

Evaluation of E-Rapor Usability using Usability Testing Method

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Abstract—E-rapor is a desktop-based application used to process students' final grades. There are some obstacles in using e-rapor, so it is necessary to evaluate of usability aspects using usability testing method. The purpose of this study was to evaluate e-rapor from the use side of effectiveness, efficiency, and user satisfaction. The population in this study is 577 people. The sampling technique used was a stratified random sampling with a total sample of 30 people (15 novice users and 15 expert users). Data collection techniques in this study using performance measurement, think aloud, and SUS questionnaires. The method used for data analysis is descriptive statistics and t-test. The results of this study show that: (1) e-rapor is not effective in terms of usage, because there are still many errors made by the user in completing the task (with completion rate <90%), (2) e-rapor in terms of use is efficient, because there is no time difference in completing the task on the user's novice and expert (not significant with $p < 0.05$), (3) unsatisfied user in using e-rapor, with mean score of SUS 64,26 <68. Recommendations for improvement of e-rapor in this research are: (1) improvements in data base design, (2) the need for additional help modules on e-rapor, and (3) improvements in import and export value format features.

Keywords—e-rapor, usability testing, effectiveness, efficiency, satisfaction.

I. INTRODUCTION

Rapor is a student study result on the value of students' learning ability and achievement in the school, which is usually used as a teacher report to the student's parents or guardian. Along with the development of technology at this time, the government in Indonesia has developed a digital report called the electronic report (e-rapor). E-rapor is a desktop-based application that automatically generates produce final grade of student after the assessment process on the affective, cognitive, and psychomotor aspects

In Indonesia has been applied desktop-based e-rapor in various schools in junior high and senior high school that has implemented the 2013 curriculum (K13). East Lombok is one of the districts in West Nusa Tenggara Province (NTB), where the numbers of schools that have used e-rapor are 300 schools. With the e-rapor, it can facilitate the user to conduct the assessment of the final results (final grade) of student learning digitally. Currently, the e-rapor used is 2017 version, where the previous version is 2016 version.

Based on the results of preliminary studies, there are some obstacles experienced by users in using e-rapor, such as: failure in the process of input student score, the absence of some list of course that will in the input student scores, the failure of the process of printing student scores on the aspects of cognitive, affective, and psychomotor, etc.

Based on the findings of the problem, it is necessary to take action to ensure that the product (e-rapor) will be accepted by the user, it is important for the product to have a good use [1,2,3]. Based on these, it is necessary to have an effectiveness, profitability, quality and satisfaction, usability evaluation which can be used to assess and improve the products' usability, and also usability evaluation is an important element of systems development and software development [4,5].

ISO 9241-11 states that usability is defined as the extent to which a product can be implemented by certain effectiveness, efficiency, and satisfaction in certain context of a particular use [3]. Furthermore, Nielsen [3] defines that the usability component consists of learnability, efficiency, memorability, errors, and satisfaction. Meanwhile, Jokela [6] argues that usability is one of the important quality characteristics of system and software products. It has been regarded as a science [7,8]. There are many topics in usability science, such as usability definitions, usability design, and usability evaluation [1,9,10,11,12,13]

Usability testing is one of the usability evaluation methods used to evaluate the product by testing it directly on the user. Usability testing is the most fundamental usability evaluation technique [3] and has now been accepted as an essential activity in the lifecycle of software design, implementation, testing, acceptance, and revision [14]. In addition, other opinions also suggest that usability testing is a tool used to measure users' performance by looking at the number of errors and the time required to complete a task [15,16].

Some researchers have previously used usability testing methods to evaluate the product or software that has been applied [17,18,19,20,21,22,23,24,25,26, 27, 28, 29].

Based on the above explanation, the focus of this research is to evaluate e-rapor in several schools in East Lombok in high school level by using usability testing method, where the method is used to obtain information about the e-rapor by way of direct testing and provide questionnaires to the respondent as the user of the e-rapor. The purpose of this study was to evaluate e-rapor usability to measure the effectiveness of e-rapor using performance measurement techniques, and to measure the level of user satisfaction using System Usability Scale (SUS) and think aloud techniques.

The rest of this paper is organized as follow: Section II describes proposed research method of this work. Section III presents the obtained results and following by discussion in section IV. Finally, Section V concludes this work.

II. PROPOSED METHOD

This type of research is user-based survey research using descriptive method. The research design is the stage done by writer to give description and easiness in doing research among others: (1) preparing research by defining the topic, formulating the problem, objectives, and research methods, (2) data gathering, (3) data analysis, and (4) conclusions and suggestions.

