

Usability Testing on Student Document Management Application using Retrospective Think Aloud (RTA) and USE Questionnaire Methods

Halimah Tus Sadiyah and Ema Kurnia

Information System Department
Universitas Pakuan
Jl. Pakuan, PO Box 452, Bogor, 16143, West Java, Indonesia
sadiyahht@unpak.ac.id, ema.kurnia@unpak.ac.id

Eneng Tita Tosida

Computer Science Department
Universitas Pakuan
Jl. Pakuan, PO Box 452, Bogor, 16143, West Java, Indonesia
enengtitosida@unpak.ac.id

Abdul Talib Bon

Department of Production and Operations, University Tun Hussein Onn Malaysia, Malaysia
talibon@gmail.com

Abstract

Management of student data and documents are usually still stored and centralized in one PC computer. This causes data and documents not to be systematically recorded and the damage to files due to viruses cannot be avoided. Therefore, a student data and document management application was built for easy access, search, recap, filter of data and documents. The applications that will be implemented to end users need to be tested for the usability. Usability testing is important to do, to see whether the application that has been developed can be accepted by the user or not. This study aims to conduct usability testing on student document data management applications. The method used in usability testing is the RTA method and the USE Questionnaire. Tests were carried out on students as end users, administrative operators, and lecturers. The results of the first usability test using the RTA method were 72%. In testing using the RTA method, there are suggestions for improvements to the application, namely the need for notification of the maximum upload file size limit and upload error notifications. In addition, buttons that do not work should be disabled because it is worried that the user clicks the button but the data does not come out so the user assumes there is no data. The revised student document data management application was then retested using the USE Questionnaire method. The results of the second test have increased by 16% on the usability value of 88%. This shows that the application has a good quality attribute value so that it can be accepted by users

Keywords

Usability testing, USE Questionnaire, Application, Document Management, Students

1. Introduction

The volume of documents in a department and even faculties at a university from day to day will increase and accumulate. Student data and documents that are still stored and centralized in one PC cause many problems. The first problem is that data and documents are not systematically recorded and the damage to files due to viruses cannot be avoided. Therefore, a student document data management application was built for easy access, search, recap and filter of data and documents (Hidayat et al. 2021). Applications that will be implemented to end users should be tested for usability first.

According to ISO 9241-11, usability is defined as a measure of whether the product can be used by users and can achieve certain goals with effectiveness, efficiency, and satisfaction in use (ISO-9241-210:2010) (Ng et al.

2011)(Nawaz et al 2016). Usability can also be defined as a measure of the quality of system interface attributes (Sadiah, et al. 2020b) (Nielsen, 2012), (Nurhadryani et al., 2013). Usability testing aims to evaluate the suitability between user needs and the system that has been developed (Nurhadryani et al., 2013) (Putra and Tanamal 2020). Usability testing is very important because from the test we can find out the quality of the software and the success of the software system (Madan and Dubey 2012) (Alhadreti and Mayhew 2018). In addition, the value of usability testing can represent whether the application built can be accepted by users or not (Nurhadryani et al. 2013). The high value of the usability of a product shows the value of the benefits of information systems in helping users is getting higher (Hendra and Arifin 2018).

In the usability testing there are several methods, namely indirect testing using a questionnaire and direct testing using the think aloud method (Nurhadryani et al. 2013). Direct testing using the think aloud method can assist in usability evaluation in terms of ease of use of the tool (Richardshon et al. 2017). In addition, direct testing using the retrospective think aloud (RTA) method can help identify critical usability problems and gain an in-depth understanding of application usage issues (Cho et al. 2019). This study aims to measure the usability of e-dictionary drugs using the RTA and USE Questionnaire methods. The USE Questionnaire method is used to measure product usability subjectively (Gao et al. 2019).

2. Methods

The application tested for usability was the student document management application (Hidayat et.al. 2021). This application was tested on end users (Hua & Gong 2013). This application has several functions which can be seen in Table 1. In Table 1 there are 122 tasks which are categorized into 17 main functions, where each main function can only be accessed according to its role. User roles as staff and lecturers can access all functions. As for the user role as a student, can access all functions, except for the student profile function (T14-T21), and the certificate submission function (T114-T121).

