THEORY OF PLANNED BEHAVIOR MODEL IN ELECTRONIC LEARNING: A PILOT STUDY

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ABSTRACT

Internet and World Wide Web (WWW) technologies have had an increasingly significant impact on the design and delivery of courses in universities. While the Internet is not replacing traditional classroom instruction, it allows instructors to enhance and add value to traditional classroom delivery methods. However, the acceptance of this technology has not been universal. This paper presents the motivations, progress and plans for an ongoing project assessing the behavior of university faculty in adopting Internet and Web technologies. The project uses the Theory of Planned Behavior (TPB), a well-researched intention model from social psychology, as its theoretical foundation. Results from interviews with professors and case studies of internet technology implementation at the university level has provided an initial validation for the use of this model to study adoption behavior. An initial survey instrument has been developed to measure the major TPB factors in the context of adopting Internet technology for pedagogy. These additional items are intended to provide information on the comparative value of these competing models in this particular area. This initial survey will be sent to a random sampling of university professors across the United States.

Keywords: Web-Based Education, Theory of Planned Behavior, IT Adoption

INTRODUCTION

Internet and World Wide Web (WWW) technologies have had an increasingly significant impact on the design and delivery of courses in colleges and universities. Technologies such as course web pages, discussion and chat groups, newsgroups, list servers and comprehensive server based course management packages have changed the ways instructors communicate and interact with students in and out of the classroom. While the WWW is not replacing traditional classroom instruction, it allows instructors to enhance and add value to traditional classroom delivery methods (4). Although the use of the Internet is increasing among faculty, its acceptance has not been universal.

The objective of this paper is to discuss a research project designed to assess the behavior of university faculty in the adoption of web based course material using the Theory of Planned Behavior (TPB) (1, 2) as a theoretical foundation. The paper begins with a literature review of web based course instruction and the TPB. It will then present the proposed methodology for the research project. The results of initial phases of the study are presented. This phase was conducted to: 1) determine if TPB would be an appropriate method for assessing the intent to adopt web technologies to supplement course delivery, 2) elicit possible items for a fully developed survey instrument and 3) conduct a pilot study to validate the instrument. The paper concludes with a discussion of future research directions.
WEB BASED INSTRUCTION

Web based instruction has its foundation in the early mainframe text-based computer-based training (CBT) and multimedia PC-based systems. It was not, however, until the emergence of the Internet and the World Wide Web (WWW) that the use of computer systems for course delivery became more practical. Email, hypertext, hypermedia, and other Internet-based tools allow for inexpensive access to material by a large number of users. The relative ease of creating web pages and the introduction of comprehensive web-based course delivery systems further facilitate the use of the technology.

More college courses are using technology resources. This is shown by the 2002 Campus Computing Survey (6) that reported that nearly 70 percent of all college courses were making use of electronic mail, up from 44 percent in 1998 and 59 percent in 2000. Similarly, 50 percent of college courses use Web resources in the syllabus. About a third of courses have a Web page, and approximately 30 percent using some type of course management software. Although the use of the Internet is increasing among faculty, its acceptance has not been universal. As the survey shows, a majority of instructors still do not actively use the Web for course delivery. This may be due to several technical, personal and organizational factors. For example, Sumner and Hostetler (13) reported that most faculty wanted to pursue the uses of technology, but that the time, effort, and technology support required to implement these technologies were major inhibiting factors.

THEORY OF PLANNED BEHAVIOR

The Theory of Planned Behavior (TPB) is a widely studied model from social psychology that is concerned with the determinants of consciously intended behaviors (1). According to TPB, a person’s performance of a specified behavior is determined by that person’s behavioral intention to perform the behavior. This behavioral intention is, in turn, determined by three factors concerning the behavior in question: the person’s attitude (A), subjective norms (SN), perceived behavioral control (PBC). TPB uses estimates of these factors to predict behavioral intentions, which in turn, are used to predict behavior.

Attitude is a function of products of behavioral beliefs (the likelihood or extent to which an action will result in a particular outcome) and outcome evaluations (positive or negative evaluation of the desirability of the outcome). Subjective norms are determined by a person’s perceived expectation of specific referent individuals or groups multiplied by his or her motivation to comply with these expectations. Perceived behavioral control (someone’s perception of the presence or absence of requisite resources and opportunities to perform a behavior of interest) is a product of belief (a perception of the availability of skills, resources, and opportunities) multiplied by perceived facilitation (an assessment of the importance of those resources to the achievement of outcomes). Figure 1 presents a simplified schematic of the theory of planned behavior.
The Theory of Planned Behavior (TPB) has been used successfully in a wide range of behavioral science disciplines to empirically predict and understand behavior in a variety of situations. Examples of its use in the Information Systems field include its use in identifying users’ behaviors and attitudes in issues relating to computer privacy, user acceptance of word processing technology, users’ intentions to use microcomputers (12), users’ intention to use information systems (8) and in making application development outsourcing decisions (3). TPB is one of several models that have been used to predict user acceptance of and intention to use information systems. None of these models though have achieved universal acceptance. Venkatesh, Morris, Davis, and Davis (14) present a review and comparison of eight such models in developing a unified model incorporating aspects from each, including TPB. While these models all have particular strengths and weaknesses, we believe that the variety of situations in which TPB has been employed and its general acceptance provides support for its applicability in this study.