The population in this study is all e-rapor users at high school level in East Lombok, amounting to 577 people, and the number of samples in this study were 30 people consisting of 15 novice users and 15 expert users. The method used for sampling is stratified random sampling method. The variables of this study consisted of effectiveness, efficiency, and user satisfaction. The techniques used to data collected in this study are think aloud, performance measurement and SUS questionnaire with Likert Scale, while the technique used to data processing is descriptive statistic and t-test.

III. RESULTS

In this section, we describe the the analysis results of effectiveness, efficiency, and user satisfaction with the usability testing process. To measure the effectiveness of e-rapor using performance measurement techniques by looking at the number of errors and completion rate performed by respondents. While to measure the level of efficiency using the t-test technic by comparing the results of the average score of novice users and expert users. Furthermore, to test the level of user satisfaction is measured by looking at the results of SUS respondent questioner recapitulation. In Table I below, the results of the effectiveness of respondents in using e-rapor.

TABLE I. THE RECAPITULATION RESULT OF E-RAPOR USER EFFECTIVENESS

| Task Type | Number and Percentage of errors | | Completion Rate (%) | |
|-----------|---------------------------------|---------|---------------------|--------|
| | Novice | Expert | Novice | Expert |
| Task 1 | 0 (0%) | 0 (0%) | 100 | 100 |
| Task 2 | 5 (33%) | 4 (27%) | 67 | 73 |
| Task 3 | 5 (33%) | 4 (27%) | 67 | 73 |
| Task 4 | 5 (33%) | 4 (27%) | 67 | 73 |
| Task 5 | 5 (33%) | 2 (13%) | 67 | 87 |
| Task 6 | 4 (27%) | 3 (20%) | 73 | 80 |

Based on Table I above, the obtained results by the effectiveness of e-rapor users using performance measurement techniques, where some users fail or error in completing the task both on the user novice and user expert. In task 1, they can complete the task well, while on task 2 to task 6 they fail to complete the task. Furthermore, the level of effectiveness in using e-rapor by looking at the value of completion rate, where the value of completion rate of each

task is done below 90% both in novice users and expert users.

Based on the results of Table I above, it can be concluded that with the presence of failure or error and the amount of presentation completion rate is below 90% average, it can be concluded that the e-rapor in terms of its use is not effective. Measurement of usability e-rapor on efficiency aspect, researcher use t-test technique, by comparing time doing task in user novice and user expert. If ρ -value ($\rho > 0.05$), then there is a difference of usage time between novice and expert users, whereas if ρ -value ($\rho < 0.05$), then there is no time difference between novice and expert user. The results can be seen in Table II below.

TABLE II. THE EFFICIENCY RESULT ON E-RAPOR USER

| Task Type | ρ value |
|-----------|--------------|
| Task 1 | 0.023 |
| Task 2 | 0.034 |
| Task 3 | 0.045 |
| Task 4 | 0.046 |
| Task 5 | 0.032 |
| Task 6 | 0.037 |

Based on Table II above, task 1 has ρ -value = 0.023, task 2 has ρ -value = 0.034, task 3 has ρ -value = 0.045, task 4 has ρ -value = 0.046, task 5 has ρ -value = 0.032, and task 6 has ρ -value = 0.037. From these results, the average ρ -value of each task is less than 0.05 ($\rho < 0.05$), so it can be concluded that there is no time difference in the execution of the task, both in the novice and expert user. Therefore, it can be decided that the e-rapor in its use is efficient. After doing measurement with performance measurement and t-test technique, then user (respondent) is given SUS questionnaire to measure user satisfaction level after using of e-rapor.

Obtaining scores obtained after the respondent is given a SUS questionnaire is having an average value of 64.26. The results are below the standard score of SUS. According to Brooke [30], if the score of SUS score is 68 or more, then the products considered are included in the normal category or eligible to be used, so that the user is satisfied in using the product. Based on these results, the value of 64.26 less than 68. So, it can be concluded that the respondents have not been satisfied in using of e-rapor.

IV. DISCUSSION

At this section will discuss the results of our research that aims to test the usability of e-rapor seen from aspects of effectiveness, efficiency and user satisfaction.

A. Effectiveness

In the aspect of effectiveness, our results show that e-rapor is said not yet effective, because it still many errors or failure of some users in performing tasks that have been given. Failure that users do is when they do task 2 to task 6 both on the user's novice and expert. The failures are caused by several problems, including: (1) the user is still confused in changing the contents of the basic competencies on the list of course being taught, (2) users are still confused in filling aspects: aspects of knowledge, attitudes, spiritual

attitudes, and social attitudes, (3) there is still an error in export and import value of learning outcomes, (4) there is still error in doing data input about student description data, and (5) the occurrence of failure in sending the final grade to the database. In addition, the average completion rate or effectiveness rate is below 90%. The effectiveness of the novice user is 73.3%, while the expert user is 81.1%. These results indicate that the e-rapor that has been applied so far has not been effective.

