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Perceptions of Students in an Event Management Program of Annotation Systems and Their Influence on Student Learning

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ABSTRACT

Nota bene is a collaborative document annotation Web site on which students can read lecture notes and class material and ask or answer questions of other students online. Utilizing collaborative theories of learning and the technology acceptance model in this study, we examined use and perceptions of Web-based collaborative annotation software among event management students. A self-reported survey instrument was given to 206 event management students, and findings revealed significant relationships between learning climate and social interaction and between perceived ease of use and perceived usefulness. Perceived ease of use and perceived usefulness were also related to learning satisfaction. In addition, learning satisfaction was related to behavioral intentions to use Nota bene. Implications for educators are discussed.

KEYWORDS

Collaborative learning; event management education; technology acceptance model; web-based annotation

Introduction

Event management (EM) educators continue to enhance the design of classroom instruction by incorporating more active and collaborative methods of teaching and learning. In fact, the advancement of computer-supported collaborative learning provides enhanced opportunities for developing Web-based systems that allow students to learn from other students (Wang, 2009). *Collaborative learning* is defined as social interaction that includes a community of learners and instructors in which students share their experiences and knowledge about a topic asserted by instructors (Su, Yang, Hwang, & Zhang, 2010). Collaborative activities center on four elements: (a) The student is the focus of instruction, (b) interaction and doing are of relevance, (c) working in groups is important to facilitating learning, and (d) real-world challenges and issues are incorporated into the learning (Cornell University, 2016). Numerous scholars have examined the role of collaborative learning in higher education (e.g., Su et al., 2010). Based on work by Johnson and Johnson (1989) and Panitz (1996), Laal and Ghodsi (2012) suggested that collaborative learning includes social benefits (e.g., it develops a social support system for learners), psychological benefits (e.g., it increases students' self-esteem), and academic benefits (e.g., it increases classroom results). Furthermore, hospitality educators have examined collaborative learning in the context of hospitality education (e.g., Altinay & Paraskevas, 2007).

Nota bene (Nb; https://nb.mit.edu/welcome), a collaborative document annotation Web site recently developed by the Massachusetts Institute of Technology (MIT) Computer Science and Artificial Intelligence Laboratory, is a technological tool that can be used to enhance collaborative learning. In Nb, an instructor can post lecture notes and class material in a portable document format (PDF) document, and students can engage in an online discussion of the material by hovering their cursor over the material and leaving annotated comments. Other students and instructors can add to the discussion by leaving additional annotated comments and responses. Nb was designed to eliminate the drawbacks of traditional paper-based notes, such as students losing their paper notes, as well as the inefficiency of students having to e-mail questions to faculty (Zyto, Karger, Ackerman, & Mahajan, 2012). Although methods of annotating class instruction have existed for some time (e.g., annotating a traditional textbook), limited research has documented the impact of annotation systems on collaborative learning.

Collaborative learning is based on the constructivist theory of learning, which states that students are active learners and need to construct knowledge for themselves (Geary, 1995) with interaction between individuals and the environment. Constructivist learning is complex and nonlinear in nature. Prior research has shown that social factors, such as collaborative learning

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(Francescato et al., 2006) and the learning climate (Chou & Liu, 2005), can impact a learner. One of the attributes of Nb annotation is the interaction one has with others.

For many students, the use of an annotation system Web site is a new technological method and format for collaborative learning and interactions. The technology acceptance model (TAM; Davis, 1989) has been used extensively by researchers to explain how users accept and adopt new technology. The original TAM consists of five variables: perceived ease of use, perceived usefulness, attitude toward using technology, behavioral intention to use technology, and actual system use. TAM has been used in computer-supported learning studies such as studies on Web-based learning (Gong, Xu, & Yu, 2004), online learning communities (L. Liu, Chen, Sun, Wible, & Kuo, 2010), and collaborative learning (Su et al., 2010) as a framework to explain how users acclimate to new technology.

