cannot be used to justify a casual relationship to the completion status.

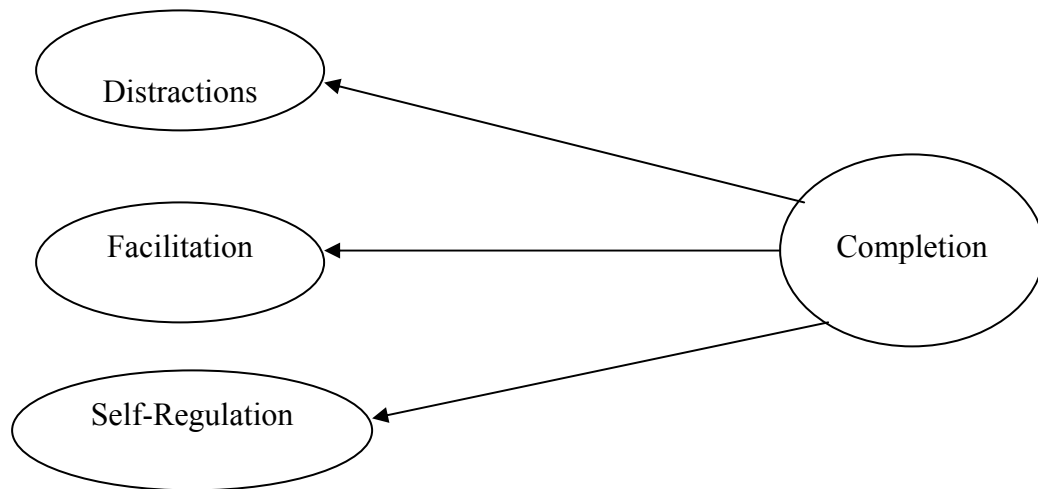


Figure 1: Model of Research Question 1

Factors that Distract

Because e-learning is not conducted in a vacuum, external forces, such as work, network problems or family concerns, will be present. Traditional classrooms control this by having a setting that is free from work or family demands when material is being presented. It is unlikely that a student in a traditional classroom setting will have their boss interrupt them to pursue a suspense or that their children will distract them while they are taking notes from a lecturer. E-Learners do not have this luxury. Evidence presented by Reynolds suggests that external forces can indeed negatively influence their

behavior (Reynolds, 2002: 81). The potential benefit of anytime, anyplace learning could be counterbalanced by forces not aligned to assist the e-learner during their course of study. The classroom blocks out interruptions from coworkers, noise at one's home, or alternate tasks from supervisors and allows for concentration free from these distractions. An environment free from such distractions is critical for success. These factors can "pull" the student away from course completion and make it difficult to achieve their initial objective.

This is a difficult hurdle for administrators to overcome. E-Learning will continue to become a more prevalent method for instruction each year but the anywhere environment can not prevent such distractions. In order for the e-learner to succeed, they will have to instill personal discipline (Guglielmino, 2003). The first hypothesis measures the pull factors of external pressures that VSH students face.

Hypothesis 1: Those students who complete their course without difficulty should report fewer distractions than those who experienced difficulty completing their coursework.

Factors that distract are important factors for research; however, they are generally beyond the control of administrators and courseware designers. There is very little an administrator can do to control for a student's environment in this type of instructional method. The promise of anywhere, anytime learning has its potential pitfalls that the student will have to balance to become effective at this discipline. The remainder of this research focuses on motivational aspects of student course completion

rates. It is hoped that the research provided here could be used to provide more motivationally sound courses.

Factors That Facilitate

The American Heritage College Dictionary (Costello and others, 1993) defines motivation as forces acting on or within a person to initiate behavior. As such, psychologists have studied this force for many years and have developed many theories of motivation to explain human behavior from numerous angles. The most popular theory of motivation being researched is goal setting (Mitchell, 1997). This approach is widely used in explaining why people engage in learning behavior. Locke and Latham (1990) simply define a goal as “something that the person wants to achieve” (Locke and Latham, 1990: 2).

In goal oriented behavior, people set a distal (or long-term) goal and then subdivide the distal goal into smaller proximal (or short-term) goals. In essence, the proximal goals are used as stepping stones towards the final, overarching goal (Alderman, 1999). This type of division of goals has been shown to increase one’s intrinsic motivation by accomplishing these proximal goals (Bandura and Schunk, 1981).

The effectiveness of these goals can be measured by commitment (Klein and others, 1999). One of the important aspects to the theory postulated by Latham and Locke is this notion of commitment (1991). Latham and Locke define goal commitment as “the degree to which the individual is attached to the goal” (Latham and Locke, 1991: 217). As the difficulty of the goal rises, the commitment towards goal completion also rises (Klein and others, 1999). With easy goals, the level of commitment is not as great

as a relatively difficult goal. Likewise, as the commitment towards a goal increases, the likelihood of goal attainment is also likely to increase (Locke and Latham, 1990).

In the context of e-learning, the likelihood towards course completion would increase as the commitment increases. For instance, if an e-learning course is needed to complete a certification to compete for a job promotion the commitment towards completion would be strong. On the other hand, if a student takes an e-learning course just for personal knowledge gain, the commitment towards course completion may not be as high. With this argument, it is hypothesized that:

Hypothesis 2a: Those students who completed their course should report a greater commitment towards the goal of completing than those who failed to complete their e-learning course.

Intrinsic and extrinsic motivation are other factors that facilitate. Deci and Ryan laid out the groundwork for the competing forces of intrinsic motivation and extrinsic motivation with their self-determination theory (Deci and Ryan, 1985). In this theory, people are seen as motivated towards the need for competence, or mastery, and autonomy. This source of motivation comes from within. These intrinsically motivated people seek challenges in order satisfy these needs. In the realm of e-learning, competence would include such things as gaining knowledge and using that knowledge to improve job performance. Positive autonomy, on the other hand, can be viewed as the gratification one receives from working alone. Ryan and Deci (2000) emphasize that both of these factors must be present for the motivation to continue.

Whereas intrinsic motivation occurs for the enjoyment of the task, extrinsic motivation occurs whenever there is a separable instrumental value (Ryan and Deci, 2000). In other words, motivation is initiated from something else beyond the interest of doing the activity itself. This can be for any number of reasons. Many people work solely for acquiring money or prestige. With e-learning, extrinsically motivated people could be involved because they are being forced to by their supervisor or perhaps because they desire a promotion that the classes could assist them in acquiring. Thus, based on the well documented and tested theory of self-determination, the following hypothesis tries to predict the completion of an e-learning course given intrinsic and extrinsic motivational factors.

Hypothesis 2b: Those students who complete their course without difficulty should report higher intrinsic motivation than those who experienced difficulty while taking their course.

Hypothesis 2c: Those students who complete their course without difficulty should report higher extrinsic motivation than those who experienced difficulty while taking their course.

Factors that Support Self-Regulation

Feedback and self-efficacy are two facets of self-regulation that is considered in this research. Performance feedback should be levied both throughout the process of goal attainment and also at the point of goal completion (Locke and Latham, 1990). This regular feedback is particularly important with difficult tasks (Skinner, 2002). Feedback

helps a student to focus effort towards goal completion and away from non-relevant activities. Equally, goals are not effective as motivators if the individual can not assess their movement towards completion (Locke, 1996). This method of receiving and providing feedback to students is being incorporated into distance learning modalities. Having a forum to provide and receive timely and relevant feedback was found to be an important aspect to student motivation in a distant learning environment (Moti, Kurtz and Levin, 2002).

The third factor addressed by Reynolds (2002) is the student's ability to self regulate. Students assess their progress through feedback mechanisms provided by the instructor and by the course itself. Students then assess their efficacy of completing the required tasks given the demands of the course content and the course technology.

Hypothesis 3a: Those students who complete their course without difficulty should report that they received more timely and relevant feedback from their instructor than those who experienced difficulty while taking their course.

Hypothesis 3b: Those students who complete their course without difficulty should report that they received more timely and relevant feedback from the course than those who experienced difficulty while taking their course.

Another factor of self-regulation is self-efficacy. "Self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994). In other words, a person's confidence in themselves influences their motivation for accomplishment of

goals. In essence, the stronger one's perceived self-efficacy the more motivated they are at tackling a project and the more likely they will persist towards completion (Bandura, 1986).

This pioneering theory has been extended to the realm of education and learning to describe why students engage and persist in a learning environment. Ponton (2002) laments that positive self-efficacy in college students must be developed in order to motivate them to meet their desired goals. He further states that when "students become more confident in their capability to execute competencies required in college, they are more likely to be motivated to enact such skills after graduation," (Ponton, 2002). Therefore, when self-efficacy is raised in students they are not only more motivated to complete the task at hand but they are further propelled to complete like tasks in the future.

Hypothesis 3c: Those students who complete their course without difficulty should report a higher rate of self-efficacy with course content than those who experienced difficulty while taking their course.

Self-efficacy can be influenced in other ways as well. The technology involved with e-learning can in itself be a contributing factor to a student's self-efficacy. There have been several studies conducted which evaluated the motivating effects of IT on student learning. One of the more popular studies has been the work of Davis, Bagozzi and Warshaw (1989), who developed the theory known as the Technology Acceptance Model (Davis et al, 1989). The model, shown below, links the user's perceptions of the

perceived usefulness of the technology and how easy it is to use along with their attitude to use the IT and their intentions to use it (Cox et al, 1989).

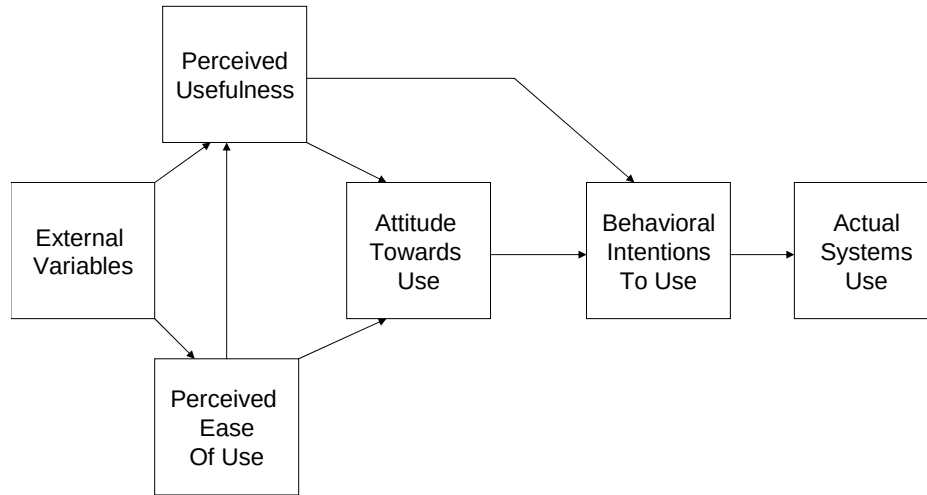


Figure 2. Technology Acceptance Model (Davis, Bagozzi and Warshaw, 1989, p. 985)

This study and the others that followed have given evidence to the motivating effects of IT on student leaning (Cox, 2002).

