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# SUCCESSFUL TECHNOLOGY ADOPTION IN DISTANCE LEARNING: A MOTIVATION PERSPECTIVE

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## Abstract

*Advances in information technology have explored avenues for today's higher education to offer a quality curriculum while reducing costs. Many colleges and universities are tapping into the hot market of distance learning programs that allow students to seek college or advanced degrees without coming to campus. Due to its nature, distance learning relies heavily on technologies that enable students to communicate with their instructor and other participants in both synchronous and asynchronous formats. Since learning activities are mostly conducted online, successful application and implementation of online learning technologies is essential for the effectiveness of distance learning. Positive user attitude (or user acceptance) has been considered a critical factor that contributes to the successful application and implementation of any new information technologies including online learning technology (Barki and Huff 1985; Griffith 1996; Melone 1990; Rademacher 1989). Yet, empirical research examining factors that influence an individual's receptivity towards online learning technologies using a sample of potential users of distance learning has been relatively unexplored (Anakwe et al. 1999). This study examines the application of Expectancy Theory in explaining students' motivation to adopt an online learning technology. Data gathered from 74 distance-learning students suggest that Expectancy Theory is appropriate for evaluating and understanding students' motivation to adopt an online learning technology. On average, the students considered that improving competence in performing course work is the most attractive outcome of an online learning technology. This study also provides empirical evidence that technology adoption in distance learning is more likely to succeed when the technology is perceived by the students to be in their best interest and when successful adoption results from reasonable efforts.*

**Keywords:** Distance learning, technology implementation, expectancy theory

## Introduction

Advances in information technology have opened additional options for today's higher education. Major colleges and universities race to develop online course capability in a rapidly emerging cyber education market. Virtually, every major institution of higher education in the U. S. offers at least a portion of their classes over the Internet. Over 400 accredited colleges and universities have nontraditional bachelor's degree programs available that allow students to spend little or no time physically on the college campus. As the demand for lifelong learning increases and technological improvements enable us to truly simulate a live classroom, the growth in distance learning will continue to explode.

The unarguable upside of distance learning is that it requires little or no physical time on campus, thus making it more cost-effective. Via technology, teacher and students, while physically separated, are intellectually connected. To enable students to communicate with their instructor and other participants in both synchronous and asynchronous formats, distance learning relies heavily on communication technologies. In fact, most online courses provide mechanisms, such as bulletin boards, chat-rooms, and e-mail, through which students can communicate with the teacher and other students whenever their schedule allows. Since learning activities are mostly conducted online, successful application and implementation of online learning technologies is essential for the effectiveness of distance learning.

Positive user attitude (or user acceptance) has been considered a critical factor that contributes to the successful application and implementation of any new information technologies including online learning technology (Barki and Huff 1985; Griffith 1996; Melone 1990; Rademacher 1989). Using expectancy theory, this study seeks to explain the behavioral intention (motivation) of a student to adopt an online learning technology. Specifically, we examine the contributing factors toward students' motivation of adopting an online learning technology. The relative importance (weighting) of the contributing factors is also assessed.

## **Theoretical Background and Supporting Literature**

### ***Prior Distance Learning Research***

Consistent with a topical area at its infancy or developmental stage, a majority of the distance learning literature has focused on what distance learning is; who delivers distance learning; who benefits from it; and how distance learning is delivered. As a result, there is an overwhelming amount of information on the logistics, infrastructure, and technologies of distance learning (e.g., Hopey and Ginsburg 1996). Studies on a specific institution's or an organization's model of distance learning and its impact on the participants are abound (e.g., Hall 1996). Writings on structural changes resulting from partnering relationships among the major players and with the society as a whole for both delivery and acquiring distance learning have also been well represented (e.g., Wreden 1997).