Education in the EM field is dynamic and continuously evolving. This field involves an EM curriculum that should entail learning in areas of strategic planning, project management, risk management, financial management, administration, human resources, stakeholder management, design, site management, marketing, professionalism, and communication (Meeting Professionals International, 2012). EM education is a logical fit for the use of collaborative annotation systems for two reasons. First, industry-related work in EM is accomplished through the use of collaborative teams involving suppliers, contractors, venue managers, and skilled hourly labor. Collaborating through annotation allows students enrolled in an EM program to enhance their skills related to collaboration. Second, learning, accepting, and mastering unfamiliar technology is a vital skill, as technology advancements are commonplace in EM. Students' introduction to Nb provides them with experience in learning a new system.

The aim of this research was to explore students' use and perceptions of annotation systems in an EM program and their influence on learning achievements. This research was guided by the following three research questions: (a) What are students' attitudes toward using an annotation system? (b) What is the effect of learning climate and social interaction on perceived usefulness and perceived ease of use? and (c) What is the effect of learning satisfaction on behaviroal intentions? Using the constructivist theory of learning and TAM, this research extends the theoretical understanding of annotation in a collaborative environment. Furthermore, this study's findings provide implications and best practices for EM education instructors who are interested in utilizing annotation systems.

Literature Review

Theories of Collaborative Learning

Collaborative learning is based on the constructivist theory of learning, which states that students are active learners and need to compose knowledge for themselves (Geary, 1995). According to this viewpoint, collaborative learning in the classroom, with interaction between individuals and an environment, provides an opportunity for students to share their own perspectives and experiences and build onto experiences with others. Furthermore, the collaborative learning approach involves students working together to solve real-world challenges. Through collaborative learning, students are able to decide for themselves how to exchange ideas, share perspectives, provide experiences, and use previous knowledge on how best to answer a question or solve a problem (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007). Prince (2004) noted that collaborative learning can be described as students working in small groups to complete a goal. Moreover, students understand class material better when they are able to discuss the material (Bonwell & Eison, 1991).

Educators have utilized collaborative learning in a variety of settings, including in Web-based education, which has been the focus of a growing number of researchers since the 1990s. For example, Web-based collaborative learning environments allow students to share and participate without limitations based on their specific knowledge levels (Kagan, 1994). Evidence from research has revealed other benefits of Web-based collaborative learning environments, including group interconnectedness, incorporation of professional experiences, enhancement of students' critical thinking skills, an increase in involvement with the subject, and enhancement of problem-solving skills (Waugh & Su, 2016). However, a few researchers have suggested limitations to Web-based collaborative learning. Collaborative learning in the online environment may be impacted by a student's ability to navigate technology (Kagan, 1994) as well as by his or her frustration (Capdeferro & Romero, 2012). Recently, scholars have begun to examine Web-based collaborative learning environments in the areas of computer-simulated three-dimensional virtual environments (e.g., Correia, Fonseca, Paredes, Martins, & Morgado, 2016), social media (e.g., Kimmerle, Moskaliuk, Oeberst, & Cress, 2015), and the use of cloud-based systems such as Google Docs (e.g., S. H. Liu & Lan, 2015).

Nb Annotation System Description

Many Web-based annotation systems were developed in the 2000s (Su et al., 2010) with their roots in hypertext systems, and several annotation systems (e.g., Dublin Core) have been used to enhance learning.

However, some research (e.g., Brush, Bargeron, Grudin, Borning, & Gupta, 2002) has suggested that collaborative annotation tools present various barriers to adoption. Nb was designed by The Haystack Group in the Computer Science and Artificial Intelligence Laboratory at MIT through efforts by David Karger and Sasha Zyto (Karger & Zyto, 2012). Zyto et al. (2012) suggested that the design of Nb contrasts with past linked hypertext programs in three ways: (a) Users can comment in the margins without leaving the document; (b) comments in margins attract users' attention, encouraging responses; and (c) users are able to consider all comments and threads together.

The design of Nb allows individuals to read and annotate PDF documents. These documents are then augmented by annotations that students and faculty have written, which appear as an expandable discussion on the right side of the panel. Hovering the cursor at a particular spot in the document highlights the annotations relating to the material at that spot, whereas clicking somewhere on the document scrolls to the corresponding annotation. Users can choose whether their comment will be visible to everyone in the class, to just their team, to the teaching staff, or to themselves only. For example, a student may highlight a specific region in a document and post a question, and then any student or instructor can respond to that question. In addition to viewing the comments, an instructor can download a report that provides the number of comments, number of characters, and number of words used by each user.

