GOING THE DISTANCE WITH DISTANCE LEARNING: AN ANALYSIS OF MOTIVATIONAL FACTORS THAT INFLUENCE E-LEARNING COURSE COMPLETION RATES

THESIS

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AFIT/GIR/ENV/02M-04

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Abstract

Currently, e-learning technology is being used to train and educate a myriad of personnel and each year enrollment numbers grow. Evidence shows, however, that completion rates among e-learners are lower than that of traditional learners. Motivational theory is applied to this problem to explain why e-learners initiate, sustain, and terminate behavior. In particular, an integrative motivational model, that highlights distal and proximal processes, is introduced to identify and measure those factors most likely to influence e-learning course completion rates. Findings offer recommendations that may be useful to e-learning course instructors, administrators, and designers.

Three research questions, guided by 13 hypotheses, were used to investigate motivational theory and its relation to e-learning course completion rates. Eight (8) e-learning courses were analyzed along with 497 responses received from an on-line survey. Data was coded according to whether the student completed or dropped the course. Statistical analysis showed that e-learners are more likely to invest their time, talent, and energy when they encounter fewer technical problems, fewer distractions, and more environmental support from supervisors and instructors. Furthermore, lengthy modules and low self-efficacy were found to decrease the motivational tendency to persist. Overall, results demonstrated that motivational theory can be used to predict and explain those factors most likely to influence a person's desire to "go the distance" with e-learning. Practical and theoretical implications of the research are discussed.

GOING THE DISTANCE WITH DISTANCE LEARNING: AN ANALYSIS OF MOTIVATIONAL FACTORS THAT INFLUENCE E-LEARNING COURSE COMPLETION RATES

I. Introduction

"Even as we use technology to shape our environments, technology is shaping us."

Michael Schrage (1995)

Background

The rapid expansion of the Internet has promoted the necessity for technological competence as well as promised the global connectivity of educational material for distance learning (Fabos & Young, 1999; Fetterman, 1998). Many educators compare the Internet revolution with the California gold rush of the mid 1800s. The educational hype brought by this new technology has often left unfulfilled promises (Howell, 2001). Studies reveal that distance learners using the Internet as their educational platform tend to have lower course completion rates than traditional classroom learners (Cheng, Lehman, & Armstrong, 1991; Jewett, 1997; Phelps, Wells, Ashworth, & Hahn, 1991; Phipps & Merisotis, 1999), sometimes by more than 40 percent (Zielinski, 2000). In one study, while the on-campus course completion rate was 85 percent, only 66 percent of the students successfully completed the same course via the Internet (Jewett, 1997). Unfortunately, these studies do not adequately explain *why* Internet based course completion rates are lower. As stated by one electronic learning (e-learning) course

designer, "Completion rates determine e-learning success, but I am not sure what it is that motivates people to complete them" (Miller, 2001).

The proliferation of e-learning technologies has created a need to understand factors that decrease, as well as increase their optimal use. A look at factors that influence e-learning course completion rates is a step in this direction. This study focuses on the role motivation plays in explaining why some people persist and others drop out of e-learning courses. In particular, the study will seek to identify and measure those motivational factors that promote or inhibit e-learning course completion rates.

E-learning is a subset of distance learning—a generic term for experiencing learning in some form other than traditional instructor-led training in the physical presence of students. Distance learning includes correspondence courses delivered through the mail as well as courses delivered electronically through satellite broadcasts, videotapes, video conferencing, and computer-based training. E-learning, on the other hand, is education delivered by computer via a network. The network is most often the Internet, but could also include an intranet or local area network.

E-learning is an innovative concept that educates and trains personnel using a presentation rich format to deliver information and instruction across a network directly to a desktop or laptop computer. In contrast to traditional classroom instruction where teachers and students interact directly, teachers and students interact indirectly via phone, e-mail, or web-based chat rooms in e-learning courses. While computer based training systems are also technology-based learning systems, they do not have the same level of flexibility to update and conduct education and training any time and anywhere like e-learning does.

Some e-learning researchers have indicated that motivation plays a key role in determining human behavior in learning environments, and could be the underlying cause of e-learning's relatively low completion rates (Dalton, Manning, Hagen, Paul, & Tong, 2000; Finnemann, 1998; Hellebrandt, 1999; Hoffman, 1995; Lee, 1997). Up until now, very little evidence has been collected to support this hypothesis. This research addresses this deficiency by using motivation theory to examine what influences an e-learner's desire to "go the distance" with e-learning. An investigation using motivation constructs may lead to a better understanding of how e-learning course design can promote or inhibit course completion. Practitioners, academics, and researchers can use this information to devise practical methods for evaluating e-learning's effectiveness as well as design motivational features into e-learning courses to improve completion rates.

The Concept of E-learning

E-learning's origins date back at least to 1984 and the advent of computer-based training courses delivered via floppy disk. As the World Wide Web evolved during the mid- to late 1990's, training providers began to explore new ways to impart education and training by taking what was in print and delivering it online. These online connections produced a virtual learning environment where students and teachers were now able to interact indirectly through hardware and software. Online connections also provided students with access to a much broader range of educational and training material.

In its simplest form, e-learning is "…the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance" (Rosenberg,

2001:28). In most instances, participants connect to e-learning systems via the Internet or company intranet using a logon-id and password. E-learning then provides the training and instruction by using various combinations of text, graphics, animation, sounds, streaming video, hotlinks, flipbooks (viewer controlled mini movie), and self-running screen capture display programs (automated slideshow) to further enhance the experience. All of these features are used in conjunction with a computer system to convey the required information and provide training that is much more appealing than the formal and static nature of text-based training (Mayor, 2001:1). The concept of a typical e-learning environment is diagramed in Figure 1.

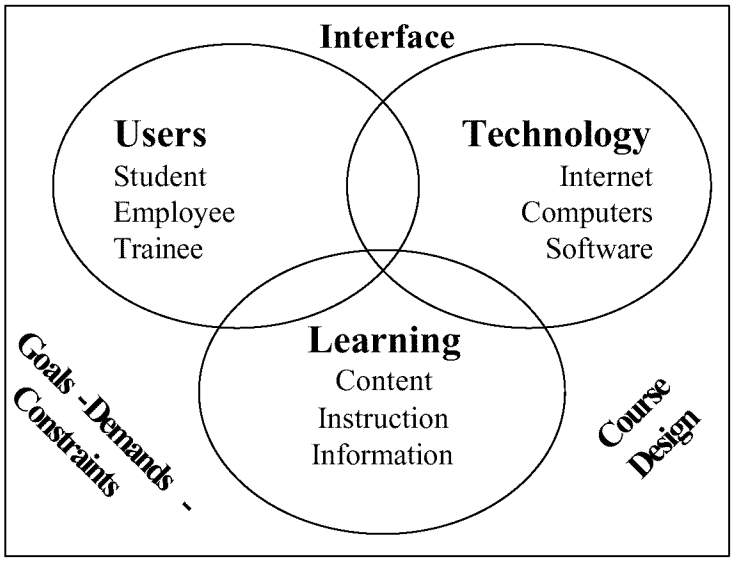

Figure 1: Typical E-Learning Environment

As can be seen from the diagram, users interact directly with technology to receive the type of learning they need or desire. Both, the quality of the interface between users and the technology, and the design of e-learning courses play a major role in influencing the effectiveness of the learning experience. Users must also contend with

factors like goals, demands, and constraints (e.g., hardware and software limitations, security issues) that may interrupt the learning process or hinder the user's desire to continue.

Today, the Internet, and similar network-based systems fulfill a rapidly growing demand for distance learning with their great accessibility and flexibility. E-learning technology, in particular, continues to evolve as a premier way to educate and train the workforce (Abell, 2001; Dalton & others, 2000; Hall, 2000; Katz & Oblinger, 2000; Mayor, 2001; Rosenberg, 2001). The private and academic sectors have embraced this technology to efficiently disseminate education and training, as well as to maintain a competitive market edge. In the United States, e-learning is the fastest growing market segment of adult education (Carr-Chellman, Fitzpatrick, Ke Zhang, & Salt, 2000:291). Last year American schools and corporations poured more than $1 billion into this new technology, and leading researchers of distance learning technology project that figure will surpass $10 billion by the year 2003 (Dobbs, 2001:24; Grimes, 2001:R6).

The future of e-learning in the federal government looks bright as well. White House Executive Order #13111 (1999) requires each executive department to choose one area of training and implement some sort of e-learning initiative. The purpose of this order is to encourage the effective use of technology to improve training opportunities for federal government employees.

The Department of Defense (DoD) has also adopted e-learning as a means to educate and train its personnel. E-learning appeals to the military because it eliminates the barriers of place and time by providing education and training anywhere in the world, at a fraction of "in-person" instructor costs (DoD 1993 Bottom-Up Review; Rosenberg,

2001:26). For example, the DoD's Readiness and Training unit, stationed at the Pentagon, has implemented e-learning as a means to teach officers how to employ joint force military doctrine in battle and other situations (Klaila, 2001). In addition, the Army has launched Army University Online, which allows soldiers to participate in e-learning courses to continue their education and training no matter where they are deployed in the world (Seffers, 2001). E-learning has become integral, if not essential, to the operation of modern-day learning in military organizations.

The Air Force Institute of Technology School of Systems and Logistics, at Wright-Patterson Air Force Base, Ohio, is exploring ways to build motivational features into e-learning that help improve completion rates for their Virtual Schoolhouse courses. The Virtual Schoolhouse (VSH) is a professional, flexible, continuing education resource that offers instruction in acquisition fundamentals by means of the worldwide web (AFIT/LS Department of Systems Acquisition Management Homepage, 2002). So far, while e-learning has proven to be a promising concept, VSH administrators believe that the completion rates for several of their courses are lower than that of traditional classroom courses and, therefore, must be improved upon.

Implications

As Internet technology continues to expand, it is likely that the number of e-learning courses will also increase. A pivotal factor in maximizing the power of this technology becomes our ability to create courses that preserve an e-learner's desire to persist until completion. If a substantial number of distance learners fail to complete their courses, then the notion of unlimited access to information and instruction becomes

meaningless (Phipps & Merisotis, 1999:25). Identifying the appropriate motivational factors that influence course completion rates has proven to be challenging (Rosenberg, 2001:42). E-learning is an entirely different style of education that is not yet fully understood (Phipps & Merisotis, 1999:1). Misguided perceptions, about e-learning's ability to train and educate people, have done more to cloud its usefulness than to enhance the learning experience (Cox, 1999). Being able to identify those motivational factors that inhibit or promote e-learning course completion rates may help un-cloud its usefulness.

Motivational Theory Approach

Though no one approach is likely to capture all the dynamics involved in determining whether or not people will successfully complete an e-learning course, motivational theory provides readily available constructs that may help explain why students invest their time, talent, and energy in e-learning educational and training opportunities (Maehr & Braskamp, 1986:17). Schunk defined motivation as "the process whereby goal-directed behavior is instigated and sustained" (1990:3). This study makes use of Schunk's definition of motivation, and considers process factors that direct, intensify, and terminate goal-directed behavior (Campbell & Pritchard, 1974). Understanding the motivational process may help provide insight as to why some individuals complete their courses, while others drop out. Motivational theory provides guidance for determining those factors most likely to influence a person's desire to complete an e-learning course.

Research Focus

In recent years, there has been considerable effort to research the costs, implementation, and return on investment issues of e-learning (Rosenberg, 2001:48). Some of this research examined the synchronous or asynchronous features of e-learning and measured interactivity factors like download speeds, collaboration capability levels, and multimedia use (Sevcik, 1996:27). Other studies examined its effectiveness by comparing it to traditional, brick and mortar classroom methods of learning. This study takes a different approach by focusing on a student's motivation to complete e-learning courses based on the amalgamate of external factors such as technical problems, off-task demands, and environmental support, with motivational factors and course design characteristics. The study plans to look at motivational processes and make comparisons across e-learning courses and across students to explain any variation in course completion rates.

Problem Statement

E-learning is being used to train and educate a myriad of Air Force personnel and each year e-learning enrollment numbers grow. Evidence shows, however, that completion rates among e-learners are lower than that of traditional learners. Unfortunately, there are no definitive answers as to why. This dictates the need to explore those factors that influence e-learning course completion rates. Efforts may in turn allow organizations, like the Air Force Institute of Technology School of Systems

and Logistics, to design motivationally sound courses that better harness e-learning's capability.

Transcripts from personal interviews with nine e-learning administrators were used to create the focus of this research. Interview questions were designed to extract information on perceptions as to why some individuals complete e-learning courses, while others drop out. The questions were open-ended towards the beginning of the fieldwork, but became more structured as the research effort evolved. The general findings from the interviews led to the model depicted in Figure 2.

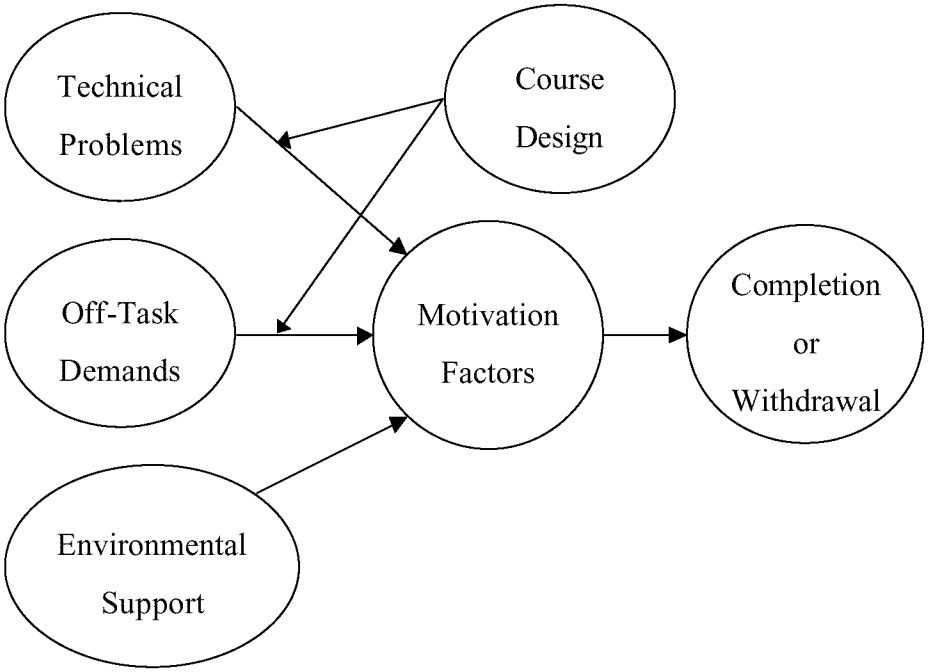

Figure 2: General Findings from Interview Transcripts

As can be seen from the model, motivation, or lack thereof, was viewed as a key determinant of e-learning course completion rates. When asked to identify e-learning factors that influenced this motivation, the e-learning administrators identified three

external factors: technical limitations or problems with computer hardware and software, off-task demands encountered while engaged with e-learning, and the amount of support received from the environment that promotes the e-learning effort. They also believed that course design can lessen the negative effects and enhance the positive effects of these external factors and, in turn, motivational constructs on e-learning course completion rates.

Technical Problems

Several of the administrators stated that e-learners who continuously experience technical problems like slow or choppy response times are more likely to withdraw from e-learning. One administrator summed up the technical aspects of e-learning, by stating, "We either lose students on the high-end or low-end. E-learning courses full of innovative bells and whistles (high-end) are ineffective if students are limited by firewalls or do not have the proper hardware or software to handle them. On the other hand, courses that are static and boring (low-end) do not adequately grab and keep the e-learner's attention" (Lewis, 2001).

Course Design and Technical Problems

Elements of course design can accentuate or dampen the effects of technical problems on e-learners' motivation. One e-learning designer noted, "Obtaining high e-learning completion rates hinge on designing courses that provide adequate amounts of interaction and feedback, and a set time limit in which the course must be finished" (Miller, 2001). Implementing these features, he believed, would increase an e-learner's commitment and motivation because it forces them to interact, be attentive, and get the

course done in a timely manner. However, he added, "It is important for designers to know their customers limitations so a proper balance can be reached between the practical and impossible." There were similar findings within e-learning course critiques. The negative comments most frequently made were centered around technical or content problems with the course. Course critiques identified such factors as slow system response times and poor or wordy course content as areas of concern. Un-compelling, static content (low-end) also serves as a motivational roadblock because it reduces interaction to simple reading (Dalton & others, 2000:5).

Off-task Demands

Off-task demands were another area of concern for the interviewees. Most of the administrators reported that e-learning is often conducted in an uncontrolled or work-related environment in which the e-learner is susceptible to distractions and interruptions. Off-tasks hinder the e-learning effort because they force the e-learner to allocate time, energy, and attention towards things not related to completing the course at hand. As put by one e-learning administrator, "To be successful at e-learning the environment must allow the student to devote the necessary time, attention, and energy to the course." The administrator went on to say that, "…in some cases, e-learners should be removed or remove themselves from these uncontrolled environments" (Gaudreault, 2001). Many comments from the e-learning critiques stated, "I had difficulty completing the e-learning course with my current workload and the many distractions I encountered," or "My job sent me TDY mid-way through the course." Observations found that competing demands complicated the motivational process and "delayed" efforts to complete the course.

Frequent interruptions from peers, email, and telephone calls force students to reallocate their attention from the e-learning course.

Course Design and Off-task Demands

Elements of course design can also accentuate or dampen the effects of off-task demands on e-learners' motivation. Course structures that provide adequate and timely feedback help e-learners maintain focus on completing the goals and objectives. Observation notes revealed that high levels of support like feedback helped re-focus efforts and increase the levels of persistence towards course completion. Students often report a desire to simply "printout" the e-learning course material and go read it in a quiet, environment-friendly place. Difficulty printing e-learning course material is another common criticism from the course critiques.

