

Usability Criteria for Multimedia Interactive Learning Based on Website in Mathematics for SMK

Moch. Sukardjo

Dept. of Education for Electrical Engineering
Faculty of Engineering, State University of Jakarta
Jakarta
msoekardjo@unj.ac.id

Lipur Sugiyanta

Dept. of Education for Informatics and Computer
Engineering/ Faculty of Engineering, State University of
Jakarta
lipurs@unj.ac.id

Abstract—Web usability, if evaluation done correctly, can significantly improve the quality of the website. Website containing multimedia for education should apply user interfaces that are both easy to learn and easy to use. Multimedia has big role in changing the mindset of a person in learning. Using multimedia, learners get easy to obtain information, adjust information and empower information. Therefore, multimedia is utilized by teachers in developing learning techniques to improve student learning outcomes. For students with self-directed learning, multimedia provides the ease and completeness of the courses in such a way that students can complete the learning independently both at school and at home without the guidance of teachers. The learning independence takes place in how students choose, absorb information, and follow the evaluation quickly and efficiently. The 2013 Curriculum 2013 for Vocational High School (SMK) requires teachers to create engaging teaching and learning activities that students enjoy in the classroom (also called invitation learning environment). The creation of learning activity environment is still problem for most teachers. Various researches reveal that teaching and learning activities will be more effective and easy when assisted by visual tools. Using multimedia, learning material can be presented more attractively that help students understand the material easily. The opposite is found in the learning activity environment who only rely on ordinary lectures. Usability is a quality level of multimedia with easy to learn, easy to use and encourages users to use it. The website Multimedia Interactive Learning for Mathematics SMK Class X is targeted object. Usability website in Multimedia Interactive Learning for Mathematics SMK Class X is important indicators to measure effectiveness, efficiency, and student satisfaction to access the functionality of website. This usability measurement should be done carefully before the design is implemented thoroughly. The only way to get test with high quality results is to start testing at the beginning of the design process and continuously testing each of the next steps. This research performs usability testing on of website by using WAMMI criterion (Website Analysis and Measurement Inventory) and will be focused on how convenience using the website application. Components of Attractiveness, Controllability, Efficiency, Helpfulness, and Learnability are applied. The website in Multimedia Interactive Learning for Mathematics SMK Class X can be in accordance with the purpose to be accepted by student to improve student learning outcomes. The results show that WAMMI method show the usability value of Multimedia Mathematics SMK Class X is about from 70% to 90%.

Keywords—web; usability; WAMMI criteria; mathematics; self learning

I. INTRODUCTION

There are many things to consider when building a new website for education. Basically, the site needs to be attractive enough that students want to use it. It also needs to contain all of the materials that students need in order to help them achieve the objective for learning targets. One of the most important aspects of building a website is testing for usability. Internet users (students) are accustomed to being able to figure out how to use a website quickly. Most of them will not take the time to figure out a site that is not usable.

Usability is defined by the International Standard Organization as “the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use” [1]. In [2], web usability is translated as how easy it is to learn, remember and use a web interface with minimum errors.

The main reason that usability is so important is because there are so many similar websites that people will go to the next site if the first one they visit is not usable. Beautiful website may not achieve its objectives if users are unable to figure out how to navigate the site quickly. According to [3], users will return to a website only if the website can provide useful information that is easy to navigate in presented in a well-structured layout. In other words, the acceptance of a website depends on how easy it is to use the site to find helpful information. Web usability testing aims to determine whether a website is in accordance with the needs of the user (students) or not.

This research does usability testing on Website containing Multimedia Interactive Learning Based in Mathematics for SMK on by using field observation method is by observing users how they use the application. The website is not only a cost efficient and timely method to communicate with various students. That's vitality of usability issue for the websites. Usability is importance in terms of satisfying website users' needs and expectations. In this research, usability components tested consist of attractiveness, controllability, efficiency,

helpfulness, and learnability. It also presents a description of two such methods developed by [1] and [2].