Nb has been used in more than 100 courses at 10 institutions (Karger & Zyto, 2012), including by faculty from MIT, Harvard, California State University, and Iowa State University. Only a limited number of studies of the impact of Nb exist. A study by Zyto et al. (2012) of 14,000 distinct annotations found that students and faculty generally gave positive feedback regarding the use of Nb in classes. Their findings indicated that students (a) interleave annotation with reading, (b) combine responses to several geographically located threads, and (c) appreciate a fast response time to their own questions left in the annotated environment.

TAM

TAM (Davis, 1989) is the predominant model utilized to explain how users adopt and use technology. TAM, based on Fishbein and Ajzen's (1975) theory of reasoned action, holds that perceived usefulness and perceived ease of use explain the factors that influence the decision of a user to adopt and to use a new technology. *Perceived usefulness* can be defined as the degree to which a user believes that a specific technology can increase his or her performance, and *perceived ease of use* is defined as how comfortable a user believes he or she will be using that specific technology. Please see Legris, Ingham, and Collerette (2003) for a meta-analysis of empirical research using TAM.

This model has been used extensively in examining how classroom technology is adopted by students (X. Liu, 2010; Su et al., 2010). For example, Chung and Ackerman (2015) used self-efficacy theory and TAM to explain students' reactions to the classroom management software Moodle. TAM has also been used to explain technology acceptance in hospitality and tourism education, specifically in the area of computer-supported collaborative classrooms (Ali, Nair, & Hussain, 2016). In addition, Mejia and Phelan (2014) found support for TAM in students' enrollment in online courses in hospitality.

Model Development and Research Hypotheses

In this study, we propose a model to explain students' perceptions of using Nb as an annotation tool to facilitate learning of EM concepts. We conceptualize learning climate and social interaction as predictors of students' evaluation of the perceived usefulness and perceived ease of Nb. Furthermore, we suggest perceived usefulness and perceived ease of Nb as predictors of learning satisfaction. In this section, we provide a discussion of the six constructs used in this model: learning climate, social interaction, perceived usefulness, perceived ease of use, learning satisfaction, and behavioral intentions to use Nb in the future.

Learning Climate

Scholars have provided numerous definitions for learning climate, which is a complex concept to measure. For example, Ambrose, Bridges, DiPetro, Lovett, and Norman (2010) defined the *classroom climate* as the intellectual, social, emotional, and physical environment in which a student learns new information pertaining to class. For this study, *learning climate* refers to the course content as well as the environment in which students learn. Content features affect formats and types of information in terms of course-related information that can provide value for a learner (Wu, Tennyson, & Hsia, 2010). Ambrose, Bridges, DiPietro, Lovett, and Norman (2010) suggested several factors that influence and enhance classroom climate, such as stereotypes, tone, student-to-student interaction, faculty–student interactions, and the course content. In Nb, instructors can affect the classroom climate as they upload PDFs of classroom notes, textbook

chapters, industry-related readings, and other relevant readings, and they also have the freedom to upload numerous PDFs throughout the course. Students who have a positive experience with the learning climate related to a particular technology are more likely to have a positive experience with that technology. Thus, we hypothesized that the more positive the perceptions of learning climate among students, the more positive the perceived usefulness and perceived ease of use of Nb would be:

H1: Learning climate has a positive effect on perceived usefulness of Nb.
H2: Learning climate has a positive effect on perceived ease of use of Nb.

Social Interaction

The increased use of technology in the classroom has resulted in an increased focus on human interaction in online collaboration (e.g., Madland & Richards, 2016). Online interaction promotes the cocreation of three presences—social, cognitive, and teaching (Cho & Tobias, 2016)—and enhanced learning can take place when online interaction occurs among all three types of presence (Akyol, Vaughan, & Garrison, 2011). Researchers have found positive benefits, such as in higher order thinking skills (Garrison, Anderson, & Archer, 2001) and cognitive learning outcomes (Berge, 1997), and also a direct effect on individuals using an e-learning system (Pituch & Lee, 2006) when individuals interact in online environments. For this study, we utilized the definition of social interaction given by Garrison and Anderson (2003), which suggests that social interaction can occur in four ways: between (a) the teacher and the learner, (b) the learner and the learner, (c) the teacher and the content, and (d) the learner and the content. Pituch and Lee (2006) found that social interaction had a direct effect on the use of a learning system. While using Nb, students are able to view and respond to others' comments, and instructors are able to view and respond to students' comments. We hypothesized that the greater the perceptions of social interaction when using Nb, the greater the perceived usefulness and perceived ease of use of Nb would be:

H3: Social interaction has a positive effect on perceived usefulness of Nb.
H4: Social interaction has a positive effect on perceived ease of use of Nb.