Table 1. Functions in student document data management applications

Function		Task								
		Read	Input	Edit	Delete	Download	Upload	Search	Filter	Export to excel
F1	Home Information	T1	T2	T3	T4			T5		
F2	Self-Profile	T6	T7	T8	T9	T10	T11	T12	T13	
F3	Student Profile	T14	T15	T16	T17	T18	T19	T20	T21	
F4	Personal Data	T22	T23	T24	T25	T26	T27	T28	T29	T30
F5	Population Data	T31	T32	T33	T34	T35	T36	T37	T38	T39
F6	Education Data	T40	T41	T42	T43	T44	T45	T46	T47	T48
F7	Family Data	T49	T50	T51	T52	T53	T54	T55	T56	T57
F8	Achievement	T58	T59	T60	T61	T62	T63	T64	T65	T66
F9	Activities	T67	T68	T69	T70	T71	T72	T73	T74	T75
F10	Training	T76	T78	T79	T80	T81	T82	T83	T84	T85
F11	Seminar	T86	T87	T88	T89	T90	T91	T92	T93	T94
F12	Certificate	T95	T96	T97	T98	T99	T100	T101	T102	T103
F13	Login Page	T104	T105							
F14	Account Data	T106	T107	T108	T109			T110	T111	
F15	Category	T112	T113							
F16	Certificate	T114	T115	T116	T117	T118	T119	T120	T121	

Function		Task								
		Read	Input	Edit	Delete	Download	Upload	Search	Filter	Export to excel
	Submission									
F17	Logout	T122								

Usability testing using the RTA method was carried out online through recorded video conference. The number of respondents in the RTA test was 10 people, consisting of 5 students, 3 lecturers and 2 staff. Table 1 is a collection of tasks that must be completed by users when testing with RTA. The number of tasks that must be completed by users with the roles of lecturers and staff was 122 tasks. The tasks that must be completed by users with student roles are 104 Tasks. The next stage after RTA testing is to recap all user suggestions and then revise the application according to user suggestions. The revised application was then tested using the USE Questionnaire. The users access the questionnaire form and fill out a list of questions on the USE Questionnaire method (Table 2). The several interfaces for student document data management applications can be seen in Figure 1 and Figure 2.

Table 2. List of USE Questionnaire

Usability Criteria	Question Code	Question
Usefulness	U1	It helps me be more effective
	U2	It help me be more productive
	U3	It is useful
	U4	It gives me more control over the activities in my life
	U5	It makes the things I want to accomplish easier to get done
	U6	It saves me time when I use it.
	U7	It meets my needs
	U8	It does everything I would expect it to do
Ease of use	E1	It is easy to use
	E2	It is simple to use
	E3	It is user friendly.
	E4	It requires the fewest steps possible to accomplish what I want to do with it
	E5	It is flexible
	E6	Using it is effortless
	E7	I can use it without written instructions
	E8	I don't notice any inconsistencies as I use it.
	E9	Both occasional and regular users would like it
	E10	I can recover from mistakes quickly and easily
	E11	I can use it successfully every time
Ease of learning	E12	I learned to use it quickly
	E13	I easily remember how to use it
	E14	It is easy to learn to use it
	E15	I quickly became skilful with it
	S1	I am satisfied with it
	S2	I would recommended it to a friend
	S3	It is fun to use

Usability Criteria	Question Code	Question
	S4	It works the way I want it to work
	S5	It is wonderful
	S6	I feel I need to have it
	S7	It is pleasant to use

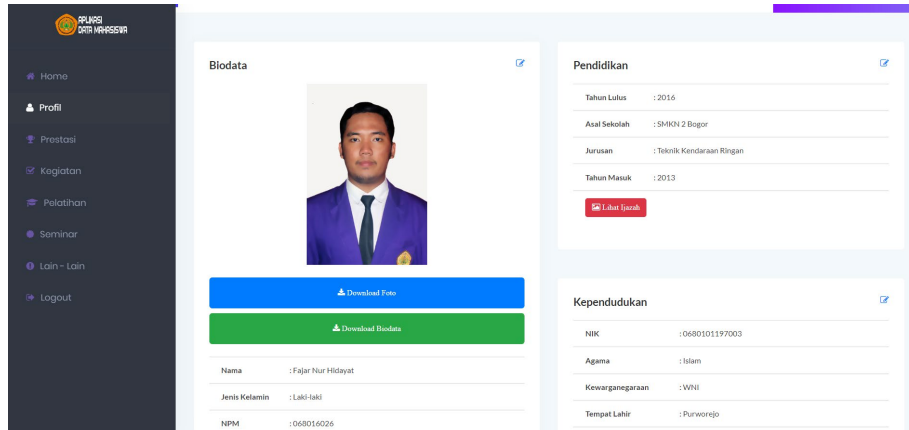


Figure 1 Student Profile Page on student data management applications (Hidayat et al. 2021)