II. RELATED RESEARCH

The criteria used in the research of usability websites are quite diverse and vary from one journal to another. For example, the HHS guidelines proposed by Koyani et. al [4] list 187 extensive principles to assess the usability of information-oriented web sites, sourced from 375 cited publications. Another recommendation (the JISC) by Bevan and Kincla [5] provide the 121 guides to assess academic website usability. In this paper however, we refer to two guidelines as follows:

- “Assessing the Usability of University Websites: An Empirical Study on Namik Kemal University” [6]
- “Common Usability Problems on Educational Websites” [7]

[6] use five usability criteria defined by WAMMI (Website Analysis and Measurement Inventory). These criteria can be seen in table 1.

TABLE I. CRITERIA USED IN PAPER 1 “ASSESSING THE USABILITY OF UNIVERSITY WEBSITES: AN EMPIRICAL STUDY ON NAMIK KEMAL UNIVERSITY”

Criteria	Definition
Attractiveness	Website have a visually pleasing appearance and can draw the user's attention to visit the web.
Controlability	The level of control that a user perceives when a person interacts with a website. The site with good controlability enable users to navigate the website easily and can do the things they want to do.
Efficiency	Users can achieve their target with a short visit without the need to use a lot of cognitive effort.
Helpfulness	Website has the structure and content that matches the expectations of users.
Learnability	Ease in the time and effort of users to learn the website.

That research aims to measure the usability of the Namik Kemal University (NKU) web site via the five factors of usability: attractiveness, controllability, helpfulness, efficiency and learnability. The results reveal that the five usability factors are positively related with usability perception, i.e., attractiveness, helpfulness, efficiency, learnability, and controllability.

[7] uses five different criteria. The criteria used in the paper and its definition can be seen in table 2 below.

TABLE II. USABILITY CRITERIA FOR PAPER 2 “COMMON USABILITY PROBLEMS ON EDUCATIONAL WEBSITES”

Criteria	Definition
Navigation	Assessing whether a site has the tools and links that facilitate user navigation on the site.
Architecture	Associated with the information structure where the site structure is divided into logical groups and each group contains related information.
Ease of use and Communication	Relates to the cognitive effort required to use a website.
Design	Visual Attraction website, use of good design and use of images, fonts, good color.

Criteria	Definition
Content	Assessing whether a website already has the information the user needs.

The criteria in Table 2 comprehensively evaluated the usability of three large public university websites in Jordan, using the heuristic evaluation method. The results identified a list of 34 specific types of common usability problems that were found on the selected Jordanian university websites, and described the frequency number of these problems. The results of 34 problems that were uniquely identified in this research included: Misleading links, links don't open the destination pages, links cause disappearance of the menu, broken links, various types of inconsistency problems, inappropriate orientation of the page design, ineffective text format, broken images, inappropriate choice of color, empty page, inappropriate content, difficult interaction with a website, and lack of support to the Arabic language.

Furthermore, the common and specific usability problems that were uniquely identified in that research, could be used as guidelines for universities in Jordan, to investigate and improve their universities' websites, and therefore to achieve the advantages of usable educational websites.

Therefore, given the different criteria used by the two papers, further studies were conducted by investigate and improve their educational websites followed by comparing the definitions of the two groups. Table 3 shows the results of the comparison:

TABLE III. COMPARISON OF CRITERIA

Paper 1	Paper 2
Attractiveness: Website have a visually pleasing appearance and can draw the user's attention to visit the web	Design: Visual Attraction website, use of good design and use of images, fonts, good color.
Controlability: The level of control that a user perceives when a person interacts with a website. The site with good controlability enable users to navigate the website easily and can do the things they want to do.	Navigation: Assessing whether a site has the tools and links that facilitate user navigation on the site.
Efficiency: Users can achieve their target with a short visit without the need to use a lot of cognitive effort.	Ease of use and Communication: Relates to the cognitive effort required to use a website.
Learnability: Ease in the time and effort of users to learn the website.	Architecture: Associated with the information structure where the site structure is divided into logical groups and each group contains related information.
Helpfulness: Website has the structure and content that matches the expectations of users.	Content: Assessing whether a website already has the information the user needs.

