



The application of system usability scale method to measure the usability of electronic learning system (e-learning) at politeknik caltex riau

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Abstract

The COVID-19 pandemic that has occurred globally in all countries, including Indonesia, has generally changed the series of business process arrangements in almost all sectors, including education. One of the affected educational institutions is the Caltex Riau Polytechnic (PCR) campus. The impact of this pandemic has forced the academic members (lecturers and students) to carry out the online lecture process since the odd semester of the 2020/2021 academic year. The online lecture process is facilitated by an electronic learning system (e-learning). Changes in the pattern of learning process, from face-to-face to online methods using e-learning, raises several usability problems. The usability measurement of e-learning at PCR was carried out using the System Usability Scale (SUS) questionnaire. This study involved 196 participants. From the usability analysis of e-learning at PCR, the score obtained was 58.75 with the assessment criteria on the adjective rating was OK, the grade scale was D, and the acceptable ranges were at marginal low. This means that it is necessary to evaluate and improve the utilization of the features/services provided by the e-learning platform so it can be more efficient, effective, and satisfying to its users.

Keywords: E-learning; Politeknik Caltex Riau; Usability; System Usability Scale.

Introduction

Electronic Learning System (E-Learning) is a medium that can be used in the learning process, not only for delivering learning materials but also for the development of various competencies of student. Through e-learning, students do not merely listen to material descriptions from lecturers but also actively observe, perform, demonstrate, and so on. Teaching material materials can be virtualized in various formats that are more attractive and more dynamic in order to motivate students to be more interested in the learning process. E-learning can be used as an alternative media to support the learning process, which can be accessed anytime and anywhere. Politeknik Caltex Riau has determined regulation of the duration of the use of e-learning through academic policy. This is because PCR is a vocational-based higher education, requiring more intense face-to-face lectures to support the mastery of applied skills according to their respective study programs.

The impacts of covid-19 pandemic which have been felt globally, including Indonesia, has generally changes the series of business processes in almost all sectors, for instance, education. PCR as one of education institutions has been impacted by forcing its academic members (lecturers and students) to carry out the online lecture process since the odd semester of the 2020/2021 academic year using e-learning. Before pandemic, the academic affairs of PCR of stipulated that the implementation of learning using e-learning was only allowed to be carried out for theoretical lectures with predetermined maximum duration. However, with the current conditions, all lectures, both theory, practicum, workshops, have been transferred to online platform.

The change in the lecture method raises several usability problems in the use of e-learning. Based on the initial random survey by several PCR academic members (lecturers and students), several problems were identified, namely: (1) Students complained that no notifications appeared when lecturers uploaded lecture or assignment materials. Notifications for other systems in PCR are integrated with official e-mail. All parties must be aware that there are things that have changed in the system. The existence of notifications will make it easier for users to get notified, because they do not always access the PCR e-learning; (2) There is also no notification when the lecturer makes the class attendance list, so that many students do not fill out the attendance list during the lecture so they are considered absent; (3) The system is unstable and often experiences problems during lectures; (4) Many features are provided but are not used properly; (5) System navigation for many users is neither understandable nor familiar; (6) There is no conference

meeting feature, so lecturers and students must use additional applications to conduct conferences; (7) and several other problems

The importance of measuring e-learning usability has been proven by Zaeni Miftah and Indah Purnama Sari (2020) in their research entitled "Analysis of Online Learning Systems using the SUS Method". E-learning implemented at Indraprasta Universitas PGRI applied the Moodle Learning Management System (LMS), where the initial application was imposed to students in the Economics Education Study Program. Usability measurements were carried out on 60 respondents using the System Usability Scale (SUS) method. The average value obtained in this study was 65.67 indicating the use of e-learning can be accepted and used by all students of Economic Education Study Program [6]. Another study was conducted by Negah Widya Utami, I Ketut Resika Arthana, and I Gede Mahendra Darmawiguna (2020) with the research title "Usability evaluation of Universitas Pendidikan Ganesha's e-learning with the Usability Testing Method". The method used was Performance Measurement and Retrospective Think Aloud (RTA) with three usability aspects being tested, namely effectiveness, efficiency and user satisfaction. The results of the study proposed that e-learning still does not have good usability with an average value of 60.94. This study provides recommendations for improvement to be focused on changes in layout, navigation menus and simplification and consistency of language use in menus [16]. Furthermore, a study by Nindian Puspa Dewi and Nanik Winarsih (2020) with the title of "Implementation of E-Learning Learning in Practicum Classes (Case Study: Universitas Madura)". This study developed an e-learning to support practical learning activities. Based on the results of tests carried out using the SUS method, an average value of 74.30% was obtained. This shows that with the existence of e-learning, practitioners and lecturers do not experience difficulties when carrying out practicum activities. It is instead more effective and efficient [5].

