Will They Like It or Use It?
The Development and Use of an Instrument to Measure Adult Learners' Perceived Levels of Computer Competence, Attitudes Toward Computers, and Attitudes Toward e-Learning Within a Corporate Environment

by

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This applied dissertation was submitted by Steven R. Yacovelli under the direction of the persons listed below. It was submitted to the Fischler School of Education and Human Services and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

_____   _____
Gary Anglin, EdD   Date
Committee Chair

_____   _____
Todd Curless, PhD   Date
Committee Member

_____   _____
Maryellen Maher, PhD   Date
Executive Dean for Research and Planning

Acknowledgments

Abstract

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While "e-learning" has proliferated in our society, the problem exists that many corporations are delving into e-learning without fully understanding end users' self-reported computer competence or attitudes toward e-learning or computers in general, which could ultimately impact the success of e-learning at an organization. Studies have been done to examine these phenomena, but the vast majority center around the academic environment, and many are deemed archaic due to advances in technology. To examine this problem, this research study's goal was to develop a valid and reliable instrument that measures self-reported computer competence, overall attitudes toward computers, and attitudes toward e-learning appropriate for the corporate, adult learner.

The author reviewed various investigations that examined the definition of *attitudes toward computers* and the phenomenon of computer literacy. Little research exists that examines attitudes toward e-learning, and there is a lack of research for exploring all three phenomena on a nonacademic population.

The result of the study yielded the Regan Computer Competence, Attitude, and Behavior Survey. This instrument consists of five sections, totaling 130 items. Each section was comprised of entirely new questions or a combination of existing instruments whose validity and reliability have been explored in previous studies. The author employed a sample of 144 American adults working in a corporate or government organization. The author's analysis revealed that the Regan Computer Competence, Attitude, and Behavior Survey was a valid and reliable instrument. In addition, hypotheses were examined in this research study that looked at the correlation between certain variables and the three phenomena in question.

Table of Contents

Chapter 1: Introduction

Corporate America is undergoing a type of renaissance with regard to training and development. With the recent embracement of alternative technologies to accomplish training and development objectives, many companies are turning to media such as CD-ROM, the Internet, and private intranet in order to facilitate corporate training and education. The term being used throughout the business world and beyond is *e-learning*, and it is helping to revolutionize the way in which businesses educate their employees (Urban & Weggen, 2000).

In its infancy, the expectation for e-learning was rather high. According to the Commission on Technology and Adult Learning (2000), industry experts initially expected e-learning (specifically, Web-based training) to "surge by more than 900 percent between 1999 and 2003" (p. 10), but these high expectations did not materialize due to a variety of factors. Although the September 11, 2001, terrorist attacks on the United States and the economic recession afterwards continue to have an impact on businesses' expenditures on corporate training, corporate spending on employee training remains and e-learning still continues to transform most companies training landscape but not at the level in which it was initially expected (Thompson, Koon, Woodwell, & Beauvais, 2002). According to the American Society for Training and Development (ASTD), organizations were reportedly sending fewer employees to classroom courses and opting for e-learning instead for reasons of both cost savings measures and security (Thompson et al.). In a recent survey of 270 United States training organizations, almost 77% of these companies said they had increased their use of e-learning since September 11, 2001 (Thompson et al.). In addition, the latest data available from ASTD show that training delivered via learning technologies (e-learning) increased in a sample ($N = 476$)

of global training and development organizations analyzed in late 2002, between 15 and 29% and is projected to increase more in subsequent years (Sugrue, 2004). This utilization of learning technologies is not isolated to the United States: In 2002, Japanese organizations reported to be delivering 20% of training via technology, while Latin American organizations delivered approximately 3% of their training efforts via e-learning methods (Sugrue). Brennan (2003), a market research analyst whose area of expertise is corporate learning and performance, noted that "E-learning has entered the period of mass adoption. Training professionals realize that Web-based technologies will play a growing role in the way that training programs are created, managed, and delivered for the foreseeable future" (p. 6).