Environmental Support

Environmental support is the third area of concern for the e-learning administrators. They believed that the amount of support e-learners receive from supervisors, peers, instructors, and family members, goes a long way in determining the success of their e-learning experience. Support includes, but is not limited to, being given: the proper resources to conduct e-learning, the time to devote attention and energy towards the course without disruptions, and the opportunity to take the course for career advancement. Critique comments that were negative in nature stated such things as, "My boss or co-workers dislike e-learning—they thought I was slacking off," or "I received low amounts of course feedback and interaction with my instructor." Positive critiques included statements like, "It was nice to be given the time to devote to e-learning so that I

could actually work at my own pace," and "The outstanding support I received from the e-learning administrators made a difference."

Research Questions

Analysis of the initial interviews and observations led to the following research questions concerning external factors and course design.

Research Question 1: In what ways do technical problems, off-task demands, and environmental support (external factors) influence motivation to complete e-learning courses?

Research Question 2: How does e-learning course design influence the effects of external factors on motivational constructs?

The interviews and observations produced a fairly clear picture of the relative influence of the three external factor and moderating effect of course design on completion rates, but provided less insight into how these factors influenced motivational processes. Further research into the motivational theory was required to identify the specific processes that may be influenced by external factors and e-learning course design.

Research Question 3: What motivational factors influence e-learning course completion rates?

Thesis Overview

This chapter briefly introduced the problems faced by e-learners and e-learning course administrative in terms of external and design factors that influence course completion rates. The chapter also builds a case for motivational theory as a possible approach to explain disappointing e-learning course completion rates. Chapter II presents a review of previous research on motivational theory and other literature relevant to the research. Chapter III presents the methodology used to answer the research question and describes the course selection, research instrument development, and data collection techniques. Chapter IV details the results of the research and provides the statistical analysis of the data. Chapter V presents the conclusion and recommendations from this research.

II. Literature Review

"It is the spirit that motivates, that calls upon a man's reserves of dedication and effort, that decides whether he will give his best or just enough to get by."

Peter Drucker (1954)

Introduction

This chapter reviews and then integrates motivation theory to identify factors that influence completion rates in e-learning environments. The majority of this literature is taken from the field of psychology's sub-disciplines of motivational and cognitive psychology, with a few sources being cited from research in the organizational and educational domains. This chapter is divided into several sections presenting a road map of the external factors and motivational constructs people encounter while engaged in e-learning activities.

The chapter starts with a review of several attrition studies and how their findings, combined with the external factors introduced in chapter one, influence completion rates in e-learning environments. Next, the motivational process model is presented followed by an explanation of distal and proximal concepts of motivation. Several motivational theories are then used to clarify how behavior is initiated, directed, intensified and sustained. This chapter concludes with a discussion of an integrative approach to motivation. By applying a combination of explanatory text and literature on current theories of motivation, scholars and researchers may obtain a more comprehensive understanding of those factors that influence e-learning course completion rates.

External Factors

Theories have been used to explain why people persist or drop out of learning environments (Catalano, 1985; Miller, 1967; Spanard, 1990). Miller (1967) proposed a push-pull theory in which positive driving forces push an adult toward completion while negative, restraining factors pull the person away. The theory indicates that retention depends on the degree of congruence or conflict between the person's needs and the perceived strength of the social and situational factors in the decision (Miller, 1967). This theory is similar to Lewin's (1951) theory of Force-Field Analysis, which states that human behavior is a result of competition between driving and restraining forces.

Catalano (1985) developed a similar model to explain retention among students in college. The model helps define and organize the complexity of students' choices to remain in college as it relates to the pushing and pulling forces they encounter. In addition, Catalano's model adds the non-educational aspects of the person's life by combining the salience of all forces drawing on a student's attention and energy simultaneously with the costs and benefits of education (Spanard, 1990:323).

Spanard (1990) proposed a descriptive model illustrating the path of adult problem solving and thinking that leads to retention and eventual completion of academic programs. Spanard introduced several theories, including Catalano's and Miller's, in her study. She presents a longitudinal model that suggests many factors weigh in the decision to stay or drop out of programs (Spanard, 1990:309). Of these factors, a person's aspiration, effort, and persistence to achieve the goal of program completion are

important elements in each stage of the "stay or leave" decision-making process (Spanard, 1990:309).

Though much of the early retention research focused on adult learners enrolled in traditional classroom settings, several of its findings could possibly apply to e-learning environments. Lower levels of self-motivation and career aspiration, combined with uncertain goals, inadequate work habits, and immature attitudes and perceptions, were associated with an increased likeliness to drop out of school (Hoyt, 1999; Morrison, 1999; Spanard, 1990; Waxman & Huang, 1996). The research also suggests that the lower the amount of environmental support (e.g., family, instructor, job, social), the more likely the student will drop out of school (Hoyt, 1999; Waxman & Huang, 1996). Findings from this research have provided valuable information that practitioners have used to develop better retention programs (Morrison, 1999:11; Spanard, 1990:309).

The external factors introduced in Chapter 1 are presented in this research to identify those pushing and pulling forces that influence completion rates within e-learning environments. E-learning environments present some additional challenges not found by students in traditional classroom settings. For starters, traditional classroom learning typically takes place in a controlled environment in which external distractions are unlikely. E-learners, on the other hand, often contend with external factors like network problems, noise, interruptions from peers, off-task requests from the boss or family, email, and an array of similar factors due to the "anywhere" learning environment that e-learning presents. Such factors "pull" them away from completing the course while offsetting factors like environmental support "push" them towards completion (Catalano, 1985).

The lessons learned from the retention studies should still apply to e-learning. With few exceptions, much of the distance education research suggests that similar outcomes can be expected from students that participate in e-learning (Phipps & Merisotis, 1999:1). To apply lessons from classroom settings, one must first consider whether "push" factors like environmental support, and "pull" factors like off-task demands and technical problems have similar effects in e-learning environments. E-learning course designs also play a pivotal role in determining how external factors influence completion rates. For instance, the longer the course, the greater the chance the e-learner could become distracted and focus attention elsewhere. The first hypothesis predicts the likelihood that an e-learning course will be completed given the amount of technical problems and off-task demands (pull factors), and environmental support (push factors) encountered by the e-learner.

> **Hypothesis 1a:** The fewer the technological problems, the more likely an individual will persist at e-learning.
>
> **Hypothesis 1b:** The fewer the off-task demands, the more likely an individual will persist at e-learning.
>
> **Hypothesis 1c:** The greater the environmental support, the more likely an individual will persist at e-learning.

Understanding that external factors influence e-learning completion rates is not sufficient for e-learning course designers and administrators to increase the likelihood that students will persist until they have completely finished the course. Course designers and administrators often have little influence on technical problems, off task demands, or environmental support. To improve e-learning completion rates, practitioners need to

understand how external factors influence human motives to persist at e-learning. Research in this area may produce findings that help e-learning scholars and practitioners design motivationally sound courses that, in turn, improve e-learning completion rates.

Motivational Constructs

New developments in technology, performance demands, research, and a host of other factors influence how humans view the world. The fundamental ideas behind human behavior, however, have remained constant (Lawler, 1994:xii). For fifty years, human motivation has been described as the energizing force that prompts people to act and seek out particular goals. Motivation represents a highly complex phenomenon that affects, and is affected by, a multitude of internal and external factors. Some well-known definitions of motivation include:

> …[an explanation of] how behavior gets started, is energized, is sustained, is directed, is stopped, and what kind of subjective reaction is present in the organism while all this is going on. (Jones, 1955)
>
> …an intra- and inter-individual variability in behavior not due solely to individual differences in ability or to overwhelming environmental demands that coerce or force action. (Vroom, 1964)
>
> …the immediate influences on the direction, vigor, and persistence of action. (Atkinson, 1964)
>
> …a dynamic resource allocation process responsible for the activation, direction, intensity, persistence, and termination of an individual's behavior holding constant the effects of personal factors (aptitude, skills, task understanding, etc.) and environmental constraints. (Campbell & Pritchard, 1976:65)

Motivational Process

Lawler (1994) argues that motivational theory serves as an important learning tool because it presents a way of thinking about what motivates individuals and why they seek

to accomplish particular goals. Campbell and Pritchard (1976) identified motivational constructs as forces that activate, direct, intensify, persist, and terminate behavior. Steers and Porter (1991) expanded upon this concept and developed the motivational process model depicted in Figure 3.

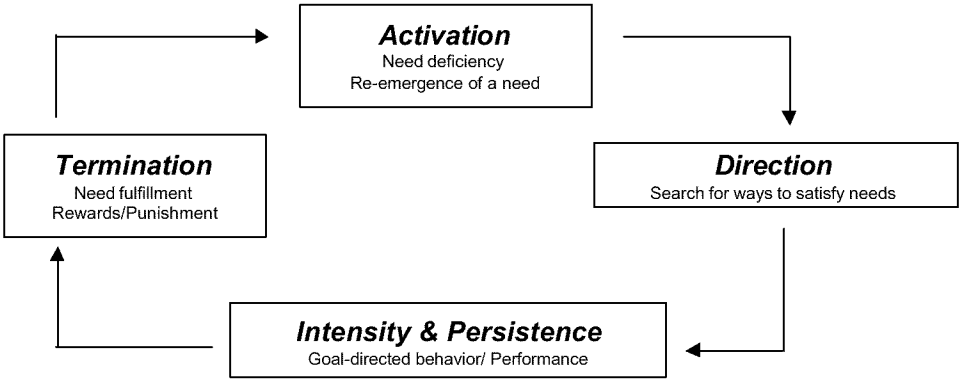

Figure 3: Generalized Model of the Motivational Process (Steers & Porter, 1991)

According to Steers and Porter, "activation" identifies internal and external energetic forces that drive individuals to behave in certain ways (Steers & Porter, 1991:6). These energetic forces are normally considered in the context of human needs, values, or goals. "Direction" identifies the decisions a person makes when faced with choosing one course of action over another (Kanfer, 1990:79). Direction choice is dependent on the strength of the need discrepancy or the relative value of competing goals. "Intensity" identifies the amount of effort given towards a task in a given situation (Kanfer, 1990:79). The strength of the effort depends on two factors: 1) the strength of an expectancy that the behavior will lead to desired goals; and 2) the attractiveness, or valence of the goal (Lawler, 1994:57). "Persistence" identifies the pattern of behaviors

over time (Kanfer, 1990:79). Before a person decides to persist, they take a systematic approach by considering those intrinsic and extrinsic forces that either reinforce or dissuade behavior (Steers & Porter, 1991:6). "Termination" refers to those factors that cause individuals to cease or redirect behavior (Kanfer, 1990:131). Such factors can take the form of feedback, self-evaluation, and goal-attainment (Steers & Porter, 1991:7).

According to Lawler (1994) and Steers and Porter (1991), any discussion of motivation should be primarily concerned with answering questions concerning what activates and directs behavior, and then what determines the intensity of the goal directed behavior over time. Kanfer (1990) reviewed a variety of different lines of motivational research and concluded that motivation can be classified as either distal or proximal. Distal motivational theories primarily emphasize behavior activation and direction of goal directed behavior, while proximal theories explain the intensity and persistence of goal directed behavior over time.

Distal Theories of Motivation

Distal theories of motivation emphasize processes that affect goal choice and intended future effort. They are key to understanding the effect of the external factors on the desire to take an e-learning course (activation and direction). Distal theories describe the types of activities that people choose to engage in, but do not describe how people allocate their attention once they are performing the activity (Kanfer, 1990). Distal theories help with the assessment of potential cost versus potential benefit. In the context of completing an e-learning course, the distal system of motivation would explain the priority placed on completing the course given the salience of other activities demanding

attention, and the confidence that the course would be completed given the amount of available resources.

Proximal Theories of Motivation

Proximal theories of motivation emphasize motivational constructs and processes that control the initiation and execution of actions *during* task engagement (intensity and persistence). They are also key to understanding the effect of external factors and the influence of course design on e-learning course completion. They refer to discrete performance accomplishments aimed towards goal attainment (Kanfer, 1990). A person operating under a proximal system would set some type of short-term goal, say to complete one out of ten e-learning modules within an hour, and then exert energy and effort towards accomplishing that goal, with subsequent short-term goals to follow.

An E-Learning Example of Distal and Proximal Theories of Motivation

An important implication of the distinction between the two types of theories is that the same variable might exert a different effect depending on whether it is deployed within the distal or proximal system (Kanfer, 1990:82). For example, in distal systems, individuals that are computer savvy may have a lot of self-confidence and ability to successfully complete an e-learning course. In the proximal system, however, this high level of self-confidence may undermine motivation by reducing the amount of time and resources this person allocates towards e-learning (Kanfer, 1990:83).

People take e-learning courses for various reasons. These reasons include, but are not limited to: increase knowledge, promotion opportunity, earn credits for a degree, pacify a need for accomplishment, satisfy curiosity, or some combination of them all.

Whatever the case may be, students view e-learning as a vessel to help them achieve some desired goal. In theory, e-learners follow a chain of events as depicted by the motivational process. The following example may help explain the motivational process in terms of an individual taking an e-learning course to achieve their goal.

Imagine a student with family responsibilities, who would like to receive a promotion. The student's boss will only promote the most knowledgeable employee. To gain more knowledge, the student can attend a three-month long course at the local university, or enroll in one of the company's e-learning courses. Attending the university's course will require the student to spend several evenings a week away from the family. Spending time with the family, however, is another salient desire of the student. Company policy allows the student to work on e-learning courses during business hours, which frees up evenings to spend with family. The student's motivated behavior to gain knowledge is activated and directed towards e-learning because it possesses the most attractive and timely option for goal-attainment. Distal theories of motivation explain the student's choice of the e-learning course over a traditional course, or no course at all.

After enrolling in the e-learning course, the student finds it hard to engage in course work because of competing factors like job demands, office noise, interruptions, and network problems. The student must now contend with the decision to either persist at or modify (i.e. re-direct or terminate) the goal-oriented behavior. If the "pushing" thoughts of having more money for their family are enough for the student to persist, then there is a good chance he or she will successfully complete the course. On the other hand, if the "pulling" forces are too great to overcome, the student may decide to drop the

e-learning course and enroll in the local university's course to gain the desired knowledge. Proximal theories of motivation explain the student's reactions to stimuli from the environment and help explain the extent that attention is focused on the e-learning task. Proximal motivation theory can also explain how the educational goal may change over time leading to increased attention on the e-learning and eventual course completion, or decreased attention ending in course withdrawal or termination.

Many contemporary theories of motivation address different portions of the motivational process. They attempt to explain individual behavior in specific situations where action to attain desired outcomes are prevalent. A review of these theories, as well as a look at an integrative approach, may help increase our understanding of those motivational factors that influence e-learning course completion rates.

External Effects on Activation and Direction (Distal Theories of Motivation)

The motivational process exerts its most powerful effects on e-learning environments by influencing the individual's decision to work on the task rather than to do something else (Kanfer, 1990:95). Those factors that activate and direct individual motives are important precursors to understanding the rationale behind intensity, persistence, and termination of goal-directed behavior. Therefore, this section reviews Needs-Motives-Value and Cognitive Choice approaches to motivation in an attempt to explain why people are activated and directed to take e-learning courses.

Need-Motive-Value Approaches to Motivation

Motivational theories that focus on needs, motives, and values help identify those internal and external forces that answer the question, "What activates and directs human behavior?" Need-motive-value approaches view person-based factors as major determinants of human behavior (Kanfer, 1990:81). Early need-motive-value studies focused on personality and humanistic needs (Alderfer, 1969; Maslow, 1943, 1954; McClelland & others, 1953). These studies assumed that individuals are motivated to act, (or in the case of this study, take e-learning courses), due to some internal tension like hunger, need for power, or need for job security (Cherrington, 1991).

Recent needs-motive-value studies have tended to focus on the influence of intrinsic psychological motives, such as mastery, control, challenge, competence, and self-determination (Deci, 1975; Deci & Ryan, 1985; Kanfer, 1990). Deci and Ryan (1985) defines intrinsic psychological motives as innate, needs for competence and self-determination. Deci and Ryan (1985) believed that intrinsically motivated individuals seek and conquer challenges that are optimal for their ability and would take e-learning courses to satisfy such things as a need for mastery (i.e. competence), or a need for autonomy (i.e. self-determination).

Similar to Deci and Ryan's theory, deCharms (1968) viewed self-determination, or freedom from control, as the necessary and driving force behind intrinsic motivation. According to deCharms, a person with a high need for locus of control may be motivated by the fact that e-learning allows them to engage in learning when, where, and how desired (deCharms, 1968:269).

Steers and Porter (1991) also noted that any complete understanding of the forces that energize human behavior must take into account the nature of extrinsic motivation. Extrinsic motivation refers to the behavior where there is a desire to do something, but not out of interest in the activity itself (Deci &Ryan, 1985). Extrinsically motivated people are likely to initiate behavior when it is perceived that salient rewards are tied to effective performance (Lawler, 1987). Thus, based on the above intrinsic-extrinsic discussion, the second hypothesis predicts the likelihood that an e-learning course will be completed given intrinsic and extrinsic motivational factors.

> **Hypothesis 2a:** The greater one's need for competence, the more likely they will complete the e-learning course.
>
> **Hypothesis 2b:** The greater one's need for self-determination, the more likely they will complete the e-learning course.
>
> **Hypothesis 2c:** The greater one's extrinsic motivation, the more likely they will complete the e-learning course.

Findings within needs-motive-value theories have led researchers to recognize that motives play an important role in activating and directing human behavior (Kanfer, 1990:112). As such, this research contributes to the understanding of the theoretical formulations that predict behavioral choice and action as discussed in many cognitive choice theories within the nomological network of motivation.

Cognitive Choice Approaches to Motivation

Cognitive choice models are also used to explain activation and direction of behavior (Kanfer, 1990:82). Expectancy x Valence (E x V) theories dominate the understanding of cognitive processes involved in the decision-making process. These

theories rest on the assumption that people will seek activities that increase their chances to achieve valued outcomes (Kanfer, 1990:113).

