Going Further with E-Learning: Factors Influencing Persistence, Transfer and Intentions to Continue

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ABSTRACT

Completion rates for web-based courses tend to lag behind their traditional classroom counterparts, sometimes as much as 40% (Carter, 1996; Phipps & Merisotis, 1999; Zielinski, 2000). Thurston and Reynolds (2002) employed motivational constructs to explain why some people persist while others drop out of web-based courses. Their analysis of 8 web-based courses and responses from 497 e-learning students indicated that completion goals, off-task distractions, availability of feedback for self-regulation, and continued confidence were important factors that distinguished those who completed their courses from those who did not. One limitation for the 2002 study was its inability to assess the independent effects of these factors on persistence. This current study addresses this limitation, and then expands beyond persistence to assess the influence of motivational factors on both transfer of learning to the work environment and intentions to pursue e-learning courses in the future. We distributed an on-line survey to approximately 2000 active duty and civilian students who had initiated one of the 20 e-learning courses offered by the Air Force Institute of Technology's Virtual Schoolhouse. Results were analyzed using the LISREL (Jöreskog & Sörbom, 1993) structural equation modeling program. Analysis of the 575 responses provided strong evidence for the hypothesized detrimental effect of off-task distractions and the beneficial effects of both completion goals and feedback on students' continued confidence. Analysis also supported the hypothesized relationships of confidence with transfer of learning and intentions to pursue e-learning opportunities in the future. We also found additional independent effects of distractions, feedback, and completion goals on transfer of learning to the work environment that were not mediated through continued confidence. Completion goals also had an unmediated effect on intentions to pursue e-learning in the future. Practical implications of the research are discussed.

ABOUT THE AUTHORS

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Worldwide revenues in the corporate e-learning market will surpass $23 billion by 2004 and is the fastest growing segment of the U.S. corporate business market (Pastore, 2001). The promise of anywhere and anytime learning for everyone has taken both the public and private sector by storm. The reality, however, is that a fairly large segment of students who attempt e-learning, never complete. Completion rates for web-based courses tend to lag behind their traditional classroom counterparts, sometimes as much as 40% (Carter, 1996; Phipps & Merisotis, 1999; Zielinski, 2000).

E-Learning can be thought of as education or training that is delivered via a computer network. A subset of distance learning, the roots of e-learning can be traced back to about 1984 when then PC explosion began in earnest and advents such as Windows 3.1 began to make the personal computer user-friendly. The early e-learning courses were generally text based and instructor interaction was limited in scope. Web based technologies now dominate the e-learning arena and the courses are much more graphically enriched. The latest wave of e-learning format includes such innovations as streaming media and real-time mentoring from instructors (Knowledgenet.com, 2003).

Such innovations have led to an explosion in e-learning course enrollments (Parker, 1999). Despite the infusion of technology in e-learning initiatives, course completion rates still tend to lag behind their traditional classroom counterparts. Carr (2000) points out in a comparative study that completion rates in the traditional classroom setting were 71% while the identical course provided online had a completion rate of only 58%. Current research is lacking in providing understanding for this troublesome problem (Lewis, 2002; Phipps & Merisotis, 1999: 11).

Thurston and Reynolds (2002) attempted to explain why some fail to "go the distance" with e-learning through motivational theory. They employed motivational constructs to explain why some people persist while others drop out of web-based courses. Their analysis of 8 web-based courses and 497 e-learning students indicated that completion goals, off-task distractions, availability of feedback for self-regulation, and continued confidence were important factors that distinguished those who completed their courses from those who did not. One limitation for the 2002 study was its inability to assess the independent effects of these factors. This current study addresses this limitation, and then expands beyond persistence to assess the influence of motivational factors on transfer of learning to the work environment and intentions to pursue e-learning courses in the future. This study will help to build evidence as to why this phenomenon is occurring.

BACKGROUND

As the popularity in the Internet grows, enrollments in distance education will also continue to grow. E-Learning fills the niche for anytime, anywhere, flexible learning on-demand. With this accessibility and promise, e-learning has evolved as a cost effective and flexible method to train and educate today's workforce (Goodridge, 2002; Rosenberg, 2001). Businesses, academia, and government all have embraced this form of education and training and will continue to exploit the benefits for the foreseeable future.

Private companies enjoy the cost benefits of teaching their employees in-house versus sending them out on an expensive business trip or bringing in an outside expert. In academia, e-learning growth is just as dramatic. "The number of colleges and universities offering e-learning will more than double, from 1,500 in 1999 to more than 3,300 in 2004" (Pastore, 2001: 1). US universities are pouring billions into educating students across all disciplines. Students too enjoy the benefits of accessing their classes whenever they want.

