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An Inductive Analysis of Factors Affecting Student Attitudes toward a Virtual World Learning Environment

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ABSTRACT

Virtual world learning environments have great potential to enhance education, yet the specific factors that attract students are relatively under-researched. Drawing on insights from a qualitative analysis of student reactions to the Second Life environment, we identified five main factors that influence student attitudes toward using a technology in education: ease of use, usefulness, likability, technology accessibility, and system quality. The results supplement traditional notions of enhanced capabilities as the key to use of technology, by discovering additional factors that influence adoption and sustained use of new technology in a learning environment.

Keywords

Virtual world environment, Technology Acceptance Model, users' attitude toward technology

INTRODUCTION

Three-dimensional internet-based virtual world environments such as Second Life have been used in education since 2003 (NMC, 2008; Hew and Cheung, 2010). A virtual world learning environment (VWLE) can be defined as a "computer-based simulated environment resembling the real world in which learning takes place through simulation and interaction among avatars and with virtual objects" (Zhang and Zigurs, 2009). In educational settings, the integration of Second life activities can enhance student learning satisfaction (Shen and Eder, 2009; Wagner and Ip, 2009; Wang and Braman, 2009; Zhang and Zigurs, 2009). However, students report mixed feelings about the technology, including the lack of occupants in the virtual world, decreased learning satisfaction, demanding system requirements, and unintuitive interface design (Zhang and Zigurs, 2009).

This study furthers our understanding of student attitudes toward VWLEs and the factors that affect technology usage from a student's perspective. VWLEs are so novel and different from current course management systems or Web 2.0 social networking environments that we do not expect theories and insights from traditional forms to easily translate to this environment. Thus a certain level of inductive understanding of the new environment needs to be achieved.

CONCEPTUAL BACKGROUND

Numerous factors affecting technology usage and acceptance have been examined, from such perspectives as technology characteristics (Tornatzky and Klein, 1982; Segars and Grover, 1993), users' beliefs (Fishbein and Ajzen, 1975), users' perceptions (e.g., Davis, 1989), and external variables (Venkatesh and Davis, 1996). Key findings from this research are: beliefs and evaluations impact attitude toward behavior; normative beliefs and motivation to comply affect subjective norms; and beliefs combine to influence behavioral intention and actual behavior (Fishbein and Ajzen, 1975). Compatibility, relative advantage, and complexity impact adoption significantly across a wide range of innovation types (Tornatzky and Klein, 1982). Factors of perceived usefulness and perceived ease of use determine users' intention of using a technology (Davis, 1989). External variables include system characteristics, user training, user participation in design, and the implementation process (Beldarrain, 2006; Ely, 1990; Venkatesh and Davis, 1996). Motivation is believed to be a key determinant of IT adoption (Deci and Ryan, 1985; Agarwal and Karahanna, 2000). This wide range of studies sets the foundation for expectations about technology use and acceptance in general.

In studies of web-based technologies in particular, perceived enjoyment and computer playfulness have been shown to affect technology usage (Sun and Zhang, 2009). User satisfaction, relative advantage, and perceived security influence web-based

technology adoption (Ye, Desouza, Papagari Sangareddy, and Jha, 2008). The limited research on virtual worlds has examined such factors as sense of presence, sense of social presence, personality traits, computer anxiety, computer playfulness, computer self-efficacy, perceived enjoyment, entertainment value, visual attractiveness, perceived usefulness, and perceived ease of use (e.g., Van Raaij and Schepers, 2008; Shen and Eder, 2009; Verhagen, Feldberg, van den Hooff, and Meents, 2009; Zhang and Zigurs, 2009). Although the literature provides some direction for issues that might influence student attitudes, a greater depth of understanding is needed in this environment.