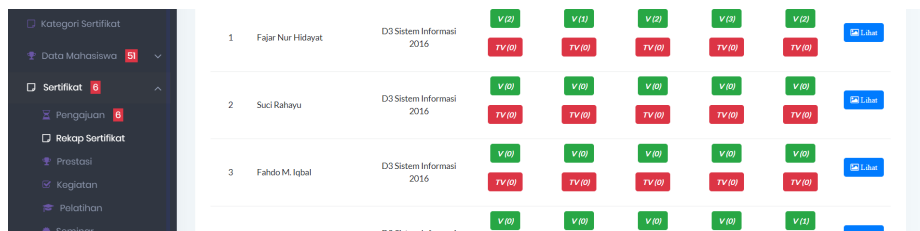


Figure 2 Certificate submission page on student data management applications (Hidayat et al. 2021)

3. Results and Discussion

Usability testing on student document data management applications uses two methods, namely RTA and USE Questionnaire. The results of usability testing using the RTA method can be seen in Figure 3 and the results of usability testing using the USE Questionnaire method can be seen in Table 3.

In usability testing using RTA, it is known that the test result in Figure 3 stating that the average respondent can complete the task was 72%. All respondents can complete their tasks on the logout function, category, home page, self-profile, and student profile. In this RTA test, it was found that users often fail to upload documents. Therefore, users provide suggestions for application revisions in the form of the need for notifications, namely the need for notification of the maximum upload file size and upload error notifications. In addition, buttons that do not work should be disabled because it is worried that the user clicks the button but the data does not come out so the user assumes that there is no data.

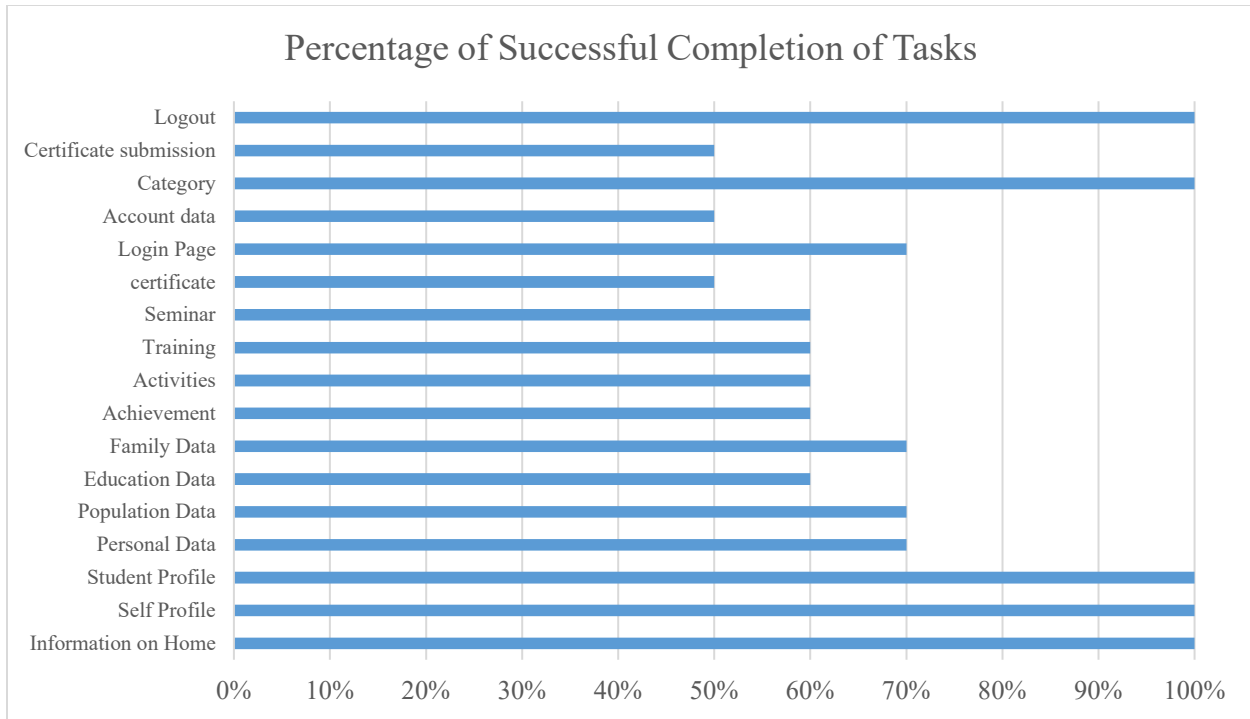


Figure 3. Graph of application usability test results using the RTA method

Table 3. The results of usability testing of applications using the USE Questionnaire method

