

Evaluating User Experience on E-learning using the User Experience Questionnaire (UEQ) with Additional Functional Scale

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Abstract: eLisa is a Learning Management System (LMS) used by most Gadjah Mada University students. After an extended usage period, eLisa has not undergone many changes and updates, so it is necessary to know the user's wishes for the development of eLisa going forward. Currently, eLisa is focusing its development on the mobile phone platform. This paper will explain the measurement of user experience scores (UX) using the User Experience Questionnaire (UEQ) and combined with the reference model standards to meet the Sharable Content Object Reference Model (SCORM). SCORM is combined with UEQ because it is considered an appropriate standard for presenting functionality in LMS, so eLisa can represent educational content that can be shared but also in the interface between eLisa content and e-learning platforms uses. The results of evaluating user experience with a combination of these two methods show that from the calculated aspects such as Attractiveness, Pragmatic Quality, Hedonic Quality and also Functionality. The evaluation value of UX eLisa that we got was terrible. Where out of the nine scales we calculate, six of them got bad results, and the other three were still below average.

1 INTRODUCTION

Indonesia is a country that has a positive trend in the development of e-learning or online education. With an average growth of 25% every year, Indonesia is ranked 8th in the world based on the total e-learning market (Squiline.com, 2017). At present, the community is developing into a society with high mobility, so the need for learning media that supports the level of mobility that exists in the community, especially in universities.

There is a considerable interest in exploiting the appeal of universal and abundant technology for use in education, consequently learning with technology becomes prevalent and becomes an ample opportunity for research. In developing countries, mobile phone are better devices than desktop or laptop computers (Shen, Xie and Shen, 2014). So that learning accessed via mobile phones becomes a new opportunity in the development of future educational technology.

One e-learning that is developing is the LMS (Learning Management System). The university that implements and develops its own LMS is Gadjah

Mada University (UGM), we commonly call this LMS eLisa (eLearning System for Academic Communities). The first goal of developing eLisa is to be used intensively by lecturers in supporting all teaching activities. However, in daily learning activities, there are still many lecturers who have not used eLisa well. Some lecturers prefer to use other e-learning such as Google Classroom, Edmodo, Schoology and others. eLisa serves to facilitate the process of direct learning in class and online in the context of lectures. The development of eLisa itself is very much realized by the needs of users, especially the needs of academics in the UGM campus environment. It can be said that students and lecturers play an essential role in developing eLisa in the future. (Dahrurzak, 2017).

The Center for Innovation and Academic Studies (PIKA) UGM, which is an eLisa developer, also states that current eLisa users do not meet their expectations. Therefore, there is a need to design eLisa to be applied for mobile phones. This development is expected to attract the interest of eLisa users. There are two challenges that eLisa will face in developing into applications that can be accessed using mobile phones, and those challenges

are appearance and functionality. Therefore, it is good to measure previous user experience to get someone's perception and response from using eLisa. Different interpretations are used to define user experience with quality criteria using the User Experience Questionnaire (UEQ) (Schrepp and Hinderks, 2014). Also, to find out whether functionality also influences user experience, the author tries to combine UEQ with the SCORM reference model which is considered a benchmark in the analysis and comparison of e-learning platforms. The reference model taken is only a specification divided into three areas, namely content, interaction, and management, to meet the SCORM online learning presentation standards (Buendía and Hervás, 2006). This study aims to analyze whether functionality affects the e-learning user experience so that when eLisa is applied to a mobile phone, eLisa becomes e-learning in accordance with the user's wishes.

focusing on product quality using 80 sets of raw items, finally found 6 UEQ scales and items extracted from several data sets that are considered to be represent. Where each item represents two terms with opposite meanings (Schrepp, 2015). Conversion to some of their natural languages is also done to get semantic differences like in UEQ. Some of the languages that have been built and validated are English, Spanish (Rauschenberger *et al.*, 2013), Portuguese (Cota *et al.*, 2014), and many more. One of them is Indonesian (Santoso *et al.*, 2016). For Germany, there are also simplified versions of children and young people (Hinderks *et al.*, 2012).