METHODOLOGY AND PRELIMINARY RESULTS

This study is following the methodology proposed by Mykytyn and Harrison (1993) for determining and measuring the constructs of the TPB and TRA. For this study, the behavior of interest is the active use of World Wide Web technologies by professors for course delivery in the following academic year. “Active use” is defined as using the WWW in such a way that the course delivery material is updated on or that students are required to access materials or use the tools on a regular basis. As recommended by the literature (1, 5, 9), elicitation interviews were conducted with a representative sample of the target population (university professors). Fifteen subjects, all professors in business or engineering programs from several different four-year universities were interviewed. An open-ended questionnaire developed based on models provided by Mykytyn and Harrison (9) and Mathieson (8) was used to collect and organize the results. The questionnaires were completed during face to face or phone interviews. The items on the questionnaire were designed to elicit the most commonly cited factors of the TPB. The responses were classified and grouped according to similarities leading to the identification of the factors deemed most relevant for each of the elements of the TPB.

Based on the most common responses for each of the factors, a survey instrument was developed. Specific questions that evaluate the constructs of the TPB were developed. The questions were developed using guidelines found in the literature (1, 2, 8). A previously
validated instrument used by Riemenschneider and McKinney (12) and by Grandon and Mykytyn (5) was used as the basis for the survey. The questions themselves are anchored seven point Likert scales. For example, a question for a Normative Belief item might look like the following:

**Administrators at my University would approve of my using WWW and Internet technologies in the delivery of my courses.**

<table>
<thead>
<tr>
<th>Unlikely</th>
<th>____</th>
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<th>____</th>
<th>____</th>
<th>____</th>
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<th>Likely</th>
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<tr>
<td></td>
<td>Extremely</td>
<td>Quite</td>
<td>Slightly</td>
<td>Neither</td>
<td>Slightly</td>
<td>Quite</td>
<td>Extremely</td>
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**Pilot Sample and Survey Reliability**

Respondents for the pilot study were identified through a two-stage process. A list of 530 schools was obtained and each school assigned a random number. A set of 50 schools was then selected from this group so that each state in the United States was represented. Two faculty members were chosen from each of these 50 institutions. One faculty member was selected from the business school and one from either the school of liberal arts or science. Faculty members were selected without consideration as to rank, gender, age, or ethnicity. The questionnaire developed in the initial phase of the study was mailed to each of the faculty member identified in the search. There was no attempt to pre-qualify potential respondents in terms of their use of the internet to support course delivery. Fifteen faculty members agreed to participate in the study, representing a 15 percent response rate for the pilot study. A response rate of 30 percent or more is considered good for a survey-based research study (7, 15). Two possible reasons for the low response rate are the timing of the mailing (toward the end of the traditional semester) and the length of the instrument.

Using the pilot data obtained from the completed surveys, Crombach alpha values were computed for each construct to assess the reliability of survey items. Crombach Alpha scores for Intention (I), Attitude (A), Perceived Behavioral Control (PBC), Subjective Norms (SN) and are .89, .586, .957, and .913 respectively. The Subjective Norms (SN) direct measure consists of a single item. Nunnally (10) suggests that a value of .60 or above is adequate for early stages of research. Although the questionnaire items are based on questions used in other studies utilizing TPB, there is no prior empirical study applying this theory to internet-based course delivery technology. The values for Intention, PBC, and Subjective Norms are well within the levels recommended in the literature and are characteristic of mature measurement scale. Attitude (A) falls below the level for early research efforts. Inspection of the Item Analysis report provided by NCSS indicated that one item in this scale was negatively correlated with the others. Removal of this item increases the Crombach alpha score to .67. In addition, an examination of the item wording in this scale provides additional insight into the unusually low score. Half of the items semantically address the issue of quality with extremes such as Good and Bad. The other half of the items use terms that are more indicative of efficiency or effectiveness, actually using the terms Effective and Ineffective. When the quality and effectiveness items are assessed independently, the Crombach alpha scores rise to .89 and .96 respectively.