The federal government has also taken interest in e-learning. The White House issued Executive Order #13111 that specifically mandated the use of e-learning initiatives in order to train government employees (1999). Directing federal agencies to use technological advances to train its workforce is expected to drive down costs and provide a timelier acquisition in needed skill sets.

The Department of Defense (DoD) has focused efforts in training and educating its personnel through e-learning projects. Because military members are constantly moving all over the world, e-learning affords members the opportunity to acquire training that is

required for their job. The DoD's Advanced Distributed Learning (ADL) initiative seeks to modernize education and training through the smart use of information technology (DUSD (R), 1999). The army's online university allows soldiers to take courses wherever they are deployed (Seffers, 2001). So far, the project is wildly popular with over 35,000 soldiers enrolling since its inception in January of 2001 and with 100% of the costs covered, the Army expects the enrollments to over 80,000 soldiers by 2005 (Caterinicchia, 2003). Education on demand from e-learning will become an integral part of military life as technology and accessibility increase.

The Air Force Institute Technology's (AFIT) Virtual Schoolhouse is not immune to the problem of poor completion rates. Completion rates for the 20 courses offered by the Virtual Schoolhouse during the CY 2002 ranged from 50-100%. The average completion rate across all 20 courses was 67% (2635 of 3931 completed). To combat this problem AFIT is exploring ways to build motivational features into e-learning that may help improve completion rates for their Virtual Schoolhouse courses. The Virtual Schoolhouse is a professional, flexible, continuing education resource that offers instruction in acquisition fundamentals by means of the worldwide web. So far, while e-learning has proven to be a promising concept, Virtual Schoolhouse 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.

The demands for this flexible technology are already high and are likely to increase in the future. As enrollments increase, the costs of high non-completion rates will also increase. The challenge to researchers and practitioners is to discover factors that explain why the disparity in completion rates exists. The theory of motivation may hold the key to answering this dilemma.

MOTIVATIONAL FACTORS

This research effort attempted to explore the important motivational factors that predict persistence, transfer of knowledge to the work environment, and intentions to pursue e-learning opportunities in the future. Thurston and Reynolds (2002) found that completion goals, off-task distractions, availability of feedback for self-regulation, and continued confidence were important factors that distinguished those who completed their courses from those who did not.

The model depicted in Figure 1 captures these important motivational factors and describes their relationship to knowledge transfer and intentions. The model suggests that off-task distractions will have a detrimental effect on a student's continued confidence

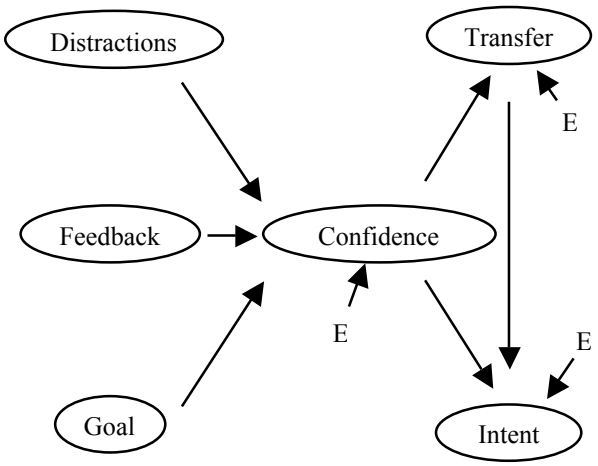

Figure 1. Hypothesized motivational framework for e-learning.

while taking a course. The model also depicts the beneficial effects of completion goals and feedback on students' continued confidence. According to Kanfer and Ackerman's (1989) integrative model, students who maintain a high level of confidence that their efforts will result in success, will continue to allocate attention to the task at hand. Effort ceases when either the task is completed, or confidence fades. Continued confidence translates to effort, success, and eventual transfer of knowledge learned to applications in the work environment. Further, successful students will be more likely to take other e-learning course in the future. Intentions will be further increased to the extent that knowledge from the e-learning course can be transferred to the work environment. Each of these factors is described in more detail in the sections that follow.

Off-task Demands -- Distractions

Because e-learning is not conducted in vacuum, external forces, such as work, network problems or family concerns will present common distractions not normally found in traditional learning environments. Traditional classrooms control distractions by creating a setting that is free from work or family demands when material is being presented. It is unlikely that a student in a traditional classroom will have their boss interrupt them to pursue a hot project or that their children will distract them while they are taking notes from a lecturer. E-Learners do not have this luxury. Evidence presented by Thurston and Reynolds (2002) suggests that external forces can indeed negatively influence their behavior. The potential benefit of anytime, anyplace learning could be counterbalanced by forces

not aligned to assist the e-learner during their course of study.

