Investigating user acceptance of a screenshot-based interaction system in the context of advanced computer software learning

Travis K. Huang
Department of Information Management
Ling Tung University
1, Lingtung Rd., Taichung, Taiwan, R.O.C.
travisk.huang@gmail.com

Abstract
Most e-learning systems provide course materials in a variety of formats, such as text, image, and video, and allow students to interact with their classmates and teachers by means of discussion forums, chat rooms, or e-mail. However, most interactions between students seeking technical support are in textual format. To promote effective discussion and interaction between users, e-learning systems should make better use of media. Drawing on the media-richness theory, screenshot-based interaction can be regarded as the best medium for describing problems and troubleshooting in the context of computer software. As this form of interaction between users is based on screenshots, it is termed “screenshot-based interaction.” This study entailed the development of a screenshot-based interaction system, which is a system of discussion forums for advanced computer software learners, by integrating the richness of social-networking media with the traditional structure of present-day discussion forums. The system provided students with a convenient and clear means of explaining advanced computer software problems, by uploading screenshots, dragging rectangles, and leaving comments in text boxes. It also allowed students to give and receive individual responses to these problems, thereby enhancing their learning. In addition, the study investigated user acceptance of the screenshot-based interaction system. The results, based on data collected from 418 students, indicated that students’ perceived enjoyment had a strong, positive, and direct effect on their behavioral intention, and that colleague opinion had a direct effect on their perceived enjoyment and their perception of the system’s ease of use and usefulness, which in turn affected behavioral intention indirectly.

1. Introduction

Over the past two decades, technology has changed the way we learn. From books on paper to books in browsers, training CDs and DVDs to video streamed on the Web and even in apps, it is becoming more and more convenient for people to explore information on the go. In the field of e-learning, there are many different types of virtual environment for enhancing learning via electronic media, but they all have similar functions [1][2]. For instance, most e-learning systems provide course materials in a variety of media formats, such as text, image, and video, and allow students to interact with their classmates and teachers by means of discussion forums, chat rooms, or e-mail. However, interactions with individuals providing technical support, who are defined as “people trained to help users in solving problems related to computer hardware and software” [3], usually occur in textual format. Media-richness theory [4][5] states that higher-richness media can be used to enhance shared meaning and understanding by reducing the degree of equivocality or uncertainty when problems are proposed for further discussion. Hence, those developing e-learning systems should make good use of media to promote effective discussion and interaction between users, as well as providing instructional materials in different media.

There are three major categories of computer software: system software, programming software, and application software. System software, such as device drivers or operating systems, provides the basic functionality for computer usage, and is responsible for the management of a variety of independent hardware components, whereas programming software provides tools for coding computer programs or using programming languages. Application software is developed to perform specific tasks, and encompasses software of many kinds, such as business software, word-processing software, image-editing software, spreadsheet software, and telecommunications software. It is usually more difficult to use system software and programming software than application software, and correspondingly easier to become skilled in application software than in advanced computer software such as system software or programming.
software. In the latter cases, learners may not have a clear picture of their situation, and may not even know how to describe their problems. This hinders the acquisition of computer-software skills, especially advanced computer software skills. As a result, learners need either technical support to diagnose their problems, or the provision of an e-learning system that facilitates discussion and interaction by making good use of higher-richness media, rather than text alone.

Social-networking sites have become the preferred forum for social interaction among the Net generation. People tend to interact with each other through these websites by texting, talking, playing games, or sharing photos. Some social-networking sites, such as Flickr and Facebook, furnish users with a highly interactive photo-sharing environment, which allows users to create additional tags or text boxes for photos posted. Using a mouse to drag and click, a member can easily create a free-width and free-length rectangle located anywhere on a photo. To respond more specifically to photos, users can ask questions or share their opinions by leaving comments in new text boxes next to the rectangle. This kind of photo-sharing environment inspired the development in this study of a screenshot-based interaction system using higher-richness media, which allows users to post screenshots rather than personal photos.