Hypothesis 3d: Those students who complete their course without difficulty should report a higher rate of self-efficacy with the e-learning technology than those who experienced difficulty while taking their course.

This study tries to replicate the findings of Thurston and Reynolds (2002) research. A host of distractions, three types of facilitation, and four types of self-regulation factors have been hypothesized to mark differences between those who had difficulty completing their e-learning course and those who completed without difficulty. The next section describes how a subset of these factors may independently influence two measurable outcomes of the motivation process—transfer of learning to the workplace and intentions to advocate and participate in e-learning in the future.

Effects on Motivational Outcomes

The primary limitation of Reynolds' (2002) research was the inability to assess the combined relationship of distracters, facilitators, and self-regulators on course completion. Research question two asked, what are the relationships of these factors to transfer of information to the workplace? Because of the dichotomous nature of the course completion variable, and the relatively low survey response rates of people who had difficulty completing their course, surrogate measures of motivational outcomes were developed.

This research question tries to capture what effect these factors have on a student's ability to learn and eventually transfer the acquired knowledge to their work. The premise here is that if motivational factors are favorable, people will learn the material and transfer it to work. The fourth set of hypotheses then test the relationship between each factor and transfer of information. Only five of the eight factors investigated in research question one were carried forward to this second research question. Distractions remain the same. Facilitation factors are represented by goal

commitment. Intrinsic and extrinsic motivation were dropped. Self-regulation factors are represented by course provided feedback, instructor feedback, and perceived ease-of-use of the technology. Self-efficacy associated with the course content was dropped from the analysis.

Hypothesis 4a: There is a negative relationship between the reported quantity of types of distractions and the transfer of information to the workplace.

Hypothesis 4b: There is a positive relationship between the reported goal commitment and the transfer of information to the workplace.

Hypothesis 4c: There is a positive relationship between the reported quantity of types of feedback provided by the instructor and the transfer of information to the workplace.

Hypothesis 4d: There is a positive relationship between the reported quantity of types of feedback provided by the course and the transfer of information to the workplace.

Hypothesis 4e: There is a positive relationship between the reported ease-of-use and the transfer of information to the workplace.

Research question three posits the consequences of persistence with e-learning. The motivational factors have an effect on the transfer of knowledge from the courses to

the work environment, and both motivation and transfer should influence a student's intent to pursue e-learning in the future.

The transfer of information from the e-learning environment to the work place can have a profound impact on one's motivation. Thompson, Brooks, and Lizarraga (2003) point out in their study that not only did transfer of information occur from distance learning but that the student's confidence increased when they found the information to be useful.

Beyond transfer, the motivational factors may also be related to e-learning future intentions. Students who experience severe amounts distractions may be so frustrated that they choose to never use the technology again. The same phenomenon is likely for ease-of-use. People frustrated with the technology are unlikely to come back. Students with strong completion goals will likely have greater intentions to engage in e-learning in the future, regardless of the amount transferred.

Hypothesis 5a: There is a positive relationship between the reported transfer of information and intent to pursue e-learning in the future.

Hypothesis 5b: There is a negative relationship between the reported quantity of types of distractions and the intent to e-learn in the future.

Hypothesis 5c: There is a positive relationship between the reported goal commitment and the intent to e-learn in the future.

Hypothesis 5d: There is a positive relationship between the reported quantity of types of feedback provided by the instructor and the intent to e-learn in the future.

Hypothesis 5e: There is a positive relationship between the reported quantity of types of feedback provided by the course and the intent to e-learn in the future.

Hypothesis 5f: There is a positive relationship between the reported ease-of-use and the intent to e-learn in the future.

Integrated Model and Concluding Observations

This study's objective was to define the host of motivational factors that influence students to persist at e-learning and give course designers and administrators some additional insights as to the student's persuasion. The revised integrated model below is an update to the model developed by Reynolds (Reynolds, 2002: 39).

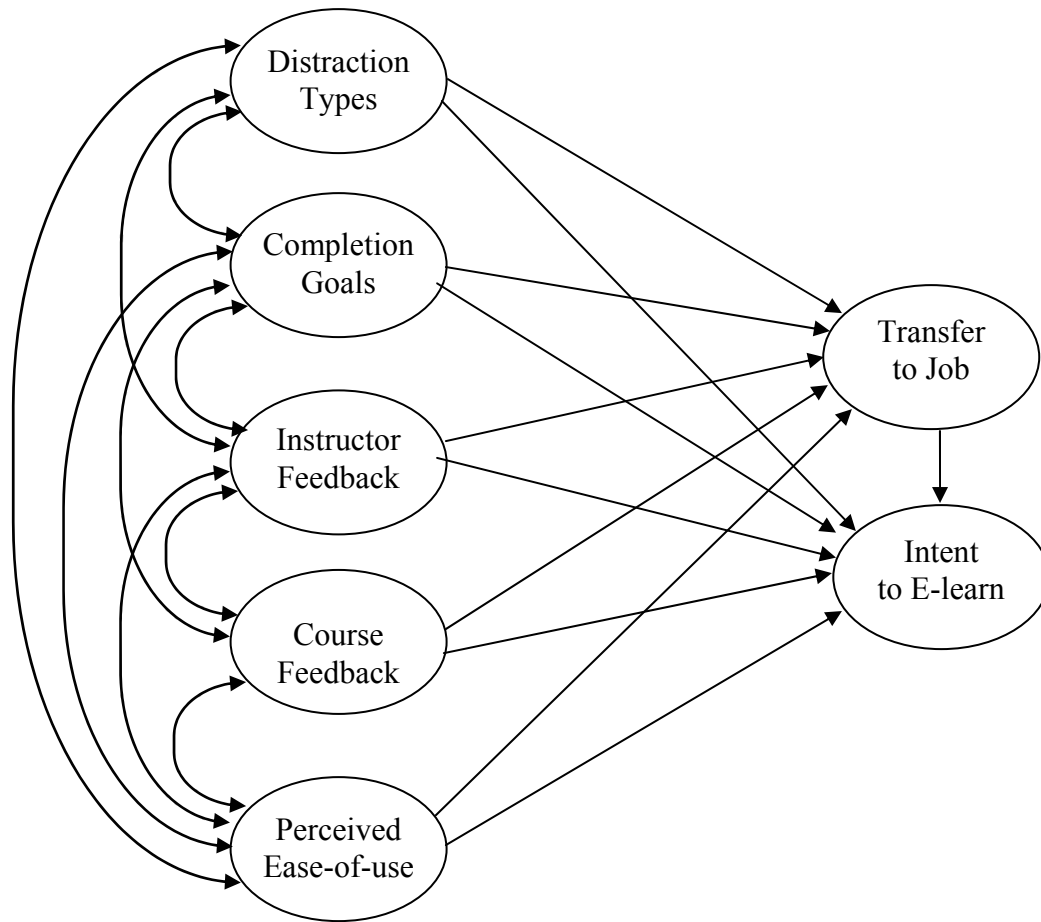


Figure 3. Integrated E-Learning Course Completion Model

Summary

This research effort attempts to measure the independent effects of the motivational factors on transfer of knowledge and intentions to continue e-learning. Research question one attempted to define the factors that distract, facilitate, and support self-regulation in students engaged in e-learning. The second research question then investigated the relationship of those factors with the transfer of the information to the workplace. Finally, the third research question asks what is the relationship of those

same motivational factors and transfer to a student's intent to pursue e-learning in the future.

In short, the integrated model highlights the effects of external factors as well as the complex psychological notation of motivation. Findings from this research could provide administrators and designers insights into developing a more motivationally sound experience in order to boost completion rates, transfer, and intentions to e-learn in the future. Researchers may be able to add to the findings to better predict and explain e-learning attrition rates and what specifically can be done to further reduce them. Chapter three discusses the method used to test the hypotheses listed in this chapter.

III. Methodology

Though this be madness, yet there is method in 't.

William Shakespeare (1623)

Introduction

This chapter provides details of the methodology used to measure the constructs of motivation which were listed in Chapter 2. The research instrument, Revised E-Learning Course Questionnaire, was a web-based survey built to garner the information required to address the hypotheses listed in the previous chapter. The questionnaire was constructed from Reynolds' survey and then supplemented by a literature review. All 20 courses offered by the Virtual Schoolhouse during 2002 were included for analysis. The questionnaire was sent to every student who enrolled in one of these courses. The remainder of the chapter further describes the development of the research instrument, subject pool, data collection, and the statistical analysis used in this effort.

Instrument Development

The items selected to measure the constructs were developed by various means. Similar or exact questions from the work of Thurston and Reynolds (2002) were used to test the relationship among motivational constructs. These questions were bolstered by research ideas developed by similar e-learning attrition studies (Parker, 2003; Carr 2000). The entire questionnaire was built on the premise that the students were initially motivated to at least enroll into the course. The question is then to discover what either

motivated them to continue towards course completion or propelled them to cease short of completion.

The survey consisted of an introduction page with instructions and Privacy Act information, nine questions concerning demographics and 43 items used to measure the motivational constructs. The demographics section collected data such as marital and dependency status and the respondent's rank or civilian grade. The respondent was also asked to provide information on which course they enrolled, whether or not they completed the course, whether or not an extension was required and if they needed to retake the course for any reason. Furthermore, the survey questioned how many previous e-learning courses they had taken prior to the one in question and where and when they worked on this course. The types of items used were check all that apply, choose the best answer, and a 5-point Likert scale ranging from 1 (Strongly Disagree) to 3 (Indifferent) to 5 (Strongly Agree).

The survey included six questions that were designed as "check all that apply." Following each question, the subject could select any combination of responses that they felt applied to their e-learning experience. In order to achieve a quantity for the question, a summation of the responses from the question was tallied to produce a construct measurement. For example, there was one question on the survey from the check all that apply category that measured intrinsic and extrinsic motivational factors. There were ten responses that a subject could answer. Then, based on the total number of subject selections, a measurement of extrinsic or intrinsic motivation was deduced. Also within

this section, there were questions dealing with distractions, off-task demands, and feedback.