Usability Criteria	Criteria code	Question	Test Results	
Usefulness	U1	It helps me be more effective	94%	88%
	U2	It help me be more productive	90%	
	U3	It is useful	96%	
	U4	It gives me more control over the activities in my life	86%	
	U5	It makes the things I want to accomplish easier to get done	80%	
	U6	It saves me time when I use it.	94%	
	U7	It meets my needs	80%	
	U8	It does everything I would expect it to do	80%	
Ease of use	E1	It is easy to use	98%	88%
	E2	It is simple to use	96%	
	E3	It is user friendly.	92%	
	E4	It requires the fewest steps possible to accomplish what I want to do with it	80%	
	E5	It is flexible	88%	
	E6	Using it is effortless	90%	

Usability Criteria	Criteria code	Question	Test Results
	E7	I can use it without written instructions	94%
	E8	I don't notice any inconsistencies as I use it.	80%
	E9	Both occasional and regular users would like it	80%
	E10	I can recover from mistakes quickly and easily	80%
	E11	I can use it successfully every time	90%
Ease of learning	E12	I learned to use it quickly	96%
	E13	I easily remember how to use it	80%
	E14	It is easy to learn to use it	90%
	E15	I quickly became skilful with it	80%
Satisfaction	S1	I am satisfied with it	96%
	S2	I would recommended it to a friend	94%
	S3	It is fun to use	92%
	S4	It works the way I want it to work	82%
	S5	It is wonderful	92%
	S6	I feel I need to have it	80%
	S7	It is pleasant to use	88%

The application was revised based on the input from the RTA test results, then the application was tested using the USE Questionnaire method. According to the results of usability testing using the USE Questionnaire, it is known that there is an increase in the average usability value from 72% to 88% where the average value of Usefulness and Ease of use criteria is 88%. As for the criteria for Ease of learning and Satisfaction, the average score is 89%. This shows that input from respondents from the results of the first test using RTA can improve the quality of student management application so that the application can be accepted by users.

4. Conclusion

Usability testing on student document management applications uses two methods, namely RTA and USE Questionnaire. The first usability test using the RTA method resulted in a value of 72% and received input for application revision. The application was revised based on the input from the RTA test results, then the application was tested using the USE Questionnaire method. Based on the results of usability testing using the USE Questionnaire, it is known that there is an increase in the average usability value from 72% to 88% where the average value of Usefulness and Ease of use criteria is 88%. As for the criteria for Ease of learning and Satisfaction, the average score is 89%. This shows that the respondents input from the results of the first test using RTA can improve the quality of student data management applications so that the application can be accepted by users.