As screenshots are digital images, they can be captured by cameras, webcams, and smart phones, by a specific application, or even by an operating system such as Windows or Linux. Screenshots are also a more intuitive means of describing a computer problem than words, and are widely used to demonstrate the status of a software program, such as running, sleeping, paused, or stopped. When users encounter particular problems with their computers, describing their screen output to others using screenshots is very helpful. Screenshot interaction may thus be a more effective method of describing computer problems and troubleshooting software than text alone.

This study involved the implementation of a screenshot-based interaction system, which is a new system of discussion forum for advanced computer software learners, by integrating rich social-networking media, specifically screenshots, with the structure of traditional discussion forums.

In short, the screenshot-based interaction system is a discussion forum using higher-richness media, and can be regarded as an extension of traditional discussion forums, which are mostly in textual format. When a student uploads a screenshot to the system, accompanied by a description of the problem, other students are able to diagnose and solve the problem with greater certainty. In addition, when a user wishes to respond to the screenshot, he can pinpoint the subject of his enquiry by dragging a rectangle above the screenshot and leaving comments in another text box, as shown in Figure 1.

As the entirety of the interaction, including the description of the problem and the subsequent responses, is based on a screenshot, this kind of interaction is termed a "screenshot-based interaction." When a student uploads a screenshot, other students...
may interact with the screenshot by creating rectangular text boxes in which to leave comments, as shown in Figure 2. All screenshot-based interactions are thus accessible by all participants, including students and their teachers. Moreover, this kind of screenshot-based interaction not only provides students with an efficient way to explain their advanced computer software problems, but also helps them to understand these problems. It is clear, therefore, that screenshot-based interactions may enhance students’ learning.

The emergence of social-networking media has increased connectivity within society. As people tend to rely heavily on peer-to-peer interaction, they have swiftly adopted the new media formats [6]. After implementing the screenshot-based interaction system, therefore, it was necessary to examine user acceptance of the system. Several models were considered, including TRA, TPB, TAM, TAM2, UTAUT, and TAM3, from which a technology-acceptance model (TAM) [7] was chosen to measure user acceptance. This decision was due, first, to the widespread use of TAM over the past two decades to predict and explain user acceptance of new information technologies (IT). Second, this model is sufficiently extensible and flexible to include other context-specific constructs. In addition, much MIS research has shown TAM to be a valid means of explaining users’ adoption of various IT tools and methods [8][9][10][11].

This study investigated user acceptance of a screenshot-based interaction system in the context of advanced computer software learning. The subjects of the study were undergraduates taking courses in advanced computer software, specifically the Linux operating system, and the information technology addressed was the screenshot-based interaction system. In addition to applying TAM, three context-related factors were chosen as the basis for the research model, namely perceived enjoyment, colleague opinion, and personal innovativeness. The study aimed to answer the following questions: What are the fundamental relationships expressed by TAM when users are using the screenshot-based interaction system to explain their problems and obtain individual responses? What is the relationship between users’ perceived enjoyment and their intention to use the screenshot-based interaction system? What are the effects of three factors (perceived enjoyment, colleague opinion, and personal innovativeness) on TAM variables when measuring the adoption of the screenshot-based interaction system?

2. Literature review

2.1. Media richness theory

With the rapid growth of computer and Internet technologies, e-learning has become a widely accepted learning method. Indeed, e-learning is a process of knowledge construction.

![Figure 2. An example of a screenshot-based interaction (two rectangles and two text boxes are positioned above a screenshot).](image-url)
Social constructivism provides a theoretical basis for e-learning systems that enable users to engage in interactive, creative, and collaborative activities during knowledge construction [12]. All types of media, such as text, image, audio, animation and video, can be used to present instructional materials on an e-learning platform. However, discussion and communication between users continue to be formatted as text, as in the case of discussion forums. When tasks entail a higher degree of equivocality and uncertainty, negotiation among users is more difficult in traditional discussion forums. This may explain Bartscha and Cobern’s [13] finding that the use of multimedia instructional materials does not necessarily have a significant effect on users’ understanding of instructional content. As a consequence, e-learning systems should make effective use of media not only to present instructional materials but to enhance discussion and interaction between users.