Based on a review of previous research, it is necessary to measure the usability of e-learning which will be the main platform for conducting the current learning process. Since this study applies e-learning that is different from previous studies, it is necessary to measure the usability of e-learning applied by PCR as object of this study. The measurement results obtained will then be used as input for feature customization according to needs and most importantly to present a user experience of e-learning that is user friendly, attractive and easy to interact with during the learning process.

Therefore, this study aims to analyze the usability of e-learning applied at PCR. Usability consists of quality attributes that assess how easy the interface is by referring to methods to improve ease of use during the design process [17][18][19]. According to ISO 9241-11, usability measures should include [6]: (1) Effectiveness, which means the ability of users to complete tasks using the system as well as the quality of the output of the tasks performed; (2) Efficiency, means the level of resources consumed in performing tasks; (3) Satisfaction, refers to the user's subjective reaction to using the system. The measurements made can determine the effectiveness, efficiency and convenience for both lecturers and students in interacting in the new method of learning process through this platform. There are many measuring tools that can be used to measure the usability of a system, one of which is the System Usability Scale (SUS). Lewis and Sauro (2017) in their research explain that usability measurement using SUS is proven to be reliable and valid [15][8]. Therefore, this study employs SUS to measure the usability of e-learning at PCR.

Method

A. Research Framework

Research data were collected by observation, literature study, and survey (questionnaire). The research framework is formulated as presented in the **Figure 1**.

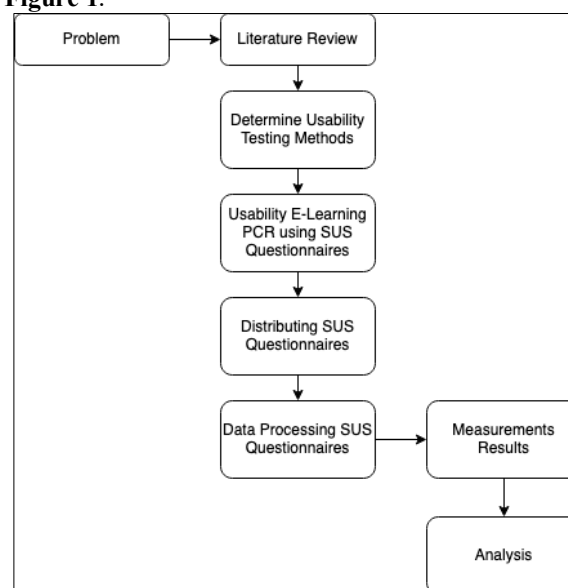


Figure 1. Research Framework

This research begins by identifying the problems faced by academic unit in implementing e-learning during the odd semesters of the 2020/2021 academic year. The result was that the e-learning system has never been measured and evaluated in terms of its usability. To measure the usability of users while interacting with the system, a literature study was conducted to determine the appropriate usability testing method. A review of several literatures suggested that SUS proved to be cheap, easy, valid and reliable [9][10][13]. The next stage of this study was to prepare and distribute questionnaire to e-learning users to measure the interactions during the odd semester of the 2020/2021 academic year. The questionnaires were distributed online using google forms in the range of March 31 – April 17 2021, with a total of 196 respondents. The results obtained were then processed and measured using the SUS score.

B. System Usability Scale

The System Usability Scale (SUS) is used to measure the user's perception of the system, which will be used as a benchmark for the usability of the system and features in e-learning to help smooth the learning interaction process. SUS is a usability test measuring tool that refers to the user perspective, developed by John Brooke in 1986. SUS consists of 10 questions [1][2][3] with a 5-point likert scale, as shown in **Table 1**.