The survey was analyzed and approved by a VSH administrator, transformed into a webpage via Cold Fusion programming language, and placed onto an AFIT School of Engineering and Management Web Server with the address of <http://en.afit.edu/env/elearning/>. The Air Force Survey Branch of the Air Force Personnel Center (AFPC/DPSAS) approved the survey for Air Force members and gave it a control number of USAF SCN 03-051 with the expiration date of 1 September 2003. The survey was also submitted to the human subjects review board for exemption from full protocol review. The survey was determined by the Air Force Research Laboratory's Institutional Review Board (AFRL/HEH) on 17 April 2003 to have met the Air Force's protocol requirements, was lawful, and was given an exemption approval number of FWR 2003-0056-E. The survey was approved for release in order to collect data from Air Force members.

Data Collection Procedures

A total of 2,103 e-mail messages (sample provided in Appendix A) were sent out to all of the potential subjects of this research urging them to participate. 157 of those e-mails were returned as undeliverable. Ten days later, a follow-up e-mail (Appendix B) was sent to the same pool asking those who had not yet participated to please reconsider. Both messages explained the purpose of the study, contact information and a hyperlink to the survey. The e-mails were batched according to course and every student who enrolled in that particular course was sent an e-mail highlighting which course they had

enrolled to remind them which they had taken. This would also assist them to choose the correct course from the drop down menu on the demographics page of the survey in case they had forgotten. This separation of courses then allowed for statistical information to be conducted on each individual course offered by the VSH.

The hyperlink included in each e-mail directed the subject to the on-line survey. The opening page provided the students with instructions on how to navigate through the questionnaire and information on their assurances of anonymity. Once the “Start Survey” button was clicked, the subject was directed to the survey and information could be entered via a “point and click” method. The pages were designed so that the subject would not have to scroll and information such as the time started and completion status was prominently displayed at the bottom of each screen. In order to advance to the following page, the subject would have to click the “Next Page” button located at the bottom of each page. To help ensure completeness, a subject could not advance to the next page of the survey unless data had been entered into each question. Once completed, the subject was asked to click the “Finish” button and a screen thanking them for their participation was displayed. After finishing, the completed survey information was sent to a database that also collected information on the subject’s start and finish time and Internet Protocol address but did not collect any information to compromise their anonymity.

The survey was kept online for 14 days after the follow-up e-mail was sent to the enrollees. Overall, 909 students responded to the survey; however, only 791 of those responses were usable. This was because the software used to conduct the analysis

required all fields to contain a value. In the end, a total of 791 usable responses were received out of a total number of 1,946 survey requests sent to active e-mail addresses for an overall response rate of 40.6%.

Sample

The subjects of this research effort included all enrollees in all of the Virtual Schoolhouse's e-learning courses during the year 2002. Of the 20 classes offered that year, the school enrolled 3,931 students, though some of these students had enrolled into multiple classes over the course of the year. In essence, there were 3,931 class participants, not 3,931 individual people. The pool was a mixture of male and female, military and government civilian. The military ranks ranged from E-4 (Senior Airman) to O-7 (Brigadier General) and the civilian pay grades ranged from GM-13 to GM-15 (wage grade) and GS-2 to SES-4 (Senior Executive Service).

The subject list was gathered from a spreadsheet of metric measurements provided by the VSH. The spreadsheet captured information on the student's name, job location and description, e-mail address, courses enrolled, and course completion status (i.e. not completed, completed, or withdrew). The population for this study included all enrollees. All duplicate names for a particular course were deleted so that a subject would only receive one notification for a particular course.

Each subject who participated did so voluntarily. No compensation was afforded those who chose to participate nor any retribution to those who did not contribute to the questionnaire. Subjects were informed of the reasons for the research and who would

have access to their results. In addition, the AFPC survey control number and the subject's Privacy Act rights were clearly displayed on the survey's front page. The survey is included in its entirety in Appendix C.

Demographics Data

The first page of the survey asked students basic questions in order to gather demographics. The questions probed for answers on such questions as their rank or civilian grade, marital status, whether or not they had children, which course they had enrolled in, whether or not they had completed it, whether or not they completed the course, if they required an extension, e-learning experience, and when and where they normally engage in e-learning activity. These questions were all designed to check for influences on the e-learner that could possibly help or hinder their motivation to complete their study.

Completion Status.

In total, there were 169 (21.3%) military respondents, 90 (11.3%) contractors, and 532 (67.3%) government civilians. The questionnaire asked respondents to state whether or not they had completed the course under question. Out of the 791 usable responses, 86 (10.8%) were not able to complete the course versus the 705 (89.2%) that did complete. Thirty-four (4.8%) of those that completed the course had to either request an extension or retake the course in order to finish it. Of the 86 who were unable to finish the course, 13 (15.1%) had also requested an extension or re-enrolled in the course later. The overall completion rate for the school in 2002 was 67%, so the sample under-

represented those who did not complete their e-learning course (11% versus 33% in the total population). Table 1 illustrates the completion statistics.

Table 1. Status of Completion

	Total	Percent Completed	Percent Not Complete
Overall	791	89.2%	10.8%
Military	169	83.4%	16.6%
Contractors	90	83.3%	16.7%
Civilians	532	92.3%	7.7%

Marital and Children Status.

Asking students their marital and dependency status was important for it could identify additional off-task demands that might not otherwise deter people without these family concerns. Having this additional load may be a significant influential factor in determining whether a student maintains the motivation to complete the coursework. Administrators could use this information to help design classes to assist students under such conditions.

Those students with children comprised 63.3% of the sample or 502 of the total number of responses. Not surprisingly, this group had the highest percentage of dropouts, at 12.5%. Dependents add another source of distractions for e-learners to cope with. This compares to 79 (10.0%) replies from students who were married but had no children. The number of single students with dependents was 103 or 13% of the sample. That this category had completions rates that were very similar to those without children and is contrary to the findings reported by Reynolds (2002) In that study, single people

with dependents reported the lowest rates of completion. Finally, single students without children comprised 13.4% of the sample or 106 responses and had a dropped rate of only 7.5%. Three people chose not to answer this question.

Table 2. Marital Status

	Marital Status	Total	Percent Completed	Percent Dropped
Married	With Children	502	87.4%	12.5%
	Without Children	79	92.4%	7.6%
Single	With Children	103	93.2%	6.8%
	Without Children	106	92.5%	7.5%

When and Where E-Learning Takes Place.

Another potentially important motivational factor in determining a student's successful completion of a course would be when and where a student studies the material. The survey asked participants to "check all that apply" to the question, "I normally worked on the E-Learning Course..." and had a list of three possible answers: primary work location, a special work area assigned for e-learning, or a location other than their primary work location (home, library, etc). Likewise, having time to work on e-learning coursework at a desired location could help motivate a student to persist at e-learning. The questionnaire asked users to "choose one," either during regular work hours or outside of regular work hours. Tables 3 and 4 lists the results of the survey.

Table 3. Where E-Learning Takes Place

	Total	Percent Completed	Percent Dropped
At work only	648	90.1%	9.7%
Special area at work	4	100.0%	0.0%
At work and other	80	83.8%	15.0%
Other than work	56	89.3%	8.9%

Table 4. When E-Learning Takes Place

	Total	Percent Completed	Percent Dropped
Outside regular work hours	191	85.30%	14.70%
During regular work hours	600	90.00%	10.00%

Measures

Distractions.

The first measurement for distractions was a “check all that apply” type. Students could select from a list of ten different distractions that they might have encountered while engaged in e-learning. Distractions included general background noise (phone, office chatter, television), job related demands (meetings, deadlines, requests), personal demands (family, friends, clubs), poor course design, network outages and hardware/software problems. Respondents could also select that none applied or choose an “other” category and describe their particular dilemma. In the other category, job related demands not specifically mentioned dominated the responses. “TDY” was mentioned five times. Other job related comments included, “I wish that I could have

gone to another site to take the course without the daily job interruptions” and “Just a supervisor that didn't want you to do this during your working hours.” A second question asked respondents to select from a list of improvements from the following statement, “I would gladly take another e-learning course if the following improvements were made.” Five choices were listed, including: “fewer technical problems”, “fewer job demands/distractions”, “fewer personal problems”, “no problems”, and “other.” Many people responded to the “other” category. The feedback from this question ranged from the time demands that this coursework places on them to requesting more classes in a wider array of areas. Selected comments include, “more courses offered in other areas,” and “more time to complete the course.” The scale for the distractions construct was a simple sum of the seven items from the first question and three items from the second question. The scores ranged from 0-10, with a mean of 1.9 and a standard deviation of 1.6. The distribution of the distractions data was slightly deviated from a normal distribution (skewness = 0.1 and kurtosis = 1.5).

Goal Commitment.

The measurement for the goal oriented questions was an average of four related items on a five point Likert scale. Students responding to the survey were asked to rate the extent to which they either agreed or disagreed with the following four statements: “completing the ____ course was important to me”, “once I enrolled in the course, my initial intentions were to complete it”, “from the beginning, I planned to give the ____ course my best possible effort”, and “when I started the ____ course, I was confident that I would complete it.” This four item scale had a satisfactory level of internal consistency

as indicated by Chronbach's alpha ($\alpha = .84$). The measure ranged from 1 to 5 with a mean of 4.4 and a standard deviation of .58. The distribution of the goal data deviated from a normal distribution (skewness = -2.1 and kurtosis = 9.0). The previous stated assumption that most people enter the e-learning course with the initial intentions to complete it appears to be correct. Only 1.9% of the respondents had a scale average of "indifferent" or less and 89.4% of the respondents either "agreed" or "strongly agreed" with the four statements.

Feedback.

The measure for the feedback construct was also a "check all that apply" type. Respondents were asked to select the types of feedback they received while taking the e-learning course. The list included seven items of possible feedback. Three types were automated messages from the course and three types were from the course administrator. Both automated and instructor initiated messages concerned with, results of quizzes and exercises, hardware/software issues, the student's course performance were included in this question. A seventh item concerned messages received by the student in response to question they initiated. An "other" category as well as "I received **NO** feedback" was also listed as possible responses. The scale for this measurement was also a simple sum of the 8 number of items. The scores ranged from 0 to 7 with a mean of 1.2 and a standard deviation of 1.1. The distribution of the distractions data deviated moderately from a normal distribution (skewness 1.6 and kurtosis 5.0).

Perceived Ease-of-Use.

This measure was derived from the perceived ease of use scales. Students were requested to define the extent to which they either agreed or disagreed with the following six statements: “it was easy to find the information I needed to complete this course”, “I found it easy to stop and restart this course”, “I found the course navigation tools easy to use”, “the content of the course was well organized”, “the information on each page was presented clearly”, and “the help function was easy to use.” The six item scale had a satisfactory level of internal consistency as indexed by Chronbach’s alpha ($\alpha = .89$). The measure ranged from 1 to 5 with a mean of 3.9 and a standard deviation of .55. The distribution of the data deviated moderately from a normal distribution (skewness = -1.0 and kurtosis = 3.5).

Transfer.