Based on the review results of the two papers above, it is known that both groups of criteria have the similar form of definition but criteria in Paper 1 is more extensive coverage than Paper 2, therefore in this research, criteria in the Paper 1 will be used.

The preliminary research paper was presented at ICVEE (International Conference on Vocational and Electrical Engineering), Surabaya, on November 9, 2017.

III. METHOD AND TOOLS

Set up a website usability testing is carefully construct activities to build a scenario wherein a person performs a list of tasks that someone who is using the website for the first time is likely to perform. This form will be used to evaluate a product (in this case a website) by testing is on users (students). Researcher observes and listens to the students who is performing the tasks while taking notes. Watching students perform common tasks on a website is a great way to test whether the site is usable because quick response will immediately be able to see whether they are able to perform the tasks and any difficulties they have while doing so.

The following is a brief description of the main usability testing methods that are used.

TABLE IV. DESCRIPTION OF CRITERIA

Main Criteria	Sub-Criteria	Definition
Attractiveness	View	Applied good resolution at least 640 x 480. Can be viewed using mobile with a resolution of 1280 x 800 (HD) to 320 x 240 (QVGA).
	Color	Color used is dominant cool color (pastel color or grey color).
	Font	Selected of fonts is readable (Arial 10-15 pt or Calibri 10-15 pt).
	Images	Images have good quality that is type PNG or type TIFF
	Video	Video is encoded with minimum resolution of 480p: 854x480.
	Animation	Animation embedded is not autoplay.
Controlability	Design	Website visualization is easy to understand by users in the form of buttons and links with no different from the usual looking of Facebook.
	Menu navigation	Menus are grouped according to their similarity.
Efficiency	Speed launch/display	Time needed to load/display the entire web in a short time from the beginning of the click (is ranging from 1-5 to 21-25 second).
Learnability	Ease of use	Users can use the website without any constraints even though it has not opened for 1 month.
Helpfulness	Content architecture	Information is divided into logical groups and each group contains updated regularly.

The criteria above need to be quantitative to make student's perceptions on usability of website could be analyzed. This quantitative fulfillment restriction is useful for each sub-criteria to have a maximum and a minimum constraints response that can be fulfilled. The limits used letters A-B-C-D-E, each representing the mark of the criteria. The letter "A" representing the best rating of fulfillment and the lowest rating represented by letter "E". Students will provide value in accordance with column that has been provided. The table 5

below is the criteria and quantitative description of usability website used in the research.

TABLE V. DESCRIPTION OF CRITERIA

Main Criteria	Sub-Criteria	A	B	C	D	E
Attractiveness	View	Website use 1280x800 resolution Could open via mobile with 1280x720 resolution (HD)	Website use 1024x768 resolution Could open via mobile with 960x540 resolution (HD)	Website use 1024x600 resolution Could open via mobile with 800x600 resolution (SVGA)	Website use 800x600 resolution Could open via mobile with 640x480 resolution (VGA)	Website use 640x480 resolution Could open via mobile with 320x240 resolution (QVGA)
	Color	Dominant color is cool (green, blue, purple)	Dominant color is warm (red, yellow, orange)	Dominant color is neutral (chocolate, grey)	Dominant color is black and white	Dominant color is black
	Font	Arial size 10-15	Open Sans size 10-15	Times New Roman size 10-15	Verdana size 10-15	Calibri size 10-15
	Images	Format PNG (Portable Network Graphics)	Format JPEG (Join Photographic Experts Groups)	Format JPG	Format BMP	Format TIFF (Tagged Image File Format)
	Video	Format MKV, MOV	Format MP4	format WMV	Format FLV, SWF	Format AVI, MPEG, 3GP
	Animation	Format 3D	Format SWF, SWI	Format EXE	Format PPTX	Format GIF
Controlability	Design	Button underlined, Pointer hover	Button in individual frame, Pointer hover	Pointer hover	Pointer change size	No effect
	Menu navigation	Grouped according to head menu	Grouped	Some are grouped	Few are grouped	None
Efficiency	Speed launch/display	1-5 secs	6-10 secs	11-15 secs	16-20 secs	21-25 secs
Learnability	Ease of use	Users capable using the	Users capable using the	Users capable using the	Users capable using the	Users capable using the