RESEARCH METHOD

We used an inductive approach (Patton 2002; Thomas 2006; Trochim and Donnelly, 2007) with collection of data through open-ended questions. Insights gleaned from the analysis of responses were used to classify emerging factors that influence student attitudes toward using a virtual world environment. The existing literature provided perspectives for the types of factors that might influence student attitudes. However, given the relative dearth of empirical research on these environments, along with the unique features of virtual worlds that distinguish them from other technologies used in education, an inductive approach was appropriate for examining the question in greater depth. By acknowledging and taking into consideration insights from the extant literature, investigation of the research question helped to identify new emergent factors that might influence student attitudes towards using a virtual world environment.

Participants

The study was conducted in the fall semester of 2009 in a traditional classroom setting at a Midwestern university in the United States, in an introductory course on the use of information systems in organizations. Fifty-eight students participated (93% male; 67% between 18 and 20 years of age, with the rest older; 38% freshmen, 30% sophomores, 18% juniors, and the rest higher level). Only 10.7% of the students reported no experience at all with Second Life or other virtual worlds.

Task and Procedures

Second Life was used as the virtual world learning environment for a six-week group project. Students were instructed on how to create their own avatar within Second Life. Preliminary assignments provided basic experience with navigating the virtual world and background knowledge on potential uses of Second Life, including videos, reading material, and a discussion forum on the prospects of Second Life in education and business.

The task for the group project was to explore how businesses or organizations were using their Second Life sites. Second Life was both a learning platform and a collaboration tool. At the end of the semester, students were required to submit a group report of their findings and experiences in Second Life, answering two questions:

1. How have your ideas about Second Life changed after the group project using the technology?
2. What factors are taken into consideration when assessing a technology used for courses from a student's perspective? Please elaborate.

Data Analysis

Coding of student responses to the two questions started with close reading of text and consideration of multiple meanings inherent in the text. All transcripts were read by the first author, to identify text segments that contained meaning units and to create labels for categories into which the text segments were assigned. A category could be linked to other categories via different relationships, such as a hierarchy or a causal sequence. To ensure trustworthiness of the data analysis and following the procedure of coding consistency checks in the general inductive approach, a subsample was read and coded by the second author. The second author was given the research objectives, the categories, and some of the text assigned to the categories. She was then given text that had not been coded and asked to assign sections of the new text into the initial categories. The two independent coders came to consensus on categories and descriptions through discussion.

RESULTS

Change in Ideas about VWLE

This section presents the results of analysis of responses to the first question: **How have your ideas about Second Life changed after the group project using the technology?**

A majority of students commented that their ideas about the Second Life platform remained unchanged by their experience. For those whose ideas had changed, some changed for better and some for worse. Second Life appears to have excellent potential as a platform for education, as well as for business use in developing new concepts and products and getting customer feedback on ideas, but there are obstacles that need to be overcome.

During my group project, I took note of how many more uses for Second Life that other companies have found that I could never have thought of myself. I feel that right now, its current survival will rely on human ingenuity to find new ways to use what little tools are currently available on Second Life.

The advantages of Second Life for use by business and education were still there. The ability to use Second Life as a long distance medium for businesses is a nice touch for those businesses that are global. Besides the communication, businesses can use Second Life as an advertising place.

When I first heard of Second Life, I thought it was a video game, and just another social network. Now I see it as more of an Internet tool.

I have had several of my ideas and opinions about Second Life change throughout the project. I originally thought it wasn't a very useful program and could be hard to use. In reality, the interface is pretty helpful once you get used to it. Second Life has a lot of potential that I didn't see at first. Now only could business use it to assist in their marketing campaigns but upstarts could begin to exchange virtual content for profit.

The analysis revealed three major issues about Second Life that needed to be overcome: (1) accessibility: Second Life should be able to run and function purely online with no software installation; (2) user base: Second Life has a very small and limited user base; if more people could access Second Life more easily, then it could become more mainstream; and (3) system quality: Second Life is very slow to render images regardless of the user's internet connection speed; it uses low-level graphics; the user interface still has a learning curve; and much of the program remains extremely visually-oriented.