Vroom (1964) perceived expectations, instrumentalities, and valence as the key cognitive variables that determine motivational force and choice. Expectancies were seen by Vroom as the strength of a person's belief about whether a particular outcome is possible given available resources (e.g., effort, persistence, time). Vroom defines instrumentalities as the perceived relationship between levels of performance and the probability that distal outcomes will occur. Valence refers to the anticipated attractiveness of each distal outcome (Vroom, 1964).

According to Vroom, people will direct resources toward a particular outcome when they have a high confidence that the can achieve the outcome given resources under their control. The theory suggests that people make relative effort-to-reward comparisons to decide on the most promising courses of action. For example, individuals may enroll in e-learning courses because they expect valuable outcomes, such as pay, recognition, or a promotion to follow, and believe that spending several hours per day engaged with e-learning is instrumental to attain the distal outcome of course completion.

Similar to Vroom's E x V theory, Atkinson (1957) suggests that achievement motivation is a multi-faceted approach consisting of four elements: motive, probability (P_s), incentive (I_s), and expectancy. The theory implies that persons differ in the extent to which motives for success (M_s) are stronger than motives to avoid failure (M_f). In the context of e-learning, achievement motivation theory suggests that individuals with higher motives for success ($M_s > M_f$) are potentially valued students because they plan ahead, are ready to be confronted with difficulty, are independent and hardworking, and

persist longer at tasks (Kanfer, 1990:115; Ward, 1994:983). Based on the combination of expectancy theory (Vroom, 1964) with achievement motivation (Atkinson, 1957), the third hypothesis suggests that:

> **Hypothesis 3:** The greater an individual's expectancy for success, the more likely they are to complete an e-learning course.

The many variables of cognitive choice theory, in one form or another, can be related to goal-directed behavior because they all lead to some desirable endpoint. Therefore, goals could possibly have a direct influence on whether a person intensifies, sustains, or terminates behavior aimed towards course completion. Proximal theories of motivation could prove beneficial to this research effort because they investigate goals and the role they play in motivating human behavior.

External Effects on Intensity and Persistence (Proximal Theories of Motivation)

Proximal theories of motivation focus on the *self-governing* concepts of the motivational processes underlying goal attainment (Kanfer, 1990:131). More precisely, proximal motivational theorists suggest that goals represent a critical component of the self-regulation process because they provide the mechanism by which motivational states are translated into action or terminated (Kanfer, 1970; Kanfer, 1990; Kanfer & Schefft, 1988; Latham & Locke, 1979; Locke, 1967). Therefore, this section reviews Goal-Setting and Self-Regulation research in an attempt to identify those factors that influence the intensity and persistence of goal-oriented behavior.

Goal Approaches to Motivation

Locke's (1968) goal-setting theory proposed that goals are the driving force behind mobilizing on-task effort and encouraging task persistence (Locke, 1968; Locke & others, 1981). Intensity is one of the major goal-setting attributes in Locke's theory. Intensity refers to the strength of the goal in relation to perceived goal importance and amount of goal commitment obtained (Locke, 1968). Goals that are perceived as "very important" are more likely to have stronger goal intensity than those perceived as "unimportant", or are less valuable. For instance, Defense Acquisition personnel must complete e-learning courses to obtain job certification. Locke's theory posits that the goal intensity to complete these courses is stronger for Defense Acquisition personnel than for those taking the courses out of curiosity.

Steers and Porter make a similar argument and suggest that certain environmental forces can influence goal importance. An e-learner who is not required to complete a course until the following week, may decide to expend effort towards some off-task (Steers & Porter, 1991). But, if that e-learner's boss expects the course to be completed by day's end, the e-learner will likely intensify efforts towards completing the course due to fear of not meeting the boss's expectations. In this case, the boss' expectations increased the goal intensity of completing the e-learning course. Given these arguments on goal intensity, it is hypothesized that:

> **Hypothesis 4:** The greater the goal intensity, the more likely the e-learner will complete the e-learning course.

Raynor and Roeder (1987) expanded Atkinson's original theory of achievement motivation and suggested that many goals, such as career advancement, require

performance of a hierarchical series of tasks. According to Raynor and Roeder's theory, a person will divide a larger goal (e.g., get a college degree), into several smaller tasks or goals (e.g., pass Chemistry 101). Each new task within the series is contingent on successful completion of the prior tasks (Raynor & Roeder, 1987). Raynor and Roeder (1987) theorized that as the number of steps in the contingent path increases, achievement-oriented persons ($M_s > M_f$) should demonstrate higher levels of motivation than failure-oriented persons ($M_f > M_s$) on the first step. In addition, the anticipated time it takes to complete the goal would increase. According to their theory, this increase in time it takes to achieve a goal decreases the beneficial effects of contingent paths on motivation (Raynor & Roeder, 1987).

Raynor and Roeder's (1987) findings suggest that course length (i.e. average time it takes to complete a module and time given to complete course) could prove instrumental in determining the amounts of effort and persistence put forth towards the course. For instance, failure-oriented students may feel threatened by e-learning if the course is perceived as being too long. In this case, the amount of effort and persistence put forth towards the course will likely decrease. Conversely, intensity and persistence may increase for shorter courses because they are seen as "low hanging fruit" in which goal-attainment is perceived as quick and easy. The fifth hypothesis predicts the likelihood that an e-learning course will be completed given the length of the e-learning course and achievement motives of the e-learner.

> **Hypotheses 5**: E-learning course length in terms of the time it takes to complete a module and the total time given to complete the course, will have different effects on completion rates for success and failure oriented students.

Considerable differences can exist among individuals concerning the manner and intensity in which they select certain motives over others (Steers & Porter, 1991:7). Self-regulation theorists suggest that self-governing factors such as self-efficacy, feedback, and historical events and experiences, whether satisfactory or dissatisfactory, helps de-conflict goals because of the mediating affect they have on the executive processes that guide goal choice and effort (Kanfer, 1990:124).

Self-regulation Approaches to Motivation

The concept of self-efficacy receives much attention in self-regulation research. Bandura defines self-efficacy as "the historical judgment an individual makes about his or her ability to execute a particular behavior" (Bandura, 1978:240). Wood and Bandura (1989) expanded upon this definition by suggesting that self-efficacy judgments form a central role in the regulatory process because they determine how much effort people will spend on a task and how long they will persist with it. Self-efficacy theory suggests that there are four major sources of information used when forming self-efficacy judgments (Bandura, 1977). Figure 4 identifies these sources.

Personal accomplishments refer to past experiences with the specific task being judged. Vicarious experience, also referred to as modeling, is gained by observing others perform activities successfully. Social persuasion refers to activities, such as coaching and feedback, where people are led to believe that they can successfully accomplish the task (Bandura, 1977; Bandura & Cervone, 1986). Physiological and emotional states refer to an individual's state of mind with respect to a specific task (Bandura, 1988).

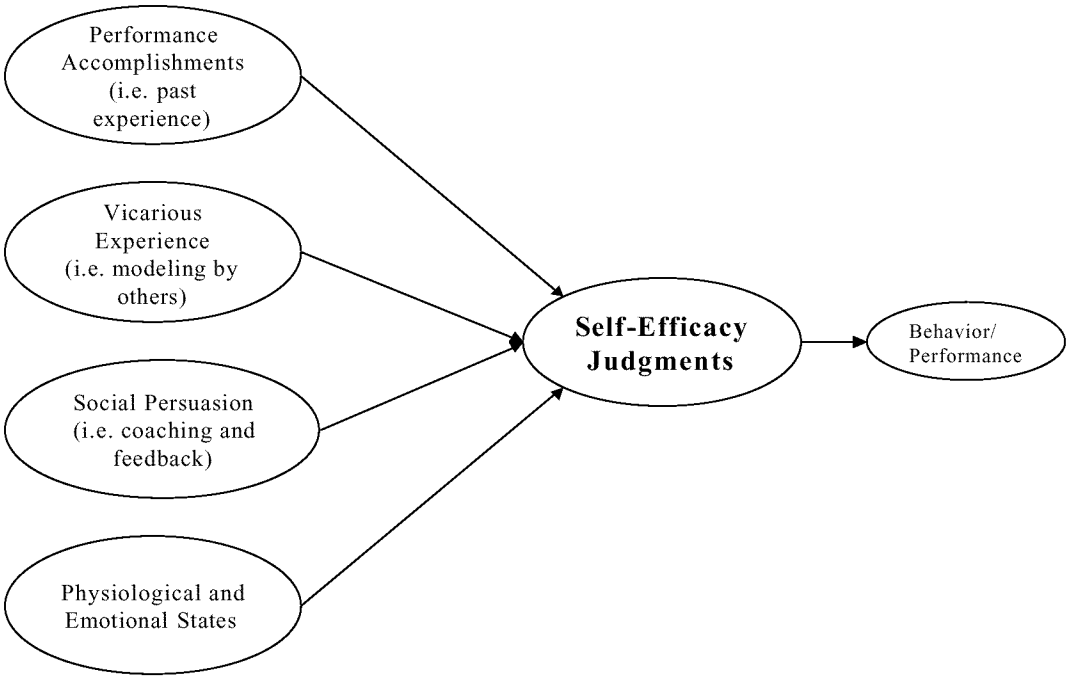

Figure 4: Self-Efficacy Theory (Bandura, 1977)

Self-efficacy theory has been used in numerous studies, including those of information technology (Compeau, 1992; Hill, Smith, & Mann, 1987; Staples, Hulland, & Higgins, 1998) and learning domains (Gist, 1989). In particular, Staples, Hulland, and Higgins (1998) concluded that if organizations can learn how to increase their employees' self-efficacy judgments about their abilities to complete relevant tasks, this should lead to improved performance.

These results suggest e-learners with positive beliefs about their ability to perform tasks will exert greater efforts towards completing an e-learning course, while those with negative self-beliefs are likely to reduce their efforts, switch to an off-task, or quit altogether (Bandura & Schunk, 1981; Weinberg, Gould, & Jackson, 1979). The sixth

hypothesis predicts the likelihood that an e-learning course will be completed given the level of an e-learner's self-efficacy.

> **Hypothesis 6:** The greater one's self-efficacy in e-learning environments, the more likely they will complete the e-learning course.

Bandura (1982) and Kanfer (1970) take a different look at self-regulation processes. They view self-regulation as comprised of three interrelated components—self-observation, self-evaluation, and self-reaction. *Self-observation* refers to the knowledge gained from feedback about those features of activity most significant for goal attainment (Bandura, 1982, 1986). *Self-evaluation* allows a person to compare their desired goal state with their observed performance. *Self-reactions* are the satisfactory or dissatisfactory internal responses that occur in response to self-evaluation. Goal-performance discrepancies occur when performance is observed as falling short of perspective goals.

Feedback moderates the relationship between goals and performance. Feedback comes into play in one's subsequent effort to achieve desired results (Steers & Porter, 1990, 186). Studies show that when workers got feedback relevant to the specific goal, performance improved (Steers & Porter, 1990:360). These results lead one to infer that feedback information is important because it provides individuals with a means to assess their performance. Therefore, based on the research by Bandura (1982) and Kanfer (1970), it appears reasonable to hypothesize the following:

> **Hypothesis 7a:** E-learners that believed they received sufficient and timely feedback information are more likely to complete e-learning courses.

> **Hypothesis 7b:** E-learning courses that provide feedback information that shows progress towards proximal and distal goals will have higher completion rates than courses that do not.

Wiener's (1971) attribution theory suggests that individuals make causal explanations about past behavior that determine future levels of intensity and persistence. These causal explanations can be explained by internal (e.g., effort and ability) and external (e.g., task difficulty and luck) forces. Figure 5 summarizes these attributional forces from an e-learning perspective.

	Internal	**External**
Stable	Ability *Cognition level*	Task difficulty *Poor course design*
Unstable	Effort *Time put towards course*	Luck *Internet problems*

Figure 5: Attribution Classification Scheme (Wiener, 1972)

The primary attribute of concern for e-learning practitioners is effort. E-learning designers, instructors, and administrators must keep people willing to put forth effort even if the other three attributes are poor or missing. Findings within attribution theory suggest that changes in an individual's expectancy for goal attainment are primarily influenced by perceived stability of outcome causes.

According to Wiener's theory, the perception that effort can be increased stabilizes or enhances expectations for future success with the e-learning course (Wiener, 1986). In addition, the ability attribute is a stable, internal motivational factor that is under volitional control and can therefore be modified to suffice the goal-oriented situation (Weiner, 1972). Conversely, an e-learner that repeatedly fails at e-learning, may eventually attribute the failure to Internet problems, which are considered uncontrollable,

external factors (Wiener, 1986). Therefore, this e-learner will likely expect failure to continue and terminate behavior (Wiener, 1986). The eighth hypothesis predicts the likelihood that an e-learning course will be completed given the amount of external difficulty encountered in terms of course design.

> **Hypothesis 8:** The greater the amount of external difficulty encountered in terms of course design, the more likely the e-learner will drop out of the course.

Theories in self-regulation provide a framework for understanding cognitive determinants of goal-directed behavior (Kanfer, 1990:133). They also allow individuals to interpret performance and judge themselves in relation to goal driven behaviors. Similar to the understanding of external factors, individual theories of motivation are not sufficient to determine why people fail to complete e-learning courses (Kanfer, 1990:81). An approach that integrates several motivational theories into one may prove more appropriate to explain the complex nomological network of the motivational process.

An Integrative Approach

Kanfer and Ackerman (1989) introduced the Integrative Resource Model of Ability-Motivation Interactions for Attentional Effort as an approach to describe an individual's performance based on allocation of resources towards a task. Analyzing tasks in this manner allows for the discovery of differences between tasks according to the affects attentional demands have on behavior and performance (Kanfer & Ackerman, 1989). For purposes of this study, the task refers to e-learning while performance is measured in terms of whether the course was completed or not.

Kanfer and Ackerman posit that the mapping of motivational processes to task performance involves the simultaneous operation of three cognitive mechanisms called performance-utility, effort-utility, and perceived effort-performance (Kanfer & Ackerman, 1989). The performance-utility function refers to the value placed on any perceived benefits associated with different levels of performance. The effort-utility function refers to the perceived costs and benefits of expending effort towards a particular goal. The perceived effort-performance function brings together the two functions of performance-utility and effort-utility and allows a person to judge the point at which costs of effort override the benefits (Kanfer, 1990:148).

Similar to Expectancy x Value theories, these three mechanisms hypothesize that an individual's expectancy that a given action will be followed by a given result, and the amount of effort put towards that result, determines the motivational force expended (Vroom, 1964). In addition, the effort-utility function mirrors the portion of Catalano's motivation-retention model that highlights the cost and benefits associated with effort applied in terms of attention and energy (Catalano, 1985).

Kanfer and Ackerman's integrative model, shown in Figure 6, purports that the amount of resources used towards a task, and how those resources are allocated, depend on motivational processes (Kanfer & Ackerman, 1989). According to their theory, both distal and proximal processes, as well as feedback, affect the manner in which resources are allocated to off-task, task, and self-regulation. Distal and proximal processes are in turn affected by goal setting. Self-regulatory processes help determine changes in the allocation policy, as well as changes in the perceived effort-performance function.

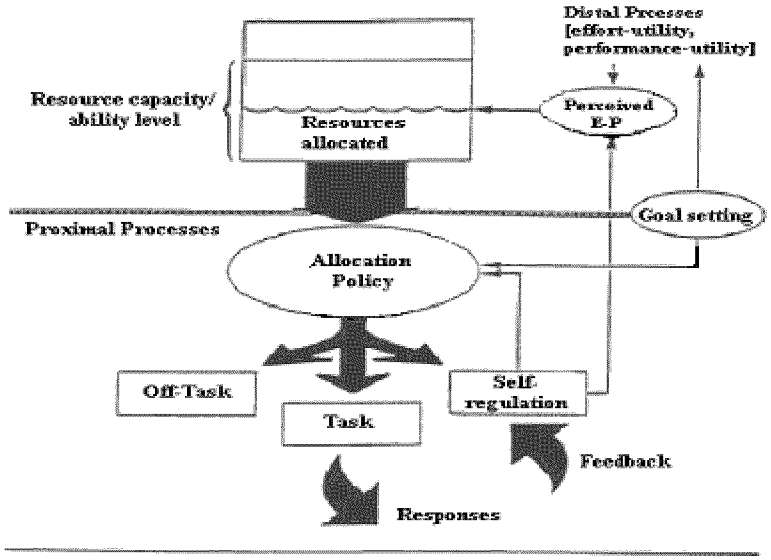

Figure 6: Integrative Resource Model of Ability-Motivation Interactions for Attentional Effort (Kanfer & Ackerman, 1989)

In addition, the Kanfer and Ackerman model assumes that when tasks are difficult, or task demands are high, the individual allocates more effort and persistence towards the task (Kanfer & Ackerman, 1989).

The model has demonstrated successful results under field conditions in previous Air Force studies involving computer systems and learning (Kanfer & Ackerman, 1989). Therefore, it may prove helpful in determining the motivational impact levied on performance in e-learning environments while providing a heuristic view of how motivation influences e-learning course completion rates. For instance, an integrative approach may help determine how e-learners that engage with e-learning in noisy environments allocate their attentional resources. Efforts may help alleviate such distractions so that individuals can better allocate the necessary attention towards the goal at hand: e-learning.

As can be seen from Kanfer and Ackerman's integrative study, motivation is a complex phenomenon that can be best understood within a multivariate framework (Kanfer, 1990; Steers & Porter, 1991). Some theorists argue that researchers, practitioners, and scholars must take such complex factors into consideration if they are to properly evaluate the adequacy of motivational theory in explaining behavior in learning environments (Steers & Porter, 1991:23).

E-Learning and Motivation: Some Concluding Observations

Some theorists believe that the ultimate question of motivation comes down to the complex interaction between the "push" forces within persons and "pull" forces originating from the environment (Steers & Porter, 1991:108). Recall push forces refer to the positive mechanisms that drive a person towards goals or desires, while the pull forces are the negative, restraining cues that thwart or offset goal-oriented behavior. General findings from this research would suggest that persistence, or lack thereof, is a chief determinant of whether a student stays or leaves the learning environment.