Perceived Usefulness and Perceived Ease of Use

In TAM, outcome variables generally include perceived usefulness and perceived ease of use. If a technology system is easy to use, a learner will feel that online learning is useful (L. Liu et al., 2010). Several authors have found positive relationships between perceived usefulness and intention to use in e-learning environments. In a study of online learning communities, L. Liu et al. (2010) found that perceived usefulness and perceived ease of use influenced intention to use an online community.Perceived ease of use refers to the "degree to which We hypothesized that the greater the perceived usefulness and perceived ease of use of Nb, the more satisfied students would be with their learning in Nb:

H5: Perceived usefulness of Nb has a positive effect on learning satisfaction.
H6: Perceived ease of use of Nb has a positive effect on learning satisfaction.

Learning Satisfaction and Behavioral Intentions

Students make evaluations about new technology after direct experience with and use of the technology. Similar to Wu, Hsai, Liao, and Tennyson (2008), we conceptualized learning satisfaction as the sum of student feelings, attitudes, and evaluation resulting from the benefits of using the Nb system. We conceptualized behavioral intentions as the degree to which a student would favor using Nb in a future class. The relationship between learning satisfaction and behavioral intentions has been established with previous students in online education and e-learning (e.g., Lee, 2010). Thus, we hypothesized the following:

H7: Learning satisfaction has a positive effective on behavioral intentions.

Methodology

Survey Instrument

After obtaining university instructional review board approval for this study, we used a self-administered survey instrument to examine the relationships among the six study variables as follows. The first variable, social interaction, was measured via three items adapted from Johnston, Killion, and Oomen (2005; e.g., "Nb enables interactive communication among students"). Learning climate, the second variable, was measured via four items adapted from Wu et al. (2008),

previously adapted from Chou and Liu (2005; e.g., "The content in the Nb annotation system is interesting"). The third variable, perceived usefulness, was measured with three items adapted from Su et al. (2010; e.g., "I think Nb was useful in my group"). Perceived ease of use, the fourth variable, was measured by four items also adapted from Su et al. (e.g., "Using Nb makes me more productive"). Learning satisfaction, the fifth variable, was measured by four items adapted from Wu et al. (2008; e.g., "I am satisfied that Nb met my learning needs"). The sixth variable, behavioral intentions, was measured by two items adapted from Wu et al. (2008; e.g., "I would like to use Nb in other courses"). All measurement items utilized a 7-point Likert-type scale with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). All measurement items are displayed in Table 1. Four demographic questions were also included.

Data Collection and Sample

A purposive sample of 206 undergraduate EM students enrolled in a Midwestern university in the United States was recruited. Participants were students enrolled in either an introductory EM course (one semester) or a capstone EM course (two semesters). Both courses utilized a face-to-face approach with supplemental online and digital activities, including Nb annotation. Of the participants, three were not included because of missing values on their surveys, resulting in a total of 203 useable responses. Data collection took place during the second half of each semester. At that time, students had completed three sets of annotations over three different class modules and had annotated class material, including lecture notes, textbook passages, and research articles for each module.

Data Analysis

In this study, a two-step approach to structural equation modeling was utilized. First, a confirmatory factor analysis was used to examine the measurement model. Second, maximum likelihood estimation was used to estimate the structural model and examine the causal relationships among the study's variables. Mplus Version 7.4 software was used for all analyses.

Results

Demographic Profile

In terms of demographics, 95.0% of the students were female, and 92.6% identified as White/Caucasian. The high percentage of females was representative of the department's enrollment of EM students. The average self-reported grade point average of the respondents was 3.32 (SD = 0.41), and on average students had 1.82 years of event industry experience, with the length of experience ranging from no experience to 8 years. As expected, there was a significant difference in the number of years of student industry experience between the two classes (0.92 vs. 2.30), $t(176) = -6.294$. This can be

Table 1. Item loadings and reliability tests.

