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Evaluation of Lontar Prasi Bali Application based on Augmented Reality Using User Experience Questionnaire

I Gede Iwan Sudipa[1]*, Putu Wirayudi Aditama[2], Christina Purnama Yanti[3]
Bali Cultural Digitization Study Center, Institute of Business and Technology Indonesia (INSTIKI)
Corresponding Author: I Gede Iwan Sudipa iwansudipa@instiki.ac.id

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A B S T R A C T

The digitalization era supports the use of technology to preserve and strengthen local culture, such as using Augmented Reality (AR) to visualize Lontar Prasi figures and stories. To design and operate the Lontar Prasi Bali AR application optimally based on user demands, User Experience (UE) testing was conducted on 56 respondents with 8 questions on the applicati on using User Experience Questionnaire (UEQ) test shows that the average pragmatic and hedonic quality is 1.94, meaning the application is good at providing user pleasure and comfort. The Lontar Prasi Bali AR app provides above-average results (Excellent) and matches user expectations.

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INTRODUCTION

Technology and media are currently being used in efforts to preserve culture. In an effort to preserve local culture and pass it on to the next generation(Aditama & Setiawan, 2020)(Vital & Sylaiou, 2022), the digitalization period can have a positive impact on how technology is used to digitize cultural artifacts, such as Bali's Lontar Prasi, which is considered a cultural heritage. Lontar prasi is one of the pictorial lontars that depicts wayang characters from the Ramayana and Bharathayuda legends and offers advice and insights into Balinese local knowledge(Hinzler, 1993). Augmented reality is one of the technology advancements that can be used to visualize the characters(Yan et al., 2021), in the Balinese lontar prasi narrative.

The AR Lontar Prasi Bali application is an augmented reality-based application that can be used to view characters and figures depicted on a lontar prasi sheet. Using the AR motion function, each character may move, and there is a narration of the story being told(Santoso et al., 2021). Each sheet of lontar prasi is unique. The AR Lontar Prasi Bali application was developed using the Research and Development (R&D) method, which is suitable for application development with a relatively limited scope and application processing time, but still facilitates communication between application developers and users in analyzing application requirements(Habib et al., 2018).

User Experience (UX) is user feedback on a system. A product's interactiveness depends on its UX(Mirnig et al., 2015). To improve quality, measure UX with standardized questions and assessments(Laugwitz et al., 2008). UEQ is a test questionnaire with international standards that are easy and effective in computing UX values, so it can produce comprehensive UX measurements(Schrepp et al., 2017). Several studies have employed user experience testing with UEQ to determine the demands of AR application users (Hinderks et al., 2019)(Derisma & Hersyah, 2021) and to provide feedback for functional system requirements analysis throughout system development(Verhulst et al., 2021)(Arifin et al., 2018). UEQ can also provide quantitative assessments of user ratings(Sandhiyasa et al., 2021).

THEORETICAL REVIEW

User Experience

The perception and reaction of a person toward a product, system, or service is referred to as the User Experience (UX)(Zeiner et al., 2018). The term "User Experience" refers to the range of emotions, perceptions, behavioral responses, physical and psychological reactions, and solutions that occur to users both before and after they use a particular product or application(Derisma & Hersyah, 2021). User experience, also known as UX, is concerned with all elements of how people use interactive products, including how they feel while using the product and how well a product fits the general environment in which it is used by the user(Hartson & Pyla, 2018). The International Organization for Standardization (ISO) defines user experience (UX) as a response or feedback resulting from the use of a software application(ISO 9241-210, 2019).