The following is an interpretation of the structure of the UEQ scale which contains six scales with 26 items in Figure 1. Attractiveness is a pure ranking dimension, Perspicuity, Efficiency and Dependability are pragmatic quality aspects (directed towards the goal), and for the hedonic quality aspects there are Stimulation and Novelty (Schrepp, 2015):

2 USER EXPERIENCE FOR E-LEARNING

2.1 User Experience Questionnaire (UEQ)

In 2005 UEQ was first designed by a data analysis approach to ensure practical relevance for creating different qualities at each scale. It consists of 229 potential items related to user experience in the German version. Then it is reduced to 80 sets of items from the questionnaire with evaluation from experts (Schrepp and Hinderks, 2014). In several studies

- Attractiveness: Overall impression of the product. Do users like or dislike is?
- Perspicuity: Is it easy to get familiar with the product? Is it easy to learn how to use the product?
- Efficiency: Can users solve their tasks with the product without unnecessary effort?
- Dependability: Do the users feel in control of the interactions?
- Stimulation: Is it exciting and motivating to use the product?
- Novelty: Is the product innovative and creative? Does the product interest users?

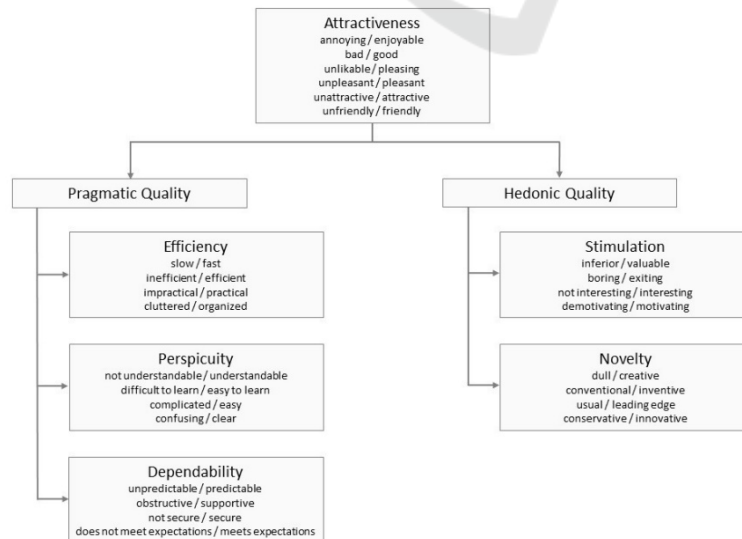


Figure 1: Assumed scale structure of the UEQ.

2.2 Sharable Content Object Reference Model (SCORM)

SCORM (Sharable Content Object Reference Model) illustrates how learning content standards are presented in LMS to make easy portability of LMS learning content and reuse learning objects to other platforms (Bohl *et al.*, 2002). Not only its ability to represent educational content that can be shared but also the interface between content and the e-learning platform it uses. There are two main components in SCORM, namely CAM (Content Aggregation Model), which defines a model for packaging learning content and RTE (Run-Time Environment), which defines the interface to allow communication between learning content and other platforms (Buendía and Hervás, 2006). The following Table 1 is a DemoScorm evaluation to meet the standard reference model.

Table 1: DemoScorm evaluation criteria.