Another line of research looks into the effectiveness and quality of distance learning. Those with favorable results argue that online education provides students with better and faster access to information, allows for more individualized instruction, accommodates different learning styles, and increases students' satisfaction with their courses (e.g., Baker et al. 1997). They also argue that the new computer-assisted technologies can promote not only greater student involvement in learning, but also more individual responsibility for learning. On the contrary, some criticize online learning for its lack of crucial personal interactions, not only between students and professors, but also among students as well. They see a depersonalization of the learning process and an empty pedagogy that stresses memorization rather than synthesis and analysis (e.g., Burdman 1998).

While many prior studies have examined the effect of distance learning and the new online learning technology on student performance and learning effectiveness, few have looked into students' attitudes toward distance learning and the various technologies. As mentioned by Anakwe et al. (1999), empirical research examining factors that influence an individual's receptivity towards distance learning using a sample of potential users of distance learning has been relatively unexplored.

### ***Prior Implementation Research***

Two major streams of information technology (IT) implementation research suggested by Ginzberg (1980) are implementation factor research and implementation process research. The implementation factor research involves the identification of factors that directly or indirectly impact the implementation success. Two commonly used measures of implementation success have been system usage (Barki and Huff 1985) and user satisfaction (Ives and Olson 1984). Within this stream, positive user attitude (or user acceptance) is considered a critical factor that contributes to both proxies for success.

The second stream identified by Ginzberg (1980), implementation process research, recognizes IT implementation as a process of introducing new IT to users. User commitment to change during the implementation process is considered to have favorable impacts on IT implementation. Some notable works in this stream examined related aspects of the implementation process on user attitude and system use (DeSanctis 1983; Melone 1990).

In summary, implementation research indicates that measuring user attitude toward an IT is essential for assessing IT implementation success. However, research in implementation success tends to underutilize existing knowledge in the behavioral science and typically fails to tie implementation research to more general models of work behavior (Griffith 1996; Melone 1990). Ives and Olson (1984, p. 600) urge that future implementation research be grounded in rigorous research methodology that draws from established reference disciplines and "where possible, the user involvement measures should be behaviorally anchored."

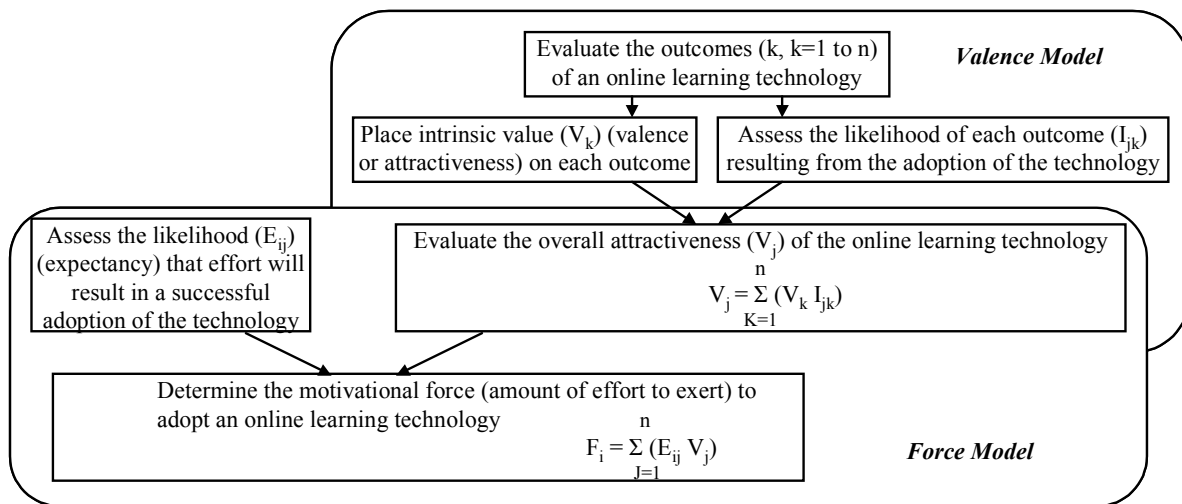
In order to effectively conduct learning activities, distance learning relies heavily on online learning technologies and their successful implementation. Implementation success is assumed to include knowledge of the technology, attitudes toward the technology, normative consensus among the participants regarding the value of the technology, and actual use of the technology. Technology implementation will succeed only when it is perceived by the participants to be in their best interest (Griffith 1996). Expectancy Theory is considered as one of the most promising conceptualizations of individual's behavior intention. Many

researchers have proposed that Expectancy Theory can provide an appropriate theoretical framework for research examining user attitude toward a new information technology (DeSanctis 1983).