User Experince Questionnaire (UEQ

UEQ is a questionnaire-based measurement for calculating the value of UX fast and effectively. UEQ is a questionnaire that measures in a complete and exhaustive manner. UEQ's design fits neatly into a UX research framework. Effective user experience evaluation is possible with UEQ. The scale of the UEQ is divided into three categories: Attractiveness is a variable consisting of pragmatic and hedonic qualities. Aspects of pragmatic quality relate to perceived product benefits, efficacy, and usability(Hinderks et al., 2018). Aspects of clarity, effectiveness, and dependability are categorized as pragmatic characteristics. In contrast, hedonic quality is associated with stimulation and novelty. UEQ contains 26 question items covering 6 variables, namely(Benyon, 2019):

1. Attractiveness is the product's appeal or the user's opinion of the product.
2. Perspicuity (clarity) refers to the product's simplicity of use and comprehension.
3. Efficiency (efficiency) refers to the simplicity with which a product can be used, as well as the product's speed when used as desired with minimal effort.
4. Dependability (accuracy) is the extent to which the user has control over every interaction with the product and the system.
5. Stimulation is how enjoyable it is for the user to use the product and how interested the user is in utilizing the product.
6. Novelty (novelty) the degree to which product data is utilized in a new and non-repetitive manner.

METHODOLOGY

In this study, respondents were given the UEQ questionnaire using random sampling. The research process is depicted in Figure 1.

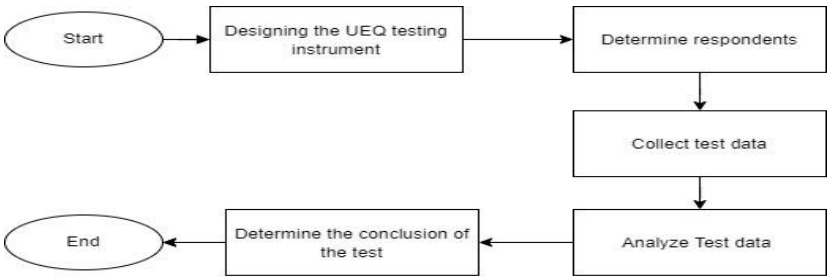

Figure 1. Research Flowchart

This research begins with the preparation of research instruments, namely questionnaires, followed by the respondent selection stage, namely the selection of respondents who will be used as research samples, namely 56 users of the Lontar Prasi Bali AR application with eight questions related to the use of the Lontar Prasi Bali AR application, questionnaire data collection, and data analysis until a conclusion is drawn from the data analysis.

RESULTS AND DISCUSSIONS

UEQ Analysis Result

The objective of evaluating user satisfaction with the User Experience Questionnaire (UEQ) is to ensure that the created system meets user requirements and is simple to use. The test was conducted by delivering 8-item questionnaires via Google Form to users of the Lontar Prasi augmented reality application. Of all the disseminated questionnaires, 56 responses were collected and entered into the UEQ database for data analysis with the UEQ data analysis tool. Then, this tool will conduct data transformations automatically. Each UEQ item is subtracted by four to determine these results, which are either positive or negative. The maximum positive value is +3, and the lowest negative value is -3. Table 1 displays the outcome of the data transformation.

Table 1. Questionnaire Answer Results

No	Items							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	7	7	7	7	7	7	7	7
2	5	6	6	6	7	6	6	6
3	6	7	6	6	6	7	6	6
4	7	6	6	5	6	6	5	6
5	5	6	4	6	7	6	4	7
6	6	7	5	6	7	6	7	5
7	4	5	5	6	5	6	7	7
8	6	7	6	7	7	6	7	7
9	6	6	5	7	6	5	6	6
10	5	6	6	5	6	6	5	7
11	7	6	6	6	6	5	6	7
12	5	6	5	6	6	7	6	6
13	6	6	6	7	7	6	6	5
14	6	6	5	7	7	6	6	7
15	7	7	6	7	7	7	7	7
16	5	5	6	5	6	5	5	5
17	5	6	5	6	6	5	6	6
18	6	6	5	7	7	6	6	6
19	5	5	6	5	6	6	6	6
20	6	5	4	6	6	5	6	6
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
51	6	6	7	6	6	7	6	6
52	6	5	6	7	6	5	5	6
53	6	7	6	6	5	7	6	7
54	6	6	4	7	6	6	6	6
55	6	7	6	6	6	5	7	6
56	6	6	7	5	7	6	6	6

Data Transformation

The results of the 56 respondents' ratings are shown in Table 1, however the ratings are still on a scale of 1–7, which will later be converted to -3–+3 in Table 2 below.