Factor and Item	Label	*M*	*SD*	Factor Loading	Reliability
Learning Climate (Chou & Liu, 2005; Wu et al., 2008)	LC				.88
The content in the Nb annotation system is interesting.		4.46	0.03	0.81	
I feel less pressure in the Nb annotation system.		5.15	0.04	0.70	
The climate in the Nb annotation system helps me learn.		4.71	0.01	0.96	
The interaction feature in the Nb annotation system helps me learn.		4.68	0.01	0.96	
Social Interaction (Johnston et al., 2005)	SOI				.88
The Nb annotation system enables interactive communication between the instructor and students.		4.38	4.38	0.81	
The Nb annotation system enables interaction communication among students.		4.82	4.82	0.88	
The Nb annotation system environment is an excellent medium for social interaction.		4.17	4.17	0.89	
Perceived Usefulness (Su et al., 2010)	PU				.95
I think the Nb annotation system is useful to share individual thoughts in my group.		4.62	0.02	0.90	
I think the Nb annotation system is useful to organize individual or group knowledge in my group.		4.59	0.01	0.96	
I think the Nb annotation system is useful in my group.		4.27	0.01	0.93	
Perceived Ease of Use (Su et al., 2010)	PEoU				.94
Using the Nb annotation system improves my grades.		4.98	0.03	0.73	
Using the Nb annotation system makes me more productive.		4.45	0.01	0.95	
Using the Nb annotation system makes me more effective.		4.43	0.01	0.98	
I find the Nb annotation system to be useful for schoolwork.		4.46	0.01	0.90	
Satisfaction (Wu et al., 2008)	SAT				.97
I am satisfied that the Nb annotation system meets my learning needs.		4.65	0.01	0.96	
I am satisfied with the efficiency of the Nb annotation system.		4.87	0.02	0.90	
I am satisfied with the effectiveness of the Nb annotation system.		4.71	0.01	0.96	
Overall, I am satisfied with the Nb annotation system.		4.78	0.01	0.96	
Behavioral Intentions (Wu et al., 2008)	BI				.95
I would like to keep using the Nb annotation system in the future.		4.18	0.01	0.98	
I would like to use the Nb annotation system in other courses.		4.04	0.01	0.95	

Note: Nb = Nota bene.

explained by the fact that one course was an introductory course, usually taken near the beginning of the student's course of study, and the other was a capstone course, typically taken toward the end.

Nb Statistics

At the beginning of the semester, the instructor explained the Nb annotation system by providing a handout, a grading rubric, and examples of annotations. In addition, in the first week of the semester, the instructor e-mailed the Nb annotation link to all students' e-mail addresses and put each student in a group comprising six to eight people. For each module, students were encouraged to annotate on a variety of aspects, including original content, questions pertaining to the material, industry anecdotes, and personal examples, and were required to complete a minimum of eight annotations. Students were able to see only the annotations of their assigned group members. Results indicated that a total of 13,944 annotations were created by three courses over five modules per course.

Measurement Model

Prior to testing the hypotheses, we conducted a confirmatory factor analysis that assessed the study variables' psychometric properties by estimating a measurement model containing the variables. Results yielded good fit indices for the six-factor model, $\chi^2(155, N = 203) = 315.05$, $p < .001$, comparative fit index (CFI) = 0.97, Tucker–Lewis index = 0.96, root mean square error of approximation (RMSEA) = 0.07 (Chen, Curran, Bollen, Kirby, & Paxton, 2008). We assessed convergent validity by considering composite reliability and the average variance extracted (AVE) scores for the constructs. The Cronbach's alpha values for each factor were satisfactory (.88–.97, above the recommended lower threshold value of .70; Nunnally, 1978; see Table 1). AVE scores were used to assess convergent validity. As shown in Table 2, AVE values ranged from .75 to .93, exceeding the .50 cutoff value (Fornell & Larcker, 1981). Furthermore, interconstruct reliability values ranged from .9 to .97, higher than the suggested value of .70 (Nunnally, 1978). Finally, we assessed discriminant validity by comparing the square root of the AVE of each latent construct with any interconstruct correlations in the model (Fornell & Larcker, 1981). As shown in Table 2, the AVE values arranged diagonally were greater than any of the correlations between the constructs, providing evidence for discriminant validity.