Reliability measures were also computed for the elements that comprise Attitude, PBC, and Subjective Norms. Table 1 below lists the Crombach alpha scores for Behavioral Beliefs...
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(BB), Outcome Evaluations (OV), Control Beliefs (CB), Perceived Facilitation (PF), Normative Beliefs (NB), and Motivation to Comply (MC).

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach α Score</th>
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<tbody>
<tr>
<td>Behavioral Beliefs</td>
<td>.66</td>
</tr>
<tr>
<td>Outcome Evaluations</td>
<td>.78</td>
</tr>
<tr>
<td>Control Beliefs</td>
<td>.90</td>
</tr>
<tr>
<td>Perceived Facilitation</td>
<td>.96</td>
</tr>
<tr>
<td>Normative Beliefs</td>
<td>.17</td>
</tr>
<tr>
<td>Motivation to Comply</td>
<td>.92</td>
</tr>
</tbody>
</table>

Table 1. Component Scale Reliability Measures

With the exception of the Behavioral Beliefs and Normative Beliefs measurement scales, all of these fall within an acceptable range. Several items used to measure the Behavioral Beliefs construct are written in the negative (reversing the indication of favorable versus unfavorable responses). Although this technique is widely used in survey construction, respondents commented that this made the questions confusing. The most severe problem is in the Normative Beliefs, which asks about the level of approval for using the Internet to supplement classroom pedagogy. The main groups identified during the initial stages of this study are students, peers, and administrator. Examination of the item analysis report generated by NCSS shows the items in this scale to be relatively uncorrelated. The item addressing the approval of peers is negatively correlated with that of students and administrators ($R^2 = -.186$). This lack of correlation is not wholly unexpected given the vast divergence in the nature of the three reference groups (students, administrators, and peers).

Initial Study Results

As part of the theory building process, an initial statistical examination of the data from the pilot study was performed to determine if there was some degree of support for the proposed model. Studies of technology adoption in other areas that are based on the TPB model have employed the multiple regression method for data analysis (5, 12). The multiple regression analysis method relies on the assumption of normality within the data. Graphical plots of residual values of Intention and statistical tests for skew and kurtosis did not indicate that the normality assumption was violated. A regression analysis was run in NCSS using the following model:

$$\text{Intention} = \text{Attitude} + \text{Perceived Behavioral Control} + \text{Subjective Norms}$$

Using the pilot data, this model was able to explain a significant degree of variation in responses with $F=4.2493$ and a level of significance of $p=.0319$. The correlations between the independent variables (Attitude, Perceived Behavioral Control, and Subjective Norms) and dependent variable (Intentions) were also examined. Attitude and Perceived Behavioral Control most highly correlated with Intentions (.546 and .56 respectively), while Subjective Norms was less uncorrelated with Intention ($R^2 = .379$). Given the problematic nature of Subjective Norms in this study, further analysis of the impact of reference groups was conducted, using only a one of the three groups at a time. When the model was adjusted to address motivations to address student needs, the results improved somewhat ($F = 4.402$).
CONCLUSIONS AND FUTURE DIRECTIONS

In the current operating environment, public and private universities across the United States are attempting to utilize the Internet to expand their traditional service areas and to improve the educational experience for students (11). However, this drive to increase on-line course content is not universal. A number of barriers exist to employing the Internet to improve classroom pedagogy (i.e., time, effort, and technical support).

The study discussed in this paper is still underway, and the results reported here are not intended to provide any definitive inferences on the usefulness of the TPB model in this technology adoption context. However, examination of the pilot study data appears quite promising. The presence of statistically significant results provides at least a cursory indication that the TPB model may be useful in analyzing faculty acceptance and adoption of Internet technology to support teaching efforts. The results indicate that Attitude and Perceived Behavioral Control have the largest effect on Intention, with Subjective Norm having little effect. This is not inconsistent with other reported applications of TPB. Indeed, Ajzen and Fishbein (1) state that intentions which are more likely to be under attitudinal control are better predicted by attitude, while intentions more under normative control are better predicted by subjective norms. In this case, the intention to use the Internet for pedagogy would seem to be under attitudinal control. The seemingly diminished effect of Subjective Norms in the model may be due in some part to issues of academic freedom in the university environment and the subsequently high degree of independence granted to faculty in developing classroom pedagogy. The impact of this construct does tend to improve when each reference group is examined independently.

These findings provide some level of confidence that the research design is sufficiently robust to detect the phenomena of interest. The next phase of this study is to take the lessons learned in the pilot study and to perform primary data collection. Additional data analysis is being conducted on the preliminary. The survey instrument is being revised based on the results and comments of respondents. The survey will then be administered to a larger population for data collection and final analysis.

REFERENCES


