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Full Length Research Paper

To evaluate interface usability of an e-course platform: User perspective

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As a core term in Human-Computer Interaction (HCI), the analysis of system usability continues to be one of priority focuses of HCI researchers. Through users' evaluation, a system's inherent problems can be learned and its design be improved. This research was conducted to obtain the overall evaluation from the participants over the e-Course platform based on the data gathered from questionnaires, interviews and scenario simulations. This study recruited five participants, three of whom were professors and the rest were teacher's assistant. We used nine constructs to evaluate interface usability of the system. The research results showed that the average scores of three scenarios from high to low were S1a, S1b and S2. In terms of usability goals, efficiency, learn ability, utility, effectiveness, their average score is high than 3. In terms of user's experiences goals, the average score is less then 3, but near to 3. Overall, the interface of e-Course platform is ease to use and acceptable. Finally, we organized interview results and provided nine suggestions for a director of computer department and system designer. These suggestions can let them to know about the priority of system improvement, and provide a useful reference for practice.

Key words: System usability, usability goals, user experience goals, human-computer interaction, user perspective.

INTRODUCTION

With the flourishing of computer telephony integration (CTI), electronic learning (e-learning)-a form of learning enabled by internet technology has quickly becomes an emerging trend (Hashim et al., 2010). This educational revolution has had a great impact on the current educational system (Kopcha and Sullivan, 2007). A number of new issues have been raised thanks to the new vehicle for education. How to provide an effective e-learning system with flexibility, accessibility and interface appeal has become a key topic (Ardito et al., 2004). As a core term in human-computer interaction (HCI) (Hornbæk, 2006), usability defines a system from a user's viewpoint. Through users' evaluation, a system's inherent problems can be learned and its design improved (Agarwal and Venkatesh, 2002). In other words, usability is a suitable indicator for the value of a user-centered system. It is also a crucial research target for system analysts and HCI scholars alike (Hornbæk, 2006).

In the last few decades, studies on user behavior have relied greatly on the self-report method to collect information about the participants' attitudes toward an object. This method, which is most commonly and frequently used in surveys, is based on their cost-effectiveness and ease of administration (Mullens and Kasprzyk, 1999; Kopcha and Sullivan, 2007). Kihlstrom (2004) pointed out that the self-report procedure assumes that the participators are fully aware of their attitudes and beliefs that guided their behaviors, they therefore would be willing to present them if asked suitably.

LITERATURE REVIEW

Not only redefining the model of teaching and learning,

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e-learning also promises a multitude of benefits. Initially used as a teaching aid by educational institutes, the application of e-learning has gradually extended to the business, as companies favor its use in their employee training (Alam, 2009). Now, it has even become an important business model (Ruiz et al., 2008; Wang et al., 2007). E-learning refers to a learning activity performed via the internet (Wang et al., 2007). An e-learning platform is an environment integrating software tools and services (Ardito et al., 2004) to satisfy certain learners' demands. As a learner-centered design (LCD), it allows learners to take control of their own learning pace, progress and content (Hiltz and Turoff, 2002; Zhang et al., 2006). How to provide an effective e-learning system with flexibility, accessibility and interface appeal, therefore, has become a key research topic. Such a system should also accommodate the need for customization and be able to integrate learning with telecommunications media (Ardito et al., 2004).

As a core term in HCI (Hornbæk, 2006), usability underlines a user-centered design (UCD) perspective. Agarwal and Venkatesh (2002) indicated that the level of usability can be increased as long as system designers have taken HCI into account when developing a system's interface and functions. This approach can promote users' positive perceptions and evaluations of a system, thus furthering their intention to use it. Moreover, for most users, their first impression of a system is determined by its interface, which exceeds functionality in creating an immediate appeal.

Norman (1993) explained the principle of a UCD as addressing the interests and demands of users to facilitate a product's ease of use and understanding. Therefore, system designers should concentrate not only on the functional side of an interface, but also on making it as user-friendly as possible (Preece et al., 2002) to shorten the users' system adaptation time. The analysis of usability becomes an important means for a UCD, helping to unravel any problems which might undermine the users' interface experience. Therefore, it also provides a fitting tool for the evaluation of any UCD, such as an e-learning system. Usability inspection refers to a set of methods in which evaluators examine the usability-related aspects of an application (Ardito et al., 2004). Effectiveness, efficiency and satisfaction are the measurement indices. In order to evaluate the usability of an e-learning system, a specific technique is required. For example, heuristic evaluation is one of the most commonly used methods for detecting usability problems. It is relatively easier to administer and less costly (Nielsen and Mack, 1994).