Other findings support the notion that different forms of motivation may come about more through conjunction of specific person-environment matches (Lepper, 1985; Lepper and Chabay, 1985; Lepper and Malone, 1987). Such findings suggest that people may be stimulated by different instructional methods that are more "in-line" with their goals and desires. For instance, computerized training has raised questions as to whether individuals differ in their responsiveness to instructional environments containing specific motivational embellishments (Kanfer, 1990:96). If as self-regulation theory argues, goals are the most potent determinant of action, and scholars believe that most

individuals enroll in e-learning courses with the goal of completing them in mind, then researchers must determine at what point do people stop putting forth effort, and why.

Therefore, the objective of this study is to discover those motivational factors that influence people to stay in or drop out of an e-learning environment. As can be seen with the complex nomological network of the motivational process, an analysis of motives may be best viewed using an integrative approach. An attempt to capture an integrated motivational approach, similar to Kanfer and Ackerman's (1989), for this study is illustrated in Figure 7.

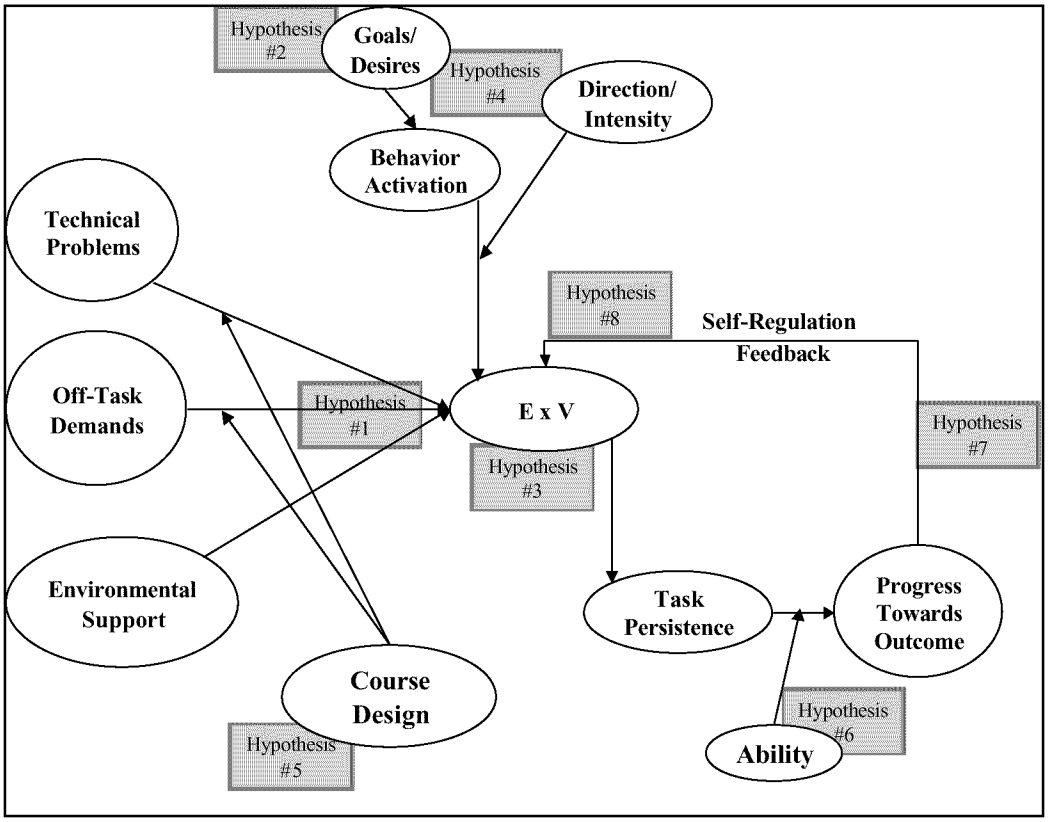

Figure 7: Integrated Motivational Approach to E-Learning Course Completion Model

The model tries to capture the impact that external factors have on motivational factors. Motivational factors are in turn related to the complex nomological network of

motivated behavior in terms of completing an e-learning course. As discussed earlier, goals and desires normally activate and direct behavior. The intensity of goal-directed effort is then determined by perceived outcomes and goal valence. From there, a person's expectance of goal attainment determines how long they are willing to persist at e-learning in order to complete the course.

Task persistence is further influenced by the person's self-efficacy in his or her ability to successfully complete the course work. Progress towards goal-attainment is assessed by self-regulation concepts and feedback. Self-regulation and feedback information are then compared to the perceived outcomes and expectancies that initially instigated the direction, intensity, and persistence of goal-directed behavior. The result is one of two things: 1) continued effort and task persistence (which leads to course completion), or 2) terminated behavior (which results in the person dropping out). The external factors of technical problems, off-task demands, and environmental support, along with the course's design, influence motivated behavior throughout the entire motivational process. The hypotheses introduced throughout the literature review are incorporated within the model as a means to show their relation to the different constructs and processes that influence behavior.

Research findings from such models may provide educators and trainers insights on incorporating motivational features into e-learning programs that significantly improve attrition rates. Additionally, future studies may be able to use these findings to develop an integrative motivational model that specifically aims to predict and explain course completion rates within e-learning environments.

III. Methodology

"The process of data analysis is eclectic; there is no right way."

Renata Tesch (1990)

Introduction

This chapter describes the methodology used to identify and measure those motivational factors that promote or inhibit e-learning course completion rates. A literature review, as well as interviews, content analysis, and observations, was used to develop the research instrument used in the study. The research instrument, entitled the E-Learning Course Questionnaire (ECQ), was then employed to elicit and extract information to address the research questions posed in Chapter I and test the hypotheses introduced in Chapter II. Eight (8) e-learning courses—five from the Air Force Institute of Technology Virtual Schoolhouse and three from the Defense Acquisition University Virtual Campus (DAU)—were targeted for analysis. The ensuing sections describe the research approach, course characteristics, instrument development, subject pool, data collection procedures, and statistical analysis used in the research effort.

Research Approach

The method used to gather information for the investigation was theory-driven using the ECQ to collect quantitative data. An overview of all the steps used in the research follows:

1. conduct interviews with subject matter experts,
2. observe e-learning as an unobtrusive participant,
3. analyze previous e-learning course critiques,
4. review e-learning- and motivation-related literature,
5. select e-learning courses (referred to as the "target" courses),
6. analyze the characteristics of the selected courses,
7. develop the research instrument,
8. select subjects from targeted courses populations,
9. administer the survey,
10. gather survey results,
11. perform statistical analysis of the final data, and
12. interpret the results.

Interviews

Multiple interviews were conducted with nine subject matter experts between the dates of 30 January 2001 and 10 June 2001. Each interview lasted approximately one hour. The subject matter experts included personnel from AFIT, DAU, and Northrop Grumman Corporation (company that designed and built the Virtual Schoolhouse e-learning courses). Interview questions were designed to extract information on perceptions of those factors that influenced e-learning course completion rates the most. Though an interview guide was used, the actual questions asked during interview sessions were composed on the spot. This interview approach was taken because it

helped fit the questions to the natural rhythm of the dialogue as well as promote maximum, unbiased disclosure by the interviewee (Dooley, 2001:258).

Observation

The researcher received permission to gain entry into the VSH Operational Safety, Suitability, and Effectiveness (OSS&E) course and participated as an unobtrusive observer from 23 April 2001 (course start date) until 19 May 2001 (course end date). The advantages that observation brings to research include: 1) researcher gains firsthand experience with environment and subjects, 2) researcher can record information as it occurs, and 3) unusual aspects can be captured during observation (Creswell, 1994:150; Dooley, 2001:255).

Content Analysis

Once the observation phase ended, end-of-course critiques were reviewed and analyzed from six of the target courses. The information extracted from the critiques was compared to both the interview and observation data collected in an attempt to identify and compare similarities, accuracies, and frequency of responses. The objective here was to identify recurring e-learning trends that influence course completion rates.

Quantitative Design Objective

One advantage of employing a quantitative design is that theory and literature are used deductively to help guide the study toward answering the research questions (Creswell, 1994:179). The information collected through quantitative procedures can be analyzed statistically to generalize from the data and support or refute theories. The objective of this design is to extend motivational knowledge while identifying e-learning

course designs that, in conjunction with motivational constructs, identify differences between those that complete e-learning courses and those that do not. Therefore, the motivational constructs—*activation, direction, intensity, persistence, and termination*—discussed in the literature review of Chapter II are analyzed in relation to e-learning course designs. The characteristics of course length, course difficulty, amount of feedback provided, and whether or not the course was a "requirement," are collectively used by this research to define e-learning course design. Course characteristics are compared to both ECQ data and course completion rates to determine if there are any significant relationships between the three.

Course completion rates refer to the percentage of students that actually complete the e-learning course compared to the number initially enrolled. The following equation was used to calculate the completion rates for the eight courses used in this study:

$$E_{cr} = \frac{\text{number initially enrolled - number that dropped}}{\text{number enrolled}} \qquad (1)$$

Number that dropped corresponds to those that did not complete the course. For purposes of this research, the term dropped is defined as "the failure to complete a given course of action or attain a desired goal for which he or she first entered" (Tinto, 1982). Students that end the course with a status of withdrawn, failed, or incomplete will be considered as *dropped* from the course. Information as to the number of students initially enrolled and the number of students that dropped was collected from the Virtual Schoolhouse database, or provided by Defense Acquisition University Virtual Campus course administrators.

Target Course Selection

The eight target courses used in the study provide information, instruction, and continuing education related to systems acquisition management. With each course, certain amounts of points or units are earned for course completion. Some of these courses are required to be taken while others are not. Defense Acquisition University Virtual Campus (DAU) courses provide mandatory, assignment-specific, and continuing education courses for military and civilian acquisition personnel. Their mission is to provide the acquisition community with the right learning products and services to make smart business decisions (DoD Directive 5000.57, 1991). Systems acquisition career fields must take and complete certain DAU courses to become certified in their specialty. They must then take and complete follow-on e-learning courses to maintain this certification. Therefore, as motivational theory would posit, career-related motives may be the activating (i.e. course is required) and intensifying (i.e. for certification) force behind course completion for the DAU courses (Locke, 1968). Virtual Schoolhouse courses are not required to be taken, however, Defense Acquisition policy states that certified acquisition professionals shall earn a minimum of 80 Continuous Learning Points (CLP) every two years to stay current in the profession (Defense Acquisition Workers Improvement Act, 1993).

Course completion rate (E_{cr}) was the primary factor used to select the eight target courses. A cumulative E_{cr} was calculated for all Virtual Schoolhouse courses in session between the months of May through December 2001. Cumulative rates were used because each Virtual Schoolhouse course was in session more than once during this time frame. Each Virtual Schoolhouse target course was then selected based on: 1) its E_{cr}, and

2) its course characteristics. The courses with the highest and lowest E_{cr} became automatic targets. The other three Virtual Schoolhouse target courses were chosen based on course length, initial number of enrollees, and course description. This helped generalize the study as well as ensure that several E_{cr} perspectives (i.e. high, medium, and low) were analyzed.

The Defense Acquisition University-Wright-Patterson Division Associate Dean of Academic Affairs, Mr. Travis Stewart, chose the three DAU target courses used in the study. He chose one course with a high E_{cr}, one course with a low E_{cr}, and one moderately difficult course, in terms of comprehension and understanding, to obtain a good cross-section of DAU courses. A cumulative E_{cr} for the period between May and December 2001 was also calculated for the DAU courses chosen for this study.

To objectively collect data on motivational factors that influence completion rates, the ECQ was administered to randomly selected subjects previously enrolled in the target courses. The questionnaire's intent was to assess motivational factors that answer questions as to when, where, and how a student's desire to complete the e-learning course is positively or negatively influenced. Therefore, ECQ responses were analyzed along with target course characteristics in an attempt to determine which prevailing motivational factors caused people to complete or drop out of e-learning courses.

Course Characteristics

Target course names, numbers, and descriptions, along with their course completion rates (E_{cr}) and whether they were required or not, are provided in Table 1.

Table 1: Target Course Names, Number, Description, Requirement, and Completion Rates (E_{cr}) (May thru December 2001)

Course Name	Course Number	Course Description	Required	Number Enrolled	Number Dropped	E_{cr}
Current Topics in Financial Management	SAS016V	Cover topics related to each of the financial processes	N	119	42	**64.7**
Weapons Systems Pollution Prevention	SAS019V	Present instruction on the activities, tools, and documentation for integrating Pollution Prevention initiatives	N	21	7	**66.6**
Advanced Concept Technology Demonstrations (ACTD)	SAS025V	Provide information to facilitate ACTD project support	N	57	16	**71.9**
Integrated Product Support	SAS011V	Provide information on air logistics center processes and operations	N	108	29	**73.1**
Modification Management	SAS030V	Present instruction on Modification Management policy and processes	N	114	21	**81.5**
Acquisition Logistics Fundamentals	LOG101	Provide a broad overview of acquisition logistics in the systems acquisition life cycle and system engineering process	Y	1459	172	**88.2**
Fundamentals of Systems Acquisition Management	ACQ101	Provide a broad overview of DoD systems acquisition processes	Y	2641	289	**89.1**
Reliability and Maintainability (R&M)	LOG203	Provide information on relationships between R&M and acquisition logistics	Y	776	81	**89.6**

Course Length

This study looks at and compares two aspects of course length—average time required to complete a module and the amount of time given to complete the entire course. The amount of time given to complete a course is directly affected by the course's subject material, lesson plan, and objective. For Virtual Schoolhouse courses, the averaged time (in hours) required to complete a module is derived by dividing CLP by the number of modules in the same course. For example, if a particular Virtual Schoolhouse course is worth 10 CLPs and has 20 modules, then it would be expected that, on average, it would take one-half (0.50) hour to complete each module. DAU uses the same calculation for their average time to complete a module, however, they use Continuing Education Units (CEU) that are depicted in tenths (i.e. 10 CEU = 1.0 hour). See Table 2 for a breakdown of target course length characteristics.

Table 2: Distinguishing Characteristics of Target Course Length

Course Name	Average Time per Module *(in hours)*	Time Given to Complete *(in days)*	Number of Modules	CLP or CEU
Current Topics in Financial Management	1.60	42	10	16
Weapons Systems Pollution Prevention	2.86	42	14	40
Advanced Concept Technology Demonstrations	1.86	28	8	15
Integrated Product Support	2.14	42	14	30
Modification Management	.75	28	8	6
Acquisition Logistics Fundamentals	1.50	60	16	2.4
Fundamentals of Systems Acquisition Management	1.00	60	24	2.5
Reliability and Maintainability	2.16	60	7	1.7

Course Difficulty

For purposes of this research, course difficulty refers to how hard e-learning courses are in terms of their competence level, readability, and whether the course requires 100-percent mastery or not. The competency level of each target course is based on Bloom's Taxonomy of Educational Objectives (Bloom, 1956) (Appendix A). Bloom categorized competency in terms of the level of abstraction required to answer commonly asked questions in educational settings. Each target course is numerically rated based on Bloom's Taxonomy, with "1" = Knowledge Level, and "2" = Comprehension Level. Though Bloom's Taxonomy goes up to the Evaluation Level, comprehension is the highest level of understanding of any target courses. Competency level information was obtained from the lesson objectives of each target course. If the competency information provided by the lesson objectives were unclear, course administrators were contacted for clarification.

Readability is based on the Flesch Reading Ease Score, which is determined by the structure of words and sentences (Flesch, 1991). Its scale ranges from 0 to 100. The higher the score, the easier it is to read. To collect this data, three modules were randomly chosen from each target course. Within each module, groups of approximately 200 words were copied into Microsoft Word. Then, the Microsoft Word readability statistics tool was turned on and run on the group of words. The average score of the three modules was then recorded as the course's overall readability score.

Some e-learning courses require 100-percent mastery, which means that a student must correctly answer *all* of the exercise and test questions presented within the course before they are allowed to proceed. For instance, DAU students get three attempts to

obtain 100-percent mastery of their end-of-module tests. If the student fails on the third try of any test, they are locked-out and must request to be re-admitted into the course. If re-admittance is denied, then the student must re-take the course, starting from the very first module. Most e-learning courses that do not require 100-percent mastery eventually provide students with the correct answers after the student has made several failed attempts. For purposes of this study, "1" identifies courses that require 100-percent mastery, while "0" identifies courses that do not require 100-percent mastery. Table 3 reveals the target course difficulty characteristics.

Table 3: Distinguishing Characteristics of Target Course Difficulty

Course Name	Mastery	Competence Level	Readability
Current Topics in Financial Management	0	1	29.8
Weapons Systems Pollution Prevention	0	2	19.9
Advanced Concept Technology Demonstrations	0	2	36.7
Integrated Product Support	0	1	35.6
Modification Management	0	2	22.6
Acquisition Logistics Fundamentals	1	1	**
Fundamentals of Systems Acquisition Management	1	1	**
Reliability and Maintainability	1	2	41.8

Note. ** unable to obtain. For Mastery: "0" = 100% mastery not required and "1" = 100% mastery required. For Competence Level: "1" = knowledge and "2" = comprehension

Course Feedback

Feedback was measured in terms of interactivity level between student and course, and the amount of "course progression" information the student received from both the course material and instructors. The interactivity of lessons and exercises is rated as "5" (high), "3" (medium), or "1" (low) depending on the researchers subjective observation of five (5) randomly selected modules from each target course. For example, a course that has many interactive lessons will be rated as "5", while a course that is wordy and static will be rated as "1."

Progression assessment refers to the amount of feedback received by the student from course exams, tests, exercises, lessons, and instructors that provided the student information on their performance and whether or not they were on track to complete the course in the time given. Progression assessment is rated similar to interactivity level. Table 4 reveals the feedback characteristics.