The measure for the transfer construct was adapted from the existing perceived usefulness scale. Students were asked to indicate the degree to which they agreed or disagreed with the following four statements, “applying what I learned in my ___ course has enabled me to accomplish work related tasks more quickly”, “applying what I learned in my ___ course has enhanced my effectiveness on the job”, “I have found that what I learned in my ___ course has made it easier to do my job”, and “I have found that what I learned from my ___ course is useful in my job.” The four item scale had a high internal consistency as indicated from Chronbach’s alpha ($\alpha = .94$). The measure ranged from 1.0 to 5.0 with a mean of 3.5 and a standard deviation of 0.72. The distribution of the data differed little from a normal distribution (skewness = -.67 and kurtosis = 1.0).

Intent to E-Learn.

The measure for the intent construct asked students to indicate the extent to which they agreed or disagreed with the following four statements, “I would be willing to take another e-learning course”, “I plan to take another e-learning course in the future”, “I would recommend this course to other students”, and “the only reason I would take another e-learning course is if I am required.” The last item was reversed scored by subtracting the given value from 6. The four-item scale had an internal consistency of .80 as measured by Chronbach’s alpha. The measure ranged from 1.0 to 5.0, with a mean of 4.2 and a standard deviation of 0.65. The distribution of the intent data differentiated only slightly from a normal distribution (skewness = -1.1 and kurtosis = 2.6).

Comparisons

Two techniques were used to test the hypotheses for research question one. The first technique used the two-sample t-test assuming unequal variance. The test was used to compare the mean score of two groups of variables associated with the Likert type questions. The two groups used in the comparison were Completed versus Not Completed and Difficulty versus No Difficulty. The null hypothesis of the t-test is that there is no difference in the means of the tested groups and any statistical difference found then is not due to random error.

The second technique used for research question one dealt with the questions that collected a frequency of responses and these required a Chi-square (χ^2) test for independence. Chi-square is used to determine if there is a relationship between the two groups under study, which in this case is students who experienced difficulty versus those

who did not. The groups are expressed numerically in contingency tables. The null hypothesis is expressed by the formula below.

$$H_o: P(S) = P(S|C) = P(S|D) \quad (1)$$

$P(S)$ is the probability that the respondent selected the motivational factor. $P(S|C)$ and $P(S|D)$ are the conditional probabilities of selecting the factor given that they completed the course without difficulty or experienced difficulty completing the course. Failing to reject the null implies that there is no difference between the relative difficulty in completing the course for that factor of persistence. Rejecting the null implies that there is a relationship between the given motivational factor and the degree of difficulty experienced with completing the e-learning class.

Structural Equation Modeling

Research questions two and three used a statistical technique called structural equation modeling (SEM). SEM is used to determine the validity of a model. The LISREL (Jöreskog & Sörbom, 1993) structural equation modeling method analyzes the observed covariance matrix of a set of variables in terms of a hypothesized structure. This approach produces several fit scales that reflect the hypothesized model's ability to reproduce the original variance and covariance matrix given the constraints provided in the tested model.

The LISREL (Jöreskog & Sörbom, 1993) structural equation modeling method analyzes the observed covariance matrix of a set of variables in terms of a hypothesized structure. This approach produces several fit scales that reflect the hypothesized model's

ability to reproduce the original variance and covariance matrix given the constraints provided in the tested model. One of these fit scales, the Chi-square (χ^2), measures the differences between the observed and predicted covariance matrices. Larger values of χ^2 reflect a greater discrepancy between the observed and predicted matrices. The χ^2 is reported with the number of degrees of freedom associated with the model. The degrees of freedom are a function of the number of covariances provided and the number of paths specified. A statistically reliable model χ^2 suggests that the specified paths did not provide a perfect fit to the data. The power to detect even slight difference associated with the large samples typically required for this type of analysis almost always results in a statistically reliable χ^2 . This implies that some additional measures of fit are required.

Jaccard and Wan (1996) describe three classes of fit scales (absolute, parsimonious, and relative) that should be considered when evaluating the fit of a structural equation model. Absolute fit compares the predicted and observed covariance matrices. The χ^2 , goodness of fit index (GFI) and standardized root mean square residual (Standardized RMR) are all indicators of absolute fit. The GFI is a function of the absolute discrepancies between the observed and predicted covariance matrices. The acceptable threshold for the GFI is .90. The standardized RMR measures the average deviation between the predicted and observed correlations. The recommended threshold for the standardized RMR is .05. The second category also considers absolute fit, but penalizes the model based on its complexity. The more paths specified, the lower the models' parsimony. The Root Mean Square Error of Approximation (RMSEA) is the common choice for measure of parsimony. The acceptable threshold for RMSEA is .08. The third category of fit scales compares the absolute fit to an alternative model. The value for the

comparative fit index (CFI) indicates the fit of the model compared to a null model (posits no correlations between the observed variables). The recommended threshold for CFI is .90.

The maximum likelihood estimation technique used in the LISREL (Jöreskog & Sörbom, 1993) structural equation model program assumes that the measured variables are continuous and have a multivariate normal distribution. Violations of these assumptions can result in overestimation of the χ^2 causing false rejections of true models, and can reduce standard error estimates that lead to increased chances of finding statistically reliable paths that are not true (West, Finch & Curran, 1995). A necessary, but not sufficient, condition for multivariate normality is univariate normality for each of the measured variables. Monte Carlo studies have shown that maximum likelihood solutions are robust to skewness with only trivial effects on estimation of parameters and standard errors (Jaccard & Wan, 1996). The same studies, however, show that parameters and standard errors can be very sensitive to kurtosis. Positive kurtosis can lead to a reduction in standard errors and consequently an increased chance of making a Type I error (Jaccard & Wan, 1996). Negative kurtosis has the opposite effect – increasing the magnitude of standard errors and the chance of making a Type II error.

Monte Carlo studies that investigated relatively high levels of non-normality (skewness = 3, kurtosis = 21) as well as moderate departures from normality (skewness = 2, kurtosis = 7) suggest that structural equation models using LISREL are fairly robust to moderate deviations from normality. The high level of positive kurtosis in the goal variable, however, offers some concern because it may negatively bias the standard error estimates and create an increased chance of making a Type I error. To avoid wrongly

rejecting the null hypothesis of no relationship, a more rigorous level for acceptable Type I errors ($p < .01$ rather than $p < .05$) was selected.

Summary

This chapter explained the methodology employed to define, collect, and measure the data used for the research effort. The collection of data was used to test the hypotheses from the previous chapter. The results from the analysis are discussed in the following chapter.

IV. Results

Results! Why, man, I have gotten a lot of results. I know several thousand things that won't work.

Thomas A. Edison (1847 - 1931)

Introduction

This chapter presents the analysis of the responses submitted to the survey in order to support or refute the hypotheses stated in chapter II. The first section analyzes the differences in reported distractions, factors that facilitate and factors that support self-regulation for those who completed their courses without difficulty to those who had difficulty completing their e-learning coursework. This section provides the tests for the first three hypotheses of this study – that these factors are different for those who were more or less successful with their e-learning endeavors. The second section analyzes the relationships with select motivation factors with reported transfer of knowledge and future intentions to e-learn. The section reports the results of a Structural Equation Modeling (SEM) analysis used to assess the independent effects of distractions, goals and feedback and perceived ease-of-use of the e-learning technology on transfer of knowledge and intentions to pursue e-learning in the future.

Research Question 1

Factors that Distract.

A statistically significant relationship was found between those who reported technical problems and reported difficulty completing their e-learning course. Of those

surveyed, 89 students reported having browser or network connectivity problems. Students who had difficulty completing their course were more likely to have reported these distractions (21%) than those who completed without difficulty (10%). The difference was statistically significant ($\chi^2 = 13.35$, $df = 1$, $p < .01$, $n = 791$). Students who had difficulty were more likely to report slow or choppy system response (22%) than those students who completed without difficulty (19%). This difference, however, was not statistically reliable ($\chi^2 = .759$, $df = 1$, $p < .05$, $n = 791$).

Students reporting difficulty completing their e-learning course and having hardware/software problems had a statistically significant relationship ($\chi^2 = 6.92$, $df = 1$, $p < .05$, $n = 791$). Students who had difficulty were more likely to report hardware or software problems (13%) than those students who completed without difficulty (6%). There were no statistically significant relationships found for students reporting difficulties with network outages. The conditional probabilities of experiencing hardware/software problems and browser/connectivity problems is listed in Table 5.

Table 5. Comparison of Technical Problems between Groups that Experienced Difficulty Completing the Course With Those Who Did Not

External factor: technical problems	P(S)	P(S C)	P(S D)	χ^2
Network outages	.08	.07	.11	1.84
Hardware/software problems	.07	.06	.13	6.92**
Browser/connectivity problems	.11	.10	.21	13.35**
Slow or choppy system response	.19	.19	.22	0.76

Note. $N = 791$. * $p < .05$, ** $p < .01$. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given complete without difficulty and experienced difficulty.

Students also faced difficulties such as competing job related demands. Students who had difficulty were more likely to report distractions due to job demands (69%) than those students who completed without difficulty (63%). This difference, however, was not statistically reliable ($\chi^2 = 1.79$, $df=1$, $p > .05$, $n = 791$).

A statistically reliable relationship was found for those students reporting difficulty completing their courses and having distracting personal demands (i.e. family, friends, clubs, etc.) ($\chi^2 = 6.19$, $df=1$, $p < .01$, $n = 791$). Students who had difficulty were more likely to report distracting personal demands (16%) than those students who completed without difficulty (9%). There was no statistically reliable relationship observed between the effects of general noise and effect on completion. Table 6 illustrates the effects of off-task demands and completion rates.

Table 6. Comparison of Technical Problems between Groups that Experienced Difficulty Completing the Course With Those Who Did Not

External factor: Off-task demands	P(S)	P(S C)	P(S D)	χ^2
Job demands	.64	.63	.69	1.79
Personal demands	.10	.09	.16	6.19**
Noise	.35	.35	.33	0.28

Note. $N = 791$. * $p < .05$, ** $p < .01$. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given complete without difficulty and experienced difficulty.

Though most e-learning seems to take place at the work site, the personal demands of family and friends were the only statistically significant measure. Respondents had an opportunity to identify additional demands that distracted them. Of

the 24 that selected the option, 6 respondents wrote in “TDY” and none of the six were able to complete the e-learning course. Another student replied, “I wish that I could have gone to another site to take the course without the daily job interruptions.” If nothing else, this lends circumstantial evidence that the encumbrances encountered on the job can strongly influence one’s decision to remain committed to completing their course.