Heuristic evaluation involves a small set of evaluators for examining the interface and judging its compliance with recognized usability principles (Nielsen and Mack, 1994). Apart from heuristic evaluation, interviewing users to extract their opinions of and experiences with a product is another commonly employed method (Rubin, 1994). Mine et al. (2001) also suggested including observation, task accomplishment, questionnaires and interviews to analyze the users' responses to the problems that they encountered when using the systems. During his time at International Business Machines Corporation (IBM), Lewis (1995) proposed a renowned system usability scale, Post-Study System Usability Questionnaire (PSSUQ), and the total of 19 items. PSSUQ approaches system usability via a multitude of aspects, ranging from system function, information and interface quality to users' satisfaction level. In a rather compact questionnaire design, the evaluation covers the standards of effectiveness, efficacy and satisfaction (Lewis, 1995). PSSUQ is proven to be of good reliability and validity (Lewis, 2002), and is therefore suitable for the evaluation of system usability. This scale will be adopted in our questionnaire survey.

MATERIALS AND METHODS

This study was conducted in the information system research Lab, at Chai-Yi, Taiwan, featuring the methods of scenario simulation, questionnaire survey and interview to collect data. The participants were informed of the research process in advance and asked to sign a consent agreement, knowing that the whole process would be audio recorded. The participants were allowed a first-hand experience with the e-Course platform via scenario simulation, which aims to initiate their evaluations of the system (Alam and Hoque, 2010). The target system chosen in this study is an e-Course platform (e-learning system) adopted by a national university in Taiwan. The participants consist of the current and potential users of this system, including teachers and teaching assistants (TAs). The foundation of scale design was based on the Lewis's (1995, 2002) 19 items from PSSUQ scale, and consulted Davis's (1989) 6 items from PU and PEOU scale, Hendersona and Divett's (2003), and Saleen's (2007) 2 items. Therefore, we used twenty-seven items to evaluate interface usability of e-Course platform. In addition, these twenty-seven items was divided into nine dimensions in accordance with Davis (1989) and Preece et al. (2002). Three academics and three practitioners were invited to our experts in this study, and help to proof the classification of these seven dimensions finally.

Scenario simulation is an unofficial portrayal of an activity or work process (Carroll, 2000). Like telling a story, it outlines the plots, demands, and issues involved. Through a scenario simulation, the participants become personally involved in the activity or work process. Their immediate reactions during the process and opinions of the overall experience can therefore be evoked. Simply put, the purpose of a simulation is to extract individual comments (Preece et al., 2002) Participants were allowed to experience the e-Course platform through scenario simulation. The selection of scenario was inspired foremost by the system's existing Questions and Answer section. The list of most common queries from instructors and TAs, provided by the director of computer center and the system administrators, was consulted as a secondary reference. This project also designed two scenarios to evaluate the usability of the target system. They are as follows. Scenario 1: (a) the announcement of the latest news; (b) the uploading of the course outline and materials. Scenario 2: the announcement of the homework assignment. The participants were allowed to react to these scenarios like the users of the system and consequently construct their evaluation based on the procedure. Evaluative priming was employed to facilitate unconscious responses from the

Table 1. The results of the questionnaire survey.

Goals	Constructs / Factors	Item No.	S1(a) Mean	S1(b) Mean	S2 Mean	Total average
Usability goals	Efficiency	E1	3.60	3.60	3.20	3.27
		E2	3.40	3.00	2.80	
	Learn ability	L1	3.80	3.20	2.80	3.20
		L2	3.40	3.20	2.80	
		L3	3.40	3.00	2.80	
		L4	3.80	3.20	3.00	
	Utility	U1	3.00	2.60	2.20	3.02
		U2	3.40	3.20	2.80	
		U3	3.60	3.20	2.80	
		U4	3.20	3.20	3.00	
	Effectiveness	EF1	3.80	3.00	3.00	3.47
		EF2	4.00	3.60	3.40	
	Safety	S1	2.20	2.20	1.80	2.27
		S2	2.60	2.40	2.40	
Average score of usability goals						3.04
User's experience	Satisfying	SA1	3.60	3.00	2.80	2.96
		SA2	3.40	3.20	2.20	
		SA3	3.00	3.00	2.80	
		SA4	3.00	2.80	2.60	
		SA5	3.40	3.00	2.60	
	Helpful	HE1	3.60	3.00	2.80	2.97
		HE2	2.60	3.20	2.60	
Average score of user's experience						2.96
Perceptions	Perceived usefulness	PU1	3.20	3.20	3.00	3.13
		PU2	3.00	3.20	3.00	
		PU3	3.20	3.40	3.00	
	Perceived ease of use	PEOU1	3.20	3.00	3.00	2.96
		PEOU2	3.20	3.00	2.60	
		PEOU3	3.20	3.00	2.40	
Average score of user's perceptions						3.04
Average score of each scenario			3.29	3.06	2.75	