Table 1. List of SUS Questions [4][5][8]

Code	Question	Measurement scale				
Q1	I would like use/visit this site frequently	1	2	3	4	5
Q2	I found this site unnecessarily complex (contains a lot of unnecessary stuff)	1	2	3	4	5
Q3	I found this site was easy to use	1	2	3	4	5
Q4	I need technical assistance to use/browse this site	1	2	3	4	5
Q5	I found the functions/features provided on this site were well designed and prepared	1	2	3	4	5
Q6	I thought there are too much inconsistencies on this site	1	2	3	4	5
Q7	I would imagine that most people will find it easy to use/browse this site very quickly	1	2	3	4	5
Q8	I found this site very cumbersome to use	1	2	3	4	5
Q9	I felt very confident using this site	1	2	3	4	5
Q10	I needed to learn a lot of things before I could explore this site properly	1	2	3	4	5

To calculate the value of the SUS score, it is necessary to consider the following rules:

1. For each odd numbered questions, the final score is obtained by subtracting one from the user's score.
2. For each even numbered questions, the final score is obtained by subtracting user's score from 5
3. The weighting of the SUS score is obtained from the sum of the total user scores multiplied by 2.5

To calculate the SUS score, add up the contribution scores of each item. SUS scores range from 0 to 100 [1][14].

$$\bar{x} = \sum_n x \tag{1}$$

Formula to calculate the total score of SUS [11], applied to questionnaire obtained is given as follows.

$$\text{Total score of SUS} = ((Q1 - 1) + (5 - Q2) + (Q3 - 1) + (5 - Q4) + (Q5 - 1) + (5 - Q6) + (Q7 - 1) + (5 - Q8) + (Q9 - 1) + (5 - Q10)) * 2,5 \tag{2}$$

The results of the SUS calculation were then converted into ratings and letter grades. The rating indicates the usability level in the form of a percentage (%), while the letter grades indicate the usability level from class A to F. The SUS weighting in the form of letter grades can be grouped into 5 namely A, B, C, D, and F, as shown in **Figure 2**. Meanwhile, the weighting of SUS which is based on the rating can be grouped as shown in **Table 2**.

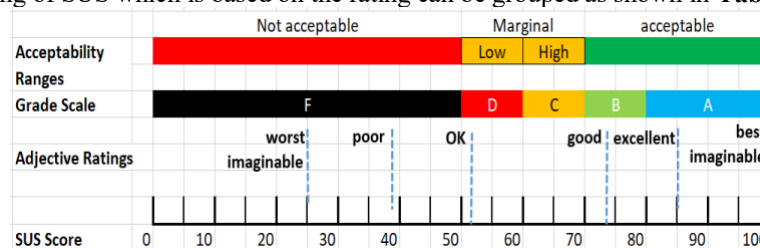


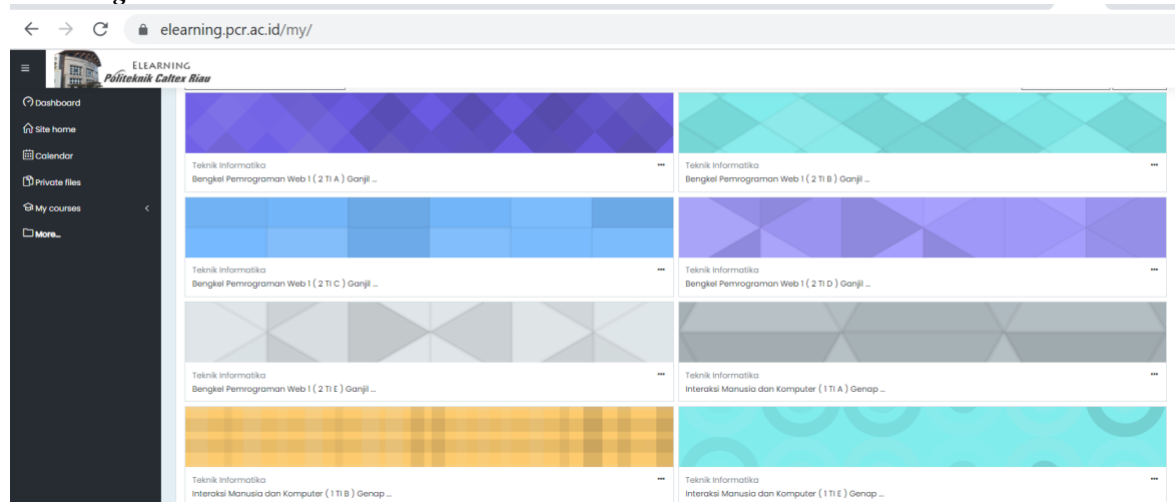
Figure 2. SUS Score [3]