Students who completed their courses were more likely to report having received a lot of support from work, family, and friends. The average response from those students who completed their e-learning course without difficulty was 3.34 on a 5 point scale ($s = 0.98$). This was higher than the average response from students who completed with difficulty ($m = 2.97$, $s = 1.03$). A t-test was performed comparing these two groups. This test was found to be statistically significant ($t = 3.60$, $df = 153$, $p < .01$).

The students reporting having difficulty completing their courses were more likely to agree that the distractions they encountered hindered their desire to persist at e-learning ($t = -6.56$, $df = 137$, $p < .01$). The average response from those students that reported having difficulty was 3.08 on a 5 point scale ($s = 1.22$), while those who reported no such difficulty averaged 2.3 ($s = 0.90$). Likewise, students who reported having difficulty completing their course were likely to pin the blame on the distractions they encountered ($t = -12.95$, $df = 127$, $p < 0.01$). The average response from those students reporting difficulty was 3.2 ($s = 1.37$) versus 1.5 ($s = 0.75$) from those students who did not report such difficulty. This preponderance of the evidence provides support for hypothesis 1.

Factors that Facilitate.

The first factor was completion goals. Students who completed their course, were more likely to report that completing the course was important to them ($t = -5.04$, $df = 93$, $p < .01$). The mean for students who felt completing the course was important to them but did not complete the course was ($m = 3.58$, $s = 0.95$) versus students who completed the course ($m = 4.13$, $s = 0.77$).

The questions, “Once I enrolled in the (course name) my initial intentions were to complete it” and “From the beginning, I planned to give the (course name) my best possible effort” each had means for all three categories above 4.3 on a 5 point scale. This clearly indicates that most students had initial positive intentions with their e-learning course; however, there was not a statistically significant difference observed in the data. Overall, the data lends partial support for hypothesis 2a.

The second kind of facilitating factors were intrinsic and extrinsic motivation. A comparison of students was made between those who did not complete their course with those who completed but experienced difficulty, and to those reporting no difficulty completing their course. A check all that apply question, “Why did you take the (course name) course,” was posed to the respondents. It listed four reasons associated with extrinsic rewards (job requirement, required for certification, supervisor recommendation, and credit for continuous learning) intermixed with four reasons associated with intrinsic rewards (to gain knowledge, improve job performance, out of curiosity, and acquiring specific information).

Table 7 indicates statistically reliable relationships between the absence of difficulty in completing the e-learning course and the reported convenience of any time learning, the convenience of anywhere learning, the convenience of being able to work independently, the convenience of working at one's own pace, and the flexibility to fit e-learning into one's schedule. Students who had difficulty were less likely to report the convenience of any time learning (78%) than those students who completed without difficulty (91%). Students who had difficulty were less likely to report the convenience of anywhere learning (70%) than those students who completed without difficulty (87%). Students who had difficulty were less likely to report the convenience of working independently (76%) than those students who completed without difficulty (86%). Students who had difficulty were less likely to report the convenience of working at their own pace (77%) than those students who completed without difficulty (87%). Also, Students who had difficulty were less likely to report the convenience of schedule flexibility (75%) than those students who completed without difficulty (87%).

The results show strong evidence for six of the nine facets as a driving intrinsic motivation for these e-learning students and supports hypothesis 2b.

Table 7. Comparison of Intrinsic Motivation between Groups that Experienced Difficulty and Those that Did Not

Intrinsic motivators	P(S)	P(S C)	P(S D)	χ^2
To gain knowledge	0.81	0.81	0.83	0.47
Improve job performance	0.61	0.63	0.5	6.51**
Out of curiosity	0.14	0.14	0.13	0.08
Get specific information	0.19	0.18	0.24	1.68
Convenience of "anywhere" learning	0.78	0.87	0.7	5.96**
Convenience of "any time" learning	0.89	0.91	0.78	15.75**
Convenience of working independently	0.84	0.86	0.76	6.67**
Convenience of working at own pace	0.86	0.87	0.77	8.07**
Flexibility with schedule	0.85	0.87	0.75	12.06**

Note. $N = 791$. * $p < .05$, ** $p < .01$. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given complete without difficulty and experienced difficulty.

The results show that even though no single extrinsic motivator was present in all of the respondents, at least a majority of the students (72%) selected one of the four motivators listed. Overall, the data reliably supports extrinsic reward as a compelling motivating factor. A complete listing of the motivators is listed below (Table 8). The findings suggest that extrinsic reward influences a student's motivation to complete e-learning courses and supports hypothesis 2c.

Table 8. Comparison of Extrinsic Motivators between Groups that Completed Without Difficulty and Those that Experienced Difficulty

Extrinsic motivators	P(S)	P(S C)	P(S D)	χ^2
Job requirement	.41	.43	.30	6.64**
Required for certification	.10	.10	.08	0.45
Supervisor's recommendation	.13	.14	.07	3.97*
Credit for continuous learning	.38	.40	.26	8.56*

Note. $N = 791$. * $p < .05$, ** $p < .01$. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given complete without difficulty and experienced difficulty.

Factors that Support Self-Regulation.

The first factor dealt with feedback. Students who completed their course were more likely to report that they were able to use the feedback they received to properly assess their progress during the e-learning course when compared to those who failed to complete ($t = -5.77$, $df = 90$, $p < .01$). Students who completed their course regardless of difficulty encountered were also more likely to report that they were able to use the feedback they received to properly assess their progress during the e-learning course ($t = -4.96$, $df = 138$, $p < .01$). The average response from those students that were able to assess their progress via feedback and had completed their course was 4.17 on a 5 point scale ($s = 0.69$). This was higher than the average response from students who experienced difficulty completing their e-learning course ($m = 3.54$, $s = 0.69$). The average response from those students that were able to assess their progress via feedback and had no difficulty completing their course was 4.17 on a 5 point scale ($s = 0.69$). This was slightly higher than the average response from students who experienced difficulty completing their e-learning course ($m = 3.72$, $s = 0.93$). This shows that feedback was a

significant factor for students not only just completing their e-learning course but to also help them complete without difficulty, making the e-learning experience more enjoyable.

Table 9 indicates the influence feedback has as an important factor with a student's ability to complete an e-learning course. Instructor feedback was not observed to be statistically significant between the two groups. The reason behind this is probably due to a low number of respondents indicating that they in fact received instructor feedback (14%). The data shows that feedback is a critical component to students in an e-learning environment. The respondents recalled that the majority of their feedback received came from electronic messages indicating their results on tests and quizzes. No feedback received was also found to be statistically significant. The findings support Hypothesis 3b but not Hypothesis 3a.

Table 9. Comparison of Feedback between Groups that Completed Without Difficulty and Those that Experienced Difficulty

Feedback	P(S)	P(S C)	P(S D)	χ^2
Instructor/administrator messages	.14	.14	.17	0.73
Electronic messages	.67	.70	.49	21.14**
No feedback received	.16	.14	.24	6.29**

Note. $N=791$. * $p<.05$, ** $p<.01$. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given complete without difficulty and experienced difficulty.

The next factor dealt with self-efficacy and course content. The question, "I found the (e-learning course) material difficult" was reversed scored in order to make a relative comparison. In addition, a t-test was performed comparing the mean likeability rating of the group which experienced difficulty ($m = 3.34$, $s = 0.93$) with regards that the

perception that the e-learning course material was not difficult ($m = 3.53, s = 0.85$), and was found to be statistically significant ($t = 2.05, df = 150, p = 0.021$). A t-test was performed comparing the difference in means between the group that completed without difficulty ($m = 3.52, s = 0.77$) with the group that experienced difficulty ($m = 3.15, s = 0.86$) in regards to the belief that the course was too long, was found to be statistically significant ($t = 4.34, df = 149, p < 0.01$). A t-test was performed comparing the difference in means between the group that completed without difficulty ($m = 3.65, s = 0.82$) with the group that experienced difficulty ($m = 2.91, s = 0.96$) in regards to the question, “Completing the (e-learning course) was easy for me” ($t = 7.91, df = 145, p < 0.01$). The question, “My confidence decreased as I progressed through the (e-learning course)” was reversed scored as well. A t-test was performed to compare the difference in means between the group which experienced difficulty ($m = 3.41, s = 1.00$) with those that reported no difficulty ($m = 4.15, s = 0.84$) and was found to be statistically significant ($t = 7.54, df = 145, p < .01$). These findings lend support to the notion that a student’s self-efficacy can be influenced by the content of the e-learning course. This supports hypothesis 3c.

Self-efficacy with the technology was the another facet of the self-regulation factor. Students who completed their course regardless of the difficulty encountered were more likely to report that they easily found the information they needed to complete the course ($t = 6.57, df = 132, p < .01$). The average response from students that easily found the information they needed to complete their e-learning course and had no difficulty completing the course was 3.98 ($s = 0.60$) on a 5 point scale. This was higher than the students who experienced some difficulty ($m = 3.40, s = 0.92$).

Students who completed their course regardless of the difficulty encountered were more likely to report that they found the course easy to stop and restart ($t = 6.50$, $df = 130$, $p < .01$). The average response from students that the course was easy to stop and restart and had no difficulty completing the course was 4.08 ($s = 0.64$) on a 5 point scale. This was much higher than the students who experienced some difficulty ($m = 3.43$, $s = 1.04$).

Students who completed their course regardless of the difficulty encountered also reported that they found the course navigation tools easy to use ($t = 5.36$, $df = 129$, $p < .01$). The average response from students that found the navigation tools easy to use and had no difficulty completing the course was 4.00 ($s = 0.61$) on a 5 point scale. This was higher than the students who experienced some difficulty ($m = 3.47$, $s = 1.03$).

Students who completed their course regardless of the difficulty encountered were more likely to report that they found the course was well organized ($t = 5.40$, $df = 132$, $p < .01$). The average response from students that found the course was well organized and had no difficulty completing the course was 3.99 ($s = 0.57$) on a 5 point scale. This was higher than the students who experienced some difficulty ($m = 3.52$, $s = 0.90$).

Students who completed their course regardless of the difficulty encountered were more likely to report that they found information clearly presented on each page ($t = 4.81$, $df = 132$, $p < .01$). The average response from students that found the information clearly presented on each page and had no difficulty completing the course was 3.99 ($s = 0.61$) on a 5 point scale. This was higher than the students who experienced some difficulty ($m = 3.56$, $s = 0.94$).

Students who completed their course regardless of the difficulty encountered were more likely to report that they found the help functions easy to use ($t = 4.65$, $df = 133$, $p < .01$). The average response from students that found the help functions easy to use and had no difficulty completing the course was 3.87 ($s = 0.65$) on a 5 point scale. This was higher than the students who completed the course with some difficulty ($m = 3.44$, $s = 0.96$).

Evidence collected from this questionnaire strongly suggests that a student's confidence plays an impact on the amount of difficulty they experience with the e-learning course. The respondents were much more likely to express confidence in their ability to continue with the e-learning given that the mentioned factors were present. The data lends support to Hypothesis 3d.