participants, in order to understand their attitudes toward the system's functions and interfaces from a user's point of view. Surveys (including questionnaires and interviews) were also conducted to gather information on the system users' feelings, preferences and satisfaction level. With regard to usability evaluation, Nielsen and Landauer (1993) pointed out that an experiment using five people is able to expose 80% of usability problems. This research recruits five participants, with three of them being the professors of a national university in Taiwan and the rest were TAs. They are all having previous experience with this e-Course platform. All the teaching assistants within the group have all undergone the qualification test arranged through this e-Course platform.

The research procedure is divided in seven steps. In sequence, these are: (1). An introduction to the process and content of the research; (2). Logging into the e-Course Platform; (3) Proceeding to Scenario 1(a and b); (4). filling in the questionnaires on Scenario 1; (5).Proceeding to Scenario 2; (6). filling in the questionnaire on Scenario 2; (7) Interview.

RESULTS

The results of the questionnaire survey

Total twenty-seven items was divided into 9 dimensions to

Table 2. The results of the interviews.

Questions	Answers in short
Q1. Were there any problems occurring during system practice?	There was no reminder when errors occurred during practice. The description of icons' corresponding functions are unclear File update is not fast enough within the platform Difficult to use
Q2. Does the system provide sufficient functions?	All the participants said that the system have provided sufficient functions. Most of the functions needed for the teaching process are included and many are hardly used. Besides, the participants believe for easier to use the system's functions should be more integrated. For instance, some found the interfaces in S1b about uploading course material are a little complicated because the task of uploading required two interfaces to complete. It is suggested that a single interface would suffice.
Q3.Please put the scenarios in sequence according to the degree of satisfaction.	About Q3: here the participants express their degree of satisfaction over Scenario 1a, 1b & 2 based on the system functions and interfaces presented in each scenario. To allow students to download additional material or answers to exam questions.
Q4.Under what circumstances would you consider using the e-Course platform?	In need of informing students of latest information. To calculate scores. Instructors demand the TAs to use the system*. To have online discussion with students. To allow students to submit homework online.
Q5. Are you satisfied with the e-Course platform?	Satisfied: participant-3 Dissatisfied: participant-1 Acceptable: participant-2,4,5
Q6. What are your suggestions regarding the e-Course platform?	System navigation: it would be easier for users to locate themselves within the system if there is a navigation function. Hide Function: among a wide variety of functions, there are only a few that are most commonly used. It would be helpful to have a Hide Function option for hiding away the functions not in use. Graphical user interfaces (GUI): a GUI with more color display would have a stronger appeal to users. An error-free function should be included. There should be more promotions helping instructors and TAs know the system better. The interfaces should be simplified. The instructions of how to use the system should be clearer and be placed in a more noticeable place. The system should be able to support different browsers. The mailing system should include a confirmation of receipt function. The reason is to informed instructors of whether a sent mail is received or not by the students.

Notes: S1a: announcing the latest news; S1b: uploading course outline and materials; S2: assigning homework online. *this question is answered by the TAs.

measure interface usability of e-Course platform. The participants were given the opportunity to use the target system via scenario simulation and asked to complete questionnaires after Scenario 1a, 1b and 2. A descriptive analysis of the results of the questionnaire survey is shown in Table 1.

The results of the interview

The interview procedure consists of 6 sections of Questions and Answers (Table 2). Designed as a semi-structured interview, it asks the participants to answer the given questions. The transcription and summary were

Table 3. The priority of suggested modifications.