Table 2. Correlation matrix, CR, and AVE.

Variable	1	2	3	4	5	6	CR	AVE
1. LC	.86	.69**	.77**	.80**	.86**	.78**	.92	.75
2. SOI	.69**	.86	.78**	.66**	.74**	.72**	.90	.74
3. PU	.77**	.78**	.93	.73**	.83**	.75**	.95	.86
4. PEoU	.80**	.66**	.73**	.89	.81**	.76**	.94	.80
5. SAT	.86**	.74**	.83**	.81**	.94	.85**	.97	.89
6. BI	.78**	.72**	.75**	.76**	.85**	.97	.97	.93

Note: The square root of the AVE for each construct is shown on the diagonal of the correlation matrix. CR = composite reliability; AVE = average variance extracted; LC = learning climate; SOI = social interaction; PU = perceived usefulness; PEoU = perceived ease of use; SAT = learning satisfaction; BI = behavioral intentions.
**$p < .01$.

Structural Equation Modeling

Structural equation modeling was used to examine the path and structural model, and goodness-of-fit measures were used to assess the overall structural model fit. The fit indices for the proposed model indicated an acceptable model fit to the data, $\chi^2(162, N = 203) = 382.28$, $p < .001$, CFI = 0.96, RMSEA = 0.08 (Chen et al., 2008). The results of structural equation modeling are summarized in Table 3, and causal relationships between the constructs and the standardized path coefficients are shown in Figure 1. Learning climate had a significant positive effect on perceived usefulness ($\beta = 0.40$, $p < .001$) and ease of use ($\beta = 0.68$, $p < .001$), providing support for H1 and H2. Social interaction had a significant positive effect on perceived usefulness ($\beta = 0.55$, $p < .001$) and perceived ease of use ($\beta = 0.21$, $p < .05$); thus, H3 and H4 were supported. Perceived usefulness had a significant positive effect on learning satisfaction ($\beta = 0.54$, $p < .001$), lending support for H5. Similarly, perceived ease of use had a significant positive effect on satisfaction ($\beta = 0.44$, $p < .001$), supporting H6. Finally, learning satisfaction had a significant positive impact on behavioral intentions ($\beta = 0.89$, $p < .001$), confirming H7. In addition, the percent variance explained was 79.7% for perceived usefulness, 72.7% for perceived ease of use, 84.2% for satisfaction, and 78.9% for behavioral intentions.

Discussion

EM educators continue to explore new learning environments for EM students, including ways to enhance collaborative learning. Findings from this study suggest that the use of Nb annotation systems could be an effective tool for enhancing collaborative learning. Moreover, with this study's examination of the impact of learning climate and social interaction on perceived usefulness and ease of use of annotation systems, we contribute to the limited literature on annotation systems in conjunction with online collaborative learning.

Table 3. Standardized parameter estimates of the structural model.

Hypothesized Path	Standardized Path Coefficient	*SE*	*t*	Result
H1: LC to PU	.40	.066	6.14***	Supported
H2: LC to PEoU	.68	.065	10.56***	Supported
H3: SOI to PU	.55	.065	8.46***	Supported
H4: SOI to PEoU	.21	.071	2.94*	Supported
H5: PU to SAT	.54	.052	10.41***	Supported
H6: PEoU to SAT	.44	.053	8.29***	Supported
H7: SAT to BI	.89	.017	51.48***	Supported

Note: H = hypothesis; LC = learning climate; PU = perceived usefulness; PEoU = perceived ease of use; SOI = social interaction; SAT = learning satisfaction; BI = behavioral intentions.
*$p < .05$. ***$p < .001$.

Study results revealed significant relationships among all stated hypotheses, and in addition the percent variance explained was high. Results from this study suggest that learning climate can have a significant positive impact on perceived usefulness and perceived ease of use. Through the use of Nb, instructors are able to provide a plethora of content, such as lecture notes, industry articles, academic journal articles, and other PDF documents. This finding suggests that perceived usefulness of the Nb annotation system among students impacts the learning climate, such as the content and the climate of the Nb annotation system.