According to the media-richness theory [4], task performance is improved when task needs are matched to a medium’s richness, as this enables users to communicate and thereby to improve their understanding. To enhance learners’ understanding, therefore, the medium used to post a comment or question online should be as “rich” as possible.

The media-richness theory [4], [5] states that media vary in richness, with “richness” defined as the ability to enable users to convey information and thus to facilitate the acquisition of shared meaning and understanding within a given time interval. The efficiency of communication between users is influenced not only by the fitness of the medium used, but also by the characteristics of the task, such as its degree of equivocality or uncertainty. Four criteria for media richness were proposed by Daft, Lengel, and Trevino [5], as follows.

**Immediate feedback:** the medium facilitates quick convergence on a common interpretation.

**Personalization:** refers either to the conveyance of emotions and feelings, or to the ability of the medium to be tailored to the specific needs and perspective of the receiver.

**Multiple cues:** an array of cues, such as physical presence, voice inflection, physical gestures, words, numbers, and graphic symbols, facilitate the conveyance of interpretation and meaning, rather than simply information or data.

**Language variety:** numbers and formulas provide greater precision, but natural language conveys a broader set of concepts and ideas.

Face-to-face interaction is considered the richest medium. In order of decreasing richness, other possible media are the telephone, personal documents (e.g., memos), impersonal unaddressed documents (e.g., bulletins), and numeric reports (e.g., spreadsheets) [5]. It is clear that media with higher levels of synchronicity, such as face-to-face communication or the telephone, exhibit greater richness. However, as Dennis and Valacich [14] suggested, the “richest” medium for communication may not be the “best” one. The best medium or set of media depends on context. The present study, for instance, implemented a screenshot-based interaction system that could be regarded as a supplement to a traditional classroom course. After class, students were encouraged to use the screenshot-based interaction system to explain their problems and respond individually to others’ problems. Therefore, asynchronous media were considered more suitable than synchronous ones in the context of screenshot-based interaction.

### 2.2. Technology acceptance model

Over the last two decades, the technology acceptance model (TAM) ([15], p.24) has been used to measure user acceptance of new information technology. It is the most frequently used method across a wide variety of corporate ITs, and consistently explains about 40% of the variance in users’ intention to use IT and actual usage [16].

In the study, we investigate the interactions that occur between users when they are using screenshots to demonstrate their problems and to get respective responses. All users describe their problems or provide their opinions by sharing their screenshots on a screen-based interaction system. To clarify what a screenshot means, users can create a rectangle or a dialog box attached to a specific screenshot, which includes further explanation. As users interact with each other on a specific screenshot by creating another rectangles or dialog boxes, the interaction is termed “screenshot-based interaction.” In fact, these screenshots function as boundary objects, which could improve the common representation and in turn increase the efficiency of communication between users [17].

Furthermore, the screenshot function could supplement e-learning systems and should be provided to learners, especially advanced computer software learners. It is easier to describe or understand computer software problems with a screenshot and text, than with only text. Furthermore, in advanced computer software learning people encounter more unpredictable problems than in basic software learning. Users are not able to describe clearly their problems with higher level of uncertainty or equivocality. Thus, based on media richness theory, a screenshot-based interaction providing higher richness can overcome the difficulties described above. As the screenshot function described
above is very similar to the photo-sharing function provided by some social networking sites, such as Flickr or Facebook, the implementation of screenshot-based interaction function in e-learning system is possible. However, it is still not available in most e-learning systems.

