Incorporating User Experience Evaluation into Application Design for Optimal Usability

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Article Info	ABSTRACT

Forest and land fires have become a national issue every year, especially in West Kalimantan. From 2015 to 2020, around 331,268.35 hectares of forest and land were burned in West Kalimantan. As a result of forest and land fires, the haze disrupts public health, the economy, and river, land, sea, and air transportation. As anticipation and prevention, the community and government monitor forest and land fires using the Forest Fire Monitoring System Application. The purpose of this study was to the User Experience (UX) evaluation for design improvement in the Forest Fire Monitoring System Application (SIPONGI) in West Kalimantan. The method used was User Centered Design (UCD) and Website Usability Evaluation Tool (WEBUSE) to provide new design solutions in the form of a website prototype. The research methodology included a literature study of the SIPONGI application. The study used a sample of 25 respondents with different work backgrounds to represent the population using the SIPONGI application. The results of this study showed that usability points per attribute and category are superior after making UI/UX improvements using the UCD process in prototype form. In conclusion, using the UCD method is better if it is accompanied by the WEBUSE method in improving the design of an application.

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1. INTRODUCTION

User Experience and User Interface is an important component of a software. The interface is the liaison between a system and its users. The interface is called good if it is easy to understand, and it is said to be bad if the user is difficult to understand when interacting with the system. The author can measure this system's user experience based on perceived experience. The Forest Fire Monitoring System application used is the SIPONGI application, a website-based application that displays information related to hotspots and forest and land fires throughout Indonesia. A website can be a tool that connects companies with customers [1]. Furthermore, a website is a page that links between web pages with related files and displays information online [2]. From the author's observation, this application is generally used by the community and the government to obtain information on hotspots, forests, and land fires. However, the user (government and society) cannot use this application optimally. This application has never been evaluated for both the content and appearance of the application, which causes the need for research related to the evaluation of the application. UI/UX design is tailored to user needs; accurate user analysis is important and must be optimized [3]. Therefore, in making UI designs, it is necessary to pay attention to user convenience so that it can be accepted by the community [4]. UX works by measuring the level of ease of a user when interacting with an application so as not to produce a bad experience [5].

One of the methods used in designing a system that is made according to user needs is User Centered Design (UCD). The User-Centered Design method is a method of designing an application design centered on the wishes and needs of the user of the application [6]. UCD involves many users in the design [7]. In [8–10] used the UCD approach in their research. However, they also added the evaluation method in the UCD method to help design new interfaces. User-centered design (UCD) and user experience (UX) are critical to successful web and mobile design. UI/UX design with a UCD allows easy use of worker's websites [11]. UCD is an iterative process that prioritizes the needs and preferences of users throughout each phase of the design process. By incorporating various research and design techniques, design teams can create products that are highly usable and accessible. UX, conversely, encompasses the entirety of a user's interaction with a product, including their physical and emotional responses. UX design concerns the product's interface, ease of use, learnability, and overall appeal.

The goal of incorporating UCD and UX into web and mobile design is to produce products that are user-friendly, accessible, and enjoyable. By actively involving users in the design process, designers can better understand their needs and preferences, allowing them to create products that effectively meet those needs. UX design emphasizes the creation of interfaces that are intuitive, easy to learn, and pleasurable to use. By fostering a positive user experience, designers can enhance user satisfaction and engagement with the product. Webuse refers to the utilization of web-based applications and services. UCD and UX are crucial in Webuse as they enable designers to develop web-based products that are highly usable, accessible, and enjoyable for users. By engaging users throughout the design process and crafting interfaces that are easy and enjoyable to use, designers can produce web-based products that effectively meet the needs of their users. The developed system has a System Usability Score of 87 [12]. Mixed user-centered design and user experience models applied by interface designers in an institution of higher learning in Malaysia are shared [13]. However, it needs to explain the sequence of designing the interface. They only add other methods, such as UEQ and Heuristics, to evaluate users based on questionnaires. This made the researcher propose a different study by choosing a prototype development process to realize the design based on the evaluation carried out at an early stage which provided different steps from previous research.