What then influences an e-learner to persist under such conditions? The theory postulated to explain this phenomenon has its origins with Lewin's (1951) Force-Field Analysis. Lewin conceptualized that motivation in humans can be explained as a competition of sorts between forces that impel actions "push" and forces that in turn repel actions "pull." The push-pull theory was then first applied to education by Miller (1967) and since then countless others have followed suit.

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

The first hypothesis explores the pull factors of external pressures that VSH students face. Distractions can take the form of noise (phone, office chatter, television), job demands (meetings, deadlines, requests), and personal demands (family members, friends, household chores, hobbies), all of which have very little to do with the design or operation of e-learning courses. Distractions can also be created by the very courses the students are trying to concentrate on. Poor course and content design, network outages, slow system responses, hardware and software incompatibilities all have detrimental effect on students continued confidence. Hypothesis 1 tests this negative effect.

Hypothesis 1. The more types of technological problems faced by VSH students, the less confident they will be in their ability to allocate attention to the demands of their course.

Goals

Goal setting theory has been widely used to explain why people engage in learning behavior. Locke and Latham (1990) define a goal as "something that the person wants to achieve" (Locke and Latham, 1990: 2). People normally set a distal (or long-term) goal that is associated with some extrinsically valued outcome. People then subdivide the distal goal into smaller proximal (or short-term) goals. In essence, the proximal goals are used as stepping stones towards the final, overarching goal (Alderman, 1999). This type of division of goals has been shown to increase one's intrinsic motivation by accomplishing these proximal goals (Bandura and Schunk, 1981).

One of the important aspects to the theory postulated by Latham and Locke is this notion of commitment (1991). Latham and Locke define goal commitment as "the degree to which the individual is attached to the goal" (Latham and Locke, 1991: 217). As the difficulty of the goal rises, the commitment towards goal completion must also increase in order allocate sufficient resources to achieve the goal (Klein et al, 1999). People are often faced with the challenge of having more goals than they have attention to fulfill those goals. Choice among goals is based on a comparison of effort with potential reward. With easy goals, the need for a high level of commitment is not as great as that needed for a relatively difficult goal. Often though, easy goals are associated with outcomes that have relatively lower reward value. More difficult goals are more likely to be associated with highly valued outcomes. As goals become more difficult and highly valued, the commitment towards the goal increases and the likelihood of goal attainment is also likely to increase (Locke and Latham, 1990).

In the context of e-learning, the likelihood towards course completion would increase as the commitment increases. This will be highly dependent on the student's perceived intrinsic or extrinsic value associated with completing the course. For instance, if an e-learning course is needed to complete a certification, qualify for a job promotion, or satisfy a supervisors' demand, the commitment towards completion would likely be strong. On the other hand, if a student takes an e-learning course just for personal knowledge gain, the commitment towards course completion may not be as high. With this argument, it is hypothesized that:

Hypothesis 2. The greater the commitment towards course completion, the more confident they will be in their ability to allocate attention to the demands of their course.

Feedback

Performance feedback should be levied both throughout the process of goal attainment and also at the point of goal completion (Locke and Latham, 1990). This regular feedback is particularly important with difficult tasks (Skinner, 2002). Feedback helps a student to focus effort towards goal completion and away from non-relevant activities. Equally, goals are not effective as motivators if the individual can not assess their movement towards completion (Locke, 1996). This method of receiving and providing feedback to students is being incorporated into distance learning modalities. Having a forum to provide and receive timely and relevant feedback was found to be an important aspect to student motivation in a distant learning environment (Moti, Kurtz, and Levin, 2002). With that information, it is hypothesized that feedback will have a positive effect on confidence.

Hypothesis 3. E-Learners that perceived that they received timely and relevant feedback throughout the course will report higher levels of confidence in their ability to allocate attention to the demands of their course.

Confidence and Transfer

"Self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994). In other words, a person's confidence in themselves influences their motivation for accomplishment of goals. In essence, the stronger one's perceived self-efficacy the more motivated they are at tackling a project and the more likely they will persist towards completion (Bandura, 1986).

In the context of e-learning, confidence is highly coupled with perceived ease of use – an important indicator of acceptance of information technology (Davis, 1989). As the perceived ease of use of the technology increases, the more likely an individual is to use it to perform tasks. In the context of e-learning then, when students find the courses easy to operate, information easy to find, content well organized and presented clearly, and help functions easy to access, their confidence in using the technology increases. As their confidence increases, they learn more, and are thus able to apply more to their work environment. Combining ease of use of the technology with one's self-efficacy leads to their continuing confidence of e-learning.