The subject of this study is advanced computer software learning, and the information technology measured is a screenshot-based interaction system. There is no doubt that TAM has successfully predicted and explained user acceptance of new IT [6][18]. Thus, the study treats TAM as a preferred model to measure user adoption, while appending appropriate constructs, and applies it to examine user acceptance of the screenshot-based interaction system. The hypotheses based on the TAM’s fundamental constructs are proposed as follows.

Hypothesis 1: The higher the level of users’ perceived ease of use, the higher the level of their perceived usefulness for the screenshot-based interaction system.

Hypothesis 2: The higher the level of users’ perceived ease of use, the higher the level of their behavioral intention to use the screenshot-based interaction system.

Hypothesis 3: The higher the level of users’ perceived usefulness, the higher the level of their behavioral intention to use the screenshot-based interaction system.

As Dishaw and Strong [19] stated, one main weakness of the TAM is its lack of task focus. The TAM does not fully reflect the variety of user task environments [20]. Therefore, one obstacle to using TAM has been problems in applying it beyond the workplace. To increase the validity of the TAM, it is necessary to further explore specific contextual factors that may influence the user’s adoption of IT. Thus, given the specific context of this study, three constructs, including user’s perceived enjoyment, colleague opinion and innovative personality, were used to extend the TAM.

2.3. Perceived enjoyment

Based on motivation theories, Igbaria, Parasuraman and Baroudi [21] have proved that system usage is influenced by one extrinsic and one intrinsic motivation, namely perceived usefulness and perceived fun, which is similar to the concept of perceived enjoyment. Van der Heijen [22] stated that perceived enjoyment is an important addendum to the TAM when explaining user acceptance of information systems. Dickinger, Arami and Meyer [6] also indicated that perceived enjoyment is an important antecedent for the adoption of technology with network externalities. Thus, users’ perceived enjoyment, which focuses on the interaction between an individual and the situation, has become a critical supplement to explaining individual acceptance of new IT.

In addition to the TAM related constructs, quite a few researchers have proposed that user’s perceived enjoyment is essential to information systems usage. For example, Liaw and Huang [23] found that user’s perceived enjoyment is an important factor affecting individual’s decisions to use search engines as an information retrieval tool. Lee, Cheung and Chen [24] also showed that both perceived usefulness and perceived enjoyment significantly and directly influenced students’ intention to use Internet-based learning mediums. Yu, Ha, and Choi [18] also found that perceived enjoyment is the most important factor affecting attitude and behavioral intention toward e-commerce, which is electronically mediated commerce using interactive television.

Extending the concept of perceived enjoyment, Moon and Kim [20] proposed perceived playfulness as a more comprehensive set of motivation states; it includes three constructs: concentration, curiosity and enjoyment. However, of the three perceived playfulness constructs, enjoyment is the most relevant to our study. Because users’ effort made in each screenshot-based interaction is quick and very short-term, neither their concentration nor curiosity is easily observed. Therefore, the proposed study only adopts the enjoyment construct. As the study implemented a discussion forum with a highly interactive media as the preferred environment for screenshot-based interactions, this environment is relatively easy to access and use. All posted contents, including rectangles, dialogue boxes or screenshots, can be reviewed by anyone. Thus, the enjoyment of social interaction can be predictably generated. As Moon and Kim [20] proved that perceived ease of use was affected by perceived playfulness, including concentration, curiosity and enjoyment, hypothesis 4 is proposed as follows.

Hypothesis 4: The higher the level of users’ perceived ease of use, the higher the level of users’ perceived enjoyment for the screenshot-based interaction system.

Furthermore, Martocchio and Webster [25] found that users experiencing a higher degree of enjoyment showed greater affective responses to computer-training tasks. In other words, perceived enjoyment cultivates a positive attitude toward computer-software
learning. Based on this argument, the following hypothesis was proposed.

Hypothesis 5: The higher the level of users’ perceived enjoyment, the greater their intention to use the screenshot-based interaction system.