References

- Alhadreti O., Mayhew O., Are Two Pairs of Eyes Better Than One? A Comparison of Concurrent Think-Aloud and Co-Participation Methods in Usability Testing, *JUS (Journal of Usability Studies)*, vol 13, no. 4, pp. 177-195, 2018.
- Assila A., Oliveira K.M.d., Ezzedine H., Standardized Usability Questionnaires: Features and Quality Focus, *electronic Journal of Computer Science and Information Technology (eJCSIT)*, vol. 6, no. 1, pp. 15-31, 2016.
- Cho H., Powell D., Pichon A., Kuhns L.M., Garofalo R., Schnall R. Eye-tracking retrospective think-aloud as a novel approach for a usability evaluation, *International Journal of Medical Informatics*, vol. 129, pp. 366-373, 2019.
- Gao M., Kortum P., Oswald F., Psychometric Evaluation of the USE (Usefulness, Satisfaction, and Ease of use) Questionnaire for Reliability and Validity, *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*; 62(1):1414-1418. doi:10.1177/1541931218621322, 2018.
- Hendra, Arifin. Web-based Usability Measurement for Student Grading Information System, *Procedia Computer Science*, vol. 135, pp. 238-247, 2018.
- Hidayat, F. N., Qur'ania, A., Sadiyah, H.T., Document Managing Application For Student Of Information Sistem Diploma III Pakuan University. *JUBIKOM | Jurnal Aplikasi Bisnis dan Komputer*. vol. 1, no. 1, pp. 13-21, 2021.
- Hua L, Gong Y., Usability Evaluation of a Voluntary Patient Safety Reporting System: Understanding the Difference between Predicted and Observed Time Values by Retrospective Think-Aloud Protocols M, *Kurosu (Ed.): Human-Computer Interaction, Part II, HCII 2013*, LNCS 8005, pp. 94–100, 2013.
- ISO-9241-210:2010, Ergonomics of human–system interaction. In: Part 210: Human-Centred Design for Interactive Systems. Geneva: International Organization for Standardization.
- Madan A, Dubey S.A., Usability Evaluation Methods: A Literature Review. *International Journal of Engineering Science and Technology (IJEST)*, vol. 4, no.2, pp. 590-599. 2012.
- Nawaz A., Skjæret N., Helbostad J.L., Vereijken B., Boulton E., Svanaes D., Usability and acceptability of balance exergames in older adults: A scoping review. *Health Informatics Journal*. vol. 22. no.4, pp. 911-931. doi:10.1177/1460458215598638., 2016.
- Ng. A.W.Y., Lo.H.W.C., Chan.A.H.S. Measuring the Usability of Safety Signs: A Use of System Usability Scale (SUS). *Proceedings of the Internastional MultiConference of Engineers and Computer Scientists 2011 Vol II IMECS*, 2011.
- Nielsen J., *Handbook on Usability 101: Introduction to Usability 4th Ed* (New Jersey), Prentice Hall, 2012.
- Nurhadryani Y., Sianturi S.K., Hermadi I., and Khotimah H, Usability Testing to Enhance Mobile Application User Interface, *Jurnal Ilmu Komputer AgriInformatika*, vol.2, no.2, pp.83-93, 2013.
- Putra, Y.S.M., Tanamal. R. Usability Analysis Using USE Questionnaire Method on Ciputra Enterprise System Website. *TEKNIKA*, vol.9, no.1, pp.58-65. Juli 2020.
- Richardson S., Mishuris R., O'Connell A., Feldstein D., Hess R., Smith P., McCullagh., McGinn T., Mann D., “Think aloud” and “Near live” usability testing of two complex clinical decision support tools, *International Journal of Medical Informatics*, vol. 106. no. 1-8, 2017.
- Sadiyah H.T, Gasbara M.A, Lily N.S.A, Tosida E.T, Ishlah M.S.N. 2020. Usability Testing on Android-based KMS for Pregnant Women using the USE Questionnaire. *International Journal of Quantitative Research and Modeling*. vol 1, no.3, pp. 164-173, 2020.

Biographies

Halimah Tus Sadiyah is a Lecturer at the Information System Department, Vocational Program of Universitas Pakuan, Indonesia. Her bachelor's and master's degree in Computer Science which obtains from IPB University, Indonesia. Her expertise is in Algorithm, KMS (Knowledge Management System), Usability, ICT Literacy, and Information retrieval. She had published articles in national and international journals. She also wrote and published 2 textbooks, namely a pharmacy computer application book, and a web programming book.

Emma Kurnia is a Lecturer at the Information System Department, Vocational Program of Universitas Pakuan, Indonesia. She has an M.Sc. in Information Technology for Natural Resources Management from IPB University, Indonesia in the year 2016. Her bachelor's degree is in Computer Science which obtains from Universitas Pakuan,

Indonesia. Her research interest and expertise is in Information System include Geographic Information System and Remote Sensing. She had published articles in National and International Journals.

Eneng Tita Tosida is a lecturer in the Department of Computer Sciences, Faculty of Mathematics and Natural Sciences, Universitas Pakuan. She teaches in Simulation Techniques and Data Mining, Linear Programming and Optimization Models and research methods. She leads research group of Decision Support System (DSS) and Socio Informatic, and actives on educational digital media base on game, Augmented Reality and Virtual Reality research. She also actives on Indonesian Operations Research Association (IORA) as Secretary. Now is serving as head of Community Services Center, Universitas Pakuan.

Abdul Talib Bon is a professor of Production and Operations Management in the Faculty of Technology Management and Business at the Universiti Tun Hussein Onn Malaysia since 1999. He has a Ph.D. in Computer Science, which he obtained from the Universite de La Rochelle, France in the year 2008. His doctoral thesis was on the topic Process Quality Improvement on Beltline Moulding Manufacturing. He studied Business Administration in the Universiti Kebangsaan Malaysia for which he was awarded the MBA in the year 1998. He's a bachelor degree and diploma in Mechanical Engineering which he obtained from the Universiti Teknologi Malaysia. He received his postgraduate certificate in Mechatronics and Robotics from Carlisle, United Kingdom in 1997. He had published more 150 International Proceedings and International Journals and 8 books. He is a member of MSORSM, IIF, IEOM, IIE, INFORMS, TAM, and MIM.