Factors for Assessing Course Technology

We next present the results of analysis from the responses to the second question: **What factors are taken into consideration when assessing a technology used for courses from a student's perspective?**

The inductive coding of responses to this question revealed five broad categories, or factors. The factors (and the number of occurrences of each) are: ease of use (43), usefulness (41), likability (18), technology accessibility (14), and system performance (10). The two pre-dominant factors were ease of use and usefulness. The following subsections discuss each of the five factors and provide key illustrative quotes from the transcripts.

Ease of Use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). The majority of students thought that ease of use and usability were two of the most important factors when assessing a course technology. The most common examples of ease of use were the ability to grasp capabilities and operation of an application quickly. Usability related to how easy the technology was to use and set up, as well as how easy the interface was to use and how it was implemented.

When a technology is required for interaction in a course, the most important thing for me is ease of use. If one single interface or task takes up a disproportionate amount of my time, it becomes quite annoying.

It can be very frustrating to use an unintuitive program, especially when grades may depend on our ability.

Students felt that a new technology could be intimidating or discouraging, and they preferred to use a technology that was familiar to them.

Many students would rather not have to learn how to use a new technology. The students would rather use technology that they are comfortable with.

If you have a class of beginners, it would not be a good idea to introduce a complex technology tool for them to use that would take them weeks to master. This would also discourage students.

A steep learning curve can be annoying.

Ease of use was also important to students as it related to their interest in the technology and their desire to keep using it once the course ended.

If some piece of technology is easy to use and keeps me interested while helping me do something, I will most likely keep using it.

Ease of use also related to the ability to run the application on a variety of hardware platforms. Second Life is an internet-based application and can be run on different platforms, which was welcomed by the students.

Usefulness

Perceived usefulness is generally defined as “the degree to which a person believes that using a particular technology will enhance his performance” (Davis, 1989, p. 320). The themes that emerged in relation to usefulness were value for learning; applicability to business environment; ability to start using quickly and stay engaged; relevance to what is being taught; and capability of the technology.

Students commented on technology benefits and value for learning:

When a technology is particularly valuable in helping students get the class work done more quickly and more accurately, it shows its value as a resource.

If students are easily able to see the real-world applications of your technology, they will want to become familiar with it for the future.

Students took into account whether the technology provided any benefit over what was already available:

I do not think technology should be used when it does not benefit more than a non-technological approach. Although I absolutely love anything that has to do with computers and technology, I still truly think that their use should be limited to providing better solutions to problems, not adding bloated, electronic messes to tasks we as creative, intelligent humans have mastered on our own.

A factor is does this technology provide any benefit over what is already available. When applied to Second Life this factor is a bit two handed, in that this benefit can be a bit subjective. Some students would like the SL forum for learning others would not. This use of SL would be beneficial for distance learning and online courses but it doesn't really offer any benefit over what is already available.

Students had different opinions on the usefulness of Second Life:

Second Life is useful to the student because that platform can allow the student to take an online course but have a sense of immersion in where he is actually in the course.

The feeling of being in a virtual world takes away the educational aspect of this technology because you are distracted by most of the things you can do and not what you can learn.

The coded comments revealed that usefulness and ease of use could be in contradiction with each other, at the same time that they were the two most important factors that could influence student attitudes toward using virtual world learning environments.

Likability

Likability was the third factor that students took into consideration, referring to whether the technology is enjoyable to use. “Appealing,” “interesting,” “fun,” and “popularity” were other words used by the students that reflected a technology’s likability. Likability keeps students interested in using the technology because if the interest is gone, the motivation to use it may also be gone. Students thought that likability and ease of use would influence their use of the technology significantly.

It should be appealing. Making a program that impresses a student visually or through performance increases the chances that they are going to put some serious time into using it and learning through it.