User interviews and low- and high-fidelity prototyping are the most frequently used techniques [14]. Prototyping is a system development method that uses an approach to create programs quickly and in stages so that users can immediately evaluate them. The UCD method is also one of the methods used to make prototypes, so researchers choose the prototype development process to realize the design. The prototyping method is an approach to finding new solutions to user-centered problems, starting with the user and ending with answers tailored to the required needs [15]. The system development method with a prototype for researchers is considered appropriate for this research because the research carried out will not only design but will also evaluate the SIPONGI and LAPAN applications using the Web Usability Evaluation (WEBUSE) method. WEBUSE is a usability measurement tool that can be used for all types of websites [16]. Based on the other research, WEBUSE focuses on developing a web-based usability evaluation system with a subjective action approach that involves users' participation in providing assessments on a website [17]. This method was developed by researchers Thiam Kian Chiew and Siti Salwa Salim in 2003 [18].

Based on the background described, this study will carry out a Design Solution, a hotspot monitoring application that users can receive well using the UCD method. The gap that this paper aims to fill is the need to evaluate the SIPONGI application and how it can be improved using the User Centered Design (UCD) method combined with WEBUSE, which involves many users in the design process and is centered on their wishes and needs. It is hoped that this improvement can provide visual comfort to the user interface and provide convenience in the user experience to obtain integrated information media so that users feel satisfied when interacting with the application to control forest and land fires even more optimally in the Province of West Kalimantan. The purpose of this study is to the User Experience (UX) evaluation for design improvement in the Forest Fire Monitoring System Application

(SIPONGI) in West Kalimantan.

2. RESEARCH METHOD

Research methodology is a process that is carried out scientifically for the purposes of research. In this study, the research steps can be carried out in Figure 1 for the first literature study about the SIPONGI application, User Centered Design method, and WEBUSE method. This research aims to make design improvements to the SIPONGI application using the User Centered Design Method. The evaluation was carried out using the WEBUSE method to explore the level of ease of use of the website by users with task scenarios and a questionnaire that summarizes the four usability variables for the application. The research data is based on recommendations for improvements obtained from the evaluation results as a reference in designing new designs. In research, [19] found four recommendation points covering appropriate criteria based on the previously used WEBUSE method. These recommendations can be seen in Table 1.
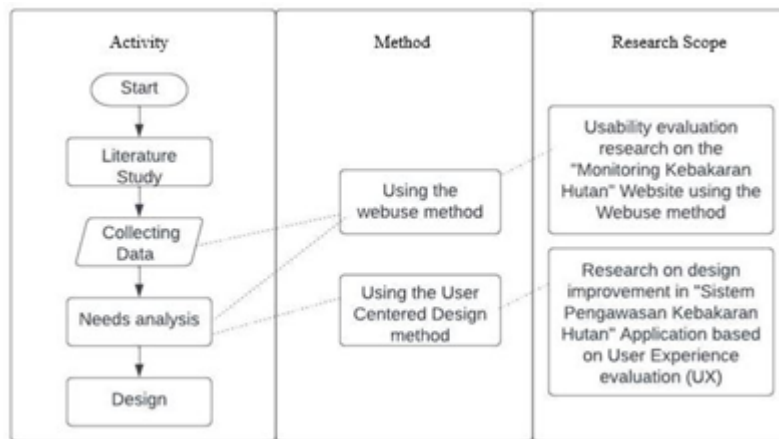

Figure 1. The Research Method

Table 1. Table of Design Recommendations

No	Recommendation Description	Related Issues	Criteria Type
1.	The structure and organization of the content or contents are improved so that it seems harmonious; Heroes, Features, Related Resources, Calls to Action (CTA), and Footers are made. This improvement is expected to make it easier for users and make users feel comfortable with the information displayed.	M-S-01, M-S-02, M-S-03, M-S-04	Content, Organisation, and Readability
2.	It is necessary to pay attention to the maintenance of links or menus on the website so that the links appear on the website so that users can easily browse it.	M-S-05, M-LFH-01, M-LFH-02	Navigation and Links
3.	Change the user interface to make it more attractive and not make users feel difficult to understand the display by making consistency in the interface display. Choose a color that represents the hotspot monitoring website and choose the Roboto font that feels right to look more formal and elegant.	M-S-06, M-S-07, M-S-08, M-S-09, M-S-10	User Interface Design
4.	Make a difference between visited and unvisited links by making the links Action and Hover so that users can find out which links have been or have not been visited.	M-S-11, M-S-12, M-S-13, M-S-14, M-LFH-03, M-LFH-04, M-LFH-05, M-LFH-06	Performance and Effectiveness