Main Criteria	Sub-Criteria	A	B	C	D	E
		website after 30 days	website after 20 days	website after 15 days	website after 10 days	website after 7 days
Helpfulness	Content architecture	Updated regularly every 3 days	Updated regularly every 5 days	Updated regularly every week	Updated regularly every month	Updated regularly every 2 months

The website become research object is named <http://www.sukardjo-lipurs.com>. The website usability testing was using the famous browser Google Chrome. In terms of this test, only 3 pages from the website will be tested. Almost all of usability criteria were evaluated through visual or eyesight not get into the elements of the website source code. Students and 3 expert (teachers) are involved during this testing. Several criteria require a period to complete the usability testing. Researcher also perform testing using online tools to measure of a website portfolio. The chosen online tools are responsivex.com; fontface.ninja; and [pingdom](http://pingdom.com) (<https://tools.pingdom.com/>). For helpfulness, these sub-criteria is verified with 16-item questionnaire was administered manually using PSSUQ (Post-Study Usability Questionnaire) template.

Website usability testing was conducted on 27 July 2017 until 10 September 2017. The research was conducted in SMKN 39 Jakarta Pusat.

IV. RESULT AND ANALYSIS

The result of the website usability testing based on criteria showed in table 6 below.

TABLE VI. RESULT OF TESTING

Main Criteria	Sub-Criteria	Result
Attractiveness	View	A
	Color	A
	Font	A
	Images	B
	Video	A
	Animation	A
Controlability	Design	B
	Menu navigation	B
Efficiency	Speed launch/ display	A
Learnability	Ease of use	B
Helpfulness	Content architecture	A
		B

A. Usability Website of Attractiveness

Website has been using the resolution of 1280 x 800 then the rating is "A". The screenshot view using responsivex.com

is given below. Website can be accessed via mobile (Smart Phone) with the best size 1280 x 720 (HD) hence the rating is "A".



Fig. 1. Website view using <http://responsivex.com/?sukardjo-lipurs.com%2F#816x984&scrollbars>

The "A" was marked on sub-criteria for color because the dominant color in the homepage of the website is cool (blue and green). Psychologically, the cool color is able to attract the attention of users because of its beauty and cool mind for whom views the website.

Mark "B" on the sub-criteria Fonts because the selection of fonts from the website in accordance with the website in the academic world, (most of) using "Open Sans" font size 10-13pt. This font has a distinctive feature as a clear, easy to read and often used by students in academic activities. Verification of this font using software called "font face ninja".



Fig. 2. Font view using FontFace Ninja.

B. Usability Website of Controlability

Mark "B" on the design sub-criteria because the navigation on the website can be distinguished by the frame limit that as shown below Fig. 3. The key menu and navigation is easy to understand because it uses language commonly used by most websites and textbooks. Navigation buttons position is designed stay in place even though visitors move pages of the website.



Fig. 3. Font view using FontFace Ninja

C. Usability Website of Efficiency

Mark “B” in the sub-criteria loading time obtained from the testers using online tools called pingdom (<https://tools.pingdom.com/>). This tool is useful to measure time required (seconds) for the entire website to load. The result of loading time website is 6,38 s with capacity of website size equal to 15,7 MB.