Table 4: Distinguishing Characteristics of Target Course Feedback

Course Name	Interaction Level	Progress Assessment
Current Topics in Financial Management	1	1
Weapons Systems Pollution Prevention	3	3
Advanced Concept Technology Demonstrations	3	3
Integrated Product Support	1	3
Modification Management	5	5
Acquisition Logistics Fundamentals	3	5
Fundamentals of Systems Acquisition Management	3	3
Reliability and Maintainability	5	5

Note. "1" = low, "3" = medium, and "5" = high

The mean completion rate for the target courses was 78.1 percent. The Reliability and Maintainability and Fundamentals of Systems Acquisition Management courses had the highest completion rates with 89.6 and 89.1 percent, respectively. The Integrated Product Support and Advanced Topics in Technology Demonstrations course have what this study considers average completion rates with 73.1 and 71.9 percent, respectively. While the Weapons Systems Pollution Prevention and Current Topics in Financial Management courses had the lowest completion rates with 66.6 and 64.7 percent, respectively. The completion rates of these latter, two courses are comparable to Jewett's (1997) findings that distance learners complete on average only 66 percent of their courses.

Instrument Development

The first phase of developing the ECQ was to generate a pool of items capitalizing on: a) conceptualizations, statements, and suggestions from previous attrition research on various external factors likely to operate in e-learning environments (Catalano, 1985; Miller, 1967; Spanard, 1990); b) empirical research on motivational theory as it relates to activation, direction, intensity, persistence, and termination of goal-directed behavior (Campbell & Pritchard, 1976; Kanfer, 1990; Lawler, 1994; Steers & Porter, 1991); c) notes generated from interviews with e-learning subject matter experts; d) observations emanating from unobtrusive participation in an e-learning course; and e) the content analysis of previous e-learning course critiques. A fundamental assumption used to develop the instrument is that all people who sign up for e-learning courses are initially motivated to complete the course. Somewhere along their e-learning journey,

students are either motivated to sustain behavior and complete the course, or de-motivated to a point that causes them to terminate behavior and therefore drop out along the way.

The items include rationale for engaging with e-learning, intent to finish the course, and motivational traits. The ECQ consisted of an introduction page with instructions, demographics section, and 23 items used to collect quantitative data. The demographic section requests information on the respondent's rank or grade, marital status, whether they have children or not. Items also requested the name of the e-learning course completion status, whether or not the student requested an extension, whether they had to retake the course, and the number of e-learning courses previously taken. Three types of items were used: check all that apply, choose the best answer, and a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with 3 being "indifferent." Four of the items are subsets of validated motivational scales used by Ray (1979), Favor (1982), and Elliot and Church (1997). The other items were derived from previous research in the field of education, and interview, content analysis, and observation transcript notes.

The second phase of instrument development involved instrument validation. To do this, the instrument was provided to subject matter experts practicing in the disciplines of education and psychology. They analyzed the ECQ for validity and consistency while looking for and eliminating any contamination. The validation phase resulted in a validated instrument containing 23 items. The ECQ was then transformed into a web page using Cold Fusion programming language software. It was then hosted on the Air Force Institute of Technology (AFIT) School of Engineering and Management Web

Server and given an address of http://en.afit.edu/env/elearning. The ECQ was now classified as an on-line (i.e. web-based) data collection instrument (Dooley, 2001:177).

Once the ECQ was developed, the third phase of development was to submit the survey and justification the Air Force Survey Branch (AFPC/DPSAS) for approval. The ECQ was approved on 13 December 2001 with a Survey Control Number of SCN 01-120 and an expiration date of 30 March 2002. The SCN granted authority to randomly select and administer the ECQ to Air Force personnel based on the prearranged agreement.

The use of a web-based questionnaire instead of a paper-based questionnaire appears to be the most appropriate way to quantitatively collect data for this research effort. Previous research tends to agree. According a recent web-based versus paper-based survey study, web-based surveys that have non-sensitive content are just as valid and reliable as paper-based questionnaires (Franke, 2001:53). The ECQ contains no sensitive content. Therefore, it appears to be an appropriate technique to collect data. The ECQ is presented in its entirety in Appendix C.

Subject Pool

The subjects used in this experiment were active duty Air Force members, civil service employees, or contractors working for the Air Force at U.S. Air Force installations around the world. The subject pool was heterogeneous consisting of both male and female, with ranks ranging from Lieutenant Colonel to Airman Basic for military members, and pay grades ranging from GS-14 to GS-4 for civilians. To qualify as a subject for this experiment, each subject had to meet all of the following prerequisites:

1. An Air Force member or working for the Air Force in that status,

2. Previously enrolled in one of the target courses between the months of May thru December 2001,

3. Had registered for the course using a military email address instead of a personal email address (i.e. *name@basename*.af.mil, not *name*@hotmail.com), and

4. Not an e-learning designer, instructor, or administrator assigned to AFIT or DAU.

A list of potential subjects from each target course was extracted from both the Virtual Schoolhouse database and the DAU Operational Support System database. The listings included name, e-mail address, grade/rank, unit, and course completion status (i.e. completed or withdrew). Subjects were then randomly selected from the lists. All duplicate names (i.e. subjects that had enrolled in more than one of the target courses during the experimental period) were eliminated. Eliminating duplicate names ensured that each subject received the ECQ only once.

All subjects who participated in this survey did so voluntarily and did not receive any type of compensation for participation. Subjects were informed that the individual results gleaned from their participation would be combined with the responses of other subjects who have taken the same course, as well as compared to subject responses from different e-learning courses. Subjects were also informed that the results would be provided to the instructors, administrators, and designers of the e-learning courses used in this experiment.

Data Collection Procedures

As stated earlier in this chapter, interviews, content analysis, and observations were conducted to gather data for this research. Handwritten notes were taken during each interview on the subject matter expert's responses to interview questions, as well as on other pertinent and unforeseen discussion that occurred. A historical transcript was generated during the OSS&E e-learning course observation. In addition to taking notes on each module event, the transcript included: date, time, and place the observation was conducted; problems encountered; level of interaction; response times; motivational level; and number of times interrupted while engaged with module. Information was collected from the six e-learning course critiques by reviewing each one then highlighting similar or recurring responses. After all the critiques were reviewed and highlighted, the data was compiled into a table (Appendix B) that summarized the content analysis findings.

To gather quantitative data, 924 email messages (Appendix C) were sent out to the randomly selected subjects asking them to participate in the study. A follow-up email message (Appendix D), asking those who did not initially participate to reconsider, was sent seven days later. The messages explained the purpose of the ECQ, how subject names were selected, and provided a link to the website where the ECQ was located. All email messages were batch processed by target course. In other words, all of the subjects who had taken the Modification Management course received an email message identifying only that course as the one in question. This was done to jog the subject's memory in case they had forgotten which course they had previously taken. It also

provided subjects with guidance to select that course from the drop-down menu on the ECQ's demographics information page. Selecting the proper course was important because it allowed statistical information to be differentiated by target course, instead of simply being generalized to the domain of e-learning.

Subjects were then asked to click on the link and take the questionnaire. The link opened up the ECQ introduction page that provided a short greeting, questionnaire instructions, and a "Start Survey" button. User responses to the ECQ consisted of "point-and-click" and typed operations. Though the subjects were asked to provide some demographic information, a couple of steps were taken to protect their anonymity. First, they were not asked to provide their name, age, race, gender, or unit at any time. Second, once the respondent completed the survey, he or she was asked to click the "Finish" button. When the Finish button was pressed, all response data was sent and saved directly to an Access 2000 database that had no way of determining from whom the information was being sent. Information as to subject anonymity, and steps taken to protect it, was provided on the introduction page.

The final page of the ECQ was a screen thanking subjects for their participation. The screen also provided an email link in case the subject wanted to contact the researcher. To protect against receiving blank responses, the ECQ programming code performed error-checking so blank items were not allowed. In addition, the code saved the date, time, and Internet Protocol address to the corresponding Access record. This information was used to identify and eliminate multiple responses from the same person, or responses that were perceived as bogus.

The questionnaire was kept on-line for 12 days after the follow-up email message was sent out. In the end, 497 usable responses were received, for an overall response rate of 58.9%. Four hundred and sixty four (93.4%) of the respondents stated they completed their course, while 33 (6.6%) stated they had to withdraw. Therefore, non-response bias could have been a factor because most of the responses received were from subjects that had actually completed their e-learning course.

Statistical Analysis

Three statistical techniques were employed in this study. Under the assumption of normality, a statistical analysis technique called the Independent Samples *t*-Test was chosen for analyzing factors of motivation in all the Likert-type ECQ items. The *t*-Test compares the mean scores of two groups on a given variable. The two groups act as the independent variable (factor), while the given variable acts as the dependent response. In this case, the two groups are: Completed and Dropped students. Levene's Test for Equality of Variances is used in conjunction with the *t*-Test to analyze whether the two groups have approximately equal variance on the dependent variable (Levene, 1960). Failing to reject the null hypothesis implies that there is no statistical difference in completion status classifications for the given factor of motivation

All of the ECQ items that collected frequency responses (i.e. Choose best answer and Check all that apply) required a Chi-square (χ^2) test for independence. The χ^2 test for independence was used to determine if each factor of motivation and if the course characteristics were independent of completion status (Completed versus Dropped).

Using the probability that a motivational factor is selected from the ECQ as an example, the null hypothesis, that the classifications are independent, is represented by:

$$H_o: P(S) = P(S|C) = P(S|D) \qquad (2)$$

P(S) is probability of selecting the item. P(S|C) and P(S|D) are conditional probabilities of selecting the item given that the respondent completed or dropped out of the course. Failing to reject the null hypothesis implies there is no statistical difference between completion status classifications for the given factor of motivation. The alternative hypothesis, then, is that relative completion of the e-learning course does matter, and at least one of the conditional probabilities is different from the others. Each factor has a similar null hypothesis, and the χ^2 test for independence was employed to determine whether the pattern of conditional probabilities in the data are unlikely, given the null hypotheses are true.

Hypothesis 5 required an interaction effect of success orientation and completion status on the course characteristics of average time per module and time given to complete the entire course. The interaction effect used is a two-way analysis of variance (ANOVA) to determine if there is statistical significance between success orientation and completion rate (first factor) on the course length characteristics (second factor). Therefore, there are three null hypotheses associated with the two-way ANOVA: the means of the first factor are equal, the means of the second factor are equal, and there is no interaction between the factors. An *F*-test is used to determine significance between the factors.

All statistical analyses are reported in Chapter IV with tables and graphs. The goal was to find statistically significant similarities in responses across the completed and dropped groups, as well as assess the hypotheses presented in Chapter II.

Summary

This chapter explained the research approach and methodology used to compare and contrast exploratory findings with questionnaire (ECQ) responses from 497 randomly selected Air Force personnel. The research goal was to assess those motivational factors that influence e-learning course completion rates and either support or refute emerging theory. Completion rate (E_{cr}) data was used in conjunction with target course characteristics and ECQ responses to determine if any differences were more or less likely for either complete or drop out groups based on motivational constructs. The results of all the analysis and assessments will then be used to draw conclusions about the impact that motivation has on e-learning course completion rates.

IV. Results

"Trust—but verify."

Ronald Reagan (1989)

Introduction

The intent of this research was to identify and measure those motivational factors that influence the desire to complete e-learning courses. This chapter presents the analysis and findings of the E-learning Course Questionnaire (ECQ) response data. Response data will be compared and analyzed along with exploratory data to support or refute the six hypotheses presented in chapter two. First, response demographics data are summarized. Next, the focus shifts to answering the research questions and associated hypotheses statements using the data acquired from the ECQ. Finally, the chapter will review the additional comments made on the ECQ.

Respondent Demographics Data

The purpose of the first section of the questionnaire (ECQ) was to gather demographics data about the respondents. The demographic data collected included military rank, civilian pay grade, marital status, whether they had children or not, target course enrolled in, completion status, number of prior e-learning courses taken, and whether or not they had to retake the course or extend their time limit. Each of these demographic variables could directly or indirectly influence a student's ability or desire

to complete an e-learning course. Therefore, it is important to see if there are correlations between the demographic variables and e-learning course completion rates.

Completion Status

The questionnaire asked respondents to state whether they completed or did not complete the course in which they were enrolled. Out of the 497 responses, a total of 464 (93.4%) stated they successfully completed the course, while 33 (6.6%) stated they did not complete the course. Those that did not complete the course will be identified as "dropped" throughout the remainder of this chapter. Though 261 (52.5%) of the respondents were civilians, and 236 (47.5%) were military members, 25 (75.8%) of the 33 that dropped were civilians. Fifty-one (11%) of the respondents that completed the course had to either retake the course or request an extension. On the other hand, 29 (87.9%) of the 33 that dropped had at one time or another retook the course or requested an extension. The information received on those that dropped, however, does not clarify whether they dropped out while retaking the course, or during the extension. Information on completion status is illustrated in Table 5.

Table 5: Completion Status Distribution

	Total	Percent Completed	Percent Dropped
Overall	497	93.4%	6.6%
Military	236	96.6%	3.4%
Civilians	261	90.4%	9.6%
Had to Retake Course	22	40.9%	59.1%
Requested an Extension	58	72.4%	27.6%

Rank and Grades

The majority of the civilians (162) were between the pay grades of GS-11 and GS-14. This accounted for 36.2% of the total responses received. For pay grades of GS-1 through GS-10, 85 responses were received, which is 17.1% of the total responses received. Contractors (14) accounted for the remaining 2.8% of the civilian respondents. The pay grade of GS-14 was the highest civilian response received. Of the military members, officers accounted for 172 (34.6%) of the responses, followed by 64 (12.9%) enlisted members. The highest military rank that responded to the ECQ was Colonel. A breakdown of the respondents by rank and grade are illustrated in Figures 8 thru 10.

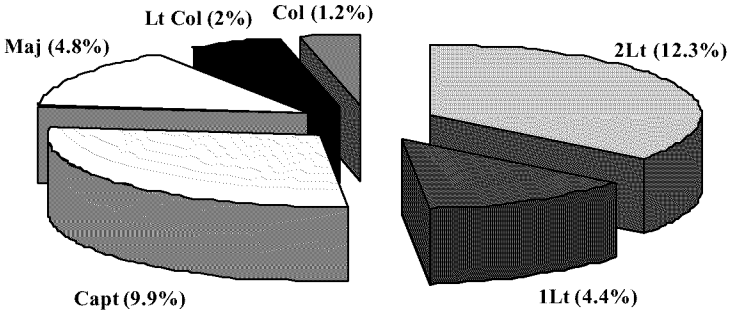

Figure 8: Officer Rank Distribution (percent of total)

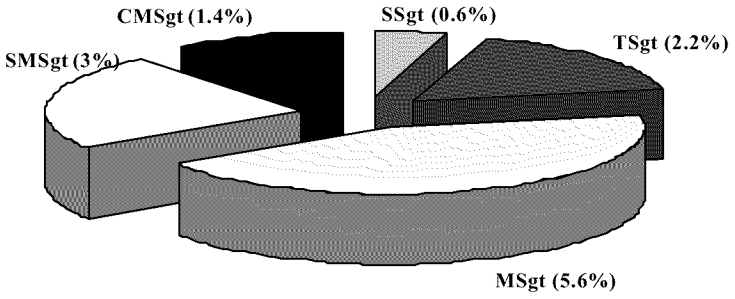

Figure 9: Enlisted Rank Distribution (percent of total)

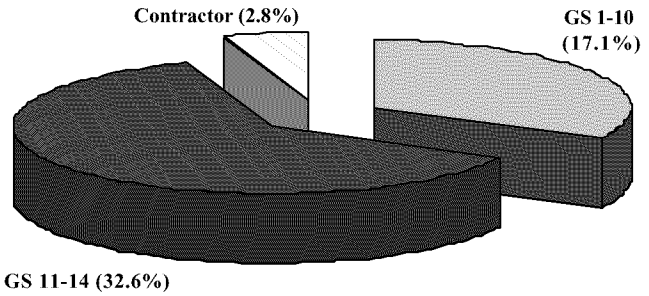

Figure 10: Civilian Grade Distribution (percent of total)

Marital and Children Status

The information gathered on marital status, and whether or not the student has children, is important because it could possibly identify those students having more personal demands (i.e. off-task demands) than others. Spanard (1990) found that persisting students had less familial pressure than non-persisting students. Therefore, a student's family situation could prove instrumental in determining whether they persist or drop out of an e-learning course.

Over half of the respondents (290) were married-*with*-children. They accounted for 58.4% of the total responses received. Those single-*without*-children were the second largest group (94), comprising 18.9% of the total responses received. Those married-*without*-children (72) accounted for 14.5%, while the single-*with*-children respondents (41) accounted for the remaining 8.2%. ECQ response data revealed that those students single-*without*-children had the lowest percentage of dropouts (3.2%). The single-*with*-children group, however, had the highest percentage of dropouts (17.1%). The married-

with-children and married-*without*-children groups had drop out rates of 6.9% and 4.2%, respectively. Findings are illustrated in Table 6.

Table 6: Marital and Children Status Distribution

	Marital Status	Total	Percent Completed	Percent Dropped
Married	With Children	290	93.1%	6.9%
	Without Children	72	95.8%	4.2%
Single	With Children	41	82.9%	17.1%
	Without Children	94	96.8%	3.2%

These findings suggest more single-*with*-children respondents dropped out than any other group within the marital status and children category. The single-*with*-children group seem to be different to the other three. There does not appear to be a difference between married-*with*-children, married-*without*-children, and single-*without*-children groups. Therefore, these three groups were combined and compared to the single-*with*-children group. A statistically reliable influence of marital status on e-learning course completion rates ($\chi^2 = 7.85$, $p < .01$) was discovered. The conditional probability of completing the course and being single-*with*-children was .85 while the probability of completing the course and not being single-*with*-children was .94.