Hypothesis 4. E-Learners that report higher levels of confidence in their ability to allocate attention to the demands of their course will also report higher levels of transfer to the work environment.

Intentions

There have been several studies conducted which evaluated the motivating effects of IT on student learning. One of the more popular studies has been the work of Davis, Bagozzi and Warshaw (1989), who developed the theory known as the Technology Acceptance Model (Davis et al, 1989). The model links the user's perceptions of the perceived usefulness of the technology and how easy it is to use along with their attitude to use the IT and their intentions to use it (Cox et al, 1989). This study and the others that followed have given evidence to the motivating effects of IT on student leaning (Cox, 2002). As the perceived usefulness (transfer of knowledge in the workplace in our model) and ease of use of the technology (confidence) increases, the more likely an individual is to use it to perform tasks -- success breeds success.

Hypothesis 5. E-learning students confident in their ability to allocate attention to the demands of the course, and successful in transferring new knowledge to the workplace will be more inclined to complete the e-learning course.

Summary

This research effort is an attempt to define the motivation of e-learners that can better predict their ultimate behavior to either persist or terminate at e-learning. In short, the model highlights the direct effects of distractions, feedback, and goals on continuing confidence and their indirect effects on transfer of knowledge and intentions to pursue e-learning opportunities in the future. Off-task demands (listed as distractions) influence the student externally and are largely beyond the immediate control of course designers and administrators. Goals create motivational discrepancies and then initiate and direct students desire to persist. Goals, however, only work when feedback is present. Students need sufficient information to guide their progress. Continuing confidence of the student is central to model. As shown in the figure, confidence mediates the effect of feedback, goals and distractions on transfer and intentions.

METHOD

Instrument Development

We developed a web-based survey to assess motivational factors related to e-learning persistence, transfer and intentions. Our fundamental assumption was that all people who sign up for e-learning courses were initially motivated to complete the course. We actually measured the validity of that assumption with the completion goal construct.

Given this assumption, somewhere along their e-learning journey, students were either motivated to sustain behavior and complete the course, or de-motivated to a point that caused them to cease their effort. The questionnaire consisted of an introduction page with instructions followed by 52 items (25 items were analyzed for this paper). We requested the name of the e-learning course, completion status, whether or not the student requested an extension, and whether they had to retake the course. We also asked both where and when they normally worked on their course.

Sample

The survey was sent to approximately 2000 students who had enrolled in one of AFIT's 20 web-based courses in its Virtual Schoolhouse during calendar year 2002. Respondents 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. Notification was sent via e-mail with a request for participation, and a link to the on-line survey. A follow-up email message was sent the following week, thanking those who had participated, and asking those who did not initially participate to reconsider. The questionnaire was kept on-line for 12 days after the follow-up email message was sent. In the end, 575 usable responses were received, for an overall response rate of about 29%. Of the total useable sample, 514 completed their course (89%) and 61 did not complete (11%). Of those who completed their course, 8 respondents reported that they had some difficulty completing the course in the allotted time requiring either an extension or retake (1.5%). Of those who did not complete, 7 were granted an extension or retake (11%). The resulting sample underrepresented those who have not completed courses by a substantial amount (11% verses 33%).

Measures

Two types of items were used to measure the target constructs in the analysis: "check all that apply" and a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Distractions. The measure for the distractions construct was a "check all that apply" type. Respondents had the opportunity to select from a list of seven different distraction types that they may have encountered while taking their course. The list included common distractions associated with noise (phone, chatter, and television), job-related demands (meetings, deadlines, and requests), personal demands (family, friends, and clubs), network outages, slow system responses, and hardware/software problems. Respondents also had an opportunity to check "other" and specify the type. A second question asked respondents to select from a list of improvements following the statement "I would gladly take another e-learning course if the following improvements were made." The list included three statements reflecting potential distractions, "fewer technical problems", fewer job demands/distractions", and fewer personal problems". The scale for the distractions construct was a simple sum of the eight items from the first question and the three items for the second question. The scores ranged fro 0 to 10, with a mean of 1.9 and a standard deviation of 1.6. The distribution of the distractions data slightly deviated from a normal distribution (skewness = 1.1 and kurtosis = 2.1).

Feedback. The measure for the feedback construct was also a "check all that apply" type. Respondents were asked to check the types of feedback they received while engaged in their e-learning course. The list included seven types of feedback. Three types were automatic messages from the course and three types were messages from the course director. Messages from both sources concerned results of quizzes znd exercises, hardware/software issues, and course progress/performance. The last category of messages concerned responses to questions initiated by the e-learner. The list also included an "other" block and a space to type in other forms of feedback. The scale for the feedback construct was a simple sum of the eight items. The scores ranged fro 0 to 7, with a mean of 1.3 and a standard deviation of 1.2. The distribution of the distractions data moderately deviated from a normal distribution (skewness = 1.7 and kurtosis = 4.9).