2.4. Colleague opinion

Due to the need for social companionship, users tend to concur with their colleagues’ opinions on new information technology [26]. In the context of IS, Kim and Kankanhalli [27] found that favorable colleague opinion, defined as the perception that colleagues favor the changes related to a new IS implementation, has a negative effect on user resistance. Thus, colleague opinion has a normative influence on users in their work environment. It follows that colleague opinion has a positive influence on users’ willingness to adopt new information systems. Students, in particular, are easily influenced by their peers. The opinions of their peers are often more important to them than those of their teachers. In this study, “colleague opinion” was understood to refer to classmates’ opinions of the screenshot-based interaction system.

Furthermore, Kim and Kankanhalli [27] described colleague opinion as a kind of subjective norm, which had already been identified as an antecedent of TAM [28]. Therefore, the present study included colleague opinion as an antecedent of TAM, because it may indirectly affect users’ behavioral intentions with regard to the adoption of new information technology. Based on this reasoning, the following hypotheses were proposed.

Hypothesis 6: The higher the level of positive colleague opinion, the greater users’ perceived enjoyment of the screenshot-based interaction system.

Hypothesis 7: The higher the level of positive colleague opinion, the greater the perceived ease of use of the screenshot-based interaction system.

Hypothesis 8: The higher the level of positive colleague opinion, the higher the perceived usefulness of the screenshot-based interaction system.

2.5. Personal innovativeness

There is a large amount of research on technology and innovation adoption, some of it focusing on the factors that affect adoption at different stages. For instance, Rogers [29] proposed diffusion of innovation theory (DIT), and classified adopters into five categories, namely innovators, early adopters, early majority, late majority and laggards. This is an interesting attempt to relate user’s personality traits to their adoption rate.

In examining the relationship between adoption rate and adopter types, Lin [30] used theories of adoption of innovations to explain adoption dynamics, and defined innovativeness as “the degree to which an individual or other unit of adoption is relatively earlier in adopting an innovation than other members of a social system” ([29], p. 22). When people try to actualize their need for innovativeness, they must look forward to and keep up with innovative ideas [30]. This phenomenon is a reflection of people’s desire for innovativeness. Besides, Busselle, Reagan, Pinkleton, and Jackson [31] investigated the factors that affect the usage of an innovation after it becomes available to the wider population. Foxall and Bhate [32] also included personality styles in their exploration of the antecedents of individual innovativeness. Hirshman [33] proposed that those with more desire for novelty may be more willing to adopt an innovation. In addition to examining the relationship between users’ need for innovativeness and their adoption of personal computers ([30], 1998), Lin [34] verified the relationship between the use of webcasting and user innovativeness, termed “personal innovativeness” in the present study. According to the diffusion-of-innovations theory and the findings of related research, personal innovativeness is an important antecedent of new-technology adoption. Based on the foregoing reasoning, this study aimed to investigate the effects of users’ characteristics, specifically their personal innovativeness, on their perception of the ease of use and usefulness of the screenshot-based interaction system developed in the study. The following hypotheses were proposed.

Hypothesis 9: The greater users’ personal innovativeness, the stronger their perception of the ease of use of the screenshot-based interaction system.

Hypothesis 10: The greater users’ personal innovativeness, the stronger their perception of the usefulness of the screenshot-based interaction system.

The complete research model for the study is shown in Figure 3. Each of the TAM-hypothesized relationships, as shown inside the dotted lines, was examined. In addition to the direct effect of users’ perceived enjoyment on their intention to use the screenshot-based interaction system, the direct effects of users’ personal innovativeness on their perception of, respectively, the system’s ease of use and usefulness were also measured.
3. Research method

3.1. Subjects

Four hundred and forty one undergraduates majoring in IS from six sections of the same course, Linux operating system, were recruited. As a major part of the course requirement, students were required to hand in their homework and describe their problems by using the screenshot-based interaction system. Specifically, they should upload screenshots and were encouraged to make response to all screenshots. Students and the lecturer discussed and shared their opinions by dragging rectangles or leaving comments in text boxes above specific screenshots. These students were quite familiar with using screenshots, because they all had experience of social networking media, such as Facebook, or Flickr. Each class was taught by the same instructor, using the same teaching materials and under the same learning conditions. This course has been offered for the past ten consecutive years.