Criteria	
Content	Writing / SCORM editions allowed
	External sources can be seen
	Multimedia content can be displayed
	Organizational structure can be chosen
	Content navigation is activated
Interaction	Announcement or discussion board available
	Tasks can be sent
	Collaboration tools can be used
	Email service-connected
Management	SCORM packages can be imported
	Navigation options can be configured
	Assessment facilities are provided
	Phone book items are allowed
	SCO Grading is displayed
	Phone book item updated
	Item tracking allowed
	Tracking results updated

3 METHOD

3.1 Research Object

The object of research is the e-learning system for the academic community, commonly called eLisa. This Learning Management System is one of the e-learning developed based on user needs by UGM and used by most academics at UGM. eLisa was developed to support all incentive teaching activities carried out by lecturers and work to facilitate the learning process in lectures both in class and online. Now eLisa can only be accessed through the website;

this is an obstacle to the lack of interest of UGM users, especially lecturers, to support lectures conducted at eLisa. For other users such as students, they use eLisa if their lecturers use eLisa to support teaching activities. The Center for Innovation and Academic Studies (PIKA) UGM, which is an eLisa developer, also states that current eLisa users do not meet their expectations. Therefore, there is a need to design eLisa to be applied for mobile phones. However, before that, it must be known whether the lack of functionality in eLisa affects the use of eLisa.

3.2 Research Subject

The subjects of this study were students from several faculties at UGM who had used eLisa for at least one semester. Demographically, the total number of subjects is 30 people. We obtained our subjects by distributing questionnaires through Google Forms, which we have adjusted to UEQ for eLisa users on UGM campus. To get respondents, we have difficulty because eLisa users are currently very few. With interviews, we do it with first-year and second-year students in various faculties. The result is that many lecturers no longer use eLisa. So we met a lot of first and second-year students who never used eLisa and in senior student interviews, most of them used eLisa in their first year of college. So this qualification is not suitable for them as our research respondents because the majority of users who have long been difficult to remember their experience when using eLisa. The data we obtained were qualitative and quantitative data from the questionnaires that we distributed, quantitative data derived from UEQ questions, while our qualitative data were obtained from open questions related to objects in the study at the end of the questionnaire session.

3.3 Implementation

Evaluations are carried out to get a quick assessment of user experience and express feelings, impressions, and attitudes that arise when they use eLisa on mobile phones (Schrepp, Hinderks and Thomaschewski, 2017). The addition of question items to UEQ was also carried out to find out if other factors influenced the lack of user experience on eLisa mobile. The items selected are questions related to functionality in eLisa. This additional question is based on the SCORM method, where this method is a standard that is very often used to develop e-learning. This application only covers reference models from research conducted by Félix Buendía *et al.*, A benchmark called DemoScorm (Buendía and Hervás, 2006). This tool is used to get benchmarks from the SCORM standard. UEQ has given a special

questionnaire to determine the scale of the most suitable product, and they call it UEQ +. There is a scale that is formulated to determine the value of content that is Quality Content, but we want to try to apply other methods to find the value of functionality scale, especially those that are very suitable for e-learning user experience.

This reference model was changed to be a question suitable for the UEQ questionnaire. We use UEQ with the Indonesian version to match the language used by respondents, so we also change the reference model about SCORM to Indonesian. Examples of UEQ that we have added to the SCORM reference model that we will share with respondents are in Figure 2 in the

Indonesian version. Items 1 to item 26 are items from UEQ, and the next items are items 27 to items 35. These items is a reference model item from SCORM that we have converted to the UEQ questionnaire model. For the grouping of scales in the SCORM reference model, we distinguish between several colors, yellow for the content scale, green for the interaction scale, and blue for the management scale. Later there will be nine assessment scales resulting from the six scales (Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty) originating from UEQ and the other three scales (Content, Interaction, and Management) are the development of the SCORM reference model.

