Usability Analysis of Students Information System in a Public University

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Abstract
This study aimed to discover factors leading to usability problem found in the students' information system. The experience of the respondents' and impressions of the investigated application were obtained from the surveys and interviews. Data was collected using Computer System Usability Questionnaire. The respondents in this study were 132 students of Computer Science program and two operation officers from Information Technology Department. Four factors were constructed using factor analysis. Assigned as the usability criteria that affect user's impressions are; useful information, timely access, interface design, and error recovery. Moreover, four qualities are found to create nuisance to the users; time taken to complete the task is frustrating, functions and capabilities of the system is not as expected, error message is not stated clearly and recovery from mistakes is not easy. Based on the results, it is necessary to develop a hostel management system for all hostels in the campus. A limited version of proposed hostel management system is presented. It is also suggested to include response from different background for example respondents from economy science in the future. Reducing these limitations is necessary in order for the results to become potential guidance for the next iteration of the development process.
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INTRODUCTION
Usability of a system or application has been a subject of interest by the system experts since the 90s. This is because system usability has a significant impact on consumer behaviour because one will not choose to use a system or revisit it if the system is impractical. However, it is a different case for institution-base system for example the student information system in a public university or the government e-service application, whereby users do not have choice but to use the system even though it is impractical and time-consuming. The absence of usability will cause users to go back to traditional means of interacting with the organization, for example students must make a visit to the academic office counter to register their courses. This paper contains study that was intended to point out the strengths and weaknesses of the usability aspects in the design of the students' information system. The aspects include system's performance and effectiveness, content and organization. The results are expected to aid the system's developer to overcome the limitations of this system and improve its efficiency.

Usability is one of crucial factor in software and system development. Condori-Fernández et al., (2013) stated in their study that lack of usability diminishes user experience and users' trust.

Furthermore, they also stated that usability is a key characteristic to obtain a good acceptance of the software for users that do not work in the area of software development. Usability should therefore be always considered as something more than an easy to understand and easy to use.

A software system is a specialized product meant for a specific context. The students' information system of Universiti Malaysia Sabah are aimed at providing up-to-date information and services to students. Information include but not limited to students' academic status, hostel application and education fee updates. Users of this system are concerned with the following questions:
1. How fast can they retrieve information from the system?
2. Is the system easy to use?

This study has two primary goals: (1) to analyse student's perception on the students' information system usability by collecting student's feedback through several statistical analysis. (2) to discover factors that affects the system's usability which would lead to usability problems. This is obtained using factor analysis to identify the attribute's impact on the system's usability. This study will determine the extent to which the information system achieved level of usability and furthermore aimed to assist

information system professionals in the identification and solution of possible usability problems which can be minimized during requirements planning.

LITERATURE REVIEW

System usability has a significant impact on consumer behaviour. Vila and Kuster (2011) conducted study on the relationship between consumers' behaviours and online system. Their studies discovered that antecedents to online satisfaction have been considered to fall into one of three groups: (i) information, (ii) system usability and (iii) customer service. Additionally, action on each of these is likely to increase customer satisfaction.

Nielsen (1993) measured usability as the learnability, efficiency, memorability, less errors, and satisfaction involved in a user's interaction with a technology. Rubin (1994) proposed similar usability dimensions, including learnability, effectiveness, usefulness, and attitude. Quesenbery (2003) defined usability in terms of five dimensions: efficiency, effectiveness, engagement, error tolerance, and ease of learning.

In a study "The importance of usability in the establishment of organizational software standards for end user computing", the term usability includes ''how easily the software can be used'', ''ease of use'', and ''user-friendly''. As for managers, usability includes feature-based definitions including ''menu-driven or Windows applications'', ''an intuitive interface with extensive on-line help'' and ''speed'' (Morris and Dillon, 1996).

Catarci (2000) define usability as an evident requirement in a software product to be interactively utilized by a user. One of the conclusions of the study entitled "An empirical approach for evaluating the usability of model-driven tools" by Condori-Fernández et al., (2013) was that the usability characteristic ''ease of use'' is important. Usability focuses on the effective, efficient and satisfactory task accomplishment and aims to support a normal and uninterrupted interaction between the user and the system (Tsakonas and Papatheodorou, 2008). Usability problems are considered any observed characteristic that might prejudice the performance of a task, might annoy or distract a user (Simone Bacellar Leal Ferreira et al., 2012).