Respondent Comments

The last question on the survey allowed each respondent to add any additional comments they may have had. Of those surveyed, 245 chose to respond and many chose to provide more than one comment. Table 10 below lists the summarized comments into like groupings.

Table 10. Summary of Additional Comments

Category	Frequency of comment	Proportion of Comment
It was a good course	61	23.3%
Suggestions for course improvement/additional courses	47	17.9%
Great way to teach/learn	29	11.1%
Suggestions to administer survey at end of course	20	7.6%
Technical problems hindered e-learning efforts	19	7.3%
Job/personal demands hindered e-learning efforts	18	6.9%
Poor or dated course content/design	16	6.1%
Suggestions to improve survey	16	6.1%
I prefer a traditional in-class setting	11	4.2%
Received little or no feedback	4	1.5%

Note. * 262 total comments. Some respondents made more than 1 comment.

Overall, the comments were largely positive. The suggestions for course improvement were not negative, simply opinions to make e-learning even more user-friendly. Separating the groups by difficulty exposed a difference in opinion. The group of students that expressed a difficulty in completing the e-learning course tended to either have job/personal demands or experienced some technical difficulty.

Research Questions 2 and 3

Structural equation modeling was performed to test hypotheses 4 and 5. The data for this analysis is the observed covariance matrix for the six variables listed earlier in this chapter. Variance, covariance and correlation coefficients for the six variables are shown in the table below.

Table 11. Variances, Covariances, and Correlations for the E-Learning Model

	<i>distract</i>	<i>feedback</i>	<i>goal</i>	<i>transfer</i>	<i>ease</i>	<i>intent</i>
distract	2.64	0.05	0.06	-0.20	-0.22	-0.14
feedback	0.10	1.30	0.15	0.22	0.11	0.15
goal	0.06	0.10	0.33	0.28	0.20	0.31
transfer	-0.24	0.18	0.11	0.52	0.29	0.35
ease	-0.22	0.07	0.07	0.13	0.36	0.27
intent	-0.15	0.11	0.12	0.17	0.10	0.43

Note. Variances appear on the diagonal, covariance coefficients on the lower half and correlation coefficients on the upper half. All correlations greater than .07 are statistically reliable ($p < .05$).

The model provided an excellent fit to the pattern of coefficients in the observed covariance matrix, $\chi^2 = 5.19$ ($df = 3$, $p = 0.16$). Indices for absolute fit (GFI = 1.00 and Standardized RMR (0.016), parsimony (RMSEA = 0.03), and comparative fit (CFI = 1.00) were also within acceptable limits.

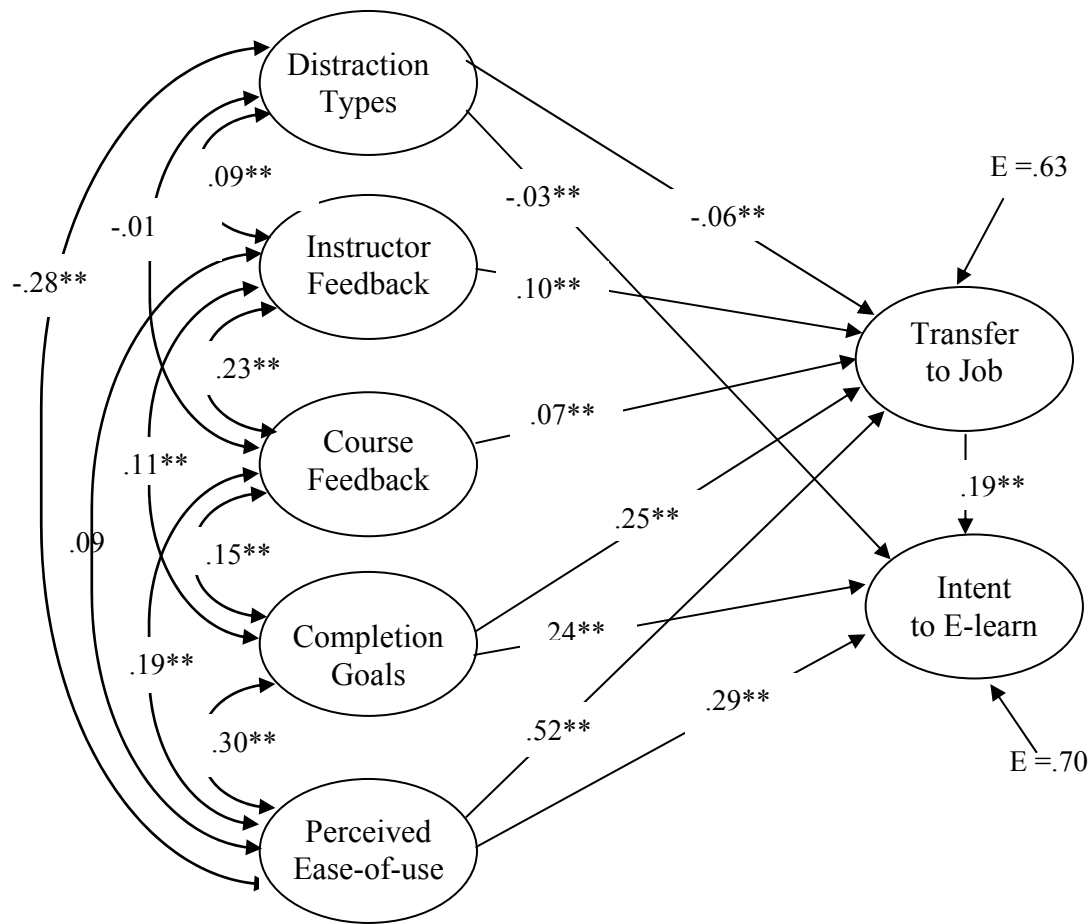


Figure 4. Integrated E-Learning Completion Model

The results provide strong support for the hypotheses. The distractions construct has a statistically reliable negative relationship with transfer and intent. An addition of a distraction type implies a .06 unit drop in transfer to the job construct and a .03 unit drop with intent to e-learn in the future. Both types of feedback, completion goals and ease-of-use all have positive relationships with transfer to the job. The effect of the feedback types with intent to e-learn in the future was hypothesized but not supported by data. An addition of a course feedback type corresponded with a .07 increase in transfer of

information to the job. A unit increase on the agreement scale for goals corresponded to a .25 increase in transfer and a .24 increase in intent to e-learn. The largest effect appears to be due to ease-of-use. A unit increase with ease-of-use translates to a .52 unit increase in transfer and a .29 increase in intent to e-learn. The combined effect of these five variables explained 37% of the variability in the transfer construct. The effect of the four variables on intent explained 30% of the variance. In motivational research, this would be considered a moderate effect.

Summary

The overwhelming majority of students responding to the survey completed their e-learning class without difficulty. Hence, most of the individuals that failed to complete the e-learning course chose not to answer the survey. It is possible that the barriers that first prevented the student from completing the course are still present, preventing them from taking the survey. Table 12 summarizes the statistically significant factors that positively and negatively influenced e-learning completion. Table 13 contains a summary of the hypotheses.

Table 12. Summary of the Influences on E-Learning Completion

Positive influences	Negative influences
Support	Technical Distractions
Completion Goals	Personal Demands
Intrinsic Motivation	Lack of Feedback
Extrinsic Motivation	
Ease-of-Use	
Course Feedback	

Table 13. Summary of Hypotheses

Hypothesis	Supported
H1: Those students who complete their course without difficulty should report fewer distractions than those who experienced difficulty completing their coursework.	Yes
H2a: Those students who completed their course should report a greater commitment towards the goal of completing than those who failed to complete their e-learning course.	Partial
H2b: Those students who complete their course without difficulty should report higher intrinsic motivation than those who experienced difficulty while taking their course.	Yes
H2c: Those students who complete their course without difficulty should report higher extrinsic motivation than those who experienced difficulty while taking their course.	Yes
H3a: Those students who complete their course without difficulty should report that they received more timely and relevant feedback from their instructor than those who experienced difficulty while taking their course.	No
H3b: Those students who complete their course without difficulty should report that they received more timely and relevant feedback from the course than those who experienced difficulty while taking their course.	Yes
H3c: Those students who complete their course without difficulty should report a higher rate of self-efficacy with course content than those who experienced difficulty while taking their course.	Yes
H3d: Those students who complete their course without difficulty should report a higher rate of self-efficacy with the e-learning technology than those who experienced difficulty while taking their course.	Yes

Table 13 continued on next page

Table 13 continued

Hypothesis	Supported
H4a: There is a negative relationship between the reported quantity of types of distractions and the transfer of information to the workplace.	Yes
H4b: There is a positive relationship between the reported goal commitment and the transfer of information to the workplace.	Yes
H4c: There is a positive relationship between the reported quantity of types of feedback provided by the instructor and the transfer of information to the workplace.	Yes
H4d: There is a positive relationship between the reported quantity of types of feedback provided by the course and the transfer of information to the workplace.	Yes
H4e: There is a positive relationship between the reported ease-of-use and the transfer of information to the workplace.	Yes
H5a: There is a positive relationship between the reported transfer of information and Intent to pursue e-learning in the future.	Yes
H5b: There is a negative relationship between the reported quantity of types of distractions and the intent to e-learn in the future.	Yes
H5c: There is a positive relationship between the reported goal commitment and the intent to e-learn in the future.	Yes
H5d: There is a positive relationship between the reported quantity of types of feedback provided by the instructor and the intent to e-learn in the future.	No
H5e: There is a positive relationship between the reported quantity of types of feedback provided by the course and the intent to e-learn in the future.	No
H5f: There is a positive relationship between the reported ease-of-use and the intent to e-learn in the future.	Yes

V. Discussion

Discussion is an exchange of knowledge.

Robert Quillen

Introduction

The focus of this study was to identify potential motivational factors that might help explain why e-learning has a seemingly high non-completion rate and the relationship of those motivational factors with transfer of information to the workplace and intent to e-learn in the future. Three broad research areas were discussed in Chapter 1 and the following portions of this chapter will discuss the findings of this research effort. Chapter 3 explained how data was collected from participating students from AFIT's VSH and analyzed in Chapter 4 in order to test the hypotheses raised in Chapter 2. Remaining sections of this chapter will discuss the limitations of this research and recommendations for further discovery.

Research Question 1 Discussion

Factors That Distract.

The purpose of this question was to examine how the external forces of various distractions and environmental support influence a students' motivation to complete e-learning courses. As mentioned in the literature section, the push-pull theory argues that a student's desire to remain in a learning environment depends on the combination of all of the forces that push a student towards completion (feedback) versus those forces pulling the student away (distractions) (Miller, 1969).