B. Efficiency

In the efficiency aspect, our findings are the e-rapor applied so far are efficient. This is because statistically, the p -value of each task that has been done is less than 0.05 ($p < 0.05$), so there is no significant time difference in doing the task, either in the novice user or expert user, although the frequency of the novice user more failure or errors than expert users.

C. Satisfaction

In the aspect of user satisfaction, the results obtained that, the average mean of SUS questionnaires given to respondents is equal to 64.26. This result is below the standard score of SUS that is 68. In addition, 48.27% respondents stated that the e-rapor is easy to use; 45.89% respondents stated that the e-rapor is well integrated; 69.55% respondents stated that there are inconsistency on the e-rapor; 75.20% respondents stated that the e-rapor was complicated to use; 49.78% respondents stated that they were very confident in using the e-rapor; 49.80% respondents state that use this e-rapor frequently; 50.09% respondents state that found the e-rapor unnecessarily complex; 63.44% respondents state that need the support of a technical person to using e-rapor; 68.89% respondents state that most people would learn to use this e-rapor very quickly; and 67.78% respondents state that needed to learn to using e-rapor (see Fig. 1).

Based on the results of this study, the average respondent gives negative statements about e-rapor that have been used, so it can be concluded that, users are not satisfied in e-rapor operating.

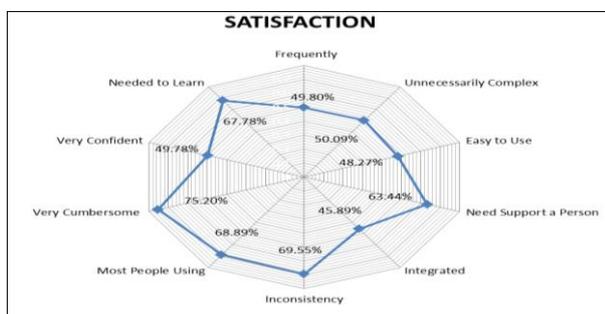


Fig. 1. The Survey Result of Satisfaction on E-Rapor Usability

V.CONCLUSION

In accordance with the findings of the study, it can be concluded that the e-rapor has not fulfilled usability criteria, because the e-rapor has not been effective (completion rate < 90%) and has not fulfilled the user satisfaction (SUS score

< 68), even though the e-rapor has been said to be efficient both from the expert and the novice user (not significant with $p < 0.05$).

Therefore, the proposed recommendation to make improvements to e-rapor include: (1) the need to do a repair of database design, (2) the need for additional help modules from all sub menus, so that the user is helped when forgotten or confused in e-rapor operating, (3) need to improvement the interface of import and export final grade. Furthermore, in order to improve user satisfaction in terms of their usefulness, should be improved or features addition of e-rapor version 2017 that already exist.

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REFERENCES

- [1] R. Benbunan-Fich, "Using Protocol Analysis to Evaluate the Usability of a Commercial Web Site," *Information & Management*, 39(2), 151-163, 2001.
- [2] B.T Karsh, "Beyond Usability: Designing Effective Technology Implementation Systems to Promote Patient Safety," *Quality and Safety in Health Care*, 13(5), 388-394, 2004.
- [3] J. Nielsen, *Usability Engineering*. San Francisco: Morgan Kaufmann, 1993.
- [4] K. Hornbæk, "Dogmas in The Assessment of Usability Evaluation Methods," *Behaviour and Information Technology*, 29(1), 97-111, 2010.
- [5] M. Hertzum *et al.*, "Usability Constructs: A Cross-Cultural Study of How Users and Developers Experience Their Use of Information Systems Usability and Internationalization," *Lecture Notes in Computer Science*, 4559, 317-326, 2007.
- [6] T. Jokela, "Evaluating the User-Centeredness of Development Organizations: Conclusions and Implications from Empirical Usability Capability Maturity Assessments," *Interacting with Computers*, 16(6), 1095-1132, 2004.
- [7] D. J. Gillan and R. G. Bias, "Usability Science. I: Foundations," *International Journal of Human-Computer Interaction*, 13(4), 351-372, 2001.
- [8] G. Lindgaard, "Early Traces of Usability as A Science and as A Profession," *Interacting with Computers*, 21(5-6), 350-352, 2009.
- [9] W. D. Gray and M.C. Salzman, "Damaged Merchandise? A Review of Experiments That Compare Usability Evaluation Methods," *Human-Computer Interaction*, 13(3), 203-261, 1998.
- [10] H. R. Hartson, T. S. Ts. Andre, and R. C. Williges, "Criteria for Evaluating Usability Evaluation Methods," *International Journal of Human-Computer Interaction*, 13(4), 1-35, 2001.
- [11] K. Hornbæk, "Current Practice in Measuring Usability: Challenges to Usability Studies and Research," *International journal of human-computer studies*, 64(2), 79-102, 2006.
- [12] K. Hornbæk and E. Frøkjær, "Comparing Usability Problems and Redesign Proposals as Input to Practical Systems Development," in *CHI '05 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Portland, April 2005, 391-400
- [13] K. L. Norman and E. Panizzi, "Levels of Automation and User Participation in Usability Testing," *Interacting with Computers*, 18(2), 246-264, 2006.