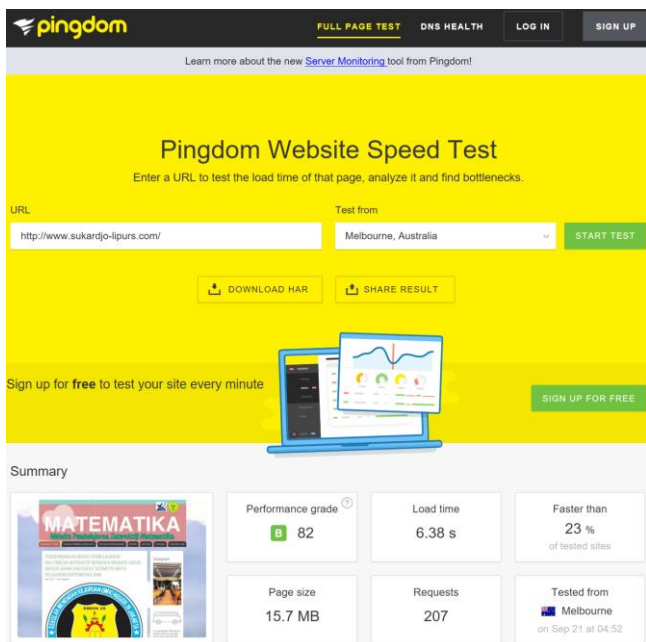


Fig. 4. Navigation button grouped in frame

D. Usability Website of Learnability

Learnability is defined as the capability of a website to enable the student to learn how to use it. This is a key usability feature that is often disregarded. In this case, the testing whether website is learnable is over a certain period (month or week), using the same students testing the interface multiple times at regular intervals. A more learnable website is one that reduces the time it takes to complete tasks as users spend more time with a website faster than others. These sub-criteria are marked with “A”. Student can use the website even though not open for 30 days. That website rank relies on the familiarity and simplicity design.

E. Usability Website of Helpfulness

Helpfulness is degree to which students feel that the site enables them to solve their problems with finding information and navigating. Website is updated regularly every 5 days. This sub-criterion is marked with “B”. Students find the website attractive, and also find it helpful.

This sub-criteria is verified with 16-item questionnaire was administered manually using PSSUQ (Post-Study Usability Questionnaire) template. The PSSUQ is a 16-item survey that measures users’ perceived satisfaction with a product or system. Obtaining an overall satisfaction score is done by averaging the four sub-scales of System Quality (the average of items 1-6), Information Quality (the average of items 7-12),

and Interface Quality (the average of items 13-16). The PSSUQ is highly reliable (.94) and is entirely free. (<https://chaione.com/blog/ux-research-standardizing-usability-questionnaires/>)

	The Post-Study Usability Questionnaire Version 3	Strongly agree							Strongly disagree							NA			
		1	2	3	4	5	6	7	1	2	3	4	5	6	7				
1	Overall, I am satisfied with how easy it is to use this system.																		
2	It was simple to use this system.																		
3	I was able to complete the tasks and scenarios quickly using this system.																		
4	I felt comfortable using this system.																		
5	It was easy to learn to use this system.																		
6	I believe I could become productive quickly using this system.																		
7	The system gave error messages that clearly told me how to fix problems.																		
8	Whenever I made a mistake using the system, I could recover easily and quickly.																		
9	The information (such as online help, on-screen messages and other documentation) provided with this system was clear.																		
10	It was easy to find the information I needed.																		
11	The information was effective in helping me complete the tasks and scenarios.																		
12	The organization of information on the system screens was clear.																		
13	The interface* of this system was pleasant.																		
14	I liked using the interface of this system.																		
15	This system has all the functions and capabilities I expect it to have.																		
16	Overall, I am satisfied with this system.																		