Table 2. SUS Weighting Based on Rating [2][12]

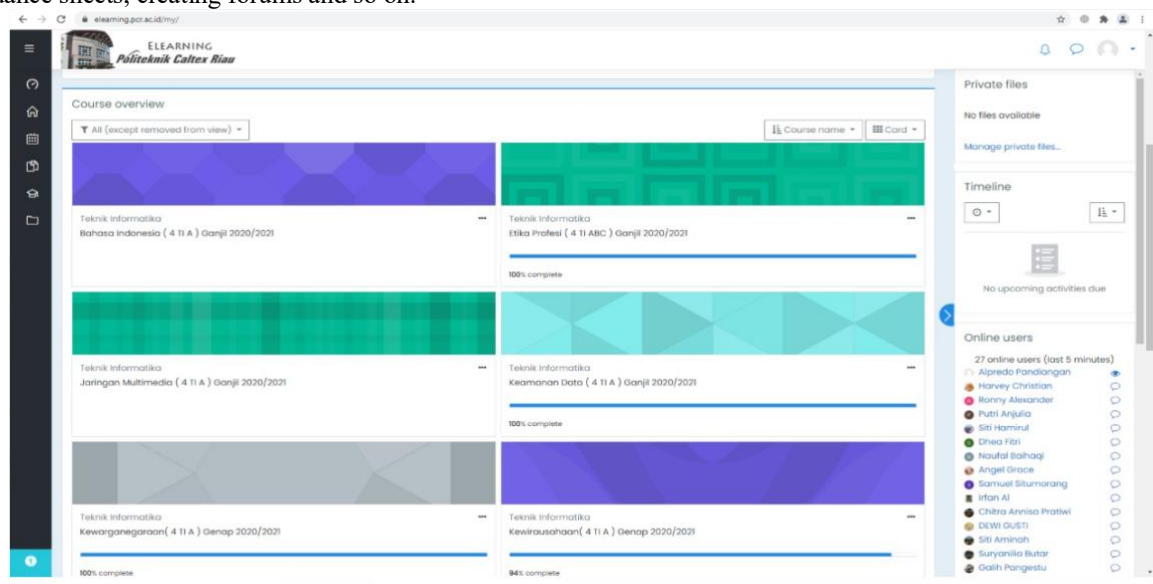
SUS Score	Percentage	Letter Grade
$\geq 80,3$	$\geq 90\%$	A
≤ 74	Between 70% \leq and $< 90\%$	B
≤ 68	Between 74,40% and $< 70\%$	C
≤ 51	Between 68,20% and $< 40\%$	D
< 51	$< 20\%$	E

Results and Discussion

A. E-Learning Politeknik Caltex Riau

**Figure 3.** Lecturer's Dashboard Page

Before commencing the semester, lecturers can request class creation to the e-learning admin by referring to class assignments that have been released by the academic affair division. Lecturers can manage classes as shown in **Figure 3**. Management of e-learning by lecturers includes distributing lecture materials, making assignments, making attendance sheets, creating forums and so on.

**Figure 4.** Student's Dashboard Page

Students can interact with their lecturers in each class according to the setting made by the admin of e-learning platform. The class that students take in the current semester in the e-learning is shown in **Figure 4**.

B. SUS Score Calculation

Applying the equation (2), **Table 3** presents the result of SUS score.