No.	Priority	Items	Suggestions
1	High	Ease of use	The TAM model proposed by Davis (1989) shows that ease of use is a crucial factor in encouraging users' willingness to use. Therefore, to the e-Course platform a user-friendly interface is of the upmost importance.
2	Medium	Simplify the interfaces	Studies by Lewis (1995; 2002) confirmed the importance of a friendly interface design. An easy-to-use interface allows users to locate the functions they need efficiently, as well as promote a higher productivity.
3	Medium	Error reminder	The function of error reminder is recommended, especially as a pop-up window when error occurs during system practice
4	Low	Explanation on the function keys	Explanations on the function keys should be clear. Similar phrasing for different keys should be avoided to prevent confusion and waste of time in searching the right function.
5	Low	GUI	A richer color palette and graphical design are good ways to create aesthetically pleasing interfaces.
6	Low	Function description	On function description, the addition of pop-out windows is recommended to allow users a better understanding of the functions chosen.
7	Low	Error-free function	An error-free function is recommended to prevent incorrect entries of file names or dates causing the difficulty of displaying within the system.
8	Low	Hide functions	The display of functions should be able to be customized or cancelled by users. It is recommended not to present all functions at once to prevent confusion.
9	Low	Speed of file update	When repeating an update of the file under the same title, the previous uploaded one cannot be replaced. The replacement only takes effect when the users log out and in to repeat the action.

summary were subsequently checked word by word according to the audio file by two doctoral students. The process of reviewing was to ensure the correctness of coding and the coherency between the original interview and the summarized text. The results of the interview are shown in Table 2.

DISCUSSION AND CONCLUSION

This research aimed to obtain the overall evaluation from the participants over the e-Course platform based on the data gathered from questionnaires and interviews. The data analysis of our questionnaires showed that the average scores of three scenarios from high to low were S1a, S1b and S2. As each of these scenarios represented different system functions and interfaces, their individual scores reflected the system's usability from the users' point of view. Norman (2002) pointed out that in some cases users would regard certain product or system error as their own mistakes or malpractice. In our interviews some participants also expressed that they thought that they could have avoid certain problems should they had been more careful at the time. Nonetheless, a friendly system should be equipped with a fool-proof mechanism to prevent careless mistakes made by its users (Chen et al., 2010). It should also include timely instruction or error reminders for users to carry out speedy problem-solving and error reversal. For an e-learning system to be effective, it should feature flexible, friendly and appealing user interfaces. The option of interface customization is equally important (Ardito et al., 2004), such as allowing users to open or hide certain functions according to personal preference. Apart from functionality, a good interface should be easy to use and highly distinguishable, in order to effectively shorten users' adaption time to a new system (Preece et al., 2002). In terms of usability goals, efficiency, learn ability, utility, effectiveness, these four-goals' average scores is higher than 3. In terms of users' experiences goals, the average score is less then 3, but near 3. According to interview, participant 2, 4 and 5 presented the target system is

acceptable, between dissatisfied and satisfied. Therefore, compare survey with interview, the result is consistency.

The study of HCI underlines the importance of human users and the introduction of a humanized design into system development. The main focus is on minimizing the gap between a system (product) and its users through friendly and easy-to-use interfaces. The analysis of usability presents an evaluative method that emphasizes the importance of the users' perspectives and needs. Norman (1993) explained the principle of a UCD as addressing the interests and demands of users to facilitate a product's ease of use and understanding. In other words, it promotes a human-centered view of technology in order to gain a whole picture of the relationship between the human, system and context.

From the perspective of cognitive psychology, Norman (1993, 2002, 2004) approached the relationship between design model, system image and user mentality. He concluded that, ideally, there should be consistence between the design model and the user model. In this way, the system is able to satisfy the users' needs when completing their target tasks. To achieve such a goal as keeping the user and system on the same page, the system image (interface) plays an indispensable role. Therefore, this explains why the user interface is a key concern in any human-centered design and humanized technology. The higher the usability level of an interface, the better it is able to promote its users' positive perceptions and willingness to use a system (Kim et al., 2009). It can also transform intentions into concrete actions (acceptance and adoption of a system) (Agarwal and Venkatesh, 2002). Turning intention into action represents the initial goal of system design, which, put simply, is to help users to accomplish certain tasks or solve specific problems (Chang, 2010).

The analysis of usability is a user-centered analytical technique. It is similar to the research on e-learning systems because such systems follow a learner-centered principle (Hornbæk, 2006). In order to realize this principle, system designers need to have a clear view of the users' requests and opinions. The usability analysis provides a key to such knowledge. According to a UCD concept, every process of system usage is a process of message management. Such a process takes place inside the minds of the users, either as a conscious or unconscious mental procedure (Preece et al., 2002). During the process, every received message would automatically contribute to a corresponding psychological cognition or impression. System image and User model hence represent the cognition of users from their system (product) experience, as well as an external expression of their ideas of the system or product (Norman, 2002).

Overall, the interface of e-Course platform is ease to use and acceptable. From the information gathered through the 1st and the 9th questions of the interviews, this research put together a list of suggested modifications to the system (Table 3).

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