Goal. The measure for the goal construct was an average of four related items measured on a five point scale. Respondents were requested to indicate the extent they agreed or disagreed with the following four statements: "completing the __ course was important to me", "once I enrolled in the __ course, my initial intentions were to complete it", "from the beginning, I planned to give the __ course my best possible effort", and "when I started the __ course, I was confident I would complete it". The four-item scale had a satisfactory level of internal consistency as indexed by Chronbach's alpha (a = .84). The measure ranged from 1.0 to 5.0, with a mean of 4.4 and standard deviation of 0.57. The distribution of the goal data deviated substantially from a normal distribution (skewness = 2.1 and kurtosis = 9.2). The previous stated assumption that most people enter the course with the goal of completing it appears correct. Less than 2% of the respondents had a scale average of "indifferent" or less – nearly 90% of the respondents either agreed of strongly agreed with the four statements.

Confidence. The measure for the confidence construct was adapted from existing perceived ease of use scales. Respondents were asked to indicate the

extent they agreed of disagreed with the following six statements: "it was easy to find the information I needed to complete this course", "I found it easy to stop and restart the course", "I found the course navigation tools easy to use", "the content of the course was well organized", "the information on each page was presented clearly", and "the help function was easy to use". The six-item scale had a satisfactory level of internal consistency as indexed by Chronbach's alpha (a = .89). The measure ranged from 1.0 to 5.0, with a mean of 3.6 and standard deviation of 0.61. The distribution of the confidence data deviated moderately from a normal distribution (skewness = -1.0 and kurtosis = 3.8).

Transfer. The measure for the transfer construct was adapted from existing perceived utility scales. Respondents were asked to indicate the extent they agreed of disagreed with the following four statements: "applying what I learned in my __ course has enabled be to accomplish work related tasks more quickly", "applying what I learned in my __ course has enhanced my effectiveness on the job", "applying what I learned in my __ course has made it easier to do my job", and "I have found that what I learned from my __ course is useful in my job". The four-item scale had a high level of internal consistency as indexed by Chronbach's alpha (a = .94). The measure ranged from 1.0 to 5.0, with a mean of 3.5 and standard deviation of 0.73. The distribution of the confidence data did not deviate from a normal distribution (skewness = -.66 and kurtosis = 0.82).

Intentions. The measure for the intention construct asked respondents to indicate the extent they agreed of disagreed with the following four statements: "I would be willing to take another e-learning course", "I plan to take another e-learning course I the future", "I would recommend this course to other students", and "the only reason I would take another e-learning course is if I am required". The last item was reversed scored by subtracting the given value from 6. The four-item scale had an acceptable level of internal consistency as indexed by Chronbach's alpha (a = .79). The measure ranged from 1.0 to 5.0, with a mean of 4.2 and standard deviation of 0.64. The distribution of the confidence data slightly deviated from a normal distribution (skewness = -1.1 and kurtosis = 3.0).

Statistical Analysis

Structural equation modeling was performed to test the five hypothesized relationships. The data for this analysis is the observed covariance matrix for the six variables described in the previous section. Variance, covariance and correlation coefficients for the six variables are depicted in Table 1. The LISREL (Jöreskog & Sörbom, 1993) structural equation modeling method analyzes the observed covariance matrix of a set of variables in terms of a hypothesized structure. This approach produces several fit scales that reflect the hypothesized model's ability to reproduce the original variance and covariance matrix given the

Table 1

Variances, Covariances and Correlations for motivational constructs.

	1	2	3	4	5	6
1. Distraction	2.58	*.08*	*.08*	*-.20*	*-.28*	*-.15*
2. Feedback	0.15	1.43	*.14*	*.19*	*.18*	*.14*
3. Goal	0.07	0.10	0.32	*.27*	*.25*	*.30*
4. Transfer	-0.23	0.17	0.11	0.53	*.48*	*.35*
5. Confidence	-0.25	0.12	0.08	0.19	0.30	*.42*
6. Intentions	-0.15	0.11	0.11	0.16	0.15	0.42

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

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

Jaccard and Wan (1996) describe three classes of fit scales (absolute, parsimonious, and relative) that should be considered when evaluating the fit of a structural equation model. Absolute fit compares the predicted and observed covariance matrices. The χ^2, goodness of fit index (GFI) and standardized root mean square residual (Standardized RMR) are all indicators of absolute fit. The GFI is a function of the absolute discrepancies between the observed and predicted covariance matrices. The acceptable threshold for the GFI is .90. The standardized RMR measures the

average deviation between the predicted and observed correlations. The recommended threshold for the standardized RME is .05. The second category also considers absolute fit, but penalizes the model based on its complexity. The more paths specified, the lower the models' parsimony. The Root Mean Square Error of Approximation (RMSEA) is the common choice for measure of parsimony. The acceptable threshold for RMSEA is .08. The third category of fit scales compares the absolute fit to an alternative model. The value for the comparative fit index (CFI) indicates the fit of the model compared to a null model (posits no correlations between the observed variables). The recommended threshold for CFI is .90.

