Usability Testing for Batik 4.0: A Web Application for Generating 3D Batik Semarangan

Revolution of the industry has now reached the industrial 4.0 era. The development and progression of the industrial revolution have meant that a country needs to have superior products as added value in order to safeguard from the threat of global competition. Indonesia has a product advantage compared to other countries in the form of Indonesian Batik. Indonesian Batik producers are spread across several cities in Indonesia, each having their own unique characteristics, one of which is Semarang. The batik in Semarang is called Batik Semarangan. To keep abreast of the changes brought about by the industrial revolution in Indonesia, a web-based application was developed to produce 3D batik motifs using a triangle mesh. This application is called Batik 4.0. It was important to measure and test the performance and efficiency of the application in order to meet existing objectives and functional requirements of the application. Usability testing was the chosen approach used to facilitate this process and to assess how well the users could learn and use the application. Batik 4.0 was applied on comparison in two platforms in the form of a one-page website and multipage website. This study describes the general description and function of Batik 4.0, and evaluates the usability of this application to produce 3D batik motifs using a triangle mesh in the application of onepage and multipage. The results will be compared to find out which one is better for the application of Batik 4.0, whether on page or multipage. The testing technique was in the form of a survey, of which was questionnaire-based and performance-based. For compare the usability of onepage and multipage , this research use the usability attributes included learnability, satisfaction, effectiveness and efficiency. The results from the testing indicated that the multipage website to generate 3D batik motifs was better than onepage website with learnability value (81.71%), satisfaction (77.43%), effectiveness (94.64%) and efficiency (92.23%) results.

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01 Introduction

Batik produced from Semarang is called Semarangan Batik. The motif is derived from the legends associated with the area, culture and culinary of Semarang. The development of batik motifs are also developed according to the tastes of consumers, ensuring that they are not inferior compared to others produced by outside competitors. However, Semarangan batik remains less popular among the public due to its limited production and labour; possibly due to the uninteresting and less modern motifs

Accordingly, employing newer technologies such as 3D printing will enable more modern and less monotonous motifs, adjusting to consumer tastes and competing globally. The motifs that are currently used depict landmark monuments around Semarang. One method used to represent a 3-dimensional object with the regularity of form is using Polygon and Quadric Surfaces. This method creates objects by connecting points to a collection of lines called polygon mesh. Because batik motifs are more complicated, varied, and relatively large object shapes, the application of 3D batik motifs is used as a triangle mesh. Triangle mesh is known to have faster computational performance as compared to quadrilateral mesh.

The application of using software to generate 3D batik motifs using triangle mesh is also applied to various forms of web platforms such as a one-page website and a multipage website. In order to explore the role of testing these technologies, software tools are used to evaluate possible solutions. The purpose of this approach is to ensure the performance of the developed application software is acceptable in order to meet the objectives and requirements as set. Testing to assess how well users can learn and use application software is known as usability testing. According to Nielsen, a product without adopting a usability process will result in many problems. This is the reason why the usability testing process is important in systems and application development.

02 Literature

The acceptance of the web is very much dependent on its usability and the satisfaction of users. Usability is defined as the quality that examines and measures the ease of appearance used by users. The International Standards Organisation (ISO) defines usability as the level of a product used by certain users to achieve specific goals such as effectiveness, efficiency and user satisfaction. Moreover, usability is generally known as the quality factor of a system that provides answers to the interactions with technology.
Furthermore, there are several bases and opinions in the determination of usability attributes that are often used in various studies, including:
1. Effectiveness: Measures how effectively the information system functions.
2. Efficiency: Measures how quickly a user can complete a task using the system.
3. Satisfaction: Measuring the level of satisfaction and comfort of users in using the system.
4. Learnability: Measures the level of ease of users learning the functions and behaviour of the system.

03 Research Methods

A. Experimental Design
The usability testing aimed to determine the level of user satisfaction, The testing parameters included customer satisfaction, completion of tasks and the time required.

B. Respondents
Respondents consisting of different genders and also with various concerns. The respondents were selected based on their technology literacy, Internet skills and knowledge for familiarity with web-based technology criteria.

C. Tasks
The tasks allocated to the respondents depicted a job or activity. To assess user satisfaction, ease of use and the understanding of users of the web, several tasks that represented these aspects were communicated to the users in the following form:
1. Making batik design selection.
2. See the results of batik designs.
3. Fill in the data for ordering.
4. Confirm the order.

D. Procedure
The testing started with providing general information about the purpose of the exercise [testing], the tasks to be performed and the benefits and expected outcomes. Next, the pre-test questionnaire was provided to each respondent to understand their initial views regarding the Batik 4.0 web application [app]. Each respondent was asked to undertake the task assigned to them, and the testing was then carried out. The post-testing questionnaire was provided to each respondent following the testing to determine the opinions of the respondents after operating the Batik 4.0 web app.

E. Experimental Data
The data collected during the testing consisted of task completion time, the number of tasks performed by the user, and the results of the post-test questionnaire. The experiment is used small sampling data with 14 respondents.

04 Results and Analysis

A. Questionnaire-based
The usability attributes calculated from the testing included; efficiency, effectiveness, learnability, and satisfaction.