- [14] J. Rubin, & D. Chisnell, *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. 2nd ed. Canada: Wiley, 2008.
- [15] H. Sharp, Y. Rogers, and J. Preece, *Interaction Design: Beyond Human-Computer Interaction*. 2nd ed. Canada: Wiley, 2007.
- [16] A.W. Kushniruk, "Evaluation in The Design of Health Information Systems: Application of Approaches Emerging from Usability Engineering," *Computers in Biology and Medicine*, 32(3), 141–149, 2002.
- [17] A.W. Kushniruk, C. Patel, V.L. Patel, J.J. Cimino, "Televaluation of information systems: an integrative approach to design and evaluation of Web-based systems," *Int. J. Med. Inform*, 61(1), 45–70, 2011.
- [18] B. Battleson, Austin Booth, and Jane Weintrop, "Usability Testing of an Academic Library Web Site: A Case Study," *The Journal of Academic Librarianship*, 27(3), 188–198, 2001.
- [19] F.T.W. Au, S. Baker, I. Warren, G. Dobbie, "Automated Usability Testing Framework," 9th *Australasian User Interface Conference*, Wollongong, Australia, 22-25 January, 55-64, 2008.
- [20] W. P. Brinkman, R. Haakma, & D. G. Bouwhuis, "Towards an empirical method of efficiency testing of system parts: A methodological study," *Interacting with Computers*, 19(3), 342–356, 2007.
- [21] R. Molich, M. R. Ede, K. Kaasgaard, & B. Karyukin, "Comparative usability evaluation," *Behaviour and Information Technology*, 23(1), 65–74, 2004.
- [22] Sonstebly, & J. DeJonghe, "Usability Testing, User-Centered Design, and Lib Guides Subject Guides: A Case Study," *Journal of Web Librarianship*, 7(1), pp.83–94, 2013.
- [23] D. J. Comeaux, "Usability Testing of a Web-Scale Discovery System at an Academic Library," *College and Undergraduate Libraries*, 19(2–4), 189–206, 2012.
- [24] D. Svanæs, O. A. Alsos & Y. Dahl, "Usability Testing of Mobile ICT for Clinical Settings: Methodological and Practical Challenges," *International Journal of Medical Informatics*, 79(4), 24–34, 2010.
- [25] M. J. Van Den Haak, M. D. T. De Jong & P. J. Schellens, Retrospective vs. Concurrent Think-Aloud Protocols: Testing the Usability of an Online Library Catalogue," *Behaviour and Information Technology*, 22(5), 339–351, 2003.
- [26] D. Ben-Zeev *et al.*, "Development and Usability Testing of Focus: A Smartphone System for Self-Management of Schizophrenia," *Psychiatric Rehabilitation Journal*, 36(4), 289–296, 2013.
- [27] C. Boothe, L. Strawderman, & E. Hosea, "The Effects of Prototype Medium on Usability Testing," *Applied Ergonomics*, 44(6), pp.1033–1038, 2013.
- [28] K. Finstad, "Response to commentaries on the usability metric for user experience," *Interacting with Computers*, 25(4), 327-330, 2013.
- [29] O. Frandsen-Thorlacius, K. Hornbæk, M. Hertzum, and T. Clemmensen, "Non-Universal Usability? A Survey of How Usability is Understood by Chinese and Danish Users," *Proceedings of CHI 2009*, 41-50, 2009.
- [30] J. Brooke, "SUS - A quick and Dirty Usability Scale," *Usability Evaluation in Industry*, 189(194), 4-7, 1996.