		1	2	3	4	5	6	7	
1	Menyusahkan	0	0	0	0	0	0	0	Menyenangkan
2	Tak dapat dipahami	0	0	0	0	0	0	0	Dapat dipahami
3	Kreatif	0	0	0	0	0	0	0	Monoton
4	Mudah dipelajari	0	0	0	0	0	0	0	Sulit dipelajari
5	Bermanfaat	0	0	0	0	0	0	0	Kurang bermanfaat
6	Membosankan	0	0	0	0	0	0	0	Mengasyikan
7	Tidak menarik	0	0	0	0	0	0	0	Menarik
8	Tidak dapat diprediksi	0	0	0	0	0	0	0	Dapat diprediksi
9	Cepat	0	0	0	0	0	0	0	Lambat
10	Berdaya cipta	0	0	0	0	0	0	0	Konvensional
11	Menghalangi	0	0	0	0	0	0	0	Mendukung
12	Baik	0	0	0	0	0	0	0	Buruk
13	Rumit	0	0	0	0	0	0	0	Sederhana
14	Tidak disukai	0	0	0	0	0	0	0	Menggembirakan
15	Lazim	0	0	0	0	0	0	0	Terdepan
16	Tidak nyaman	0	0	0	0	0	0	0	Nyaman
17	Aman	0	0	0	0	0	0	0	Tidak aman
18	Memotivasi	0	0	0	0	0	0	0	Tidak memotivasi
19	Memenuhi ekspektasi	0	0	0	0	0	0	0	Tidak memenuhi ekspektasi
20	Tidak efisien	0	0	0	0	0	0	0	Efisien
21	Jelas	0	0	0	0	0	0	0	Membingungkan
22	Tidak praktis	0	0	0	0	0	0	0	Praktis
23	Terorganisasi	0	0	0	0	0	0	0	Berantakan
24	Atraktif	0	0	0	0	0	0	0	Tidak atraktif
25	Ramah pengguna	0	0	0	0	0	0	0	Tidak ramah pengguna
26	Konservatif	0	0	0	0	0	0	0	Inovatif
27	Sumber eksternal tidak dicantumkan	0	0	0	0	0	0	0	Sumber eksternal dicantumkan
28	Konten multimedia tidak ditampilkan	0	0	0	0	0	0	0	Konten multimedia ditampilkan
29	Konten navigasi tidak tersedia	0	0	0	0	0	0	0	Konten navigasi tersedia
30	Pengumuman/diskusi tidak tersedia	0	0	0	0	0	0	0	Pengumuman/diskusi tersedia
31	Tugas tidak dapat dikirimkan	0	0	0	0	0	0	0	Tugas dapat dikirimkan
32	Alat kolaborasi tidak dapat digunakan	0	0	0	0	0	0	0	Alat kolaborasi dapat digunakan
33	Layanan email tidak terhubung	0	0	0	0	0	0	0	Layanan email terhubung
34	Penilaian tidak tersedia	0	0	0	0	0	0	0	Penilaian tersedia
35	Pelacakan Item tidak tersedia	0	0	0	0	0	0	0	Pelacakan Item tersedia

36. Saran dan masukan buat ELISA untuk menjadi lebih baik?

Figure 2: Combination of UEQ (Indonesian version) and SCORM standard reference model.

4 RESULT AND DISCUSSION

In this study, we combine the UEQ and SCORM methods to get different patterns when analyzing user experience for e-learning. At the stage of combining this method, we did not feel any significant obstacles. Before continuing to analyze using the UEQ tool, we determined three additional scales to be used from the SCORM reference model, then we determined what items we could use based on evaluating the DemoScorm criteria in table 1 to match the e-learning characteristics in eLisa. Because basically, eLisa does not use SCORM as its framework, so not all the criteria in SCORM that we apply to determine items on three additional scales. We don't use a number of criteria that don't match the eLisa character. For example, on the content scale of the five criteria in our DemoScorm evaluation, we only use three criteria (External sources can be seen, Multimedia content can be displayed, and Content navigation is activated), then on the interaction scale we use all the

criteria (Announcement or discussion board available, Tasks can be sent, Collaboration tools can be used, and Email service-connected), and on the management scale we use two criteria (Grading is displayed, and Item tracking allowed) of the eight criteria that will be determined to be items on three additional scales. Questions about the SCORM reference model that we have entered into UEQ can be analyzed properly by the UEQ data analysis tool. With a slight change in data input and pattern adjustments, we performed a calculation analysis with that tool. The first is determining the benchmark intervals needed on three additional scales of the SCORM reference model. Because there is no research on this issue and UEQ only provides unique benchmarks for two products (Schrepp, 2015), we take the average benchmarks needed for each UEQ scale and then apply them equally on our three additional scales. In table 2, we explain the comparison of the benchmarks we used in the study, for three additional scales with the benchmarks we marked in green.