Questionnaire	1	2	3	4	5	6	7	8	9	10
Learnability										
Satisfaction										

Questionnaire Data

Partici pant	Questionnaire									
	1	2	3	4	5	6	7	8	9	10
1	3	4	4	4	3	5	4	4	4	3
2	5	5	5	5	5	5	5	5	5	5
3	4	5	4	5	4	4	4	5	4	4
4	4	4	4	3	3	2	3	4	4	4
5	5	4	5	4	4	3	1	2	2	2
6	4	4	4	4	2	4	5	4	5	5
7	5	3	3	4	4	4	3	4	3	2
8	3	4	4	4	4	4	3	4	4	4
9	4	3	4	3	4	4	4	5	4	4
10	4	5	5	4	4	3	4	4	4	3
11	5	5	5	4	5	5	4	5	4	3
12	4	4	3	5	4	5	2	4	5	4
13	4	4	3	5	4	4	4	5	5	4
14	4	5	3	5	4	4	3	3	5	3
Score	58	59	56	59	54	56	49	58	58	50
Percent age	82.86%	84.29%	80.00%	84.29%	77.14%	80.00%	70.00%	82.86%	82.86%	71.43%

Questionnaire answers for multipage

Particip ant	Questionnaire									
	1	2	3	4	5	6	7	8	9	10
1	4	4	5	5	3	3	4	4	3	3
2	1	2	3	1	2	2	2	2	3	5
3	5	5	5	4	4	4	4	4	4	4
4	5	4	5	4	4	2	2	4	3	3
5	2	4	1	4	4	3	1	2	2	2
6	3	4	4	3	2	3	5	4	5	5
7	3	3	5	3	4	4	3	4	3	2
8	4	4	3	5	4	4	4	5	5	4
9	5	4	4	4	4	4	4	5	4	4
10	3	4	3	2	3	4	4	3	3	3
11	2	3	4	3	4	1	4	4	4	3
12	3	4	2	3	4	5	2	2	5	4
13	5	4	3	3	2	3	4	3	4	4
14	5	5	3	5	5	5	3	5	5	3
Score	50	54	50	49	49	47	46	51	53	49
Percenta ge	71.43%	77.14%	71.43%	70.00%	70.00%	67.14%	65.71%	72.86%	75.71%	70.00%

Questionnaire answers for onepage

The value of learnability and satisfaction was calculated as shown below:
For Multipage:
Learnability = (82.86 + 84.29 + 80 + 84.29 + 77.14) / 5 = 81.71% ,
Satisfaction = (80 + 70 + 82.86 + 82.86 + 71.43) / 5 = 77.43%
For Onepage:
Learnability = (71.34 + 77.14 + 71.43 + 70 + 70) / 5 = 72%,
Satisfaction = (67.14 + 65.71 + 72.86 + 75.71 + 70) / 5 = 70.29%

B. Performance-based
Following completion of the testing, the results for the number of completed tasks and the time needed to complete the task were compiled.

Respondents	Task Completion Time			
	1	2	3	4
1	57.46	14.31	78.47	32.05
2	31.34	5.15	54.07	10.86
3	21.96	7.91	40.03	11.64
4	20.13	15.17	27.02	12.12
5	48.07	10.07	42.03	18.57
6	22.51	7.78	45.11	9.21
7	39.31	10.45	56.4	11.94
8	24.09	7.14	48.09	2.4
9	52.3	10.8	40.35	3.67
10	17.75	5.18	35.27	2.95
11	26.2	12.14	40.5	5.13
12	38.42	20.99	76.06	13.46
13	27.65	9.22	45.58	6.12
14	45.32	14.92	20.52	16.47

Task completion time for multipage

Respondents	Task Completion Time			
	1	2	3	4
1	51.26	2.09	20.34	27.14
2	10.87	2.32	10.96	42.14
3	8.24	3.31	39.69	18.96
4	9.05	2.73	6.72	30.07
5	8.64	1.67	3.9	50.92
6	13.19	2.68	9.03	28.58
7	27.38	2.87	10.69	25.34
8	14.91	2.35	12.29	25.44
9	21.4	2.83	7.96	17.38
10	20.72	3.24	14.87	13.82
11	19.85	2.33	17.02	15.54
12	47.18	4.11	25.72	22.31
13	12.73	2.61	30.97	22.22
14	14.54	4.25	30.52	38.67

Task completion time for onepage

The overall relative efficiency of Multipage = 92.23%
The overall relative efficiency of One page = 90.83%

	Multipage Website	One-page Website
Learnability	81.71%	72%
Satisfaction	77.43%	70.29%
Effectiveness	94.64%	92.86%
Efficiency	92.23%	90.83%

usability testing result

06 Conclusion

Batik 4.0, The application to generate 3D Batik motifs using triangle mesh was applied on comparison in two platforms in the form of a one-page website and multipage website. This study describes the general description and function of Batik 4.0, and evaluates the application of this application to produce 3D batik motifs using a triangle mesh in the application of on page and multipage. The results will be compared to find out which one is better for the application of Batik 4.0, whether on page or multipage.
Usability testing was performed by participants of different gender, job, and with various concerns. This approach enabled equal distribution of users with different levels of technology literacy, internet skills and knowledge. From these results, it, therefore, suggests that developing an application to generate 3D batik motifs using a triangle mesh is more appropriate using a multipage website. T
he results of this study can be used as a basis for further research. Subsequent research can be developed for research with different numbers and types of usability attributes and adding the number of respondents to the study.

References

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