Table 3. Result of SUS Score Calculation

Respondent	Result of SUS Score Calculation										Score
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
R1	4	0	4	0	4	0	4	0	4	0	50
R2	4	0	4	0	4	0	4	0	4	0	50
R3	3	4	3	4	3	3	2	3	3	1	72,5
R4	3	4	4	4	4	2	4	4	2	4	87,5
R5	3	3	3	4	3	3	3	3	3	3	77,5
R6	0	0	0	0	2	2	2	2	2	2	30
R7	2	2	2	2	2	2	2	2	2	2	50
R8	2	2	2	2	2	2	2	2	2	2	50
R9	4	3	3	1	3	4	4	4	4	0	75
R10	1	3	3	3	3	3	3	3	3	1	65
...
R196	2	3	1	2	2	1	3	2	3	0	47,5
SUS average score											58,75

*source: research data

C. Validity Test

Validity test was carried out against 196 questionnaire results. Tests was carried out using Pearson with a significance value of 5%. The results are considered valid, if $r\text{-count} > r\text{-table}$. Based on the results shown in **Table 4**, it is found that the $r\text{-count}$ value for the 10 SUS questions is greater than the $r\text{-table}$ value, so the 10 SUS questions are all valid.

Table 4. Validity Test Result

Question	r-count	r-table	Kriteria
Q1	5,33	1,65	valid
Q2	2,98	1,65	valid
Q3	3,87	1,65	valid
Q4	7,06	1,65	valid
Q5	6,58	1,65	valid
Q6	5,46	1,65	valid
Q7	3,26	1,65	valid
Q8	5,16	1,65	valid
Q9	6,86	1,65	valid
Q10	7,47	1,65	valid

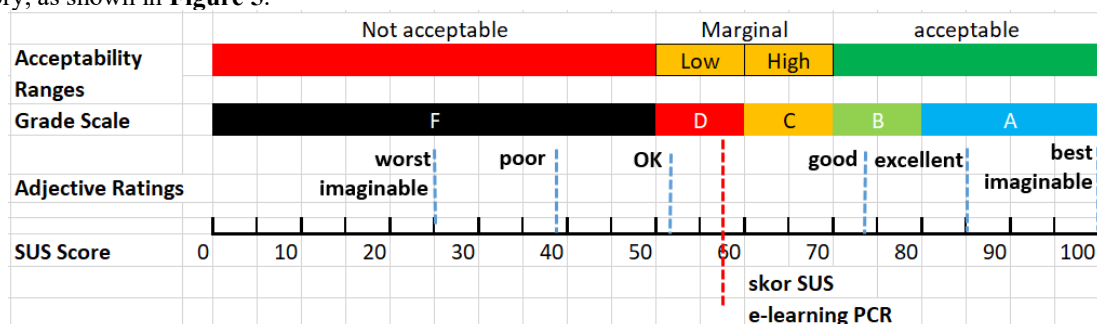
*Source: research data

D. Reliability Test

The reliability test was carried out on 10 questions that had previously been declared valid. It is considered reliable if the answers to questions are always consistent. Reliability testing uses Cronbach's Alpha, where a value greater than 0.7 is considered reliable. Based on testing on 10 SUS questions, the result is 0.75, greater than 0.7, so the SUS questionnaire is considered reliable.

E. SUS Score Analysis

SUS is a measurement tool to assess the usability of e-learning applied at PCR, including: effectiveness, efficiency, and satisfaction. The SUS score obtained shows the level of user acceptance of PCR e-learning during lectures in the odd semester of the 2020/2021 academic year. The SUS e-learning PCR score of 58.75 is included in the Marginal Low category, as shown in **Figure 5**.

**Figure 5.** Acceptance level of e-learning at PCR based on SUS

The results of the SUS score indicate that PCR e-learning has a usability level with poor ratings and grades. Therefore, there is a need for recommendations for improvement by considering effectiveness, efficiency and user satisfaction. Recommendations for improvement can be made by taking into account user suggestions. In general, what needs to be improved include removing unnecessary features, connecting to the user's official e-mail to get notifications from the system when there is learning activities imposed by lecturer, improving the appearance and speeding up the e-learning page loading.

Conclusion

The score obtained from the usability measurement using SUS on the use of PCR e-learning during the odd semester of the 2020/2021 academic year, involving 196 respondents, was 58.75. The assessment criteria for the adjective rating obtained was ok, with a grade scale of D, and the acceptable ranges were at marginal low. This means that it is necessary to evaluate and improve the utilization of the features/services provided by the e-learning platform so it can be more efficient, effective, and satisfying to its users.

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