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

Monte Carlo studies that investigated relatively high levels of non-normality (skewness = 3, kurtosis = 21) as well as moderate departures from normality (skewness = 2, kurtosis = 7) suggest that structural equation models using LISREL are fairly robust to moderate deviations from normality. The high level of positive kurtosis in the goal variable, however, offers some concern because it may negatively bias the standard error estimates and create an increased chance of making a Type I error. To avoid wrongly rejecting the null hypothesis of no relationship we chose to set a more rigorous level for acceptable Type 1 error ($p < .01$ rather than $p < .05$).

RESULTS

Results from the LISREL analysis showed that the hypothesized model provided a marginal fit to the pattern of coefficients in the observed covariance matrix. Two of the three indices of absolute fit indicated some concern with the hypothesized model. Both the χ^2 (df =9, 66.7, $p < .01$) and Standardized RMR (.07) indicated problems with absolute fit. The third measure of absolute fit (GFI = .96) was above the acceptable threshold. The measure of parsimony (RMSEA = 0.11) and measure of comparative fit (CFI = .90) were also outside of acceptable limits.

The LISREL output provides additional data in the form of modification indices that point to ways to improve the model. Investigation of modification indices suggested that there were important additional relationships between variables that should be represented in the model. The pattern of coefficients in the observed covariance matrix called for direct paths from the goal, feedback and distractions constructs to the transfer construct, as well as a direct path from goal to intentions. The revised model with un-standardized path coefficients is depicted in Figure 2. All paths are statistically reliable even when using the more strict Type 1 error constraint ($p < .01$).

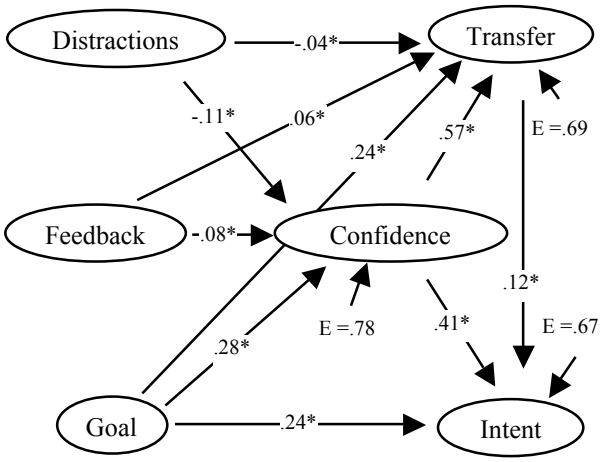

Figure 2. Revised motivational model for e-learning.

The revised model provided an excellent fit to the pattern of coefficients in the observed covariance matrix. With the single exception of the χ^2 (df =5, 19.4, $p < .01$), all indices pointed to good fit. Indices for absolute fit (GFI = .99 and Standardized RMR (.04), parsimony (RMSEA = 0.07), and comparative fit (CFI = .97) were all within acceptable limits.

The results provide strong support for the first three hypotheses. The distractions construct has a statistically reliable negative relationship with confidence. An addition of a distraction type implies a .11 unit drop in perceived confidence to effectively allocate effort within the e-learning course. The feedback and goal constructs have statistically reliable positive relationships with confidence. An addition of a

feedback type corresponded with a .08 increase in perceived confidence. The largest effect appears to be due to goals. A unit increase on the agreement scale for goals corresponded to a .28 increase in confidence. The combined effect of these three variables explained 22% of the variability in the confidence construct. In motivational research this would be considered a moderate effect.

The results also provided strong support for the fourth and fifth hypotheses. Confidence was positively related to transfer of learning to the workplace and intentions to take advantage of future e-learning opportunities. Further, transfer was also related to intentions.

Unexpectedly, there were also effects of distractions, feedback and goals on transfer that were not mediated through confidence; as well as a direct effect of goals intentions. The goals students begin with, the distractions they experience and feedback they receive while taking an e-learning course have continuing effects on the students perceived ability to transfer the knowledge to the workplace. The combined direct and indirect effects of these variables explained 31% of the variance in the transfer and 33% of the variance in the intentions constructs.