In a study by Panach et al., (2013) two groups of usability recommendations identified are recommendations that only affect the interface presentation for example, meaningfulness of a label. The other group of recommendations are ones that affect the system functionality for example a cancel function. It also receives the name of functional usability features.

MATERIALS AND METHODS

The experience of the users and impressions of the investigated application were obtained from the surveys and interviews. The opinions of respondents were sampled to discover types of information or services they needed. The objective of open-ended questions in the second part of the questionnaires is to encourage users' true experience and feelings about the information system. This has been one of the main motivations for the study to upgrade the current design to serve the needs of its users. Finally, results were analyzed, and recommendations were offered.

Respondents are students from Computer Science program and two operation officers from information technology department. 132 students undertook the analyses using the questionnaire and 13 of them were involved in the interview session. The interview session were conducted to identify and analyse the usability aspects in terms of user satisfaction, simplicity, efficiency and other factors related to the students information system in Universiti Malaysia Sabah. In addition, interview sessions conducted with two officers from information technology department to gain their experience in handling issues related to the information system.

QUESTIONNAIRE-BASED EVALUATION METHOD

The data that had been used throughout this study was primary data, which were collected from the Computer System Usability Questionnaire (CSUQ). The response data were analysed using IBM SPSS Software. CSUQ, developed at IBM, is composed of 19 questions. Each question is a statement and a rating on a seven-point scale of "Strongly Disagree" to "Strongly Agree". (Tullis and Stetson, 2004)

The analysis performed in this study are the descriptive statistics and factor analysis. McClave et al., (2005) defined descriptive statistics as utilizing numerical and graphical methods to look for patterns in a data set, to summarize the information revealed in a data set, and to present the information in a convenient form. Chua (2009) suggested that factor analysis is the procedure which always been used by the researchers to organise, identify and minimise big items from the questionnaire to certain constructs under one dependent variable in a research.

RESULTS AND DISCUSSION

The minimum sample size was five for one variable, in addition, a one hundred sample size is acceptable, however, a sample size of more than two hundred is much more acceptable to fulfil the factor analysis (Coakes and Ong, 2011). This study used a sample size of 132 students.

DESCRIPTIVE STATISTICS

The undergraduate students who participated in this study were from Computer Science programme. Table 1 shows the profiles of the respondents. There were 66 male students (50.0%) and 66 female students (50.0%). Most of the respondents are 20 years old (40.2%) while (2.3%) of the respondents are 19 years old and 26 years old.

FACTOR ANALYSIS

Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy are both tests that can be used to determine the factoriability of the matrix as a whole. Coakes and Ong (2011) suggested that if the Bartlett's test of sphericity is large and significant, and if the Kaiser-Meyer-Olkin measure is greater than 0.6, then factorability is assumed. Based on the result, the value of Bartlett's test of sphericity were large (X^2 = 1695.339) and the value is significant (p<0.001). In addition, the Kaiser-Meyer-Olkin measure is 0.847 which is greater than 0.6. Thus, based on this finding, it is appropriate to proceed with Factor Analysis to examine factors that contribute to the usability analysis.

Table 1: Profiles of Respondents

Demographic factors		Frequency
Gender	Male	60 (50.0%)
	Female	60 (50.0%)
Age	19	3 (2.3%)
	20	53 (40.2%)
	21	35 (26.5%)
	22	19 (14.4%)
	23	6 (4.5%)
	24	5 (3.8%)
	25	6 (4.5%)
	26	3 (2.3%)
	27	2 (1.5%)

Table 2 shows the rotated factor matrix. Variable with factor loadings more than 0.45 were chosen in this study because loadings equals to 0.45 is considered average, whereas loadings 0.32 is considered less good (Tabachnick and Fidell, 2001). After performing Varimax Rotation Method with Kaiser Normalization, four new factors were successfully constructed using factor analysis. These factors are assigned as the reason of users' concerns on the system usability. Table 2 illustrate further the name of new factors.

Factor number 1 is regarding information provided in the information system. It includes the clarity of the information, easy-to-understand, and effectiveness of the information to help complete the tasks.