*The "interface" includes those items that you use to interact with the system. For example, some components of the interface are the keyboard, the mouse, the microphone, and the screens (including their graphics and language).

Fig. 5. PSSUQ survey.

Using PSSUQ instrument, the questionnaire was distributed to 10 respondents chosen from the sample, i.e. students and teachers who have used the website online. From the answers, all questions were answered validly. Reply of the questionnaires produce an output shows in Fig. 6.

The Post-Study Usability Questionnaire	Strongly Agree	Strongly Disagree					Total Respond	
		1	2	3	4	5		
ITEM	1	2	3	4	5	6	7	
1	5	3	2	0	0	0	0	100 %
2	7	3	0	0	0	0	0	100 %
3	2	8	0	0	0	0	0	100 %
4	0	8	2	0	0	0	0	100 %
5	3	6	1	0	0	0	0	90 %
6	7	3	0	0	0	0	0	100 %
7	0	0	0	0	7	3	0	100 %
8	0	0	0	6	4	0	0	100 %
9	2	6	2	0	0	0	0	100 %
10	4	5	0	0	0	10	0	100 %
11	0	2	7	1	0	0	0	100 %
12	1	9	0	0	0	0	0	100 %
13	1	8	1	0	0	0	0	100 %
14	2	7	1	0	0	0	0	100 %
15	4	6	0	0	0	0	0	100 %
16	7	3	0	0	0	0	0	100 %

Fig. 6. Questionnaires results of PSSUQ survey.

Data processing produces the users’ interpretation of 70% satisfaction with the website. This satisfaction is based on the simplicity of the application (> 70%), ease of use (> 70%), application response to errors (> 70%), appropriate content (> 70%) and pleasant interface > 80%). The results of data processing are as follows:

TABLE VII. RESULT OF PSSUQ SURVEY

The Post-Study Usability Questionnaire	Result
Overall, I am satisfied with how easy it is to use this system	From 10 respondents, 5 people (50%) chose the item "1", 3 people (30%) chose item "2" and 1 person (20%) chose item "3". It can be said for item "1" generally satisfied enough.
It was simple to use this system	From 10 respondents, 7 people (70%) chose the item "1", 3 people (30%) chose the item "2". It can be said for item "2" generally the website used is quite simple.
I could complete the tasks and scenarios quickly using this system	From 10 respondents, 2 people (20%) chose item "1", 8 people (80%) chose item "2". It can be said for item "3" generally learning task can be quickly can be done after using this website.
I felt comfortable using this system	From 10 respondents, 8 people (80%) chose the item "2" and 2 people (20%) chose item "3". It can be said for item "4" the website is very convenient.
It was easy to learn to use this system	From 10 respondents, 30 people (30%) chose the item "1", 6 people (60%) chose item "2" and 1 person (10%) chose item "3". It can be said for item "5" generally very easy to use this website.
I believe I could become productive quickly using this system	From 10 respondents, 7 people (70%) chose the item "1" and 3 people (30%) chose item "2". It can be said for item "6" the website is very productive.
The system gave error messages that clearly told me how to fix problems	From 10 respondents, 7 people (70%) chose the item "5" and 3 people (30%) chose item "6". It can be said for item "7" generally website show a clear error message when there is a problem.
Whenever I made a mistake using the system, I could recover easily and quickly	Similar with question 7 that the majority of respondents stated whether appear a misuse, it is easy to fix. 6 people (60%) answered item "5" and 4 people (40%) answered answer "5". It can be said that if there are errors of use then it is easy to fix it.
The information (such as online help, on-screen messages and other documentation) provided with system was clear	From 10 respondents, 2 persons (20%) chose the item "1", 6 people (60%) chose the item "2" and 2 people (20%) chose item "3". It can be said for item "1" information submitted in website is clear.
It was easy for me to find the information I needed	From 10 respondents, 4 people (40%) chose the item "1", 50 people (50%) chose the item "2" and 1 person (10%) chose the item "6". It can be said for item "1" that 90% of respondents said it is very easy to get the required information.
The information was effective in helping me complete the tasks and scenarios	From 10 respondents, 2 persons (20%) chose the item "1", 7 people (70%) chose item "3" and 1 person (10%) chose item "4". It can be said for item "1" that 90% of participants say information is complete enough to help learning tasks.
The organization of information on the system screens was clear	From 10 respondents, 9 people (90%) chose the item "1", 1 person (10%) selects item "2". It can be said for item "1" generally the organization of website on the screen quite