**Expectancy Theory**

Expectancy Theory was originally developed by Vroom (1964) and has served as a theoretical foundation for a large body of studies in psychology, organizational behavior, and management accounting (e.g., Snead and Harrell 1995). Expectancy models are cognitive explanations of human behavior that cast a person as an active, thinking, predicting creature in his/her environment. He/she continuously evaluates the outcomes of his/her behavior and subjectively assesses the likelihood that each of his/her possible actions will lead to various outcomes. The choice of the amount of effort he/she exerts is based on a systematic analysis of (1) the values of the rewards from these outcomes, (2) the likelihood that rewards will result from these outcomes, and (3) the likelihood of reaching these outcomes through his/her actions and efforts.

According to Vroom, Expectancy Theory is comprised of two related models: the valence model and the force model. In our application of the theory, each student first uses the valence model and then the force model. In the valence model, each student evaluates the outcomes of the online learning technology (e.g., enhanced communication, increased ability to coordinate, better collaboration, and improved competence) and subjectively assesses the likelihood that these outcomes will occur. Next, by placing his/her own intrinsic values (or weights) on the various outcomes, each student evaluates the overall attractiveness of the online learning technology. Finally, the user applies the force model to determine the amount of effort he/she is willing to exert to adopt the technology. This effort level is determined by the product of the attractiveness generated by the valence model (above) and the likelihood that his/her effort will result in a successful adoption of the technology. Based on this systematic analysis, the student will determine how much effort he/she would like to exert in using the online learning technology. Figure 1 describes an individual’s decision-making process via the application of Expectancy Theory (i.e., valence and force models).



**Figure 1. Application of Expectancy Theory in Decision Making**

**Research Propositions**

The general research question examined by the this study is "Can the valence and force models of Expectancy Theory explain the motivation of a student to utilize an online learning technology?" Specifically, under the valence model, we investigate the impact of the potential outcomes of online learning technology upon students’ motivation to adopt such technology. The four outcomes of online learning technologies tested by this study are (1) enhancing the communications among classmates and professors, (2) increasing the ability to coordinate course-related activities, (3) achieving a better collaboration among fellow students, and (4) improving the competence in performing course work. All four have been proposed by prior studies (e.g., Orlikowski 1993) and proclaimed by product designers as expected outcomes of online learning technologies. Under the force model, we examine the extent that the difficulty of adopting an online learning technology will affect students' motivation to utilize the technology. Based on the above research objectives, two research propositions are developed:

- Proposition 1: The valence model can explain a student's perception of the attractiveness of adopting an online learning technology.
- Proposition 2: The force model can explain a student's motivation to adopt an online learning technology.

## Research Method

### Subjects

The subjects were 74 students enrolled in four business distance-learning courses taught at a mid-sized mid-western state university. Most of them had a senior or postgraduate rank. The number of female and male was 22 and 52 respectively, and 36 of them had used an online learning technology in a prior course or on other occasions. These students were appropriate for this study because (1) they had classroom exposure to an online learning technology and (2) they were actual users since an online learning technology (i.e., LearningSpace) was made available for their use in class activities.

### Research Design

The within-person or individual focus of Expectancy Theory suggests that appropriate tests of this theory should involve comparing measurements of the same individual's motivation under different circumstances. In response to this suggestion, this study incorporates a well-established within-person methodology originally developed by Stahl and Harrell (1981) and later proven to be valid by other studies (e.g., Snead and Harrell 1995). This methodology uses a judgment modeling decision exercise that provides a set of cues, which an individual uses in arriving at a particular judgment or decision. Multiple sets of these cues are presented and each represents a unique combination of strengths or values associated with the cues. A separate judgment is required from the individual for each unique combination of cues presented.