E-learning Experience

Approximately half of the respondents for this research had no prior e-learning experience (48.1%). There were 110 (22.1%) respondents that had taken only one prior e-learning course. This proved to be the second largest experience category, followed by

46 (9.9%) respondents who had taken two prior e-learning courses. The "other" category varied from three to 35 prior courses, with anywhere from 37 (7.4%) respondents to one (0.2%) respondent claiming to had taken that particular number of prior courses. The distribution of respondents for the six highest levels (i.e. none thru five) of prior e-learning experience is illustrated in Figure 11.

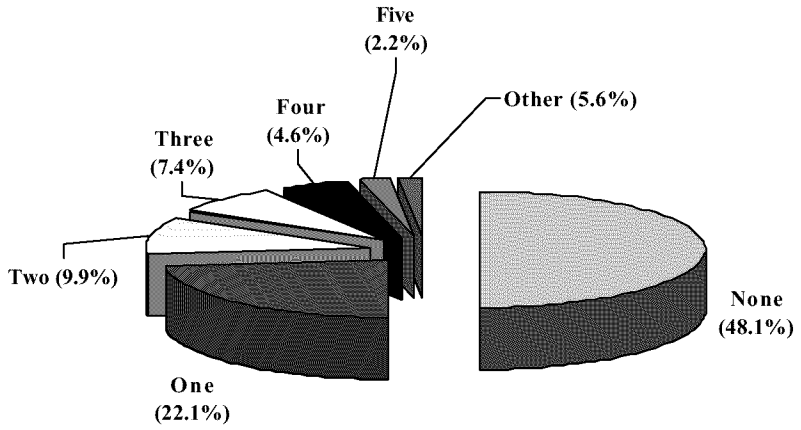

Figure 11: Prior E-Learning Experience (by number of courses)

Hypothesis Testing

The second part of the questionnaire asked the respondents to select items within each statement based on their e-learning experiences with the target course in question. As mentioned earlier in this chapter, ECQ statements were presented in one of three forms: 5-point Likert-scale, Choose best answer, or Check all that apply. The following sections discuss the response and course characteristics data used to test the hypotheses.

The Influence of External Factors

During the period between May and December 2001, the majority of the respondents (75%) engaged with e-learning at work during regular business hours. More than half of these individuals stated they encountered technical problems while taking the course. Table 7 shows the probability that technical problems influenced their decision to complete or drop out of the course.

Table 7: Comparison of Technical Problems Encountered between Completed and Dropped Groups

External Factor: Technical Problems	P(S)	P(S|C)	P(S|D)	χ^2
Slow or Choppy System Response	.22	.20	.39	6.48**
Network Outages	.20	.19	.33	3.70*
Hardware/Software Problems	.16	.15	.27	3.27

Note. N=497. * p<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

The conditional probability of encountering the technical problems of slow and choppy system response times, and network outages, given that the respondents completed or dropped out of the course supports H_{1a}. The influence of hardware and software problems on completion status was not statistically reliable.

Other distractions beyond technical problems are off-tack demands. Table 8 indicates the consequences of off-task demands on completion rates. Noise was the only off-task demand whose influence on completion rates was statistically reliable, but not in

the direction hypothesized. Job demands was the most commonly encountered off-task demand while engaged with e-learning, but its influence on

Table 8: Comparison of Off-Task Demands Encountered between Completed and Dropped Groups

External Factor: Off-Task Demands	P(S)	P(S|C)	P(S|D)	χ^2
Job Demands	.62	.61	.67	0.36
Noise	.47	.48	.30	4.09*
Personal Demands	.10	.09	.18	2.94

Note. N=497. * *p*<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

completion rates was not statistically reliable. When the respondents were asked, "What caused or triggered you to stop working on the course?"—three out of three that chose "had to go TDY" dropped out, and eleven out of fourteen that chose "other demands became more important" also dropped out. The differences between the conditional probabilities could not be tested using a contingency table because of low response frequencies in the "complete" category (0 for "TDY" and 3 for "other demands…"). Brightman (1999) states that contingency table analysis should not be conducted when any category has a frequency below five (5). Even though no statistical test results could be shown for all the data, H_{1b} seems to be partially supported. The problem could rest with the items chosen to test H_{1b}. They could have been too general in nature, and therefore poorly represented how off-task demands actually affect completion rates.

An independent groups *t*-test was performed comparing the mean likeability rating for the completed group ($m = 3.80$, $sd = 0.97$) with that for the dropped group ($m = 2.90$, $sd = 1.31$) regarding environmental support. The alpha level was .05. This test was found to be statistically significant ($t = -4.97$, $p < .0001$), indicating those respondents that received more environmental support were less likely to drop out of the course than those respondents that received little or no environmental support. In addition, a comparison of actual versus expected frequencies according to whether or not the course was "required" shows a statistically reliable influence of completion group ($\chi^2 = 92.56$, $p < .0001$). The conditional probability of completing a required course was .89 while the probability of completing a non-required course was .73. Therefore, there is strong support for H_{1c}.

Assessing Intrinsic and Extrinsic Motivation

Results show that the majority of the respondents (81%) enrolled in e-learning to gain knowledge. Even more than that (85%) found the convenience of "any time" learning the most appealing factor about e-learning. The data indicate minor differences on intrinsic motives between respondents who completed or dropped out of the e-learning course. No differences were found for the three *need for competence* items (Table 9). The conditional probability of the respondents having a need for competence given that they completed or dropped out of the course does not supports H_{2a}.

There were differences, however, for two of the five *need for self-determination* items. Table 10 shows the probability that the intrinsic component of self-determination influenced the respondent's decision to complete or drop out of the course. One

interesting finding was the respondents that selected two or less of the *need for self-determination* items have higher drop out rates, while those that selected three or more appeared to have relatively high completion rates.

Table 9: Comparison of Need for Competence between Completed and Dropped Groups

Intrinsic Factor: Need for Competence	P(S)	P(S|C)	P(S|D)	χ^2
To Gain Knowledge	.81	.81	.85	0.36
Improve Job Performance	.62	.61	.76	2.77
Get Some Specific Information	.13	.13	.21	2.06

Note. N=497. * *p*<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

Table 10: Comparison of Self-Determination between Completed and Dropped Groups

Intrinsic Factor: Self-Determination	P(S)	P(S|C)	P(S|D)	χ^2
Convenience of "Any Time" Learning	.85	.86	.70	6.63**
Ability To Fit Into Schedule	.77	.79	.48	15.68**
Could Work/Learn At Own Pace	.77	.78	.70	1.22
Could Work/Learn Independently	.66	.67	.55	2.07
Convenience of "Anywhere" Learning	.52	.53	.48	0.21

Note. N=497. * *p*<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

The conditional probability of the respondents having self-determination needs given that they completed or dropped out of the course somewhat supports H_{2b}. The convenience of "any time" learning and the ability to fit e-learning into their schedule strongly supports the hypothesis, while none of the other self-determination items were statistically reliable.

Table 11 indicates the consequences of extrinsic factors on completion rates. The conditional probability of the respondents having extrinsic motives given that they completed or dropped out of the course somewhat supports H_{2c}. Accumulating degree or certificate credits supports the hypothesis, while seeking a promotion was not statistically reliable. These findings suggest that the desire to complete or drop out of an e-learning course depends on the extrinsic reward.

Table 11: Comparison of Extrinsic Factors between Completed and Dropped Groups

Extrinsic Factor	P(S)	P(S|C)	P(S|D)	χ^2
Accumulate Degree/Certificate Credits	.37	.39	.21	3.97*
Promotion Opportunity	.19	.19	.15	0.26

Note. N=497. * *p*<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

Achievement Motives and Completion Rates

The majority of the respondents viewed themselves as being highly motivated (82%) and having stronger motives to achieve success (88%) versus avoid failure. Table 12 shows that success or failure orientation had no influence on completion rates.

Table 12: Comparison of Success Orientation between Completed and Dropped Groups

Success Orientation	P(S)	P(S|C)	P(S|D)	χ^2
Success-Oriented	.86	.86	.88	0.11
Failure-Oriented	.14	.14	.12	0.11

Note. N=497. * p<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

The conditional probability of success orientation given that the respondent completed or dropped out of the course does not support H_3. In addition, results from an independent groups t-test was performed comparing the mean responses of the completed group (m = 4.41, sd = 0.86) with that for the dropped group (m = 4.33, sd = 0.69) as to whether they planned to give the course their best possible effort (Favor, 1982). This test was not statistically significant (t = -0.469, p = .639), indicating that there is no relationship between plans to give the course their best possible effort and whether the course gets completed or not. It must be noted that self-serving bias could have contaminated these results. People tend to perceive themselves favorably when asked self-assessment questions (Myers, 1996).

Importance of Goal Intensity

The data indicates that those respondents who enrolled in e-learning because it was required for their job, or because their supervisor recommended it, had a desire to persist longer at e-learning and therefore had relatively low drop out rates. A comparison of actual and expected frequencies shows a statistically reliable influence of the goal

intensity item of "job requirement" on completion rates ($\chi^2 = 10.57, p < .01$). The conditional probability of completing the course given it is a job requirement was .96 while the conditional probability of completing the course if it is not a job requirement is .89. In addition, 111 out of 115 respondents that enrolled because of "supervisor recommendation" completed the course. The differences between the conditional probabilities could not be tested using a contingency table because of low response frequencies in the "dropped" category (Brightman, 1999). Even though no statistical test results could be shown, the data strongly supports H_4.

Interaction Effect of Success Orientation on Course Length

The average time calculated to complete a target course module ranged from .75 hours to 2.86 hours. The time given to complete the target courses ranged from 28 to 60 days. An independent *t*-test was performed comparing the mean likeability rating for the completed group ($m = 1.28$, $sd = 0.43$) with that for the dropped group ($m = 1.50$, $sd = 0.50$) in regards to average time per module was found to be statistically significant ($t = 2.76, p < .01$). Time given to complete the course was not statistically significance. Table 13 shows the interaction effect of success orientation and completion status on target course length. Figures 12 and 13 show the same, but graphically.

Course length characteristics were subjected to a two-way analysis of variance having two levels of orientation (success versus failure) and two levels for completion status (completed or dropped). For an alpha of .05, the interaction effect of success orientation and completion status on average time per module was not statistically reliable ($F(1) = .755, p > .05$).

Table 13: Interaction Effect of Orientation and Completion Status on Course Length

		Success-Oriented	Failure-Oriented
Complete	Average Time per Module	*m* = 1.29 *sd* = 0.44 *n* = 398	*m* = 1.24 *sd* = 0.39 *n* = 66
	Time Given to Complete	*m* = 54.16 *sd* = 11.25 *n* = 398	*m* = 54.06 *sd* = 11.90 *n* = 66
Dropped	Average Time per Module	*m* = 1.53 *sd* = 0.51 *n* = 29	*m* = 1.28 *sd* = 0.32 *n* = 4
	Time Given to Complete	*m* = 53.93 *sd* = 9.54 *n* = 29	*m* = 55.5 *sd* = 9.0 *n* = 4

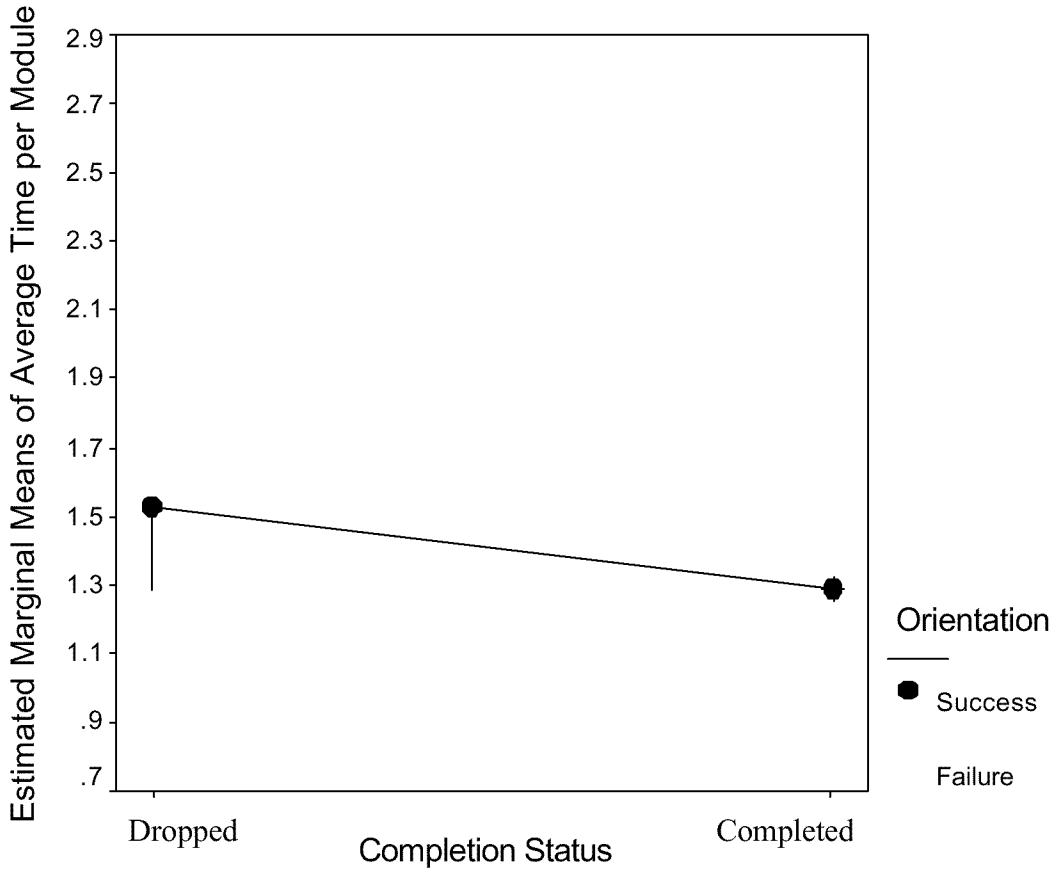

Figure 12: Interaction Effect of Success Orientation and Completion Status on Average Time per Module

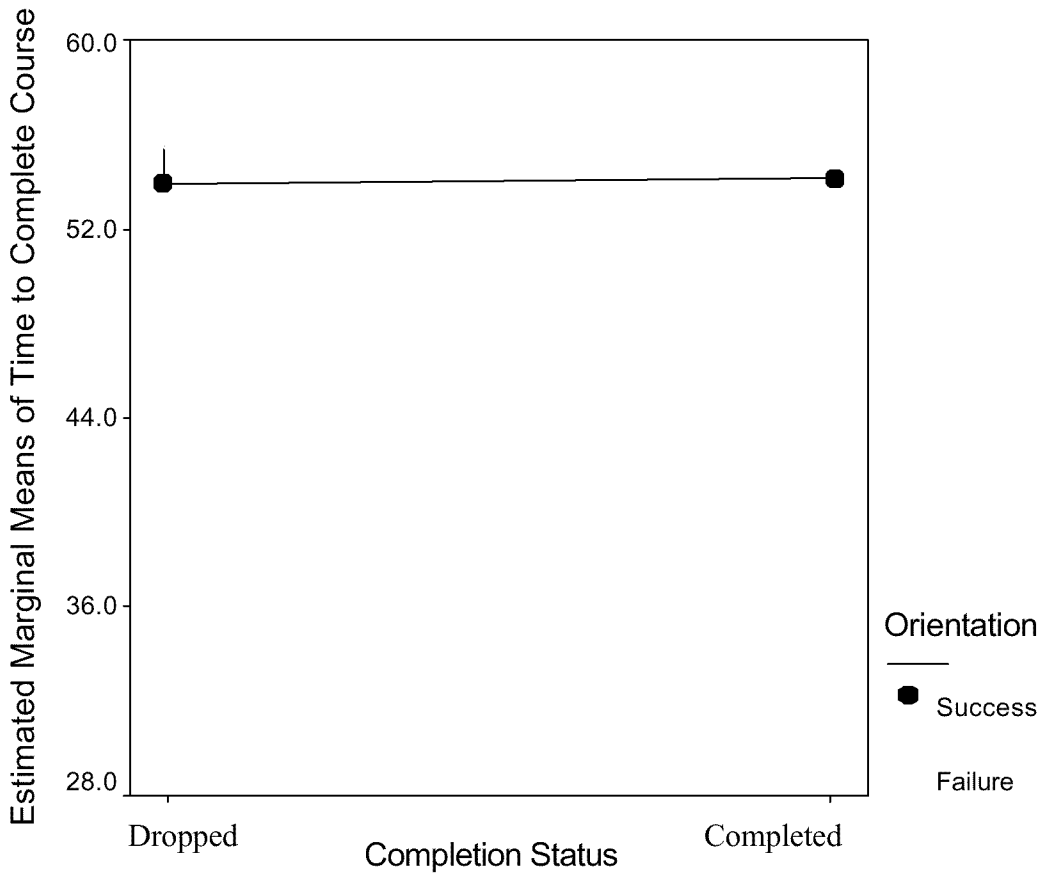

Figure 13: Interaction Effect of Success Orientation and Completion Status on Time Given to Complete Course

Similarly, the interaction effect of success orientation and completion status on the time given to complete the course was not statistically reliable ($F(1) = .073, p > .05$). In fact, the mean for the failure-oriented group that dropped the course ($m = 55.5$, $sd = 9.0$) was higher than the mean for the success-oriented group that completed the course ($m = 55.5$, $sd = 9.0$).

The interactions depicted in Figures 12 and 13 however appear consistent with H_5. Non-significance may be due to relatively small sample size. The denominator of the test statistic is the standard error (square root of the pooled variance divided by

sample size). Increasing sample size decreases the standard error, and thus increases the magnitude of the test statistic. The graphic shows an appearance of an interaction effect, but given the size of the sample, we cannot be sure that the differences are statistically reliable. Overall, there appears to be something going on here that warrants further study.