In this study, social interaction was found to have a positive impact on both perceived usefulness and perceived ease of use of Nb. This finding is supported by previous research that established that social interactions have a direct impact on use of a learning system (Pituch & Lee, 2006). Because this annotation system is used in an online format, it is important to consider the social and/or human interactions that can take place (Madland & Richards, 2016) so that perceived usefulness and ease of use for students can be improved and maximized. The findings from this research also revealed a significant effect of perceived ease of use and perceived usefulness on learning satisfaction. These findings are also consistent with previous research (e.g., Joo, Lim, & Kim, 2011). Nb annotation systems that are easy to use and understand will increase students' learning satisfaction levels (e.g., Joo et al., 2011) and increase their behavioral intentions to participate in the communal and collaborative nature of the system (L. Liu et al., 2010).

The findings of the relationship between learning satisfaction and the behavioral intentions of the students were also statistically significant. Learning satisfaction includes students' feelings, attitudes, and evaluation (Wu et al., 2008); thus, students with positive feelings and attitudes toward a system are more likely to use and engage in the system. In a traditional classroom, students may avoid raising their hand to share a comment or ask a question when they are unsure or feel that they lack the knowledge to contribute. However, because the Nb system is a Web-based collaborative learning environment, students may have higher behavioral intentions to participate despite their perception of their level of knowledge (Kagan, 1994).

Implications for Educators

Annotation systems in online collaborative learning environments provide several opportunities for EM educators. When instructors first introduce an annotation system in the classroom, they should set up clear expectations regarding learning objectives, guidelines for use, assessment guidelines, and examples. A handout explaining the annotation process, expectations, examples, and a grading rubric could be beneficial for students. Results from this study suggest that in addition to setting up the Nb process, instructors should promote a sense of social interaction as well as a learning climate when creating and describing the Nb framework for students.

It is important for educators to create and promote an environment that facilitates social interaction. Because Nb allows educators to read and comment on discussions, they should proactively engage in annotations with student teams. Several educational researchers (e.g., Gunawardena, 1995) have suggested that social presence, real or imagined, can be utilized to facilitate relationships and enhance communication

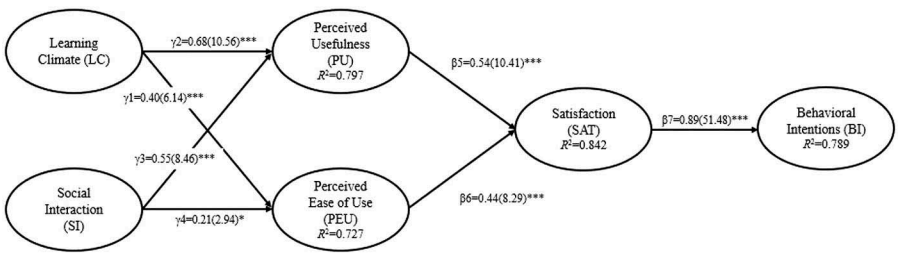

Figure 1. Structural equation model and standardized estimates. Estimated results of the model (*t* values) are in parentheses. *$p < .05$. ***$p < .001$.

among people when they interact online. Because communication in an online forum is often lacking human warmth, instructors could set up teams, utilize emoticons when communicating emotion, and use avatars when using annotation systems. Instructors should also influence the learning climate of online collaborative efforts by ensuring that the content of instruction that is posted is relevant and interesting (Chou & Liu, 2005).

Limitations and Future Research

Although this study contributes to the current literature on collaborative learning with the use of an annotation system, it has several limitations that can be used as the basis for future research. The sample for this study included undergraduate EM students at a Midwestern university, and thus the generalizability of these findings may be limited. Future studies should examine perceptions of annotation systems in a variety of disciplines, including hospitality, tourism, and other fields, as well as in a variety of higher education settings. In addition, this study is limited by its use of self-report questionnaires by students. Future studies could utilize enhanced qualitative methods, including text analysis of annotations as well as in-depth interviews of respondents utilizing the Nb system. Such methods would provide rich, detailed, and descriptive insight into the use of online collaborative learning systems.

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