We employ a one-half fractional factorial design that results in eight unique combinations of the outcomes ( $2^4 \times \frac{1}{2} = 8$  combinations), given that 16 ( $2^4$ ) combinations of the four outcomes and two levels (10% and 90%) of likelihood are possible. Each of the resulting eight combinations is then presented at two levels (10% and 90%) of expectancy to obtain 16 unique cases (8 combinations x 2 levels of expectancy = 16 cases). This furnishes each student with multiple cases that, in turn, provides multiple measures of each individual's behavioral intentions under varied circumstances. This is a prerequisite for the within-person application of Expectancy Theory (Snead and Harrell 1995). A sample case is provided in Table 1.

**Table 1. Example Questionnaire**

If you use the online learning technology to the MAXIMUM extent in your class, the likelihood that:										
You will enhance your communications with classmates and professors is .....										HIGH (90%)
You will increase your ability to coordinate course-related activities is .....										HIGH (90%)
You will achieve a better collaboration among fellow students is .....										HIGH (90%)
You will increase your competence in performing course work is .....										LOW (10%)
<b>DECISION A:</b> With the above outcomes and associated likelihood levels in mind, indicate the <i>attractiveness</i> to you of adopting the online learning technology in your class activities.										
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Very Unattractive						Very Attractive				
<b>FURTHER INFORMATION:</b> If you exert a great deal of effort to adopt the online learning technology in your class activities, the likelihood that you will be successful in doing so is.....										
										LOW (10%)
<b>DECISION B:</b> Keeping in mind your attractiveness decision (DECISION A) and the FURTHER INFORMATION, indicate the level of <i>effort</i> you would exert to adopt the online learning technology.										
0	1	2	3	4	5	6	7	8	9	10
Zero Effort										Great Deal of Effort

In each of the 16 cases, the students are asked to make two decisions. The first decision, Decision A, corresponds to the valence model and represents the overall attractiveness of adopting the online learning technology, given the likelihood (10% or 90%) that the four outcomes would result from the adoption. As mentioned earlier, the four outcomes tested are (1) enhancing communications among classmates and professors (2) increasing ability to coordinate course-related activities (3) achieving better collaboration among fellow students, and (4) improving competence in performing course work. The second decision, Decision B, corresponds to the force model and reflects the strength of a student’s motivation to adopt the online learning technology, using (1) the attractiveness of the technology obtained from Decision A and (2) the expectancy (10% or 90%) that if the student exerts a great deal of effort, he/she would be successful in adopting the technology. We use an eleven-point response scale with a range of -5 to 5 for Decision A and 0 to 10 for Decision B. Negative five represents “very unattractive” for Decision A and positive five represents “very attractive”. For Decision B, zero represents “zero effort” and ten represents a “great deal of effort”.

## Results

### The First Proposition

The first proposition predicts that the valence model of Expectancy Theory can explain a student's perception of the attractiveness of adopting an online learning technology. We assess each student’s perception through the use of multiple regression analysis, where Decision A serves as the dependent variable and the four outcomes serve as the independent variables. The resulting standardized regression coefficients represent the relative importance (attractiveness) of each outcome to the students in arriving at Decision A. The mean adjusted-R<sup>2</sup> of the regressions and the mean standardized betas of each outcome are presented in Table 2. Detailed regression results for each student are not presented but they are available from the authors.

As indicated in Table 2, the mean adjusted-R<sup>2</sup> of the individual regression models is .7246. The mean adjusted R<sup>2</sup> represents the percentage of total variation in the responses that is explained by the multiple regressions. Thus, these relatively high mean adjusted-R<sup>2</sup>s indicate that the valence model of Expectancy Theory explains much of the variation in students’ perception of the attractiveness of adopting an online learning technology. Among the 74 individual regression models, 67 are significant at .05 level. These results support the first proposition.