Self-Efficacy Concepts in E-Learning Environments

Findings from the ECQ demographics section reveal that nearly half of the respondents (48%) had no prior e-learning experience. Still, there was a strong indication that, as the respondents started the course, their confidence was high that they would complete it (response $m = 4.58$). This confidence went unchanged for 80 percent of the respondents, while 11 percent stated that their confidence actually increased. A comparison of actual and expected frequencies shows a statistically reliable influence of a decrease in self-efficacy on completion rates ($\chi^2 = 45.30, p < .01$). The conditional probability of completing the course given a decrease in self-efficacy was .06 while the conditional probability of dropping out of the course given a decrease in self-efficacy was .41. These findings strongly support H_6. However, an independent t-test was performed comparing the mean likeability rating for the completed group ($m = 4.60$, $sd = 0.82$) with that for the dropped group ($m = 4.18$, $sd = 0.95$) in regards to initial confidence that the course would be completed, was found to be statistically significant ($t = -2.824, p < .01$). The conclusion cannot be as strong as initially suggested based on the conditional probabilities. The respondents who did not complete the course attributed it to their self-efficacy getting worse, but the above t-test suggests that they started out with lower

efficacy. In short, H_6 is weakened because the respondents whose confidence decreased started the course with low confidence in the first place.

Exploring the Critical Quality of Feedback

The respondents indicated that the majority of the feedback they received was via electronic messages from the course on results of quizzes and exercises. Table 14 shows the probability that the type of feedback received influenced the respondent's decision to complete or drop out of the course.

Table 14: Comparison of Feedback Type between Completed and Dropped Groups

Feedback Type	P(S)	P(S|C)	P(S|D)	χ^2
Electronic Messages	.92	.94	.67	29.38**
Instructor/Administrator Messages	.41	.41	.55	2.50
NO Feedback Received	.20	.20	.18	0.07

Note. N=497. * p<.05, ** p<.01. P(S) probability of selecting item. P(S|C) and P(S|D) probability of selecting item given completed or dropped course.

A comparison of actual and expected frequencies shows statistically reliable influences of feedback received via electronic messages on the complete and dropped groups. Receiving feedback from e-learning instructors and administrators, or receiving no feedback at all, did not have a statistically reliable influence on completion rates. An independent samples t-test was performed comparing the mean likeability rating for the completed group (m = 3.13, sd = 1.00) with that of the dropped group (m = 2.70, sd = 1.02) with regards to the belief that there was high levels of interactivity with the e-

learning course, was found to be statistically significant (t = -0.43, p < .05). These findings suggest that interactivity level, which may be viewed as a form of feedback, supports H_{7a}.

In addition, an independent samples t-test was performed comparing the mean likeability rating for the completed group (m = 3.57, sd = 0.90) with that for the dropped group (m = 3.03, sd = 1.10) with regards to the belief that a sufficient amount of feedback was received, was found to be statistically significant (t = -3.269, p < .01). An independent samples t-test was performed comparing the mean likeability rating for the completed group (m = 3.72, sd = 0.84) with that for the dropped group (m = 3.27, sd = 1.07) in regards to the belief that any feedback received was timely, was also found to be statistically significant (t = -2.914, p < .01). Therefore, there is strong support for H_{7a}.

There was no significant relationship between the ability to assess progress while engaged with e-learning and course completion rates (t = -1.676, p > .05). Therefore, H_{7b} was not supported.

Attributing Failure to Course Difficulty

Target course difficulty characteristics were used to determine whether there was a significant relationship between course difficulty and completion rates. T-Test results show that none of the target course difficulty characteristics—*mastery, competency level,* or *readability*—had a statistically reliable relationship with completion rates. In addition, no respondent selected "The course was too difficult for me" when responding to the ECQ. These findings suggest that course difficulty has little to no influence on a student's motivation to complete or drop out of it. Therefore, H_8 was not supported.

Respondent Comments

The last section of the ECQ allowed respondents to write any additional comments about their e-learning experience. Because not all of the comments can be presented, they are grouped into like categories and summarized below in Table 15.

Table 15: Summary of Additional Comments

Category	Frequency of Comment*	Proportion of Comments
It was a good course	40	25.8%
Hardware/Software problems hindered e-learning efforts	17	11.0%
Course had poor or static content	16	10.3%
Great way to teach/learn	15	9.7%
Job demands/distractions hindered e-learning efforts	11	7.1%
Network/Web problems or restrictions hindered e-learning efforts	9	5.8%
I prefer formal teaching over e-learning	8	5.2%
Received little or no feedback from instructor	7	4.5%

Note. * 155 total comments. Some respondents made more than one (1) comment.

The comments seemed to differ between the completed and dropped group. Overall, the completed group appeared to be satisfied with what e-learning had to offer. The dropped group complained mostly about the hardware or software problems they encountered while trying to take the e-learning course. Some felt as though the technical problems encountered defeated the purpose of "any time, anywhere" learning. Other dissatisfied respondents commented about the poor, outdated, or boring content that they

encountered. As put by one respondent, "While it (e-learning) is convenient, it does not motivate me to learn the information."

Summary

The majority of the respondents successfully completed their e-learning course. Thus, many of those that dropped out of the target courses between May and December of 2001 chose not to respond. Maybe the same factors that prevented them from completing their courses in the first place are still present and prevented them from responding to the questionnaire. The majority of those respondents that did choose to participate in this study were Air Force civilians, in the grades of GS-11 thru GS-14, and married with children. Table 16 summarizes the statistically significant factors that positively and negatively influence e-learning course completion rates.

Table 16: The Positive and Negative Influences on E-Learning Course Completion Rates

Positive Influences	Negative Influences
Environmental Support	Slow/Choppy System Response Times
Convenience of "Any Time" Learning	Network Outages
Ability to Fit Into Schedule	Lengthy Modules
Accumulate Degree/Certificate Credits	Decrease in Self-efficacy
Job Requirement	
Initial Confidence (Self-efficacy)	
Electronic Feedback Messages	
High Interactivity with Course	

Table 17 contains a summary of the hypotheses.

Table 17: Summary of Hypotheses

Hypotheses	Supported
H_{1a}: The fewer the technological problems, the more likely an individual will persist at e-learning.	**Yes**
***H_{1b}*:** The fewer the off-task demands, the more likely an individual will persist at e-learning.	**Partial**
***H_{1c}*:** The greater the environmental support the more likely an individual will persist at e-learning.	**Yes**
***H_{2a}*:** The greater one's need for competence, the more likely they will complete the e-learning course.	**No**
***H_{2b}*:** The greater one's need for self-determination, the more likely they will complete the e-learning course.	**Partial**
***H_{2c}*:** The greater one's extrinsic motivation, the more likely they will complete the e-learning course.	**Partial**
***H_3*:** The greater an individual's expectancy for success, the more likely they are to complete an e-learning course.	**No**
***H_4*:** The greater the goal intensity the more likely the e-learner will complete the e-learning course.	**Yes**
H_5: E-learning course length in terms of the time it takes to complete a module and the total time given to complete the course, will have different effects on completion rates for success and failure oriented students.	**Partial**
***H_6*:** The greater one's self-efficacy in e-learning environments, the more likely they will complete the e-learning course.	**Yes**

Table 17 continued on next page

Table 17 continued

***H_{7a}*:** E-learners that believed they received sufficient and timely feedback information are more likely to complete e-learning courses.	**Yes**
***H_{7b}*:** E-learning courses that provide feedback information that shows progress towards proximal and distal goals will have higher completion rates than courses that do not.	**No**
***H_8*:** The greater the amount of external difficulty encountered in terms of course design, the more likely the e-learner will drop out of the course.	**No**

To summarize, five of the thirteen hypotheses were supported, four were partially supported, and four were not supported. The results provide overall support for application of the integrated motivational model in an e-learning environment.

V. Discussion

"The goal of shaping information technology to democratize education is highly appealing, but there are, at present, no strong well-organized forces promoting that end."

L. Winner (1998)

Introduction

Considering the enormous potential of e-learning, and the huge investment the Air Force is making in this technology, it is crucial to optimize its use. Implementing course designs that improve e-learning course completion rates is a step in the right direction. The main focus of this study was to identify and measure external and motivational factors that influence a person's desire to complete or drop out of e-learning courses. By identifying and addressing the salient objective and subjective determinants that influence e-learner's desire to "go the distance," e-learning course designers can develop new on-line courses that have an increased probability of being completed (Rosenberg, 2001).

Eight (8) e-learning courses were analyzed along with 497 questionnaire responses to answer the research questions below.

> ***Research Question 1****: In what ways do technical problems, off-task demands, and environmental support (external factors) influence motivation to complete e-learning courses?*
>
> ***Research Question 2****: How does e-learning course design influence the effects of external factors on motivational constructs?*
>
> ***Research Question 3****: What motivational factors influence e-learning course completion rates?*

The ensuing sections contain discussions of the findings, to include a review of the data analysis. These discussions are followed by a look at the practical and theoretical implications of this research. The next two sections delve into some noted research limitations and recommendations for future research. The final section of this chapter provides an overview of the research effort.

Research Question 1 Discussion

Research question one was a multipart question generated from information gathered during interviews, observation, and critique analysis. Its objective was to reveal how technical problems, off-task demands, and environmental support (external factors) influenced motivation to complete e-learning courses. As explained in the literature review, push-pull theory, presented in some prior retention studies, is used to identify the positive and negative effects that external factors have on completion rates. In short, push-pull theory argues that a student's decision to stay or leave the learning environment depends on the combined salience of all forces drawing on that student's attention and energy along with the costs and benefits of completing the course (Catalano, 1985; Miller, 1967; Spanard, 1990).

Based on the results of the three hypotheses (H_{1a}, H_{1b}, and H_{1c}) used to answer research question one, it was determined that only certain technical problems and off-task demands (pull factors) decreased e-learning course completion rates, while environmental support (push factor) proved to be a highly influential factor that increased e-learning course completion rates. Findings revealed that slow and choppy system response, and network outages negatively influence completion rates, even though respondents

indicated these technical problems occurred less than 20 percent of the time. More than one-third of the dropouts identified slow and choppy system response and network outages as the most unappealing aspects about e-learning. These findings suggest that e-learning course designers must design e-learning courses to meet customer's needs, without exceeding the customer's computer network limitations. Realizing that any particular e-learning course is only as good as the network upon which it rides, e-learning designers and administrators must be aware of such limitations and either reach some sort of minimum network standard agreement with customers, or be very sensitive to their future needs and requests. Still, this research realizes that some network problems are unavoidable and are bound to impact the e-learning experience. Such unexpected problems can and should be planned for from the beginning.

The majority of the respondents indicated their displeasure with work-related demands (meetings, deadlines, TDYs, etc.) encountered while they were engaged with e-learning. Noise, however, was the only off-task demand that significantly influenced completion rates, but surprisingly in a positive way. The probability of selecting noise as a distraction while e-learning was higher for those that completed the course (.48) than it was for those that dropped out (.30). Recall that people are limited cognitively (Kanfer & Ackerman, 1989) and the introduction of noise that constantly causes attention and energy to be focused elsewhere eventually frustrates the student's motive to persistence. Researchers argued that continued frustration will likely lead to terminated behavior (Spanard, 1990). Respondents, however, indicated that noise did not adversely affect their desire to persist at e-learning. As interesting as they are, these findings suggest that students should take e-learning away from work-related distractions, but noise positively

influences their desire to e-learn. The latter contradicts motivational theory. Nearly three-fourths of the respondents engaged with e-learning at work during regular business hours. If this is indicative of most e-learners, then more e-learning courses should be designed to allow students to print out course material. The student could then print out needed material and re-locate to a work-free environment. Re-location may help alleviate work-related distractions, but the finding on noise should be regarded with caution.

A significant difference existed between respondents that received, in their view, a lot of environmental support, and those that received little or no environmental support. Course completion was much higher for those respondents that felt as though they received a lot of support. In contrast, those respondents that indicated they received low or inadequate amounts of environmental support, dropped out significantly more often. As expected, those respondents required to take e-learning for job certification purposes, received more environmental support than those respondents who took "non-required" courses. This leads to the belief that the respondent's supervisor and peers, realizing the importance of job certification, provided the necessary resources (i.e. time, hardware, software, etc.) that enabled the respondent to successfully complete the course.

Findings also suggest that the respondent's familial situation impacted completion rates. Spanard (1990) found that persisting students have greater familial support and less familial pressure. Findings from this study indicate that the single-*with*-children respondents dropped out three times more than the other three marital status groups combined. This leads to the belief that the single-*with*-children respondents had higher levels of familial pressure than any other marital status group. Reasons could abound,

but single parents may not have the liberty or free time to work on e-learning during non-work hours as some others do.

Even though there is no proven way to improve the relationship between a student and his or her environment, an attempt must be made to incorporate environmental support into e-learning lesson plans and course designs. These findings suggest that e-learning course instructors and administrators must do their best to ensure students receive a lot of environmental support while taking the e-learning course. For instance, e-learning instructors might be able to establish some sort of on-going correspondence or rapport with supervisors. This could help alleviate some misperceptions about e-learning and provide valuable information on providing good support for successful e-learning.

Research Question 2 Discussion

Research question two's objective was to determine how course design influenced the effects of external factors on motivational constructs. E-learning course length, feedback, and difficulty characteristics were used to identify course design characteristics. Each of these characteristics was tested as to their influential effects on motives to complete e-learning courses. Based on the results of the four hypotheses (H_5, H_{7a}, H_{7b}, and H_8) used to test this question, it was determined that average time per module, course interactivity level, and receiving feedback, have significant effects on the desire to complete e-learning courses. The course difficulty characteristics of mastery, competency level, and readability had no significant effects on either motivational constructs or completion rates.

The finding that average time per module had a significant effect on e-learning course completion rates was not surprising. It was, however, surprising that the length of time given to complete the course was not significant. This may have been because the three courses with the longest time given to complete them were all "required" courses. Statistical analysis reveals that respondents tended to complete the required courses at much higher rates than the non-required ones. Although the difference between time given to complete e-learning courses and completion status did not prove to be statistically significant, the thinking here is that longer courses leave room for more technical problems and off-tasks demands. Therefore, it may promote course completion if course designers consider this factor when designing e-learning courses. The study also revealed that the interaction effect between success orientation (success or failure) and completion status on course length was not statistically significant. Still, the graphics have the appearance of interaction. Thus, it is a factor that may warrant further attention.

Respondents indicated that high levels of interactivity and feedback received via electronic message were two other course design features that positively influenced their motives to complete the e-learning course. Interestingly though, one-third of the respondents identified "lack of interactivity with instructors and other students" as the most unappealing feature of e-learning, but messages received from instructors did not significantly influence their desire to complete the course. These finding contradict each other, but response data revealed that the probability of dropping out was higher when messages were received from the instructor. A higher percentage of dropouts indicated that the messages received from their instructors were either related to their course performance or warnings that they were running out of time to complete the course. This

leads to the belief that they were either doing well and other factors caused them to drop out, or doing poorly and decided to drop out based on the feedback received from their instructor.

Findings from research question two suggest that e-learning course designers should continue to enhance interactivity features, but shorten module lengths. In addition, it appears that "feedback matters," and that providing some positive feedback may improve completion rates.

Research Question 3 Discussion

Research question three was the fundamental question of this study. Its objective was to determine what motivational factors influence e-learning course completion rates. Recall, motivational factors are classified as either distal or proximal. The distal theories of motivation emphasize processes that affect goal choice and intended future effort. The proximal theories of motivation emphasize processes that control the initiation and execution of actions during task engagement (Kanfer, 1990). Based on the results of the six hypotheses (H_{2a}, H_{2b}, H_{2c}, H_3, H_4, and H_6) used to test this question, it was determined that, within the distal system of motivation, certain types of intrinsic and extrinsic factors along with goal importance and commitment significantly influenced completion rates. Self-efficacy was the only proximal construct that proved statistically reliable in terms of influencing completion rates.

Test results on intrinsic motivation indicate that the majority of the respondents enrolled for intrinsically motivated reasons (i.e. gain knowledge, improve job performance, any time learning, etc.), but there were only minor differences on intrinsic

motives between the complete and dropped groups. Though not significant, the majority of the respondents that dropped out indicated they had a *need for competence*. The *self-determination* factors of "any time" learning and "ability to fit into schedule" had a positive influence on completion rates. Likewise, there was a positive relationship between respondents that selected the extrinsic reward of "degree/certificate credits" and course completion rates. Goal intensity, or the strength of the goal in relation to goal importance and goal commitment (Lock, 1968), was the only other distal factor that significantly influenced completion rates. Results indicated that respondents completed their courses more often when the course had the goal intensity characteristics of being "required" for job purposes, or recommended by a supervisor.

The respondents' motivational tendencies were also tested to determine if achievement motives significantly influenced course completion rates. Results reveal that they did not significantly influence completion rates. It is believed, however, that self-serving bias contaminated these results. The survey question used to test this hypothesis asked respondents to rate themselves in terms of their motivation to achieve goals. The majority of the respondents rated themselves as being both "highly motivated" and "success-oriented," which is consistent with self-serving bias theory (Myers, 1996).

Self-efficacy (confidence) was the only proximal motivational factor that significantly influenced completion rates. Findings indicate that most of the respondents had high self-efficacy with e-learning that lasted from the start to the end of the course. Respondents indicating their self-efficacy "got worse" as they progressed through the e-learning course had higher drop out rates than those indicating "no change" or "got

better." These findings suggest that a higher percentage of e-learners drop out as self-efficacy beliefs about their ability to complete the course decrease. It was also found that low initial confidence negatively influenced a respondent's desire to complete the course.

Though many of the hypotheses used to test the distal and proximal theories of motivation were not statistically supported, findings suggest motivational constructs may help to determine the likelihood that students will complete or drop out of e-learning courses. Therefore, e-learning course instructors, designers, and administrators would be well advised to find ways to design motivational features into the courses as well as their lesson plans and course curriculum that enhance such aspects as "any time" learning, the salience of extrinsic rewards, goal intensity, and a student's self-efficacy.