Table 2: Interval comparison on the SCORM scale with the UEQ scale.

	Attractiveness	Perspicuity	Efficiency	Dependability	Stimulation	Novelty	SCORM Item
Bad	≥ 1.75	≥ 1.9	≥ 1.78	≥ 1.65	≥ 1.55	≥ 1.4	≥ 1.67
Below Average	≥ 1.52 < 1.75	≥ 1.56 < 1.9	≥ 1.47 < 1.78	≥ 1.48 < 1.65	≥ 1.31 < 1.55	≥ 1.05 < 1.4	≥ 1.4 < 1.67
Above Average	≥ 1.17 < 1.52	≥ 1.08 < 1.56	≥ 0.98 < 1.47	≥ 1.14 < 1.48	≥ 0.99 < 1.31	≥ 0.71 < 1.05	≥ 1.01 < 1.4
Good	≥ 0.7 < 1.17	≥ 0.64 < 1.08	≥ 0.54 < 0.98	≥ 0.78 < 1.14	≥ 0.5 < 0.99	≥ 0.3 < 0.71	≥ 0.58 < 1.01
Excellent	< 0.7	< 0.64	< 0.54	< 0.78	< 0.5	< 0.3	< 0.58

The results of the questionnaire analysis carried out from 30 respondents, and literature studies show that eLisa currently has a bad impression on its users. An update is needed to attract more users using eLisa. Figure 3 explains from our analysis that almost all UEQ scales have shown bad results for the eLisa user experience. Four of the six scales showed bad results, and two other showed results that were still below average.

The results we got from the SCORM reference model is bad. In Figure 4 of the three scales that describe the SCORM reference model, 2 of which are bad, and the other results are still below average. These results indicate that the functionality of eLisa also affects users. The tendencies of users who are not comfortable using eLisa influence each other. Evidenced by the nine scales analyzed, almost all scales produce bad result.

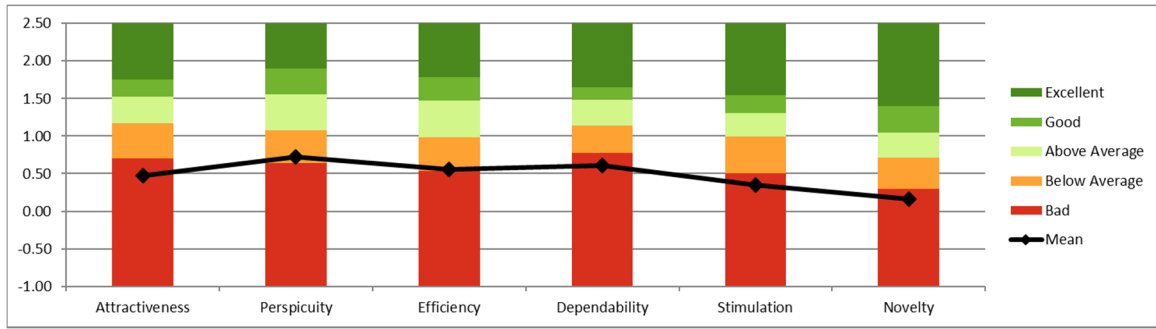


Figure 3: UEQ benchmark on eLisa.