Table 2. Data Transformation

No	Items							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	3	3	3	3	3	3	3
2	1	2	2	2	3	2	2	2
3	2	3	2	2	2	3	2	2
4	3	2	2	1	2	2	1	2
5	1	2	0	2	3	2	0	3
6	2	3	1	2	3	2	3	1
7	0	1	1	2	1	2	3	3
8	2	3	2	3	3	2	3	3
9	2	2	1	3	2	1	2	2
10	1	2	2	1	2	2	1	3
11	3	2	2	2	2	1	2	3
12	1	2	1	2	2	3	2	2
13	2	2	2	3	3	2	2	1
14	2	2	1	3	3	2	2	3
15	3	3	2	3	3	3	3	3
16	1	1	2	1	2	1	1	1
17	1	2	1	2	2	1	2	2
18	2	2	1	3	3	2	2	2
19	1	1	2	1	2	2	2	2
20	2	1	0	2	2	1	2	2
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
51	2	2	3	2	2	3	2	2
52	2	1	2	3	2	1	1	2
53	2	3	2	2	1	3	2	3
54	2	2	0	3	2	2	2	2
55	2	3	2	2	2	1	3	2
56	2	2	3	1	3	2	2	2

As shown in Table 2, each data transformation result will consider the average value for each quality, with items 1 through 4 representing pragmatic quality values and items 5 through 8 representing hedonic quality values, as well as the sum of the values of items 1 through 8.

Final Result

All variables' average (mean) and variance will be determined (variance). The variance is the distribution of respondents' data. Table 3 shows the average quality score of each person.

Table 3. Scale Means each Person

No	Pragmatic Quality	Hedonic Quality	Overall
1	3.00	3.00	3.00
2	1.75	2.25	2.00
3	2.25	2.25	2.25
4	2.00	1.75	1.88
5	1.25	2.00	1.63
6	2.00	2.25	2.13
7	1.00	2.25	1.63
8	2.50	2.75	2.63
9	2.00	1.75	1.88
10	1.50	2.00	1.75
11	2.25	2.00	2.13
12	1.50	2.25	1.88
13	2.25	2.00	2.13
14	2.00	2.50	2.25
15	2.75	3.00	2.88
16	1.25	1.25	1.25
17	1.50	1.75	1.63
18	2.00	2.25	2.13
19	1.25	2.00	1.63
20	1.25	1.75	1.50
…	…	…	…
…	…	…	…
51	2.25	2.25	2.25
52	2.00	1.50	1.75
53	2.25	2.25	2.25
54	1.75	2.00	1.88
55	2.25	2.00	2.13
56	2.00	2.25	2.13

In Table 4, the scale value of each user and the total value are displayed. The subsequent step is to calculate the mean, standard deviation, and variance for each item, as shown in Table 4.

Table 4. Mean, Varian, Std Deviasi

Item	Mean	Variance	Std. Dev
1	1.946	0.699	1.946
2	2.036	0.687	2.036
3	1.643	0.773	1.643
4	1.982	0.751	1.982
5	2.143	0.672	2.143
6	2.054	0.749	2.054
7	1.875	0.715	1.875
8	2.036	0.738	2.036

The mean, variance, and standard deviation values for each item are shown in Table 4. In addition, the value of the data transformation will be determined in order to determine the average value of each item across all respondents. From the average value of each question item, the mean, variance, and standard deviation (std. dev) were calculated. The outcomes of the data processing are displayed in Table 5.

Table 5. Measurement Results of All Aspects

Item	Mean	Variance	Std. Dev	Scale
1	1,9	0,5	0,7	Pragmatic Quality
2	2,0	0,5	0,7	Pragmatic Quality
3	1,6	0,6	0,8	Pragmatic Quality
4	2,0	0,6	0,8	Pragmatic Quality
5	2,1	0,5	0,7	Hedonic Quality
6	2,1	0,6	0,7	Hedonic Quality
7	1,9	0,5	0,7	Hedonic Quality
8	2,0	0,5	0,7	Hedonic Quality

The information gathered using the UEQ data analysis tool will use the data in Table 6 to calculate the UEQ scale results by taking the average value of each quality across all items. Table 6 displays the UEQ scale results.