Implications

While e-learning courses have considerably improved over the past few years (Rosenberg, 2001), it is apparent from the responses that there is still room for design improvements. In addition, more emphasis can be placed on providing the right and necessary environmental support to e-learners. From a theoretical standpoint, the integrative motivational approach to e-learning demonstrated that external factors, along with e-learning course design, significantly affect a user's desire to invest time, talent, and energy into e-learning. This finding suggests that motivational theory can be used to predict and explain the probability either that a particular person will complete an e-learning course, or that a particular e-learning course will be completed.

Practitioners who desire to produce e-learning courses that have a higher probability of being completed can use this integrative approach to motivation to assist

them in the development process. Academics can also use these findings to get a better understanding of their students and develop useful education, lesson, and curricula plans designed to initiate and sustained goal-directed behavior. Specifically, e-learning course instructors, administrators, and designers, should infer from the findings that improvements to e-learning course completion rates, which is chiefly determined by persistent behavior, will come about as a result of their increased understanding of how course designs, environmental support, and feedback actions both motivate and de-motivate e-learners.

The Air Force has indicated its desire to harness the capabilities of e-learning through its continual investment and implementation of e-learning technology. A pivotal factor in maximizing the power of this technology becomes the ability to create courses that preserve an e-learner's desire to persist until completion. Now that external factors, course design characteristics, and motivational constructs that influence the desire to persist have been identified, practitioners and academics may be able to design better e-learning courses that optimize their use.

Limitations

The most notable limitation of this study was the use of unproven, untested methods to measure the course feedback characteristics. Due to the time constraints placed on this research, empirical methods were not found to assist in this area. Therefore, feedback characteristic measures were subjective ones made from the observations of one person. Furthermore, the method used to measure readability (i.e. the Flesch Reading Ease Score) was designed for black text on paper, not text located on a

computer screen that often appeared in different colors and even sometimes moved around the screen. This study could have benefited from seeking and implementing a proven and well-tested method to measure feedback and readability characteristics.

The second limitation of the study is that it was assumed that each of the respondents had the same opportunity to engage with their e-learning course that everyone else in the study had. For instance, it can only be assumed that each respondent had easy access to a computer. In reality, the e-learning experience can be quite different depending on many factors not readily assessed or discussed during this study. Instructor and location differences are two of a possible many. In addition, events like the September 11 World Trade Center Disaster may have significantly changed respondents' environment or psyche in a way that highly influenced their desires to persist at e-learning.

The fact that responses are self-report is a limitation that could not be avoided. Such factors as self-serving bias (Myers, 1996) could have inflated responses, or negative experiences could have caused responses to be understated. Both cases taint results.

Another limitation concerns the fact that no pilot test was conducted before the E-Learning Course Questionnaire was deployed to the respondents. Though it was validated by subject matter experts, a pilot test could have helped eliminate some potentially ambiguous choices contained within a few of the items. This may have helped produce even better results.

A final limitation is that the subject pool consisted of only Air Force members. Though these members were located worldwide, they still belonged to the same

population—the Air Force. A similar study looking at other populations would help generalize the study.

Future Research

Several opportunities exist for future research of this topic. For starters, the integrative motivational model was developed but not validated. Future research could take this model, test it, and validate its usefulness as a true determinant of e-learning course completion rates. The model could be tested and validated under field conditions using pretests, placebo groups, and possibly a manipulated environment. Additionally, the same study could be separately conducted on both college and corporate e-learning students. Results could then be compared to see if the same motivational factors are deemed significant across the different domains.

In retrospect, those respondents who had to retake or extend their courses should have been analyzed separately from those that completed or dropped their course on the first try. From just looking at percentages, 29 of the 33 (87.9%) that dropped stated they either retook the course or asked for an extension. Contingency analyses could have been conducted comparing the completed group to a combined group of dropped, retakes, and extensions. Comparisons could then be made to the previous comparisons of the completed and dropped groups. This could present itself as a future research opportunity worth investigating.

Conclusion

The results of this study supported the belief that certain factors such as, "any time" learning, goal intensity, and self-efficacy beliefs initiate and direct behavior, as well as determine how much time and effort students will devote to the e-learning course. Other factors like slow or choppy system response, network outages, environmental support, average time per module, and interactivity level appear to directly and indirectly influence an e-learners desire to persist at e-learning. Though it is impossible to predict the occurrence of external factors or motivated behavior, practitioners and academics alike can benefit from knowing which of these factors are most likely to influence course completion rates. They can then develop methods and design new courses that seek to improve e-learning course completion rates, thus optimizing its growing potential.

In summary, this study used an integrative approach to motivation, in conjunction with the methodological steps of interviewing, observation, critique analysis, and a questionnaire, to identify and measure those motivational factors that significantly influenced e-learning course completion rates. There are still many questions to be answered, but a step forward has been made by a study that has shown "going the distance" in an e-learning environment is not as straightforward as one may think.

Appendix A: Bloom's Taxonomy

1. KNOWLEDGE

- observation and recall of information
- knowledge of dates, events, places
- knowledge of major ideas
- mastery of subject matter
- *Question Cues:*
  list, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.

2. COMPREHENSION

- understanding information
- grasp meaning
- translate knowledge into new context
- interpret facts, compare, contrast
- order, group, infer causes
- predict consequences
- *Question Cues:*
  summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend

3. APPLICATION

- use information
- use methods, concepts, theories in new situations
- solve problems using required skills or knowledge
- *Questions Cues:*
  apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover

4. ANALYSIS

- seeing patterns
- organization of parts
- recognition of hidden meanings
- identification of components
- *Question Cues:*
  analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer

5. SYNTHESIS

- use old ideas to create new ones
- generalize from given facts
- relate knowledge from several areas
- predict, draw conclusions
- *Question Cues:*
  combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if?, compose, formulate, prepare, generalize, rewrite

6. EVALUATION

- compare and discriminate between ideas
- assess value of theories, presentations
- make choices based on reasoned argument
- verify value of evidence
- recognize subjectivity
- *Question Cues*
  assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize

Appendix B: Content Analysis of E-Learning Course Critiques

Most frequently made comments on e-learning course critiques.

Possible Reasons Why Students Complete *(frequency)*	Possible Reasons Why Students Drop Out *(frequency)*
"I found a wealth of information in the material" *(34)*	"I experienced a lot of technical difficulty" *(53)*
"The course was of value to my future" *(30)*	"Difficulty completing with current workload and distractions" *(45)*
"It helped me understand my job position" *(28)*	"Too many content (e.g., typographical) errors" *(37)*
"I had no problems at all" *(24)*	"Some information was out of date" *(32)*
"Functionality was easy" *(19)*	"Many links did not work" *(30)*
"Could learn at your own pace" *(18)*	"Low amounts of feedback and interaction" *(28)*
"Could take the course from work or home" *(18)*	"Poor or boring content" *(26)*
"Liked the interactive exercises" *(11)*	"I was sent TDY in middle of course" *(9)*

Appendix C: Initial Email Message Sent to Respondents

The Air Force Institute of Technology (AFIT) is conducting research on ways to improve e-learning. It has been revealed that you were recently enrolled in the _*(target course was input here)* e-learning course administered by the Defense Acquisition University (DAU) Virtual Campus [or AFIT/LSB Virtual Schoolhouse, depending on target course]. Therefore, it would be greatly appreciated if you participate in this study by filling out the questionnaire located at the following link: http://en.afit.edu/env/elearning. It should take no more than 10 - 15 minutes to complete.

The purpose of the study is to provide e-learning instructors, administrators, and designers specific information on how to develop e-learning courses that better suit your needs. The study was reviewed and approved by the AFPC Survey Branch (Reference: USAF Survey Control Number 01-120). However, if you have any questions or concerns, please feel free to reply to this email. Please note you are free to terminate your participation at anytime.

We are very interested in your responses to the questionnaire for they will be used to build much better and more useful e-learning courses. Thank you in advance for your participation.

Just click on the above link to begin.

E-Learning Research Team

Appendix D: E-Learning Course Questionnaire

E-Learning Course Questionnaire (ECQ)

Welcome to the E-Learning Course Questionnaire (ECQ)!

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, and 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. And 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. Also,

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

The ECQ should take 10 – 15 minutes to complete.

Start Survey

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?

Please Select a Course

Have you completed the course? Yes: No:

Did you need 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 <u>PRIOR</u> to the one in question? *Please use numbers only

continue >

ECQ

Please read and answer each statement carefully.

1. **Why did you take the Modification Management (SAS030V) e-learning course?** (Check all that apply)

- ☐ Job requirement
- ☐ To gain knowledge
- ☐ Improve job performance
- ☐ Supervisor's recommendation
- ☐ Promotion opportunity
- ☐ Accumulate degree/certificate credit, continuous learning points, etc.
- ☐ Out of curiosity
- ☐ Get some specific type of information
- ☐ Other, please specify _____

2. **Completing this Modification Management (SAS030V) course was important to me.**

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
○	○	○	○	○

continue >

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3. **Once I enrolled in the Modification Management (SAS030V) my initial goal (or intention) was to complete it.**

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
○	○	○	○	○

4. **From the beginning, I planned to give the Modification Management (SAS030V) my best possible effort.**

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

5. **As I started the Modification Management (SAS030V) course, I was confident I would complete it.**

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

6. **Did this confidence change as you progressed through the Modification Management (SAS030V) course? (Choose best answer)**

☐ Yes - please specify ***How*** [it got...] and [nearer the...]

☐ No

continue >

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7. **How do you view yourself as a worker/learner?** (Choose best answer)

☐ Highly motivated

☐ Somewhat motivated

☐ Can motivate myself when needed

☐ Motivated if prodded or rewarded

☐ Not motivated at all

☐ Other, please specify [ ]

8. **In terms of working towards goals, do you consider yourself as:** (Choose best answer)

☐ Having stronger motives to *achieve* success (i.e. try to do better than others; demonstrate superior ability, etc.)

☐ Having stronger motives to *avoid* failure (i.e. worry about doing poorly; afraid you may ask a "dumb" question, etc.)

continue >

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9. **In what ways, if any, did you find e-learning <u>appealing</u>?** (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 into schedule
- ☐ Other, please specify _____
- ☐ I **DID NOT** find e-learning appealing at all

10. **In what ways, if any, did you find e-learning <u>unappealing</u>?** (Check all that apply)

- ☐ Lack of interactivity with instructor and other students
- ☐ Not enough "hands-on" exercises and activities
- ☐ Lack of personalized feedback
- ☐ Uncompelling, static nature of course content
- ☐ Browser/connectivity problems
- ☐ Slow or choppy system response times (i.e. time it takes computer to respond to a user command)
- ☐ Lack of course instruction and guidance
- ☐ Other, please specify _____
- ☐ I **DID NOT** find e-learning unappealing at all

continue >

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11. **Until you stopped working on the Modification Management (SAS030V) course (i.e. withdrew or completed), what caused or triggered you to persist?** (Choose best answer)

- ☐ My original intentions to complete the course
- ☐ Peer pressure (i.e. competition, people around me liked e-learning, etc.)
- ☐ Supervisor expectations
- ☐ Course was easy
- ☐ Course was short
- ☐ Thoughts of accomplishment
- ☐ Had not gotten the information I needed or desired yet
- ☐ Feedback that I was doing well in the course
- ☐ Other, please specify _____

12. **What caused or triggered you to <u>stop</u> working on the Modification Management (SAS030V) course?** (Choose best answer)
***Note:** *If you completed the Modification Management (SAS030V) course, please select the first option.*

- ☐ I completed the course
- ☐ Too many distractions
- ☐ Course was too difficult
- ☐ Course was too long
- ☐ Peer pressure (i.e. co-workers thought I was "slacking off", etc.)
- ☐ Had to leave on a business trip (i.e. TDY)
- ☐ Network/Hardware problems
- ☐ The content was not what I expected
- ☐ Other demands became more important (i.e. job, personal)
- ☐ Feedback that I was not doing well in the course
- ☐ I exceeded the course's time constraint
- ☐ I got the information I needed
- ☐ Other, please specify _____

continue >

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13. **Even when I scheduled to do e-learning, I felt like something would happen to make me change my plans.**

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

14. **When and where did you typically take this course?** (Choose best answer)

- ☐ On the job during regular business hours
- ☐ On the job during non-business hours
- ☐ At home during business hours
- ☐ At home during non-business hours
- ☐ During the weekend
- ☐ While on a business trip (i.e. TDY)
- ☐ Other, please specify

continue >

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15. **What distractions, if any, did you encounter while taking the Modification Management (SAS030V) course?** (Check all that apply. For those checked, choose *how often* you were distracted from the drop-down menu next to the item)

- ☐ Noise (i.e. phone, office chatter, television, etc.) - how often...
- ☐ Job-related demands (i.e. meetings, deadlines, requests, etc.) - how often...
- ☐ Personal demands (i.e. family, friends, clubs, etc.) - how often...
- ☐ Poor course content/design - how often...
- ☐ Network outages - how often...

- ☐ Slow system responses - how often...
- ☐ Hardware/Software problems - how often...
- ☐ Other, please specify how often...
- ☐ I was **NOT** distracted at all

16. The distractions I encountered hindered my desire to persist at e-learning.

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

continue >

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17. I was unable to complete the Modification Management (SAS030V) course because of distractions I encountered.

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

18. I had a lot of support (i.e. work, family, instructor, peers, etc.) in terms of being allowed time to devote attention to the Modification Management (SAS030V) course.

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

19. What type of feedback did you receive while engaged with e-learning? (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

continue >

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20. Receiving feedback is important to me while I am engaged with e-learning.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
○	○	○	○	○

21. I believe I received a sufficient amount of feedback for the Modification Management (SAS030V) course I was taking.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
○	○	○	○	○

22. The feedback I did receive was timely in terms of how long it took to receive it.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
○	○	○	○	○

continue >

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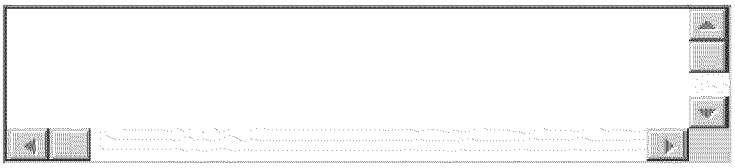
23. I was able to use the feedback I received to properly assess my progress in the Modification Management (SAS030V) course.

Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
○	○	○	○	○

Do you have any additional comments you would like to add?
Please write any comments you have below.



Or email your comments to elearning@afit.edu.

This completes the ECQ!

Please hit the "Finish" button below to submit your responses.

THANK YOU FOR YOUR PARTICIPATION!

Finish

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Thank you for your participation.

Click here to go back to the beginning.

Feel free to email us at elearning@afit.edu.

Appendix E: Follow-up Email Message Sent to Respondents

Last week you were sent an email requesting you to fill out an E-Learning Questionnaire regarding the *(target course was input here)* e-learning course you were enrolled in. If you filled out the questionnaire, we **thank you** for your participation and you may delete this email if you wish.

If you chose not to participate, we urge you to reconsider and take the next few minutes to complete it. We realize that some of you encountered problems when trying to complete the survey the first time. Most of these problems have been corrected. However, there is still a problem with the Netscape Web browser. Those of you who have Netscape as your default Web browser will not be able to see the drop-down box that goes with the statement "Please indicate the e-learning course that you were enrolled in" (located on the Demographic Information page). The only way around this problem is use Internet Explorer. Here is how you do it:

1) Open Internet Explorer (IE)
2) Cut and Paste the e-learning survey hyperlink into IE
3) Then start and take the survey

Again, your responses are vital to our efforts to improve future e-learning courses. So please click on the hyperlink below and join us in making e-learning a better and more useful tool to educate and train our workforce. And remember, you are free to terminate your participation at any time.

E-Learning Research Team

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

Reply to this email if you have questions or concerns

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Vita

Captain Kevin A. Reynolds was born in Richmond, Virginia. He graduated from Varina High School in June 1986 and soon afterwards enlisted in the Air Force. He served as a Supply Technician and rose through the enlisted ranks to the rank of Technical Sergeant. After several years of night school, he received a 2-year scholarship to New Mexico State University under the ROTC Airmen Scholarship and Commissioning Program. He graduated with a Bachelor Degree in Business Computer Systems on 13 December 1997 and, later that very same day, received his commission.

Captain Reynolds was then assigned to Ellsworth AFB, South Dakota were he worked the Base Network Control Center Chief, overseeing all base network operations. In August of 2000, he entered the Information Resource Management Master's Degree Program, Graduate School of Engineering and Management, Air Force Institute of Technology, Wright-Patterson AFB, Ohio. Upon graduation, he will be assigned to the HQ Air Force Reserve Command Communications and Information Directorate, Robins AFB, Georgia.

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14. ABSTRACT

E-learning technology is being used to train and educate a myriad of personnel. Evidence shows, however, that completion rates among e-learners are lower than that of traditional learners. Motivational theory is applied to this problem to explain why e-learners initiate, sustain, and terminate behavior. In particular, an integrative motivational model, that highlights distal and proximal processes, is introduced to identify and measure those factors most likely to influence e-learning completion rates. Findings offer recommendations that may be useful to e-learning instructors, administrators, and designers.

Three research questions were used to investigate motivational theory and its relation to e-learning completion rates. Eight courses were analyzed along with 497 responses received from an on-line survey. Data was coded according to whether the student completed or dropped the course. Statistical analysis showed that e-learners are more likely to invest their time, talent, and energy when they encounter fewer technical problems, less distractions, and more environmental support from supervisors and instructors. Furthermore, lengthy modules and low self-efficacy were found to decrease the motivational tendency to persist. Overall, results proved that motivational theory can be used to predict and explain those factors most likely to influence a person's desire to "go the distance" with e-learning. Practical and theoretical implications of the research are discussed.

15. SUBJECT TERMS

E-learning, Course Completion Rates, Course Design, Technical Problems, Off-Task Demands, Environmental Support
Motivation, Motivational Process, Distal Processes, Proximal Processes, Cognitive Choice, Self-Regulation
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