**Table 2. Valence Model Regression Results**

	Sample Size	Mean	Standard Deviation	Range	Frequency of Significance at .05 level
<b>Adjusted R<sup>2</sup></b>	74	.7246	.1793	.1777 to .9856	67/74
<b>Standardized Beta Weight:</b>					
<b>V1</b>	74	.3770	.1729	-.1659 to .7576	57/74
<b>V2</b>	74	.4017	.1951	-.0599 to .7009	56/74
<b>V3</b>	74	.3528	.1940	-.6080 to .6417	47/74
<b>V4</b>	74	.5316	.1873	-.1147 to .8987	66/74
V1: valence of communication enhanced      V3: valence of collaboration improvement V2: valence of coordination ability increased      V4: valence of competence improvement					

The standardized betas of the four outcomes are significant at the .05 level for more than half of the students. This implies that all four outcomes are important factors to a majority of the students in determining the attractiveness of an online learning technology. Although all four outcomes are important, some outcomes are more important than others. It is the *mean* of these standardized betas that explains how students, on average, assess the attractiveness of potential outcomes resulting from an online learning technology. The students, on average, place the highest valence on the outcome V4. The other valences, in descending order of their importance, are V2, V1, and V3. These results imply that the students believe that improving competence in performing course work (V4) is the most attractive outcome of an online learning technology and improving collaboration among fellow students (V3) is the least attractive outcome. In the middle is the increased coordination ability (V2) and enhanced communication (V1).

### The Second Proposition

The second proposition hypothesizes that the force model can explain a student's motivation to adopt an online learning technology. We again use multiple regression analysis to examine the force model in the experiment. The dependent variable is the student's level of effort to adopt the online learning technology in his/her class activities (Decision B). The two independent variables are (1) each student's perception about the attractiveness of the online learning technology from Decision A, and (2) the expectancy information (10% or 90%) which is provided by the "Further Information" sentence of the test instrument (see Table 1). The force model results are summarized in Table 3.

**Table 3. Force Model Regression Results**

	Sample Size	Mean	Standard Deviation	Range	Frequency of Significance at .05 level
<b>Adjusted R<sup>2</sup></b>	74	.7707	.1458	.3744 to .9816	74/74
<b>Standardized Beta Weight:</b>					
<b>F1</b>	74	.5993	.2877	-.9302 to .9726	69/74
<b>F2</b>	74	.5090	.3247	-.3095 to .9896	56/74
F1: weight placed on attractiveness of the online learning technology					
F2: weight placed on the expectancy of successfully using the technology					

The mean adjusted-R<sup>2</sup> (.7707) supports the second proposition and indicates that the force model sufficiently explains the students' motivation in adopting the online learning technology. The mean standardized regression coefficient F1 (.5993) indicates the impact of the overall attractiveness of the online learning technology while F2 (.5090) indicates the impact of the expectation that a certain level of effort leads to successful adoption of the technology. These results imply that both factors, the attractiveness of the online learning technology (F1) and the likelihood that the students' efforts will lead to successful adoption (F2), are of similar importance to the students' motivation.

### Experimental Controls

The students are asked to evaluate the 16 hypothetical cases (online learning technologies) presented to them instead of the online learning technologies they have experienced before. Therefore, the students' background should not affect their responses to these individual cases. Table 4 presents Pearson's correlations between adjusted-R<sup>2</sup> values of valence and force models and selected demographic information (i.e., rank, gender, age, GPA, and prior experience using online learning technologies). There is no significant correlation (at the .05 significant level) between either of the students' adjusted-R<sup>2</sup> values and their rank, gender, age, GPA, and prior experience. These results suggest that neither the students' perception of the attractiveness of the online learning technology nor their motivation to adopt the technology is correlated with their background or with their prior experience of the online learning technology. These results also support our argument that the subjects we use are appropriate for this study because neither their background nor their prior experience with the online learning technology affects their evaluation of the hypothetical online learning technologies tested in the questionnaire.