Table 2: Factors of System Usability Concerns among the Undergraduate Students

No.	Factors of system usability
1	Useful information
2	Timely access
3	Interface design
4	Error recovery

Factor number 2 is related to time taken to access the system and time spent to complete the tasks. Factor number 3 is related to interface design. This covers the users' feel and fondness towards system's interface. Dee and Allen (2006) include the how easy-to-use and intuitive end-user interfaces as important quality because if users cannot access the information easily, there is little point in expending the enormous amount of effort and expense it takes to provide a useful system. Study by Palmer (2003) showed that appropriate layout can increase usability. Finally, the last factor is concerning error message clarity, and the ability to easily recover from mistakes.

Usability Problems

The open-ended questions and interview sessions with respondents have helped this study to record users' experience and the officers' thoughts regarding the students' information system. While our participants were generally comfortable with the students' information system, they expressed a need for improvement. A list of usability problems has been identified.

Based on the frequency analysis, four qualities found in the system have had the users facing unfavourable experience. Note that the percentage represents number of users who agree with the present achievement. They are; (1) Time taken to complete the task (36.4%), (2) Functions and capabilities of the system is as expected (39%), (3) Clear error message (30.3%) and (4) Easy recovery from mistakes (39.5%). This figures show that more than 50% of the respondents faced some barriers in each of the listed factors.

One of the input from the interview session is users want error notification and online help to be available when they need it and from the screen that they are using. Users also express their concerns on the limitation to access the system from other browser for example Mozilla. This is because currently, the system is only accessible using Internet Explorer. In addition, other significant barriers include server lag or slow due to huge activities occur especially during course registration weeks. Coursaris et al., (2012) in their study stated that low bandwidth is most of the barriers faced by their respondents. Additionally, the database needs to be upgraded to help overcome this situation.

In addition, respondents faced very limited yet slow access to hostel information, for example application status and check-in details. Popular suggestions by respondents are to develop a hostel information management system. This is very relevant since it

will provide a more convenient way of managing all information related to the hostel for example, hostel application, complaints, and hostel's fee. Currently, informations related to hostel are available within the students' information system but very limited. Students should be able to report any inconveniences found during their stay via online report. They should receive all important announcements via the hostel management system.

Interview session with the respondents received many suggestions to improve these defects. Most of them agree that with this system upgrading, the quality of the information system can be increased.

Figure 1 until Figure 3 shows an example of suggested hostel management system.
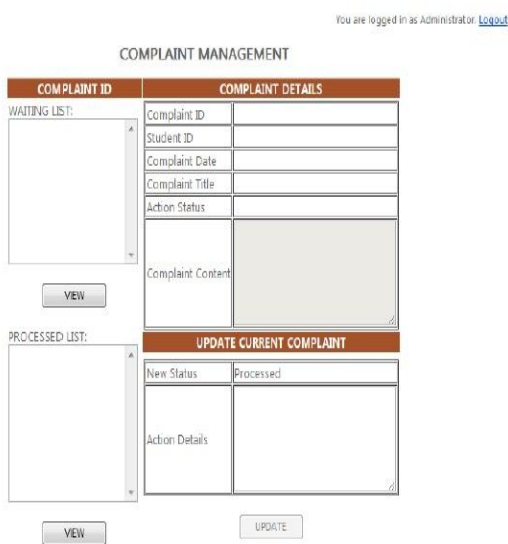

Figure 1: Log In Page

Figure 2: Complaint Management by Admin

LIMITATION
Respondents in this study consist of students from the same background – computer science. Since the students' information system are available for all students in the university, it is suggested to conduct the survey on respondents from all type of background. This step will enable the possibility of

gaining different pattern of feedback since different type of students may perceive system usability differently.

In addition, the suggested hostel management system is limited since it is based on the user requirement. A more in depth study should be conducted to collect more information to build complete functions in the system. Detail study on this will enable the possibility of developing an excellent system and a great contribution to the students' affair department.

CONCLUSION
Usability is important in creating quality (Youngblood and Mackiewicz, 2012). A variety of usability evaluation methods have been developed over the past few decades and most of them involving websites and web portals; very few conducted on information system. This study explores users' perception on the students' information system in a public university. Through factor analysis, four factors; useful information, timely access, interface design, and error recovery were usability factors which received concerns from the users. The results demonstrate that several attributes of usefulness, such as the level and the relevance of information, and usability, such as easiness of use as well as functionalities commonly met in these systems, affect user interaction and satisfaction. Our results also showed that users often face several barriers to information caused by low bandwidth.