Table 6. UEQ Scale Results

Short UEQ Scales	
Pragmatic Quality	1,902
Hedonic Quality	2,027
Overall	1,964

Table 6 reveals that the pragmatic quality is 1.902, indicating that this application is regarded as good in terms of carrying out the function of utilizing the application in terms of efficiency, practicability, speed, and ease of learning. Moreover, the value of hedonic quality is 2.027, indicating that, in terms of user pleasure and comfort, this application produces favorable results. From the findings of the pragmatic and hedonic qualities, the mean value of 1,964 was calculated. The graph in Figure 2 illustrates these outcomes.

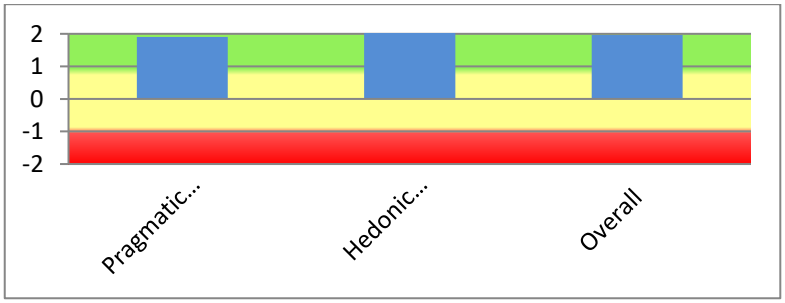

Figure 2. Results Average Value Per Quality

Each UEQ calculation result's average value will be compared to the classification benchmark value presented in Table 7.

Table 7. Benchmark Classification Value

Scale	Bad	B.A	A.A	Good	Excellent	Mean
Pragmatic	0,72	0,45	0,38	0,19	0,76	1,90
Hedonic	0,35	0,5	0,35	0,39	0,91	2,02
Overall	0,59	0,39	0,33	0,27	0,92	1,96

The results of the comparison in Table 7 are then visualized into the graph shown in Figure 3 .

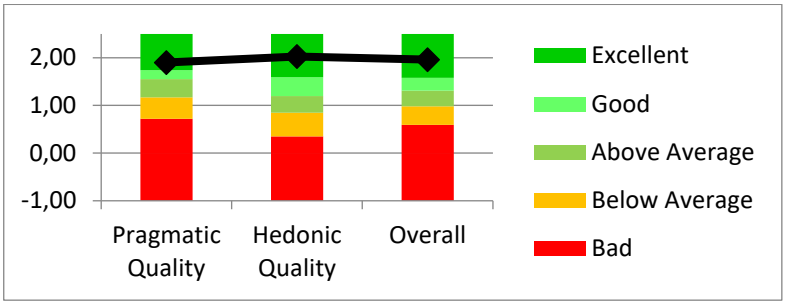

Figure 3. Benchmark Scale Results

Aspects of pragmatic quality, herdonic quality, and overall receive results above average when measured against the benchmark scale (Excellent). The Lontar Prasi Bali AR application is good and works as predicted, according to these results.

CONCLUSIONS AND RECOMMENDATIONS

The Augmented Reality (AR) application for Lontar Prasi Bali received generally positive responses from respondents, as indicated by the data collected from 56 respondents indicating that the User Experience (UX) Testing Results with the User Experience Questionnaire (UEQ) were of pragmatic quality with 1,902 results. This signifies that this system is regarded as effective in carrying out its function, both in terms of efficiency, practicality, speed, and ease of learning. Moreover, the value of hedonic quality is 2.027, indicating that, in terms of user pleasure and comfort, this system produces favorable results. From the findings of the pragmatic and hedonic qualities, the mean value of 1,964 was calculated. Aspects of pragmatic quality, herdonic quality, and the overall score are above average (Excellent), indicating that the AR Lontar Prasi Bali application has good quality and fulfills user expectations.

FURTHER STUDY

To improve the AR lontar prasi application, additional research can be conducted to develop apps based on the UEQ results, add question items from the UEQ exam, and increase the number of user respondents.

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