3. RESULT AND ANALYSIS

3.1. Users

At this stage, discussions are held with the people working on the project to get a commitment that the project development process is user-centered. This aligns with the UCD method used in the Plan the Human Centered Process stage. This stage is also carried out simultaneously, representing the second stage in UCD, Specify the Context Use. Specify the Context Use is done by sampling. The sample in this study represents the population using the SIPONGI application. Because the majority of application users are in the community and the exact number cannot be determined, the researchers focused on users who had experience using the application. The number of users determined by the researcher was 25 respondents with different work backgrounds. The work of each respondent included six students, five farmers, twelve members of the West Kalimantan Police (representing government agency officials), and two operators of forest and land fire posts at the Directorate of Special Criminal Investigation of the West Kalimantan Regional Police.

3.2. Functional Requirements

It is not only necessary to have an evaluation but also to align with the required requirements in the form of functional requirements according to the third stage in the UCD method, namely specifying user and organizational requirements. The functional requirements for the SIPONGI application can be seen in Table 2. Table 2 describes the menu function consisting of five points. The points are the most important thing in the needs that must be met on the website so that the website's goals can be achieved.

Table 2. SIPONGI Application Functional Requirements

Function Name		Information
Menu	Submenu	
Home page	-	Displays the SIPONGI main page
	PKHL Directorate	Contains information about the Directorate of Forest and Land Fire Control
About	Manggala Agni	Contains information about Manggala Agni.
	Organizational structure	Displays the organizational structure of Directorate PKHL.
	Hot Spot Distribution	Displays information on the distribution of hotspots in tabular form.
Data & Graphics	Fire Area	Displays information on the recapitulation of the area of forest and land fires per province in Indonesia per year in tabular form.
	Weekly Hot Spots	Displays weekly hotspot information in 34 provinces in Indonesia in tabular form.
	Monthly Matrix Per Year	Displays hot spot matrix data in the form of a line graph.
	CO_2 emission	Displays information on CO2 emissions from forest and land fires per province in Indonesia in tabular form.
	Provincial Hotspots	Displays provincial hot spots in the form of map images for each province.
Map	Map Filters	Displays filter satellite source, province, city/district, date, day, confidence level, and region.
	Daily Report	Displays hot spot daily data information by date.
	News	Contains news related to forest and land fires.
	Gallery	Displays PKHL Directorate activities.
	Regulations	Contains laws related to forest and land fires.
Publication	Dalkalhutla Reporting	Displays login for reporting by entering username and password.
	Command Post Daily Report	Contains the post's daily reports.
	Other documents	Contains PKHL documents

3.3. Low-Fidelity Prototype

Low-fidelity prototypes are forms of software that have low interaction between the user and the prototype. This prototype makes the delivery of designed concepts and solutions to users fast by designers. In this case, the prototype was created using the Figma application. In addition, the design is also made by considering several things, which are the usability strengths and weaknesses of existing products analyzed previously.

3.4. Product Desain Solution

In the fourth process in the UCD method, a new design is designed, which is a solution to the needs and recommendations given.

1. Color and Typography

The following colors are used in the hotspot monitoring application solutions design, which can be seen in Figure 2. In Figure 2, it can be seen that there are four colors used in the solution design, namely main-orange, secound-orange, primary-black, and gray. The base color of the display is chosen as a color that is not too bright, and the researcher uses a secound-orange color as the base color of the display with Hex #FFE2C1. Then the identical color for the design solution used is the main-orange color with Hex #E83C22 as the button color and the Active color on the navigation menu. The primary-black color with Hex #2B2B2B is used for the color of the highlighted text title and description text, while the gray color with Hex #C4C4C4 is used for the less highlighted text description. The font used for the solution design is Roboto. The researcher uses the Roboto font because it has a simple and clear form, making it easy for users to read.