The Post-Study Usability Questionnaire	Result
	clear.
The interface* of this system was pleasant	From 10 respondents, 1 person (10%) selects item "1", 8 people (80%) selects item "2" and 1 person (10%) selects item "3". It can be said for item "1" interface in this website is fun.
I liked using the interface of this system	From 10 respondents, 2 persons (20%) chose item "1", 7 people (70%) chose item "2" and 1 person (10%) chose item "3". It can be said for item "1" that the participants really like to use interface in this website program.
This system has all the functions and capabilities I expect it to have	From 10 respondents, 4 people (40%) chose the item "1", 6 people (60%) chose the item "2". It can be said for item "1" that program in website got function and capability as expected.
Overall, I am satisfied with this system	From 10 respondents, 7 people (70%) chose the item "1", 3 people (30%) chose the item "2". It can be said for item "1" that user feel satisfied with this website.

V. CONCLUSION

Web usability is how easy a website is to use. The website has fulfilled usability testing aimed to determine whether a website is in accordance with the needs of the user (students) or not. The website <https://www.sukardjo-lipurs.com/> in usability testing achieved from 70% to 90% of the criteria (Attractiveness = almost A, Controllability = almost A, Efficiency = B, Helpfulness = B, Learnability = A). Therefore, this website is qualified in order to be used in research to assess the effectiveness of self-learning using the website.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to our Dean, DR. Agus Dudung, M.Pd for the continuous support of research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped us in all the time of research and writing of this paper. Our sincere thanks also go to principal of SMKN 39 Jakarta, teachers and students of 10th grade for offering us the opportunities to conduct research in their school and leading us working on exciting projects.

REFERENCES

- [1] N. Bevan, "Human-computer interaction standards," *Adv. Hum. Factors Ergonomics*, vol. 20, pp. 885–890, 1995.
- [2] B. Battleson, A. Booth, and J. Weintrop, "Usability testing of an academic library web site: a case study," *J. Acad. Librariansh.*, vol. 27, no. 3, pp. 188–198, 2001.
- [3] M. Matera, F. Rizzo, and G. T. Carughi, "Web usability: Principles and evaluation methods," in *Web engineering*, Springer, 2006, pp. 143–180.
- [4] S. J. Koyani *et al.*, *based web design & usability guidelines*. National Cancer Institute, 2004.
- [5] N. Bevan and S. Kincla, *HCI design foundation study*. JISC. <http://www.jisc.ac.uk/index.cfm>, 2004.
- [6] A. P. D. S. Ahmet Mentess and A. P. D. Aykut H. Turan, "ASSESSING THE USABILITY OF UNIVERSITY WEBSITES: AN EMPIRICAL STUDY ON NAMIK KEMAL UNIVERSITY," *TOJET: The Turkish Online Journal of Educational Technology volume 11 Issue 3*, pp. 61–69, July 2012.

- [7] S. T. Dave Lawrence, *Balanced Website Design (Optimising Aesthetics, Usability and Purpose)*, London: Springer, 2007.
- [8] I. J. Dewanto, *Web Desain Metode Aplikasi dan Implementasi*, Yogyakarta: Graha Ilmu, 2006.
- [9] L. Hasan and E. Abuelrub, "Common Usability Problems on Educational Websites," in *International Conference on Education and Education Technologies*, Greece, 2003.