3.2. Procedure

To investigate the acceptance of screenshot-based interactions in terms of learning advanced computer software between students and their lecturer, questionnaires were administered to 441 students. Students were aware that they were involved in a project in which the frequency of occurrences of screenshots and their responses would be measured, but they were blinded to the research hypotheses.

This study administered a questionnaire survey to students to assess their perceived ease of use, perceived usefulness, perceived enjoyment, personal innovativeness, colleague opinion and behavioral intention after using screenshots to demonstrate their problems in learning Linux. The research model shown in Figure 2 was tested and all the hypotheses were examined through structural equation modeling using the collected data.

3.3. Measurement

The dependent variables in this study were students’ perceived ease of use, perceived usefulness, perceived enjoyment, colleague opinion and their personal innovativeness, respectively, whereas the independent variable was behavioral intention. All students were asked to evaluate the content validity of the measurement items using a Likert scale of 1-7, where 7 represented “strongly agree,” and 1 represented “strongly disagree.” The measurement of each construct is further described as follows.

Perceived ease of use, and Perceived usefulness. The items of perceived ease of use (4 items) and perceived usefulness (3 items) were adapted from the Davis [35] scale with modifications. They focused on measuring the degree of student’s ease of use perceptions and usefulness perceptions about the screenshot-based system. Both scales have been confirmed to have a high level of flexibility, reliability and generalizability in a number of studies. Cronbach’s α for perceived ease of use and perceived usefulness were .934 and .890, respectively.
Behavioral intention. The items of behavioral intention (3 items) were adapted from the Ajzen and Fishbein [36] scale, and focused on measuring the degree of student’s intention to use the screenshot-based system. Cronbach’s α for this three-item measure was .898.

Perceived enjoyment. According to Moon and Kim’s [20] definition of perceived playfulness, three aspects were identified. They are concentration, curiosity and enjoyment. Among them, enjoyment is most relevant to our study. Therefore, we adopted Moon and Kim’s definition of enjoyment, and called it perceived enjoyment. This is because the other constructs are not easily observed in the context of screenshot-based interaction. There are totally three items which focused mainly on measuring the degree of students’ perception about enjoyment while using screenshot-based interaction system. Cronbach’s α for this three-item measure was .915.

Colleague opinion. Kim and Kankanahalli [27] developed a scale to assess colleague opinion perceived by users. There are three items which focused on measuring the degree of classmates’ positive opinion toward the use of screenshot-based interaction system. Cronbach’s α for this three-item measure was .788.

Personal innovativeness. Lin [30] developed a scale to assess a user’s innovative personality, which is defined as user’s desire for innovative ideas or products. There are four items which focused mainly on measuring the degree of an individual’s interest and involvement in keeping up with the knowledge of innovative ideas or products. One item was eliminated on the basis of an item-total correlation test. Cronbach’s α for the remaining three-item measure was .948.

4. Results

4.1. Data analysis

Of the 441 students attending the class, 418 completed questionnaires. The response rate was 94.7%. Correlations among variables were tested by means of Pearson’s correlation coefficient. As shown in Table 1, all variables are positively interrelated.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Colleague opinion</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Personal innovativeness</td>
<td>.373**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived ease of use</td>
<td>.441**</td>
<td>.307**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Perceived usefulness</td>
<td>.509**</td>
<td>.329**</td>
<td>.401**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Perceived enjoyment</td>
<td>.507**</td>
<td>.257**</td>
<td>.547**</td>
<td>.459**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. Behavioral intention</td>
<td>.622**</td>
<td>.274**</td>
<td>.477**</td>
<td>.489**</td>
<td>.623**</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. *p<.05. **p<.01. ***p<.001.