According to the finds of this research, further evidence can be attributed to the theory. Certain pull factors (Hypothesis 1) listed in the survey were shown to be negatively influential on a student's desire to persist at e-learning. Meanwhile, certain facilitators (Hypothesis 3a) proved to be a very important factor in increasing a student's motivation.

The findings of the research showed that hardware/software problems and browser connectivity problems were statistically important factors in determining completion rates, whereas network outages and slow systems were determined to be of lesser importance. Computer networks themselves are becoming more robust and reliable, hence the low selection of that factor in the survey. Most complaints registered in the comments section of question five specifically alluded to technical difficulties with the VSH software. It is very important for designers and administrators to check their courses regularly for broken or missing links and to make sure that their courses are running as advertised. Also, keeping in regular contact with students and checking with them to see if they are experiencing any of these difficulties could help to alleviate some of the problems quicker.

Ironically, these findings are in contrast to those of Thurston and Reynolds (2002). The exact opposite was noticed with the data collected just two years ago. Have the networks gotten dramatically better but the technical difficulties with the course itself skyrocket? Probably not to a great extent but the rise in software problems with the course itself should be a noteworthy concern for VSH administrators.

The distractions of off-task demands raised some interesting findings. Approximately one-third of respondents noted general noise as a factor and nearly two-

thirds of the students responding to this survey stated that job related demands as a distraction. However, I feel no differences for these variables when I compared students who completed without difficulty to those who had difficulty completing the course. Despite these omnipresent distractions, students were still able to complete the courses. Personal demands, with which only 10 percent selected, were noted as a statistically significant distraction. The low selection of this factor is due to the fact that 92% of the respondents primarily worked on their courses at work and 76% claimed they e-learned during regular work hours. Thus, for the individuals that took their e-learning home, the personal demands of family and social life can become a negatively determining motivational influence. Still, most of the complaints registered for this question dealt with the problems that job related demands impose on their studies. A dedicated environment at the worksite for e-learning could perhaps alleviate some of the distractions. Although, job related demands were not found to be statistically important, most respondents claimed that those demands were indeed distracting.

Factors That Facilitate.

Though only partially supported statistically, more than 85% of each of the respondents agreed with all four of the goal commitment questions on the survey (Hypothesis 2a). This lends strong circumstantial evidence to support the notion that e-learning students have a high degree of initial motivation to complete the course regardless of their individual circumstances for enrolling. Again, results indicated that required courses for work were completed without difficulty on a statistically significant rate. This type of focus probably assists the student to attain their desired initial goal.

Six of the nine intrinsic motivation (Hypothesis 2b) questions were observed to be of critical importance for the students to complete without difficulty. Combined that with the fact that a majority of the students proclaimed to enroll in the classes for knowledge attainment and for job improvement, the argument can be made that intrinsic motivation is initially high. Extrinsic motivation was also shown as an important indicator of completion. It makes sense that if the job requires an employee to complete e-learning courses for as a condition for employment or promotion then the chances those students will remain until the finish would be higher than for those students devoid of such circumstances.

Factors That Support Self-Regulation.

An important factor of self-regulation deals with feedback (Hypothesis 3a and Hypothesis 3b). Results were mixed concerning the importance of feedback with respect to completion. There was sufficient evidence to support the notion that course feedback is critically important in letting a student know their progress in goal attainment. Notwithstanding, no feedback was shown to be an important factor for students having difficulty completing their courses. The one question that was not statistically telling was instructor feedback, of which only 10 percent of respondents claimed to have received. Therefore, it may be beneficial for course administrators to establish a better line of communication with their students. This line of open communication could help to bolster completion rates in the future.

Findings revealed that a student's confidence can have a significant impact on their ability to complete an e-learning course without difficulty. Self-efficacy was

measured in two ways with this survey and both hypotheses were supported statistically. All four selected indicators were statistically significant in their mean differences between students who completed without difficulty and for those students that experienced difficulty with regard to student's self-efficacy being bolstered by a course's content. These findings suggest that the length of a course as well as the challenge it presents to students can influence their persistence to complete the module.

The findings also suggest that the design of the course (H_{3d}) itself can play a major impact in a student's level of confidence. How a page is designed and where features are located are important to students. Administrators should continually monitor the effectiveness of their design through regular feedback with students and from observations of various distance learning programs and build these good ideas into the courses.

Research Questions 2 and 3 Discussion

The limitation of research question one is that the factors are viewed independently. Research question two assess the relative impact that transfer of knowledge and intentions to continue e-learning in the future.

Transfer.

The fourth set of hypotheses focused on the relationship between the external factors and transfer of information to the job. Hypothesis 4a demonstrated the negative motivational influence that distractions have with transfer. As noted before, most e-learning takes place at work and 64% of the students that responded to the survey recall

having had received some type of job demand that distracted them from pursuing e-learning. Having a dedicated time and/or place at the worksite would certainly go far in alleviating these distractions. The two types of feedback were demonstrated to have a positive relationship with transfer. Instructors could give information helping to answer any concerns a student may have about the course and the course's feedback in the form of quizzes and such would afford a student the opportunity to realize whether or not they grasp the material. These forms of feedback directly enhance the usability of the information on the job.

Completion goals were also identified as having a positive relationship with transfer. The data shows that students not only had strong hopes of finishing the course but also needed to take the information back with them to work. The strongest relationship of the model was between ease-of-use and transfer. The ease of which students had with the technological platform strongly and directly impacted the usefulness of the information to transfer to the job. If a student cannot operate the platform and the software then the ability to transfer any information to the job is nullified. It is critically important for administrators to constantly strive to provide a product that is easy to use for everyone.

Intent.

The final construct of this research measured the intent students have with taking e-learning courses in the future. As predicted, those students who intend on taking similar classes in the future were more likely to complete the course without difficulty. The reasons for high levels of intention vary from student to student. Even with the

students that had a difficult time completing the course, 86% of them stated that they were willing to take additional e-learning classes in the future.

Once again, distractions had a statistically telling relationship. Distractions negatively influence a student's intent to e-learn in the future. If the distractions are hampering someone from achieving their motive then the likelihood of that person taking e-learning courses in the future decreases. Completion goals had a positive relationship with intent. If someone has a positive experience with e-learning then the likelihood of that person wanting to take future courses via e-learning increases.

As predicted in the theorized model, both ease-of-use and transfer had positive relationships with intent. As a student's confidence with the technology increases so too does their willingness to attend future classes via e-learning. If it can be demonstrated to students that the technology is user-friendly then their intent to take further e-learning classes increases. Would anyone want to continue with a technology that was difficult to understand and navigate? The answer is probably not. Also, with the link between transfer and intent, if students see that the information is timely and relevant then their willingness to return to e-learning should increase.

The model exposed two links that were hypothesized in the original model but did not have a significant relationship. Neither type of feedback had a statistically significant relationship with intent to e-learn. Feedback was used by the students to help them complete the course and clarify information they needed to take with them to the worksite.

Limitations

The first limitation of this study would be the possible under representation of those students that failed to complete the e-learning course at question. With an average attrition rate of 37%, one would expect a similar percentage of students to complete the survey as having not completed their course. However, only 10.7% of the usable responses came from that group of individuals. This low percentage could enter bias into the data.

In addition, the population itself is a limiting factor. Though the responses came from a wide cross-section of the Air Force, the fact remains they all had that common factor as being associated with the Air Force. A more generalized study would broaden the pool of candidates to include other e-learning programs so the findings could be applied to other e-learning setups in government, industry, and academia.

Another limitation is that this study does not address the intervening variables between the motivational factors and the outcomes. We have a pretty good idea about what has an influence on completion, transfer, and future intentions. However, this study does not measure the variation in effort across the student or across time.

Future Research

This study is certainly not an all-encompassing effort to locate all factors involved with e-learning attrition rates. There are assuredly other factors that influence completion, transfer, and intentions. The factors may also differ in amounts. In addition, in order to test variation in effort an experiment would have to be conducted. Furthermore, this study is limited in its ability to generalize to similar e-learning

curriculums outside the Air Force. Future studies should also include e-learning courses from academia, industry as well as government.

Practical Implications

There are several things the schoolhouse can do improve the quality of the instruction they provide to students. The first would be involving supervisors. Since most e-learning takes place at the job and during work hours, it is important for supervisors who require their people to take these courses to provide them with a space or time free from the daily disruptions present at work. It is also important to have a robust network to run the VSH platform. Much improvement has been made in the past two years and the difference between this study and Reynold's (2002) indicates that. Administrators need to investigate what other e-learning curriculums are using to enhance the ease-of-use of their product. That construct was observed to be the strongest measured in the model and anything designers can do to constantly improve that would be most beneficial to their customers. Finally, it is evident that more needs to be done in the realm of instructor feedback. In a typical classroom, there is the opportunity to get feedback from an instructor during each class period. Similar accommodations should be afforded to e-learners.

Conclusion

Overall, the results of this study lent support to the hypothesized factors of motivation that distract, facilitate and help self-regulate e-learners. It is impossible to predict the all of the various motivators, but this research does provide the Air Force

Institute of Technology's Virtual Schoolhouse a theoretical basis for potential improvements for their curriculum and course design.

In synopsis, this research effort used as its core, aspects of proven motivational influences in order to build a survey to test some of the possible factors that might be affecting e-learning students. Furthermore, it led to additional credence to earlier work conducted by Thurston and Reynolds (2002) and created a useful model determining the influences that lead to low course completion rates. Though not all the questions have been asked, this study has gone a little further in determining what motivational influences are affecting today's e-learning students.

Appendix A: Initial E-Mail

The Air Force Institute of Technology, School of Systems and Logistics, is conducting research on ways to develop more effective and useful e-learning courses. Our records show that you were enrolled in the Introduction to Configuration Management e-learning course administered by the Virtual Schoolhouse during 2002. We would greatly appreciate you taking 20 minutes of your valuable time to fill out the questionnaire located at the following link:

<http://en.afit.edu/env/elearning/>

On behalf of our research team, I would like to thank you in advance for your feedback. Your input will help us improve our e-learning courses. Please contact me if you have any questions.

Major Paul W. Thurston, Ph.D.
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Air Force Institute of Technology
School of Systems and Logistics
2950 Hobson Way
Wright-Patterson AFB, OH 45433-7765
<mailto:paul.thurston@afit.edu>

Phone: 937-255-7777 ext 3276 DSN: 785-7777 ext 3276
Fax: 937-656-4289 DSN: 986-4289

Your participation is voluntary. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey. This survey has been approved by the Air Force Personnel Center Survey Branch (USAF Survey Control Number 03-051). Please note that you are free to terminate your participation at any time.