Figure 3: Hostel Application Status

Based on this study, the information system must address students with diverse interests, aspects that have to be reflected by the system design. An information system assessment is essential because it identifies problems to be corrected. Results will be the guidance for the next iteration of the development process. In addition, usability is context dependent and is shaped by the interaction between users, tasks

and system purpose. Therefore, development team of the system must consider barriers that exist between users and the information they need.

Researchers in this field have emphasized the successful interaction between a human and a computer as a key factor in designing and implementing a variety of computing systems (Lee and Kozar, 2012).

REFERENCES
Chua Y.P. 2009. Statistik Penyelidikan Lanjutan Ujian Regresi, Analisis Faktor dan Ujian SEM, McGraw-Hill Malaysia.

Catarci T. 2000. What Happened When Database Researchers Met Usability, Information Systems vol. 25, 3:177-212.

Dee C. & Allen M. 2006. A Survey of the Usability of Digital Reference Services on Academic Health Science Library Web Sites, The Journal of Academic Librarianship, vol. 32,1: 69–78.

Coursaris C. K. Hassanein K. Head M. M. & Bontis N. 2012. The Impact of Distractions on the Usability and Intention to Use Mobile Devices for Wireless Data Rervices, Computers in Human Behavior 28: 1439–1449.

Coakes J. C. & Ong C. 2011. SPSS Version 18.0 for Windows Analysis Without Anguish. 1st Edition. Dougall Street, Milton: John Wiley & Sons Australia, Ltd.

Ferreira S.B.L. Nunesb R.R. & Silveirac D. S. 2012. Aligning Usability Requirements with the Accessibility Guidelines Focusing on the Visually-Impaired, Procedia Computer Science 14: 263 – 273.

Condori-Fernández N., Panachb J.I., Baars A. I., Vosc T., Pastor O. 2013. An Empirical Approach for Evaluating the Usability of Model-driven Tools, Science of Computer Programming. 78: 2245–2258.

Lee, Y., Kozar, K. A. 2012. Understanding of Website Usability: Specifying and Measuring Constructs and Their Relationships, Decision Support Systems 52: 450–463.

McClave, J. T. Benson, P. G. & Sincich T. 2005. Statistics for Business and Economics. Pearson Prentice Hall, Upper Saddle River, New Jersey.

Morris, M. G. and Dillon, A. P. 1996. The Importance of Usability in the Establishment of Organizational Software Standards for End User Computing, International Journal Human – Computer Studies. 45: 243 – 258.

Nielsen, J. 1993. Usability engineering. Cambridge: Academic Press/AP Professional.

Vila N. and Kuster, I. 2011. Consumer Feelings and Behaviours Towards Well Designed Websites, Information & Management 48: 166–177.

Panach J. I. Aquino N. and Pastor O. A. 2013. Proposal for Modelling Usability in a Holistic MDD Method, Science of Computer Programming. http://dx.doi.org./10/1016/j.scico.2013.06.008

Palmer J.W. 2003. Web Site Usability, Design, and Performance Metrics, Information Systems Research 13. 2: 151–167.

Quesenbery, W. 2003. Dimensions of usability. In M. Albers & B. Mazur (Eds.), Content and complexity: Information design in technical communication. Mahwah, NJ: Lawrence Erbaum Associates.

Rubin, J. 1994. Handbook of usability testing, John Wiley & Sons, New York.

Tabachnick B. G. and Fidell L. S. 2001. Using Multivariate Statistics, Fourth Edition, Allyn and Bacon, Boston

Tsakonas G. and Papatheodorou C. 2008. Exploring usefulness and usability in the evaluation of open access digital libraries, Information Processing and Management 44: 1234–1250.

Tullis T. S. & Stetson J. N. 2004. A Comparison of Questionnaires for Assessing Website Usability. UPA 2004 Presentation.

Youngblood N. E. & Mackiewicz J. 2012. A Usability Analysis of Municipal Government Website Home Pages in Alabama, Government Information Quarterly 29: 582–588.