Explaining Behavior in an Internet-Based Learning Environment

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Abstract: Researchers have been actively investigating technology acceptance for the past decade. Although the use of virtual environments has become a significant component of the workplace, the factors that contribute to its acceptance are still unclear. More specifically, research on the acceptance factors of internet-based learning environments is still in its infancy. Using the theory of planned behavior, this empirical study attempts to understand the influence of three factors: attitudes, subjective norms and perceived behavioral control, on student’s intentions to use an internet-based learning environment. Results show that of the three factors, perceived behavioral control has the highest impact. This finding has important ramifications on the design and implementation of internet-based learning environments.

Key-Words: Theory of planned behavior, Internet-based learning environment, Attitudes, Perceived behavioral Controls, Subjective norms.

1 Introduction

Instructional systems in a higher education context aim at supporting and automating, to a certain degree, the instructional process of a specific course [21]. The objective of these systems is to satisfy the instructional needs for a specific subject domain caused by the advances in research and technology, the emergence of the information society and globalization [15]. Nowadays, instructional systems make extensive use of the internet technologies because it has the potential to advance interactivity between the learner and the content, the learner and the instructor, and the learner and another learner, offer flexibility in learning and providing reusable resources [19]. This trend of using internet technologies to build instructional systems involves a high level of system complexity, a high level of technology use and integration, a strong instructional/pedagogical component and organizational and administrative components [20].

One of the major trends in education in North America has to do with how students will learn in the resulting internet based learning environment (ILE). What causes students to adopt or seek an ILE? Is it simply due to the internet trend? Are students influenced by their peers and friends, their predisposition to using the internet for chatting, forums etc.? If these factors are important to a students’ decision to accept the ILE for learning, then are these factors inter-related? Understanding the answers to these questions have significant practical and theoretical implication with respect to realizing expected benefits because these benefits can only be achieved if students willingly intend to enroll in ILE.

Instruction over the internet is perceived by many researchers to be a significant breakthrough in teaching and learning. This is attributed to the fact that the internet technology allows and facilitates the exchange of information and expertise while providing opportunities for types of learners in remote and disadvantaged locations [13, 28]. Contrary to this perception, one finds many educators and trainers [16, 7] who do not believe the usefulness of online instruction on solving difficult teaching and learning problems [9]. Additionally other researchers are concerned about the many barriers that negatively influence effective online
teaching and learning. Some of these barriers are the changing nature of technology; the complexity of networked systems, the lack of stability in online learning environments and the limited understanding of instructors and students role in an ILE.

Much research has attempted to understand acceptance of various ILEs usage, few have addressed what motivates students in making ILE acceptance decisions. Some information systems (IS) research has addressed the motivational underlying factors that predict student acceptance [18, 23, 24, 25, 26] using the technology acceptance model (TAM) [10, 11]. Other dominant theoretical paradigms are available to understand student acceptance of ILEs. These include the theory of planned behavior (TPB) which is extensively used in health care. The TPB grounded in social psychology, posits that behavioral intentions are a function of attitudes (ATT), subjective norms (SN), and perceived behavioral control (PBC). The aim of our empirical study is to gain insight into the effects of ATT, SN and PBC on intentions to use an ILE, using the TPB.

2 Research Model and Hypotheses

Although the body of literature is large and growing, the subset of literature dealing with student satisfaction and acceptance of ILEs is small [27]. The theory of planned behavior [2] can be used to explain behavior with respect to ILEs. The historical antecedent of the TPB lies in the theory of reasoned action [12]. The TPB is an extended model to the theory of reasoned action (TRA) originally developed by [3].

**Attitude (ATT)**

**Subjective Norm (SN)**

**Perceived Behavioral Control (PBC)**

**Behavioral Intention (BI)**

![Diagram of the Theory of Planned Behavior](image)

**H1:** Attitude has a positive effect on intention to use the ILE.

**H2:** Subjective norm has a positive effect on intention to use the ILE.

**H3:** Perceived behavioral control has a positive effect on intention to use the ILE.

be measured from beliefs about the behavior under consideration. Behavioral norms include the influence that salient others (such as parents and friends whose opinions are important to the individual) would have on an individual to engage or not in the behavior under consideration and the individuals’ motivation to comply [6]. To account for such factors, a third variable, perceived behavioral control (PBC) was added in the TRA [4, 12].

The new addition of the PBC construct to the TPB model (which is absent in the TAM) has been sparingly tested and used in IS research [5]. Perceived behavioral control reflect the successful performance of an intended behavior, which is contingent on the person’s control over the factor that may prevent it and takes into account realistic constraints that may exist [2, 17].

It is clear that beliefs and associated evaluations lead to intentions. With respect to the use of ILEs, attitudes (or behavioral beliefs) of a student might be his/her beliefs that using the ILE, the individual can successfully complete the tasks and course requirements. Subjective norm (or normative beliefs) could be the students’ perception of his/her colleague’s opinions on using the ILE and experiences with taking an online course. PBC (or control beliefs) is the individuals’ perception that he/she possess the skills, resources and tools to successfully perform the required tasks. Based on the above discussion and previous theoretical expectations, we hypothesize that:

**H1:** Attitude has a positive effect on intention to use the ILE.

**H2:** Subjective norm has a positive effect on intention to use the ILE.

**H3:** Perceived behavioral control has a positive effect on intention to use the ILE.
3 Methodology

3.1 Study Context and Participants
A survey methodology approach was used for data collection. The beliefs of students registered in an introductory undergraduate management information systems on-line course were surveyed after an orientation session. The on-line course was developed for the web and students were able to use the learning tool anywhere, anytime. The system provides guidance and monitors students’ efforts with respect to three variables: Time spent on different parts of the system, chapters-based assessment scores, and participation in concept-based forum. Besides the fact that internet is widely used among students, the selection of the web to implement the learning tool is appropriate [1]. The course is required as part of their undergraduate bachelors degree. Students in the course were majoring in one of the following: finance, accounting, MIS, human resources, international business, operations management, and administration. Students from the Engineering and Computer Science faculty also take the course because it supplements their program and due to the flexibility of the online environment. Students were presented the survey questionnaire on-line and were given the choice to participate. Out of 168 students who registered for the course, 114 completed the survey. The student’s sample represented a group: with an average age close to 24 years and work experience approximately 1y ear; which claims to be somewhat knowledgeable in computers and rate their experience with at least one Microsoft product as high; and have been using the internet for about one year and uses it around 1.5 hours a day. Therefore, based on the students’ experiences with computers we expected that they are likely to possess well-formed beliefs and positive perceptions about information technologies.

3.2 Operationalization of Research Variables
All research variables were measured using a five-point Likert-type scale with anchors from “Strongly disagree” to “Strongly agree.” Items used to operationalize the constructs were adopted from different relevant prior research work.

3.3 Assessment of Measurement Model
Psychometric properties of the scales are assessed in terms of item loadings, discriminant analysis, and internal consistency. Reliabilities of individual items are assessed by examining the loadings of the items on their respective constructs. These loadings should be higher than 0.5, following the criterion indicated by [22] to indicate that significant variance shared between each item and the construct.
Table 1 presents the factor loadings of the research construct items. Descriptive statistics and reliability assessment are shown in table 2. As can be seen from the factor loading results (Table 1), all items exhibit high loadings, well above the criteria of 0.5. The loadings show a clear convergent validity for all constructs.

<table>
<thead>
<tr>
<th>Variables</th>
<th># of items</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (ATT)</td>
<td>3</td>
<td>3.8</td>
<td>0.85</td>
</tr>
<tr>
<td>Subjective Norm (SN)</td>
<td>2</td>
<td>2.6</td>
<td>0.76</td>
</tr>
<tr>
<td>Perceived Behavioral Control (PBC)</td>
<td>3</td>
<td>3.8</td>
<td>0.79</td>
</tr>
<tr>
<td>Intention to Use (I)</td>
<td>2</td>
<td>3.6</td>
<td>0.91</td>
</tr>
</tbody>
</table>

To evaluate discriminant validity, [14] suggested a comparison between the average extracted variance of each factor and the variance shared between the constructs (the squared correlations between the constructs). It is expected that the loadings of all items within a construct should be high on that construct, indicating high convergent validity, and low on the other ones, displaying high discriminant validity. The first characteristic indicates that they share a lot of variance with their construct and the latter that they are independent from the other constructs. Cross-loadings of items are reflected in Table 3.

<table>
<thead>
<tr>
<th>Table 3. Inter-Construct Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>ATT</td>
</tr>
<tr>
<td>I</td>
</tr>
</tbody>
</table>
### 3.4 Assessment of Structural Model

The assessment of the structural model was done using the PLS approach using PLS Graph \[8\]. The estimated path effects are given along with their degree of significance. The paths are interpreted as standardized beta weights in a regression analysis. A bootstrapping procedure was used to assess the level of significance of the paths computed by PLS. T-values were computed from a series of PLS evaluations made against several partitions of the data set. The results of the PLS run with the overall sample (n=114 observations) are shown in Figure 2. All of the constructs were modeled as reflective and were measured using multiple indicators, rather than summative scales.

Perceived usefulness and attitude together explain 38% of intentions, while social norm, perceived behavioral control, and attitude explain 58%. The theory of planned behavior explains intentions around 50% better. Perceived usefulness and perceived ease of use account for 46% of the variance in attitude. It is evident from figure 2, PLS results provide stronger support for the theory of planned behavior than those of the technology acceptance model.

Hypotheses 1 and 6, which posited that perceived usefulness and social norm would influence intentions, were not supported. Hypothesis 2 (ATT→I = -0.232) is marginally supported. Hypotheses 3, 4, 5, and 7 are strongly supported.

<table>
<thead>
<tr>
<th></th>
<th>SN</th>
<th>PBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect</td>
<td>0.45</td>
<td>0.52</td>
</tr>
<tr>
<td>SN</td>
<td>-0.33</td>
<td>-0.77</td>
</tr>
<tr>
<td>PBC</td>
<td>0.92</td>
<td>0.20</td>
</tr>
<tr>
<td>I</td>
<td>0.92</td>
<td></td>
</tr>
</tbody>
</table>

4 Conclusions

This research was driven by the need to better understand student behavior in online learning environments in higher education. Acknowledging the fact that the nature of information technologies has changed considerably, we argue that in the case of online learning, we need to focus our attention to a complete and structured learning-design-assessment approach to development. Not only does this approach provide a structured framework to design and assess online learning, it also

- Provides controls at different levels to reproduce under specific experimental setups
- Allows researchers to implements under different contexts
- Permits the studying of direct and indirect effects of constructs on one another
- Can give tangible and measurable results that may tell the researcher how to modify the design to obtain enhanced student experiences

The primary goal of this paper was to enhance our understanding of student behavior (more specifically intentions) in an online educational system using the theory of planned behavior. Our results demonstrated the appropriateness of the theory of planned behavior in explaining variances. This study offers new evidence that a properly designed learning environment can result in favorable behavior of students toward their online learning experience.

![Figure 2: Model parameters for the research model.](image-url)
References