With the momentum of e-learning reshaping the corporate training world, its effective use and efforts to apply appropriate performance analysis prior to its implementation are documented few and far between. Identifying corporate organizations that are willing to share their e-learning strategies are rare (mostly due to the competitive nature of the private sector), but then finding those who are willing to share their experiences and that have applied performance analysis (such as conducting a thorough needs analysis of their learners) to their e-learning strategies is even more of a challenge. This, in turn, makes it difficult for an e-learning practitioner who wishes to apply sound, theoretical research toward his or her e-learning initiatives and instructional design based upon the experiences and successes of others.

Statement of the Problem

There are few if any studies done as to whether e-learning is right for a particular business environment from a learners' perspective. Many corporate educators are being charged to change their corporate training organizations to show financial benefits by

incorporating alternative delivery technologies and not necessarily show the educational

advantages to the utilization of these new media or their appropriateness to the learners

within their respective corporate cultures (Rossett, 2002). Learners may not be ready or

have the skills to use these new delivery technologies, but corporate leaders want them to

use these delivery methods for the fiscal advantages they can bring to the company.

Urban and Weggen (2000) identified this advantage for organizations, noting that

> corporations save between 50-70 percent when replacing instructor-led training
>
> with electronic content delivery. Opting for e-training also means that courses can
>
> be pared into shorter sessions and spread out over several days so that the
>
> business would not lose an employee for entire days at a time. Workers can also
>
> improve productivity and use their own time more efficiently, as they no longer
>
> need to travel or fight rush-hour traffic to get to a class. (p. 10)

It is important to note that learners' perceptions about the characteristics of

instructional delivery media and their ability to learn using these media have been shown

to be key determinants in predicting student motivation and success in traditional

classrooms (Bandura, 1977; Clark & Sugrue, 2001; Coggins, 1988). Many researchers

noted that there is a definite correlation between successful implementation of new

technologies and the attitudes and opinions of the end users of that technology–in this

case the students (Davis, Bagozzi, & Warshaw, 1989; Zoltan & Chapanis, 1982). Several

studies have looked at how negative attitudes toward computers can influence the

learning process, and students' attitudes can enhance or hinder knowledge acquisition

(e.g., Griswold, 1983; Koohang, 1987, 1989; Marcoulides, 1989, 1991). Francis (1993)

expounded upon this, saying that "attitudes have long been recognized as important

predictors of individual differences in educational application, learning and achievement"

(p. 251). These facts rarely seem to be considered by many corporate leaders, who instead see the fiscal advantages to technology-enabled learning as opposed to the combination of learning and business advantages (American Management Association, 2003). As Koroghlanian and Brinkerhoff (2000) noted, "In general, research in Internet-delivered instruction has reflected practice rather than driven it" (p. 119).

In addition, the success of any e-learning implementation within a corporate culture is dependent upon a clear understanding of its cultural impact. Harreld (1998) noted that implementing new technologies within a culture that is not prepared to embrace them is useless; the culture needs to be ready in order for success to happen. Hall (2001) echoed this same notion, stating that organizations need to conduct a very thorough needs assessment on the potential roadblocks to success for any type of technology-enabled learning initiative. Rosenberg (2002) noted that there are typically three challenges to implementing a successful e-learning initiative for an organization: (a) motivation of the participants, (b) competence of the participants, and (c) resources for supporting the implementation. Motivation of the participants comes, in part, by conducting a readiness assessment (or performance analysis) of the culture and anticipating why potential learners will resist embracing the technology-enabled learning. As Clark and Sugrue (2001) noted, our "attitudes, beliefs and values influence our motivation to learn" (p. 81). Motivation is our enthusiasm to engage in an undertaking and then the effort put forth to accomplish that undertaking (Clark & Sugrue). Rosenberg's (2002) discussion of competence of the participants focuses on the individual's level of skill and competence to engage in the e-learning environment and initiative. Finally, the last challenge discussed by Rosenberg (2002), resource, refers to the human and technical infrastructure to support the initiative.