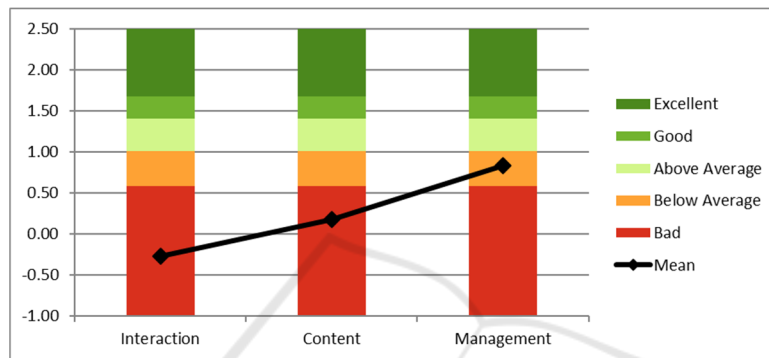


Figure 4: SCORM reference model benchmark on eLisa.

Next, we can see the Cronbach Alpha coefficient value, which represents the reliability of the data with the consistency of all items contained in each scale. UEQ evaluation data can be said to have high consistency if the Cronbach Alpha coefficient value is greater or equal to 0.7. The following Table 3 presents the Cronbach Alpha values of each scale while in Table 4 describes the results for the mean and variance. On the scale of interaction and content has a low consistency because the scale of the interaction of eLisa mobile now does have design limitations. When we access eLisa through a smartphone, eLisa's responsive design does not cover the entire page so that on some pages our access will be directed back to the web design version of eLisa and to scale the content the problem is that many eLisa users switch to using other e-learning, so that much content is not updated. Based on the value calculation carried out by combining the two methods with the UEQ calculation format, this calculation can be used to support the items needed. However, it needs to be understood further. There must be a match of data taken for the calculation and adjustment of the formula so that the calculation can find results.

Table 3: Cronbach Alpha reliability coefficient.

Scale	Cronbach Alpha
Attractiveness	0.91
Perspicuity	0.89
Efficiency	0.91
Dependability	0.85
Stimulation	0.90
Novelty	0.85
Interaction	-2.76
Content	0.22
Management	0.75

Table 4: Calculation of mean and variance on eLisa.

UEQ Scale (Mean dan Variance)		
Attractiveness	0.478	1.49
Perspicuity	0.725	1.75
Efficiency	0.558	2.19
Dependability	0.608	1.52
Stimulation	0.350	1.49
Novelty	0.158	1.26
Interaction	-0.275	0.16
Content	0.178	0.60
Management	0.833	1.40

5 CONCLUSION

Based on the results and discussion above it can be concluded that the evaluation of user experience on eLisa using UEQ and the scale of additional functionality will be explained at the points below:

- Adding the scale of functionality used is suitable for knowing whether the content on eLisa affects usage.
- The use of the SCORM reference model is perfect for evaluating e-learning functionality.
- The results obtained from evaluating the user experience of eLisa are bad. Of all the scales measured, 6 scaled bad results, and three others were below average. The following breakdown of each score obtained is an attractiveness of 0.478, perspicuity 0.725, efficiency 0.558, dependability 0.608, stimulation 0.350, novelty 0.158 and 3 additional scales namely interaction -0.275, content 0.178, management 0.833.
- Qualitative data obtained also show the same level of badness. The majority of respondents want a change in interface design and increased interaction with eLisa.

These results become a reference so that eLisa in the future gets an evaluation according to the user's wishes. To add functionality to the scale, it is necessary to adjust the input data, adjust the pattern, and the analytical tools used to calculate the appropriate UEQ. There are some limitations in research that can be improved in further research. Researchers may recruit more participants as simple audiences in future studies as elisa users increase, so the functionality scale has benchmark accuracy. Additional scales for evaluating functionality may be used in several other studies as items in UEQ evaluations. But not all e-learning will be appropriate using this functionality scale because this scale is designed with the characteristics of eLisa. For future research it is necessary to design further scale of functionality so that it can be used as a benchmark for other e-learning or general products.

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