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Exploring the antecedents of screenshot-based interactions in the context of advanced computer software learning

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ABSTRACT

Current e-learning systems provide course materials in a variety of formats, such as text, image, and video, and students are able to interact with their classmates and teachers using discussion forums, chat rooms, or e-mail. However, most interactions between students seeking technical support have a textual format. To promote effective discussion and interaction between users, e-learning systems should make better use of a variety of media. According to media-richness theory, screenshots are the best medium for describing problems and troubleshooting in the context of computer software. This study developed 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, 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 their problems, thereby enhancing their learning. As all of the interactions, including the description of the problem and the subsequent responses, were based on screenshots, they were termed "screenshot-based interactions." The study investigated the effects of five antecedents of user intention to conduct a screenshot-based interaction, including colleague opinion, personal innovativeness, perceived enjoyment, perceived ease of use, and perceived usefulness. The results, based on data collected from 418 students, indicated that students' perceived enjoyment, perceived ease of use, and perceived usefulness had a strong, positive, and direct effect on their behavioral intention, whereas personal innovativeness had an indirect effect. Colleague opinion had direct effects on their perceived enjoyment and perception of the system's ease of use and usefulness, which in turn indirectly affected their behavioral intention.

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 (Ngai, Poon, & Chan, 2007; Sanchez & Hueros, 2010). For instance, current e-learning systems provide course materials in a variety of formats, such as text, image, and video, and students are able to interact with their classmates and teachers using 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" (Ralph, 1991), usually occur in textual format. Media-richness theory (Daft & Lengel, 1986; Daft, Lengel, & Trevino, 1987) 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.

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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, users 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, users 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.

Computer-based social annotation has matured (Chen, Hwang, & Wang, 2012; Gao, 2013); people can easily make text-based annotations on a webpage by highlighting a specific portion of the text and leaving a comment. Several studies have revealed the positive effects of annotation systems on learning performance (Hwang, Wang, & Sharples, 2007; Samuel, Kim, & Johnson, 2011; Su, Yang, Hwang, & Zhang, 2010). For example, when discussing a difficult problem, an argumentative diagram tool, which has greater richness than text, would be much more useful than a text-outline tool (Munneke, Andriessen, Kanselaar, & Kirschner, 2007).

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.

A screenshot, also known as a screencap, a screen dump, or a print screen, is a snapshot of all of the items visible on the computer screen. 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 8 or Linux. As we know, a picture is worth a thousand words. Screenshots are 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 trouble-shooting 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

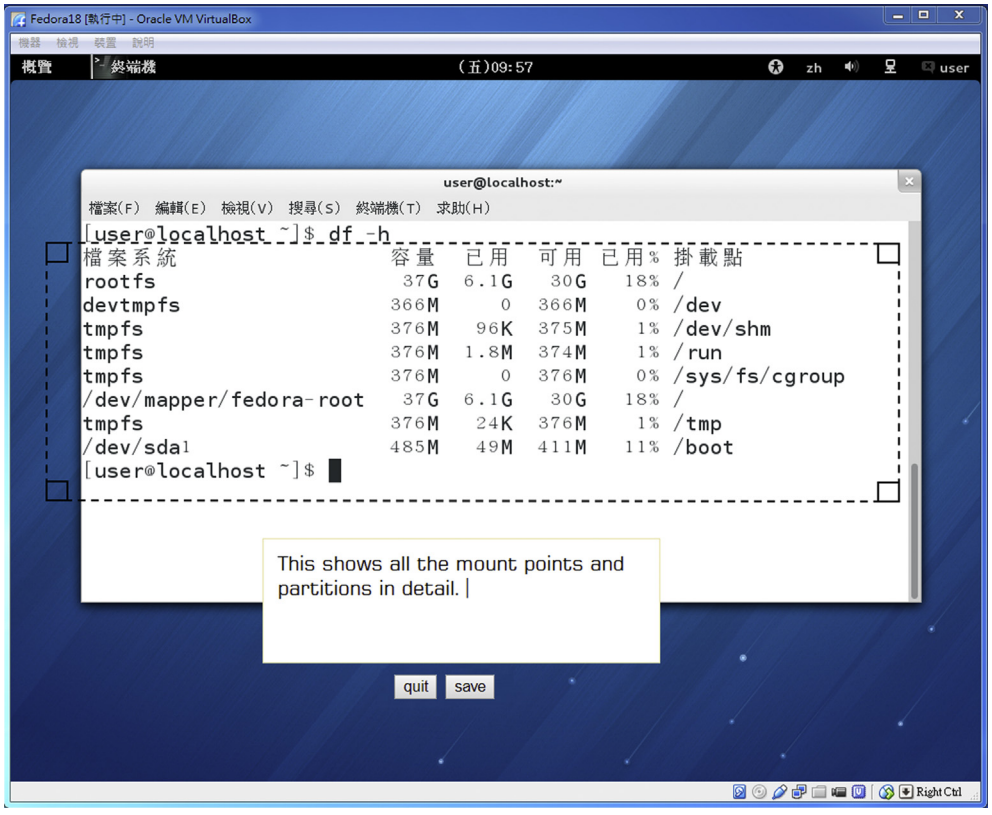

Fig. 1. Pinpointing a response to a screenshot.