The problem facing many corporate training leaders is that they may not have any benchmark data as to employee attitudes towards computers or their self-perceived computer competence. Corporations may invest thousands, if not millions of dollars into technology-enabled learning solutions only to find out that these tools are not used to their fullest extent or provide employees with a negative experience because of their preconceived attitudes toward computers. This lack of use, user dissatisfaction, or low attitude would be attributed to low employee computer knowledge or comfort level with the technology or employees' negative attitudes towards the use of computers. Studies show that an individual's self-reported computer competence is a critical predictor for the use of computer technology (Delcourt & Kinzie, 1993; Jorde-Bloom, 1988; Kinzie, Delcourt, & Powers, 1994). This fact is often overlooked by corporate leadership. In addition, as noted earlier in the literature, in the corporate sector, there is a push to focus instructional delivery methods toward electronic media and away from instructor-led facilitation because of the fiscal advantages this delivery methodology can bring without a true regard for the appropriateness of this media to the audience or learner. While the debate continues between those who believe like Clark (2001) that "media are mere vehicles that deliver instruction but do not influence student achievement" (p. 2) and those who believe media do influence the learning process (Kozma, 2001), there is no question as to the benefits that e-learning has within the corporate sector regarding cost-effectiveness, access to learning modules both synchronously and asynchronously, and more effective use of training resources and, therefore, higher return on investment of certain training expenditures (Rosenberg, 2001; Rossett, 2002; Urban & Weggen, 2000). However, because of the lack of instruments that focus on these phenomena, it is difficult for any organization to benchmark employees' readiness to embrace technology-enabled

learning solutions with regard to their self-reported computer competence as well as their attitude toward computers and attitude toward e-learning.

Research Questions to Be Investigated

In this research study, the author investigated eight specific research questions. To do this, the author first created an instrument that measures corporate adult learners' self-reported computer competence as well as their attitude toward computer technology and technology-enabled learning (also defined as e-learning). Next, the author gathered data to support the instrument's overall validity and reliability. With the data gathered from this pilot study complete, the author was able to answer three questions:

1. What is the level of corporate adult learners' attitudes towards computers?

2. What is the level of corporate adult learners' self-perceived levels of computer competence?

3. What is the level of corporate adult learners' attitudes toward technology-enabled learning and training?

Based upon key findings in previous studies, the author also sought to investigate relationships among benchmark corporate adult learners' attitudes toward computer technology, attitude toward technology-enabled learning, and their self-reported computer competence and specific demographic variables collected from the subjects. These five research questions include

1. Is there a correlation between age and self-reported computer literacy?

2. Is there a correlation between age and attitudes toward computers and attitudes toward e-learning?

3. Is there a correlation between educational attainment levels and attitudes toward e-learning?

4. Is there a correlation between gender and attitudes toward computers and attitudes toward e-learning?

5. Is there a correlation between attitudes toward e-learning and experience with various everyday technologies (such as the Internet, automated teller machine, and e-mail)?

Statement of Purpose and Rationale

In this study, the author created a valid and reliable instrument to measure employees' self-reported computer competence, attitudes toward computer technology, and attitudes toward computer-enabled learning (e-learning). Although some instruments exist around two of the phenomena being investigated (computer competence and attitudes toward computers), most of these instruments have been focused toward the kindergarten through Grade 12 (K-12) or American college learning environment with little appropriateness toward the corporate, adult learner. Although studies have shown that self-reported measures may be biased when measuring phenomena that could be classified as "sensitive," such as those involving social issues or criminal disobedience (Edwards, 1957), when the phenomena being examined are not sensitive self-reported measures can be very accurate (Ajzen, 1988; Parry & Crossley, 1950; Pomazal & Jaccard, 1976). In addition, instruments reviewed by the author around the phenomenon of self-reported computer competence or computer literacy tend to be dated in their examination of computer technology (Delcourt & Kinzie, 1993). As technology becomes more pervasive in our society and rapidly grows, past instruments looked at skills such as computer programming as being indicators of success with computer skills, which the author hypothesized is not an accurate indicator of the successful use of technology-enabled learning methods within the 21st century (Kay, 1993b; Woodrow, 1992).