DISCUSSION

We can no longer say that there is little research providing empirical support for factors that influence e-learning completion rates. The data show that distractions, feedback, goals, and confidence matter. The question now, becomes "what can we do about it?'

Ten percent of the respondents to the survey identified themselves as having not completed their e-learning course. These respondents under-represent the overall percentage of 33% of the students who enrolled in a Virtual Schoolhouse course last year and failed to complete. There is anecdotal evidence that some people who enrolled into a course never started the course for whatever the reason. We counted at least ten replies from respondents that indicated they signed up for a course, but never opened the first module. An e-mail from one respondent stated, "…not only did I not have time to complete, I didn't have time to start -- sorry I can be of no help in your survey." The reasons for this tend to vary from unexpected commitments to perhaps even forgetting about the on-line course. Part of the problem stems from a current registration policy that allows people to sign up for classes up to three weeks in advance before the regularly scheduled class actually starts. Administrators hope to combat that problem in the future by moving towards continuous registration. Students will then be able to begin a course as soon as they sign up. A second relief for this problem has already been installed but not reflected in this data. Course directors now contact their students just before the class starts to remind them of their commitment. This is feedback.

Another policy we have recently instituted to help combat high course dropout rates is the tracking of course progress by instructors. At the half way point, course directors now assess the progress made by their students and send messages reminding students of their commitment to complete the course. In this message, the course director explains that there is still sufficient time to complete provided the students give a concerted effort. Course directors also offer their assistance in case the student should need it. This approach combined feedback with goals and confidence building messages, as well as opens the door for a potential dialogue if off task demands such as technical problems are decreasing confidence.

E-Learning developers can also realize higher course completion rates by designing modules that are shorter and that provide feedback on a regular basis. Dividing longer course sections into smaller ones can help students realize proximal goals, raising their confidence to pursue more distal goals. Shorter modules can also help alleviate distractions. Students will find it easier to get 10-20 minutes of continuous uninterrupted time than an hour.

Further recommendations include reducing technical problems. Providing a robust network host for the student to connect to will increase the ease of use of the course and subsequently raise the confidence of the student. Likewise, if work demands continuous learning then employers need to realize the harm that distractions can cause while a student is attempting to complete a course. Setting aside time and a dedicated environment could provide crucial support for the student to achieve their desired goal.

CONCLUSION

This study highlights a few methods administrators can use to improve course completion rates. One way is to build an extrinsic goal to the completion of the coursework, such as adding a professional certification. Furthermore, supervisors can build a better interest in overseeing their employees complete their courses. If the boss is very interested in a student's progress then the likelihood of the employee completing the course increases. Another thing supervisors can do is to show the importance of the coursework and how it increases the effectiveness of the employee. One e-mail received from a respondent clearly demonstrated the necessity of the e-learning curriculum by saying, "I am the R&D case file manager for AFRL Kirtland with sites at Maui and Hanscom. I have made it mandatory for all newcomers to complete your training which by the way I think is awesome." Moreover, increased feedback

from instructors and the course itself will not only further motivate the student but will also let them know that even though the instructor ins not physically there, they do have a personal interest in helping the student succeed.

REFERENCES

AFIT/LS Department of Systems Acquisition Management Homepage. (2003). Available: https://www.vsh.afit.edu/VirtSchool/homepage/mainframe.htm.

Ajzen, I. (1991). The Theory of Planned Behavior. Organizational Behavior and Human Decision Processes, *50*, 179-211.

Alderman, M. K. (1999). Motivation for achievement: Possibilities for teaching and Learning. Mahwah, N.J.: Lawrence Erlbaum Associates.

Bandura, A. (1994). Self- Efficacy. Excerpt from unpublished article. Available: http://www.emory.edu/EDUCATION/mfp/BanEncy.html#sources.

------- (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Bandura, A., & Schunk, D. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. Journal of Personality and Social Psychology, 41, 586-598.

Carr, S. (2000). As Distance Education Comes of Age, the Challenge is Keeping the Students. The Chronicle of Higher Education, 23, A39.

Carter, V. (1996). Do Media Influence Learning? Revisiting the Debate in the Context of Distance Education. Open Learning, 11, 31-40.

Caterinicchia, M. (2002.). E-Gov Satisfaction leads the Way. Excerpt from unpublished article. Available: http://www.fcw.com.

Cox, M., Preston, C., & Cox, K. (1999, Septmeber). What Motivates Teachers to use IT? British Educational Research Association Annual Conference. Brighton, U.K.

Chyung, Y. (2002, August). Analyze Motivation-Hygiene Factors and Change Satisfaction-Dissatisfaction Levels of Your Online Training Program. 18th Distance Teaching & Learning Conference.