Besides, behavioral intention highly related to both colleague opinion and perceived enjoyment (r > .6), whereas personal innovativeness is lowly related others (.2 < r < .4). However, correlation does not imply causation. The causal relationship between variables would be further examined by means of structural equation modeling.

4.2. Structure model

The proposed model was assessed with the 418 records of data from students by maximum likelihood estimation using AMOS. All calculations were based on the covariance matrix of the variables. Five common model-fit measures were used to assess the model’s overall goodness of fit: the ratio of χ² to degrees of freedom (CMIN/DF), goodness-of-fit (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA).

The results indicated that the proposed model (CMIN/DF = 2.928; GFI=.906, AGFI=.873, CFI=.958, RMSEA=.068) had a good fit, because all criteria are better than the recommended values (CMIN/DF < 3; GFI > .90, AGFI > .80, CFI > .90, RMSEA < .80). Therefore, we used it to examine our hypotheses. First, as shown in Figure 4, all the standardized path coefficients of TAM fundamental relationships, except the path running from perceived ease of use to perceived usefulness, were statistically significant, thus Hypotheses 2 and 3 were supported while Hypothesis 1 (β=.096, p<.05) was not.

Secondly, the path running from perceived ease of use to perceived enjoyment and the path from perceived enjoyment to behavioral intention were both statistically significant, thereby supporting Hypotheses 4 and 5 empirically. In addition, the paths running from colleague opinion to perceived enjoyment, perceived ease of use, and perceived usefulness were all statistically significant, confirming Hypotheses 6, 7 and 8.
Finally, whereas the relationship between personal innovativeness and perceived ease of use was significant, the relationship between personal innovativeness and perceived usefulness was not. Therefore, Hypothesis 9 was supported and Hypothesis 10 was disconfirmed ($\beta=.089$, $p<.05$).

In summary, while perceived enjoyment and perceived usefulness had a positive effect on behavioral intention directly, perceived ease of use had both direct and indirect effect, which is derived from its direct effect on perceived enjoyment, on behavioral intention. Besides, colleague opinion had a direct effect on perceived enjoyment, perceived ease of use, and perceived usefulness, in turn affected behavioral intention indirectly. The $R^2$ value indicates that 52% of the variance in users’ behavioral intention was explained.

5. Conclusion

During this study, a screenshot-based interaction system for advanced computer software learners was implemented. This was accompanied by empirical examination of the effects of students’ personal innovativeness, colleague opinion, and perceived enjoyment, along with factors fundamental to TAM.

Overall, students’ personal innovativeness was found to have a positive influence on their perception of the system’s ease of use, but no significant effect on their perception of the system’s usefulness. A possible explanation for the first finding is that students with a stronger desire for novelty tried harder to comprehend the system and overcome any difficulties, which increased their perception of the system’s ease of use.

The second finding may be explained by the fact that the desire for novelty is unlikely to have affected students’ perceptions of the usefulness of the system. In short, the screenshot-based interaction system is not only suitable but also helpful for students exhibiting different levels of personal innovativeness. Contrary to our expectations, students’ perceived ease of use was found to have no significant effect on the perceived usefulness of the system. A plausible explanation is that regardless of the degree of difficulty the students attributed to the system, they all considered it to be useful.

A very important practical implication of our findings is the possibility of improving students’ performance in advanced computer software learning by introducing a screenshot-based interaction system, which can facilitate discussion and interaction by making good use of higher-richness media, specifically screenshots. To increase students’ willingness to use the system, teachers should concentrate on finding ways to enhance their perceived enjoyment of the system, and their perception of favorable colleague opinion. Although colleague opinion was not found in this study to have a direct effect on behavioral intention, its indirect effect was clear from its direct effects on perceived enjoyment and the perceived ease of use and usefulness of the system. The findings of this study contribute to the development of theories concerning the effect of colleague opinion on behavioral intention.

References