In addition, instruments that purport to measure attitudes toward computers do not specifically address subjects' attitudes or experience with using technology-enabled learning methods or e-learning, an ever-increasing component of the corporate learning landscape (Rosenberg, 2001; Rossett, 2002; Urban & Weggen, 2000). Conflicting reports have been discovered around the impact that gender has on attitudes toward computers; some note that females are more anxious than males (e.g., Griswold, 1983; Koohang, 1986; Loyd & Gressard, 1986), while other studies did not find significant differences in males and female attitude toward computers or computer literacy (e.g. Heissen, Glass, & Knight, 1987; Woodrow, 1992, 1994). These conflicting results provide an opportunity to explore gender differences further within the phenomena of attitudes toward computers, computer literacy, and attitudes toward e-learning.

Once a valid and reliable instrument has been developed that purports to measure these three phenomena, the data garnered from the instrument could then be used in a variety of ways. Instructional designers and training management could use the data to develop treatments for their corporate adult learners to help improve their basic computer utilization skills or to develop interventions to modify the learners' attitudes toward technology-enabled learning. Organizations could also use the newly developed instrument to conduct a benchmark performance analysis to ascertain whether or not their particular business environment's employees are truly ready for the company to incorporate e-learning strategies into its training and development delivery methodology. In addition, businesses could use the instrument once an employee is hired within an organization to ascertain if the new employee would be best suited to participate in future training efforts that are technology enabled or if these learning events should be conducted in a more traditional instructor-led format that best meets the needs of the

learner. Again, while some argue that the instructional delivery methodology should not matter regarding the transfer of knowledge (Clark, 2001), it should be up to the individual learning organization to determine the best method of delivery of its content, weighing the variables of learner preference and fiscal benefits.

Objectives

The primary objective of the research study was to create a reliable and valid instrument that will measure employee attitudes toward computer technology, attitudes and experience with e-learning, and their self-reported computer competence that is appropriate for the adult learner in today's corporate setting. A tertiary objective of this study was to analyze the data from the pilot group to explore certain correlations between the variables collected from the newly created instrument and the demographic variables of the participants.

Through the accomplishment of these two objectives, the author hopes to provide an expansion of knowledge to the field by developing a valid, reliable, and concise instrument to use for future performance analysis looking at these phenomena that can determine an organization's readiness to venture into e-learning and technology-enabled learning from the learners' perspective. Unlike previous instruments developed specifically for a K-12 or college student audience, this instrument would be appropriate for use on an adult subject within the corporate environment.

Elements, Hypotheses, and Theories to Be Investigated

The research study examined the development of an instrument to measure subjects' attitudes toward computers, attitudes toward e-learning, and self-reported computer competence. An analysis of the pilot study data was also done to explore relationships between attitudes toward computers, attitudes toward e-learning, self-

reported computer competence, and demographic variables (such as age, gender, and level of education and current technology use). The author investigated six hypotheses during the development of this new instrument:

1. Subjects' attitudes toward computers will be positively correlated with their attitude toward e-learning as a method of learning.

2. Subjects' age will be negatively correlated with self-reported computer competence.

3. Subjects' age will be negatively correlated with attitudes toward e-learning.

4. Subjects' level of education will be positively correlated with their attitudes toward e-learning.

5. Subjects' self-reported computer competence will be positively correlated with overall attitudes toward e-learning.

6. There will be no significant difference between gender and attitudes toward computers, attitudes toward technology-enabled learning, and self-reported computer competence.