Davis, F. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13, 319-340.

Davis, F, Bagozzi, R.P & Warshaw, P.R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science. 35, 982-1003.

Department of Defense. (1999). Department of Defense Strategic Plan for Advanced Distributed Learning. Undersecretary of Defense (Readiness), Washington, DC: U.S. Government Printing Office.

Goodgride, E. (2002). E-Learning Offers Employee Performance Boost. Information Week, 884, 42.

Herzberg, F. (1968). Work and the Nature of Man. Cleveland: World Publishing Company.

Jaccard, J. & Wan, C. K. (1996). LISREL approaches to interaction effects in multiple regression. Newbury Park, California: Sage Publications, Inc.

Jöreskog, K., and Sörbom, D. (1993). *LISREL 8*. Chicago: Scientific Software International.

Kanfer, R. & Ackerman, P. (1989). Motivation and Cognitive Abilities: An Integrative/Aptitude-Treatment Interaction Approach to Skill Acquisition. Journal of Applied Psychology, 74, 657-690.

Klein, H., Wesson, M., Hollenbeck, J., Alge,B. (1999). Goal commitment and the goal setting process: Conceptual clarification and empirical synthesis. *Journal of Applied Psychology*, 84, (6): 885-896.

Knowledge and Learning Systems Group. (2000, September). The Future of E-Learning: A Corporate and an Academic Perspective. Urbana-Champaign, Il: Wentling, T., Waight, C., Strazzo, D., File, J., La Fleur, J., & Kanfer, A.

KnowlegeNet.com (2002, October) Blended Learning Design: Five Key Ingredients. Carmen, J. Available: http://www.knowledgenet.com/pdf/Blended%20Learning%20Design_1028.PDF.

Latham P., & Locke, E. (1991). Self-regulation Through Goal Setting. Organizational Behavior and Human Decision Processes, 50, 212-247.

Lewin, K. (1951). Field Theory in Social Science. New York: Harper.

Locke, E., & Latham, P. (1990). A Theory of Goal Setting and Task Performance. Englewood Cliffs, NJ: Prentice Hall.

Miller, H. (1967). Participation of Adults in Education: A Force- Field Analysis. Boston, MA: Boston University Center for the Study of Liberal Education for Adults.

Mitchell, T. (1997). Matching motivational strategies with organizational contexts. Research in Organizational Behavior, 19, 57-149.

Moti, F., Kurtz, G., & Levin, N. (2002). Implications of Presenting Pre-University Courses Using the Blended e-Learning Approach. Journal of International Forum of Educational Technology and Society, 5, 137-147.

Parker, A. (1999). A Study of Variables that Predict Dropout from Distance Education. International Journal of Educational Technology, 1.

Pastore, M. (2001). Companies, Universities Moving Toward E-Learning. Internet.com. Available: http://cyberatlas.internet.com/markets/education/article/0,,5951_737341,00.html.

Peterson, B. (2002). Business Education: An Evolution in Process. Cromwell Catalyst. Available: http://www.imakenews.com/cromwell1991/e_article000080833.cfm.

Ponton, M. (2002). Motivating Students by Building Self-Efficacy. Journal of Professional Issues in Engineering Education & Practice, 128, (2), 54-58.

Rosenberg, M. (2001). E-Learning: Strategies for Delivering Knowledge in the Digital Age. New York: McGraw-Hill.

Schank, R. (1994). Goal Based Scenarios: A Radical Look at Education. The Journal of the Learning Sciences, 3, 429-453.

Seffers, G. (2001). Soldiers Take E-University by Storm. Excerpt from unpublished article. Available: http://www.fcw.com.

Skinner, N. (2002). The Role of Goal Setting in Workplace Development. National Centre for Education and Training on Addiction, Adelaide, 145-152.

The Institute for Higher Education Policy. (1999, April). What's the Difference: A Review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education. Washington, DC: Phipps, R., & Merisotis, J.

Thurston, P., & Reynolds, K. (2002). Going the Distance with E-Learning: Motivational Factors that Influence Course Completion. Proceedings for the Interservice/Industry Training, Simulation and Education Conference**.**

West, S. G., Finch, J. F., and Curran, P. J. (1995). Structural equation models with non-normal variables: Problems and remedies. In R. H. Hoyle (Ed.), Structural equation modeling: Concepts, issues, and applications (pp 56-75). Thousand Oaks, CA: Sage Publications.

White House Executive Order #13111. (1999). Using Technology to Improve Training Opportunities for Government Employees. Washington, DC: U.S. Government Printing Office.

Zielinski, Dave. (2000). Can You Keep E-Learners Online? Training, 37, 64-71.