Appendix B: Follow-up E-Mail

Last week you were sent an e-mail requesting that you fill out an E-Learning Questionnaire regarding the Reformed Supply Support Program course in which you enrolled in. If you filled out the questionnaire, I thank you for your participation and you may delete this e-mail.

If you chose not to participate, I urge you to reconsider for it has taken on average less than 10 minutes for participants to complete. More importantly, your valuable input is vital to the Air Force's effort to improve e-learning courses in order to better educate and train our personnel. The survey can be accessed by clicking on the link below:

<http://en.afit.edu/env/elearning/>

Please contact me if you have any questions.

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Appendix C: E-Learning Questionnaire

Welcome to the E-Learning Course Questionnaire (ECQ)! Survey Control #: USAF SCN 03-051

Please take the next few minutes to answer the following series of statements regarding the e-learning course you recently took

(i.e. the one referenced in the e-mail).

The ECQ provides you the opportunity to give e-learning instructors, administrators, and designers feedback on how to develop better e-learning courses. Your response to the ECQ will be combined with the responses of other members who have taken the same course, as well as compared to those who have taken other e-learning courses. Results will be provided to instructors, administrators, and designers of the courses in question.

Instructions:

The survey will first ask for some demographic information. Several steps have been taken to protect your anonymity. First, you will not be asked to provide your name, age, race, gender, or unit at any time. Second, your questionnaire responses will be entered directly in to a database that has no way of determining from whom the information is being sent.

There are three types of questions in this survey:

1. **Check all that apply**
2. **Choose the best answer**
3. **5-point Likert Scale**

- For the “**check all that apply**” questions, select **all** the answers you feel adequately described your experience.
- For the “**choose the best answer**” questions, select the **one** best answer that described your experience.
- For the “**Likert Scale**” questions, select one answer between ***Strongly Disagree (1) and Strongly Agree (5)***.

Please read and answer each statement before submitting your results.

**USE YOUR BROWSER'S "BACK" BUTTON TO
RETURN TO PREVIOUS PAGES**

Privacy Notice:

The following information is provided as required by the **Privacy Act of 1974**:

Purpose: To obtain information regarding employees' perceptions of the e-learning course that they have taken.

Routine Use: The survey results will be used to provide feedback for e-learning course designers. No analysis of individual responses will be conducted and only members of the Air Force Institute of Technology research team will be permitted access to the raw data.

Participation: Participation is **VOLUNTARY**. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

[Start Survey](#)

ECQ Demographic Information

Please enter the following demographic information:

Rank/Grade:

Marital Status Married: ☐ Single: ☐

Children: Yes: ☐ No: ☐

Please indicate the e-learning course that you were enrolled in?:

Have you completed the course? Yes: ☐ No: ☐

Did you need or request an extension at any time while taking the course? Yes: ☐ No: ☐

Did you have to retake the course for any reason? Yes: ☐ No: ☐

How many e-learning (or web-based) courses had you taken PRIOR to the one in question?

I normally worked on the E-Learning Course; Check all that apply

- ☐ At my primary work location:
- ☐ In a special work area assigned for E-Learning
- ☐ At a location other than work (Home, library, etc...)

Continue

Page 1 of 14

ECQ

Please read and answer each statement carefully. Check all that apply

I normally worked on the **(e-learning course)**: Choose one

- ☐ During regular work hours
- ☐ Outside of regular work hours

Why did you take the **(e-learning course)**? Check all that apply

- ☐ Job requirement
- ☐ To gain knowledge
- ☐ Required for certification
- ☐ Improve job performance
- ☐ Supervisor's recommendation
- ☐ Get credit for continuous learning
- ☐ Out of curiosity
- ☐ Get specific information
- ☐ Other, please specify (180 characters)
- ☐ None of these apply

In what ways, if any did you find E-Learning appealing? Check all that apply

- ☐ Convenience of "any time learning"
- ☐ Convenience of "anywhere learning"
- ☐ Could work/learn independently
- ☐ Could work/learn at own pace

- ☐ Ability to fit course into my schedule
- ☐ Other, please specify (180 characters)
- ☐ None of these apply

Continue

page 2 of 14

7 % Complete

Please read and answer each statement carefully. Check all that apply.

In what ways, if any, did you find **(e-learning course)** unappealing?

- ☐ Lack of interactivity with instructor and other students
- ☐ Not enough "hands-on" exercises and activities
- ☐ Lack of personalized feedback
- ☐ Course content not compelling
- ☐ Experienced technical (browser/connectivity) problems
- ☐ Lack of course instruction and guidance
- ☐ Other, please specify (180 Characters)
- ☐ None of these apply

What distractions, if any, did you encounter while taking the **(e-learning course)** ?

- ☐ Noise (i.e. phone, office chatter, television, etc.)
- ☐ Job related demands (i.e. meetings, deadlines, requests, etc.)
- ☐ Personal demands (i.e. family, friends, clubs, etc.)
- ☐ Poor course content/design
- ☐ Network outages
- ☐ Slow system responses
- ☐ Hardware /Software problems
- ☐ Other, please specify (180 characters)
- ☐ None of these apply

Continue

14% ⁷⁷Complete

ECQ

Please read and answer each statement carefully.

What type of feedback did you receive while engaged with **(e-learning course)** ?
(Check all that apply)

- ☐ Electronic messages from the course on results of quizzes and exercises
- ☐ Instructor or administrator messages on results of quizzes and exercises
- ☐ Electronic messages related to hardware/software issues
- ☐ Instructor or administrator messages related to hardware/software issues
- ☐ Electronic messages related to your overall course performance
- ☐ Messages from an instructor or administrator related to your course performance
- ☐ Messages received as a result of questions you asked
- ☐ Other, please specify
- ☐ I received **NO** feedback

I would gladly take another E-Learning course if the following improvements were made: (Check all that apply)

- ☐ Fewer technical problems
- ☐ Shorter modules
- ☐ More feedback from instructors
- ☐ Fewer job demands/distractions
- ☐ Fewer personal demands/distractions
- ☐ No Changes are needed
- ☐ Other, please specify (180 Characters)

Continue

21%⁷⁸ Complete

ECQ

Please read and answer each statement carefully.

Completing the **(e-learning course)** was important to me.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

Once I enrolled in the **(e-learning course)** my initial intentions were to complete it.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

From the beginning, I planned to give the **(e-learning course)** my best possible effort.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

When I started the **(e-learning course)**, I was confident I would complete it.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

Continue

29% Complete

page 5 of 14

Please read and answer each statement carefully.

I was able to assess my progress throughout the **(e-learning course)**.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

My confidence increased as I progressed through the **(e-learning course)**.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

I found the **(e-learning course)** material difficult.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

The **(e-learning course)** was well organized.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

continue

36% Complete

page 6 of 14

Please read and answer each statement carefully.

I thought the **(e-learning course)** was too long.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

Completing the **(e-learning course)** was easy for me.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

The distractions I encountered hindered my desire to persist at E-Learning.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

I was unable to complete the **(e-learning course)** because of distractions that I encountered.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

continue

43% Complete

page 7 of 14

ECQ

Please read and answer each statement carefully.

My confidence decreased as I progressed through the **(e-learning course)**.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I had a lot of support (i.e. work, family, instructor, peers, etc.) in terms of being allowed time to devote attention to the **(e-learning course)**.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I believe I received a sufficient amount of feedback for the **(e-learning course)** I was taking.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

My confidence level decreased as I progressed through the **(e-learning course)**.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

continue

50% Complete

page 8 of 14

ECQ

Please read and answer each statement carefully.

I was able to use the feedback I received to properly assess my progress in the (e-learning course).

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

I was satisfied with the E-Learning experience.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

I was satisfied with this method of instruction.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

I feel that the E-Learning method improves the learning process.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

continue

57% Complete

page 9 of 14

ECQ

Please read and answer each statement carefully.

I like the convenience of being able to take E-Learning at my leisure.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

The **(e-learning course)** met my expectations.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I would be willing to take another E-Learning course.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I plan to take another E-Learning course in the future.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

continue

64% Complete

page 10 of 14

ECQ

Please read and answer each statement carefully.

I would recommend the **(e-learning course)** to other students.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

The only reason I would take another E-Learning course is if I am required.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

Applying what I learned in the **(e-learning course)** has enabled me to accomplish work related tasks more quickly.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

Applying what I learned from the **(e-learning course)** has enhanced my effectiveness on the job.

Strongly Disagree Disagree Indifferent Agree Strongly Agree

☐	☐	☐	☐	☐	
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--

continue

71% Complete

page 11 of 14

Please read and answer each statement carefully.

Applying what I learned from the **(e-learning course)** has made it easier to do my job.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

I found that what I learned from the **(e-learning course)** is useful in my job.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

It was easy to find the information I needed to complete this course.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

I found it easy to stop and restart the course.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
☐	☐	☐	☐	☐

continue

79% complete

page 12 of 14

ECQ

Please read and answer each statement carefully.

I found the course navigation tools easy to use.

Strongly Disagree Disagree Indifferent Agree Strongly Agree



The content of the course was well organized.

Strongly Disagree Disagree Indifferent Agree Strongly Agree



The information on each page was presented clearly.

Strongly Disagree Disagree Indifferent Agree Strongly Agree



The help functions were easy to use.

Strongly Disagree Disagree Indifferent Agree Strongly Agree



continue

86% Complete

Do you have any additional comments you would like to add?

Please write any comments below....



finish

93% Complete

page 14 of 14

ECQ

Thank you for your participation.

The survey is 100% Complete.

If you need to go back to the beginning [click here](#)

Feel free to email us about the **Advanced Concept Technology Demonstrations**
at elarning@afit.edu.

Time Started 09:18 Time Completed 09:24

Total Time Survey Took 00:06

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14. ABSTRACT Completion rates for web-based courses tend to lag behind their traditional classroom counterparts, sometimes as much as 40% (Carter, 1996; Phipps and Merisotis, 1999; Zielinski, 2000). Thurston and Reynolds (2002) employed motivational constructs to explain why some people persist while others drop out of web-based courses. Their analysis of 8 web-based courses and response from 497 active duty Air Force students indicated that completion goals, off-task distractions, availability of feedback for self-regulation, and continued confidence were important factors that distinguished those who completed their courses from those who did not. This study addresses the limitations of the previous study and then expands beyond persistence to assess the influence of motivational factors of on transfer of learning to the work environment and intentions to pursue e-learning courses in the future. A survey was administered to 1,946 active duty and civilian students who had enrolled in one of the 20 courses offered by the Air Force Institute of Technology's Virtual Schoolhouse. Results were analyzed using the LISREL (Jöreskog and Sörbom, 1993) structural equation modeling program. Analysis of the 791 usable responses provided strong evidence for the hypothesized relationships. Practical and theoretical implications of this research are discussed.					
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