Limitations of the Study

Although the newly developed instrument being developed will have a broad use, there are limits to its utilization. First, the instrument was developed for use by corporate, adult learners and may not be appropriate for use with other populations, such as the K-12 students, traditional-aged college students, or adults working in a noncorporate organization (such as academia). Although it was the author's goal to develop a universally acceptable instrument for succinctly measuring computer attitude, attitudes toward e-learning, and self-reported computer competence, it was beyond the scope of this study to validate and test the reliability of the instrument on nonadult, noncorporate

learners.

The pilot study was conducted on a certain group of North American business personnel, and a second limitation is using the instrument beyond a North American audience. It was beyond the scope of this research study to determine if the newly developed instrument was valid and reliable to other non-North American audiences (such as Asian, European, or South American audiences).

Finally, the technological advances within our society have rapidly changed over the past few years, greatly impacting the way we live and how we learn. Like other instruments developed that focus on the measurement of computer literacy or competence as well as attitudes toward computer technology, there is a limited "shelf life" around this type of measurement due to the rapid advances of technology. An additional limitation to this study would be the potential limited time usage that the instrument could be employed. Although the author believes the phenomenon of attitudes toward computers is less impacted by specific computer advances, self-reported computer competence is contingent upon the current technological trends, and e-learning methodology being utilized today (and measured in the newly-developed instrument) may be obsolete tomorrow. Like other instruments before that have attempted to measure computer competence, technological advances could make the facet of the instrument focused on self-reported computer competence quickly out of date, making it necessary to update and revalidate the instrument as new questions more appropriate to current technology trends are incorporated into the instrument.

Definition of Terms

For the purposes of this study, the author defined key terms associated with the phenomena being examined. They include the following:

1. Aptitude is the characteristics of a person that forecasts his or her probability of success under a given treatment (Cronbach & Snow, 1969).

2. Computer anxiety is "the complex emotional reactions that are evoked in individuals who interpret computers as personally threatening" (Raub, 1981, p. 14).

3. Computer confidence is "related to the confidence in the ability to learn about or use computers" (Loyd & Gressard, 1984, p. 303).

4. Computer liking is the "enjoyment or liking of computers and using computers" (Loyd & Gressard, 1984, p. 303).

5. Computer literacy is "whatever a person needs to know and do with computers in order to function competently in our information-based society" (National Center for Education Statistics, 1983, p. 8).

6. Computer usefulness is "consisting of the perception of computers as helpful in one's future work" (Loyd & Gressard, 1984, p. 303).

7. Computerphobia is "a person's anxiety and fear about computers" (Koohang, 1986, p. 1).

8. Corporate adult learner is a person over 18 years of age who is employed part- or full-time within a nonacademic setting. This could be an organization within the public sector (such as a nonprofit organization) or the private sector (such as a business).

9. e-Learning is also referred to as *technology-enabled learning*. It is the use of such electronic media as CD-ROM, the Internet, private intranet, or any combination of these in order to facilitate training and education (Commission on Technology and Adult Learning, 2000; Urban & Weggen, 2000).

10. Performance analysis is defined as

the process for partnering with clients to help them define and achieve their goals.

It involves reaching out for several perspectives on a problem or opportunity,

determining any and all drivers toward or barriers to successful performance, and

proposing a solution system based on what is learned, not on what is typically

done. (Rossett, 1999, p. 13)

11. Self-efficacy is "personal judgment of one's capability to organize and

implement actions in specific situations that may contain novel, unpredictable, and

possible stressful features" (Schunk, 1984, p. 49). In terms of *computer self-efficacy*, this

then is the personal judgment of one's capability to use a computer effectively (also

referred to as computer competence or computer literacy).

Chapter Summary

The corporate sector is quickly embracing e-learning and technology-enabled

learning to accomplish many of its training and learning objectives. However, the

problem exists that many corporations are delving into technology-enabled learning

without understanding their end user's computer competence or attitude; they are simply

launching e-learning efforts without determining if an e-learning solution is right for a

particular business environment from a learners' perspective. In addition, although there

exists several instruments that measure attitudes toward computers and self-reported

computer competence, most are focused on the American academic or K-12 learner and

may not have applicability to the corporate, adult learner in the early 21st century. Few

instruments exist that are applicable to the corporate adult learner that specifically

address attitudes toward technology-enabled learning or e-learning.