The factors you should take when using a technology for students to use in a classroom is first of all is interest. Students must be interested in it to want to learn.

Factor popularity which coincides together as most of the time popularity is what makes it interesting.

If it isn't aesthetically pleasing or easy to jump into then I tend to toss it aside without a second thought. I feel as though Second Life failed me in both presentation and simplicity. Therefore, in its current state I would not recommend it to anyone.

Another thing that I was worried about was how popular it was or could be. I feel this is a legitimate worry since there are not many people using it today and I feel it would be hard to get people to start.

Technology Accessibility

Accessibility reflected opinions that the technology should be widely available anywhere and either free or relatively inexpensive.

The accessibility of the technology is also important. If a technology is required for a course, but the student does not have an adequate accessibility for that technology, then they will be at a disadvantage for the course.

One of the most important (factors) to me is the accessibility of that technology. It doesn't matter how good the technology is or how much help it gives, its usefulness is brought down when it is hard to get to. Second Life was not too hard to get to but it was annoying that not many of the computers out of so, so many, had Second Life on it.

Students wanted to access the technology on campus and at home, therefore the cost of the technology was a major concern for many students. Second Life is free software but it has high system requirements. Students were concerned about the demanding system requirements since they might need to pay the cost of updating components such as the video card or even the computer itself.

The first and foremost is cost. If the technology is too expensive then it will deter students from its use.

Then you must also consider cost. To include everyone the application needs to have low system requirements.

System Quality

System quality includes reliability, consistency, response time, interface design, security, and error management. Reliability means that the technology needs to be stable for people to use. If a system crashes often, due to either computer or people error, there is an unnecessary burden on students and this deters students from using the technology.

I still believe that Second Life, while it does attempt to make itself customizable and accessible to everyone, is still in its early stages. The program is very slow to render images, uses low-level graphics, and the user interface still has a learning curve.

At this point in time it takes an exceedingly long time for the graphics to render and I find the lack of people logged on as a sign of dislike for the program.

Other Factors

Other factors mentioned by the students that would influence their attitude toward a technology included viability, novelty, interactivity, and longevity of the technology.

The main things, especially for college students, are application in the business world, new and future technologies, and innovation. Application in the business world is an important one due to that fact we are about to head out into the real world and need to be viable in the workplace.

The last factor is the longevity and future potential use of the technology. It's not necessary for learning purposes but it's always a plus to teach someone something that will continue to use. Second Life has a good potential future use but it seems at this rate its longevity is going to be very short, it has a long way to go.

DISCUSSION

Before the project started, students were oriented to Second Life through readings and by watching demos and video clips in class. The majority of student comments surrounding Second Life involved using it as a potential business tool, primarily for advertising and marketing purposes, and as a useful technology for education. However, after the students had interacted and explored Second Life, the researchers were able to see changes in the ways students perceived the benefits of Second Life. We chose to investigate how and why students had changed their perceptions, which helps further our understanding of student attitudes toward VWLEs and the factors that affect technology usage from a student's perspective. VWLEs are so novel and different from current course management systems or Web 2.0 social networking environments that we do not expect that theories and insights from traditional forms would easily translate to this environment. Thus a certain level of inductive understanding of the new environment needs to be achieved.

A majority of the students initially perceived Second Life to be a useful platform for businesses and for collaboration among people. But what the students found after exploring Second Life was the lack of people and therefore lack of interaction in the virtual world. This discovery made the students question the benefits of Second Life and all the hype surrounding this virtual world environment. They also realized that it took a long time for graphics to render and that the system was not always reliable. A number of comments were made regarding the low usefulness of Second Life as a business tool due to it still being under-developed. Based on the students' experience with Second Life, it appears that the actual implementation part of this virtual world platform is not up to par yet with other online applications. The limited user base, unintuitive interface design, and clumsy controls associated with Second Life deter many potential users from continuing and exploring the virtual environment.