**Table 4. Pearson's Correlation Coefficients and (P-Values)**

	Rank	Gender	Age	GPA	Experience
<b>Adj-R<sup>2</sup> Valence</b>	0.1308 (0.9119)	0.0277 (0.8151)	0.0245 (0.8361)	0.0849 (0.5414)	0.0891 (0.4409)
<b>Adj-R<sup>2</sup> Force</b>	-0.0003 (0.9980)	0.0204 (0.8631)	-0.0730 (0.5365)	0.1173 (0.3985)	0.0433 (0.7142)

### Discussion and Conclusions

By the successful application of expectancy theory, this study provides a better understanding of the behavioral intention (motivation) of students' adoption of an online learning technology. Our empirical results show that students have strong preferences for the potential outcomes of online learning technologies and these preferences are consistent across individuals.

On average, students consider improving competence in performing course work as the most attractive outcome of an online learning technology. This result implies that students who believe that their adoption of an online learning technology will improve their competence in performing course work should be highly motivated to adopt such technology. Since successful implementation of online learning technology is an essential antecedent to the effectiveness of distance learning, this knowledge of student motivation must be considered thoughtfully when the technology is implemented.

This study also provides empirical evidence that technology adoption in distance learning is more likely to succeed when it is perceived by the students to be in their best interest and when successful adoption results from reasonable efforts. If students are kept ignorant or uninformed of the potential benefits of the online learning technology or if they see no visible results from their adopting efforts, they will cease in their efforts to use the technology.

In practical terms, this study shows that Expectancy Theory can be applied early in the design phase of product development to provide a better indication of users' intention in adopting an online learning technology. In order to maximize implementation success (e.g., technology usage and user acceptance), software developers and designers may incorporate and stress the favorable attributes (outcomes) identified in this study into their online learning technology products. Further, software developers may gauge their own efforts to achieve these outcomes according to each outcome's relative importance as suggested by this study.

Toward the goal of motivating distance-learning students to adopt an online learning technology, we make the following practical suggestions. First, select an online learning technology that is perceived to be useful by students (i.e., consistent with students' best interest). Consider an initial listing of the benefits and outcomes of the technology on the users' manuals and stress them in the training sessions. If the benefits and outcomes are consistent with the students' interest and they believe that the adoption will truly result in these benefits, the students will assign a high valence to the technology. Second, provide training that increases students' chances for success in adopting the technology. In the training sessions, reveal examples of previous students' successful adoption. This would increase students' subjective probabilities that they too can be successful, thus increasing their force or motivation in adopting the technology. Third, reward the technology adoption. Collect and disseminate statistics that show a positive correlation between the frequency of using the online learning technology and the performance of course work. The objective statistical evidence shows students that adoption of the online learning technology does lead to competency in performing course work; hence, it should have the salutary effect of encouraging the technology adoption.

Some limitations of this study need to be discussed. First, the sample size is small and the selection of subjects is not a random process. Students become subjects by virtue of being enrolled in the classes surveyed and all subjects come from only one institution. Consequently, extrapolation of the findings of this study into other groups and settings should be made with caution. Second, students are not given the opportunity for input on the outcomes that motivate them to adopt the online learning technology. In the instrument, four possible outcomes are given to the students. Third, the extreme levels of instrumentality and expectancy (10 percent and 90 percent) are used in the cases. This does not allow us to test for the full range within the extremes. In another sense, such extremes may not exist in actual practice.

In summary, this study has successfully applied a behavioral theory, Expectancy Theory, to a technological implementation area. This application (1) helps close the gap between the capabilities of an online learning technology and the extent to which it is used, and (2) responds to the claim of previous research that the gap can be better explained by behavioral elements rather than by technical attributes. Future research should revalidate the application of Expectancy Theory in different contexts. Various factors such as social norms, course nature (e.g., structure and contents), and grading system can be examined for their impact on the valence and force models. Along with the direction of several recent studies (Lucas and Spitzer, 1999; Szajna and Scamell, 1993), the relationship among attitude (i.e., perceived technology quality, perceived usefulness, and perceived ease of use), intention, and actual use needs to be further validated. The ultimate goal of this line of research is to gain more rigorous and consistent insight into understanding the effectiveness of an online learning technology on distance learning as well as our ability to explain or predict user acceptance to the technology.

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