This research study focused on the creation of a valid, reliable, and concise

instrument that measures employees' self-reported computer competence, overall

attitudes toward computer technology, and attitudes toward technology-enabled learning

(or e-learning). Through the validation and reliability analysis, the newly developed instrument is applicable for use with the adult, corporate learner as opposed to existing instruments that are aimed more toward the academic setting. In addition, the research study explored relationships between the data provided in the newly created instrument and certain demographic variables of the participants in the study.

Limitations exist to this study. As noted earlier, the instrument developed is for use by corporate, adult learners and may not be appropriate for usage with populations such as K-12 students, college students, or adults working within an academic environment. The pilot study was conducted on a group of North American business personnel, and a secondary limitation of the study is its use beyond a North American audience. Finally, like other instruments developed that focus on the measurement of attitudes toward computer technology, there is a limited shelf life around this type of measurement due to the rapid advances of technology within our information-based society.

Chapter 2: Review of the Literature

Historical Overview of the Theory and Research Literature

The phenomena of attitudes toward computers and computer literacy are not new concepts being examined within the past few years; conversely, many researchers have looked at these phenomena for decades. Today, however, the importance of computer literacy cannot be underestimated given the relevance of computers in modern society and specifically within business and education. As M. Jones and Pearson (1996) noted, "computer literacy is necessary in today's business world, not just for survival, but for basic functioning" (p. 17). The progression of this particular body of knowledge stems from several foundational constructs associated with anxiety and attitude and their impact on learning. Francis (1993) expounded upon this, saying that "attitudes have long been recognized as important predictors of individual differences in educational application, learning and achievement" (p. 251).

Specifically, theories around self-efficacy and attitudes toward mathematics provide the foundation for exploration within the phenomena of attitudes toward computers. *Attitude toward computers* emerged as having two varying definitions in the literature: (a) as defined by anxiety only and (b) with an expanded definition to include anxiety and other dimensions of attitude. This research, in turn, provides the foundation for the exploration of the phenomena of attitudes toward e-learning. In addition, early research around end-user attitudes toward computer applications also provides a basis with which to explore students' attitudes toward applications used for teaching and learning or e-learning. Computer literacy had been explored since early attempts to define the term were created in the 1970s as microcomputers began to emerge in the United States school system and business environments. Interwoven among all these studies are

results around certain demographic relationships and attitudes toward computers and attitudes toward e-learning, providing a foundation with which to analyze current relationships among demographics variables and the phenomena being examined in the research study.

First, this review of the literature explores the basic concepts around self-efficacy and foundational works around mathematics anxiety and how these two phenomena relate to the construct of computer anxiety. Then the review of the literature chronologically examines the relevant literature around the phenomena of computer anxiety and computer literacy, followed by a review of the literature that simultaneously examined these two phenomena. Finally, the review of the literature looks at the relevant literature regarding the phenomena of attitudes toward e-learning, first starting with earlier research around attitudes toward computer applications and then relevant literature studies around the phenomena of attitudes toward multimedia instruction. The ways in which researchers created their respective instruments and their steps to establish the instruments' overall reliability and validity are also discussed within each of these sections. Finally, a discussion of the trends and major contributions the literature has on the phenomena being investigated by this research study as well as the development of an instrument of measurement for the phenomena to be examined is presented.

Understanding of Self-Efficacy

The concept of self-efficacy provides one of the strongest foundations for the phenomenon of attitudes in general. As noted earlier, Bandura (1977) defined this concept around the notion that an individual who judges him or herself as being competent to perform a certain task (or efficacious) will tend to attempt and succeed in those tasks. Bandura (as cited in Murphy, Coover, & Owen ,1988) noted that there are