It is important to note that the capabilities of any new technology - in this case, Second Life - are an important factor in determining its use; however, capabilities are not the *only* factor. As the findings of our study reveal, Second Life may have numerous capabilities such as communication space, simulation space, and experiential spaces that can be utilized in conducting conferences and online classes, setting up businesses, and running simulations. But factors such as ease of use, likeability, technology accessibility, and system quality also play a role in a user's continued use of the application. We believe that the lack of a critical mass of people in Second Life, as identified by almost all the students, could be the result of the factors just stated. In terms of using Second Life for educational purposes, it may be possible to get students to use Second Life for specific simulations. However, due to the steep learning curve and the need for the existence of the factors discovered in this study, sustained use of Second Life might be challenging.

Although it might seem that the negatives weigh more heavily against Second Life, we would like to point out that students seemed to have limited understanding of the various ways in which Second Life might be used before the project. For some students, it was apparent that once they had exposure to Second Life and worked on their assigned tasks for the project, they were able to see new ways in which Second Life may be used. The following examples from the transcripts provide evidence of this point.

After going to IBM's island I see Second Life being a great tool for online conferences. It makes it unique, and engages the user more than just a normal online conference.

Businesses can...test products and see how people would react in a virtual world...

In addition, through exposure to companies that had set up their presence in Second Life, student comments portrayed "critical thinking" about business activities. Students were able to identify the need for informed customer representatives to lure visitors to those businesses.

Companies that have set up Second Life islands and venues do not provide enough company-specific avatars to answer questions from visitors to their area.

As stated earlier, five factors clearly stood out in the responses made by students as to how they would assess technology used in courses, with the pre-dominant factors being ease of use and usefulness. This finding is entirely in line with the Technology Acceptance Model (Davis, 1989). However, these two factors were not the only deciding issues. Students were of the opinion that a classroom technology should also be likeable, i.e., it should be both enjoyable and maintain their interest for sustained use. This finding supports previous research on system value (Babin, Darden and Griffin, 1994; Holbrook, 1986), in which users value a system based on its usefulness and provision of enjoyment. Technology accessibility and system quality are the other themes that were evident throughout the transcripts, consistent with previous research on the information systems success model (DeLone and McLean, 1992). The findings in this study also echoed a recent study of the use of Second Life (Verhagen et al., 2009) which found that general technology beliefs, intrinsic enjoyment, entertainment value, and visual attractiveness had direct effects on attitude toward virtual world usage.

We believe that the factors derived from the students' responses on assessing classroom technology are valid and meaningful. We did not ask them specifically to assess Second Life as a classroom technology because we wanted to obtain students' general view of classroom technologies. The students in this study were exposed to other forms of technology that was used in the course such as PowerPoint, Blackboard and YouTube. Thus their responses were based on their experience with multiple classroom enhancement technology applications.

CONCLUSION

Drawing on insights from qualitative data on student reactions to a virtual world environment, we identified five main factors that were found to influence student attitudes toward using this technology in education: ease of use, usefulness, likability, technology accessibility, and system quality. The limitations of self-reported perceptions and a single course apply in this case. However, self-report is both relevant and common practice in studies in an educational setting. The assigned task lacked some dimensions of collaboration, but coordination, distribution of labor, interaction and feedback, and group norms were all involved during this project. Students were provided guidance on the task, especially at the beginning, but ample self learning took place as they continued to work within the environment. It may be that tools that are specifically designed for training and collaboration would result in higher student satisfaction, but an open virtual world such as Second Life has benefits, alongside its drawbacks. It is not a controlled experience, but it does resemble the real world which enables discovery opportunities.

The contribution of this study lies in the fact that it questions traditional notions of enhanced capabilities as the key to use of technology, by discovering additional factors that influence adoption and sustained use of new technology in a learning environment. Future research on these and related issues will help to deepen our understanding of the important role of ever-changing technology and advanced learning environments in education.

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