Figure 2. Color Design Solutions

2. Icon and Illustration Images

All icons and illustrative images that researchers use in the design of this hotspot monitoring application solution use icons and images from free image and icon provider websites, namely Freepik and Flaticon. All icons and illustrative images that researchers use in solution design can be seen in Figure 4. The prototype is a detailed wireframe version, as shown in Figure 3. The details added are in the form of icons, colors, and others.
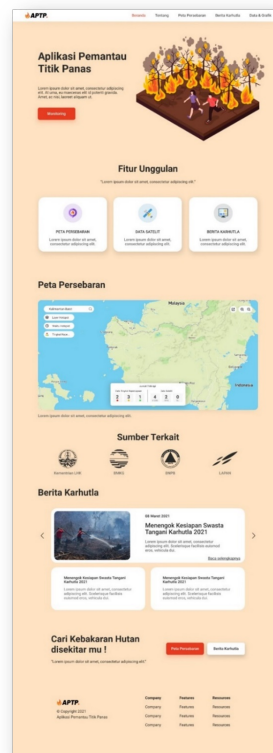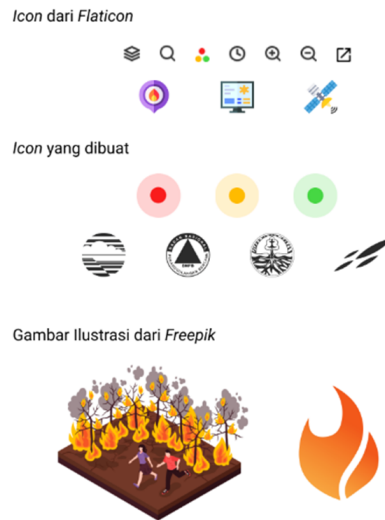

Figure 3. Solution Design Prototype

Figure 4. Icon and Illustration Image

3.5.　Comparison of Evaluation Results

The evaluation results of this study provide a detailed comparison between the benefit points obtained in the SIPONGI application and the Design Solutions derived from the questionnaire, as shown in Figures 5 and 6. These figures illustrate that the comparison of evaluation results on Solution Design has increased in most attributes compared to the results of the SIPONGI evaluation. Additionally, a comparison of values by category and attribute is also provided, allowing for a more detailed analysis of the results of each category and attribute. This level of detail was not found in previous research, highlighting the importance of this study's findings [20, 21]. Furthermore, it is essential to note that this study goes beyond simply presenting the results and discusses how the user's needs were translated and evaluated to achieve the expected implementation. This is demonstrated through graphical representations, providing a clear and comprehensive understanding of the research findings.
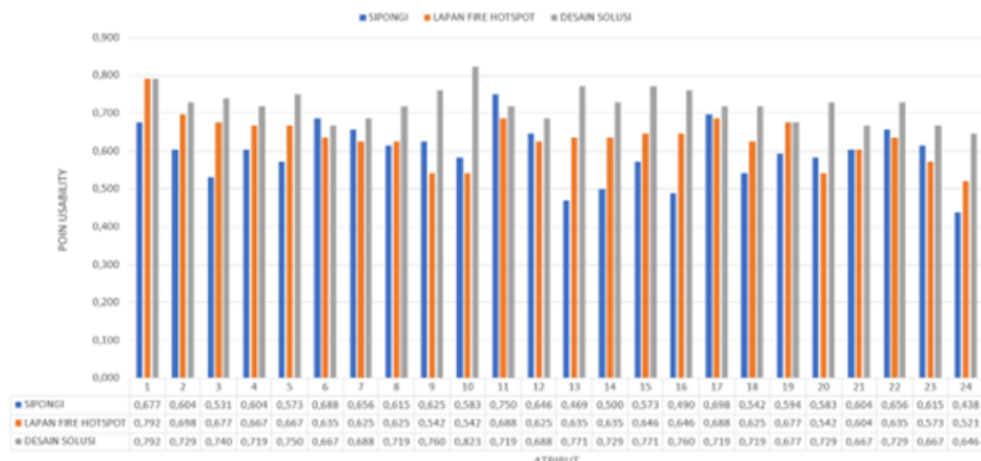

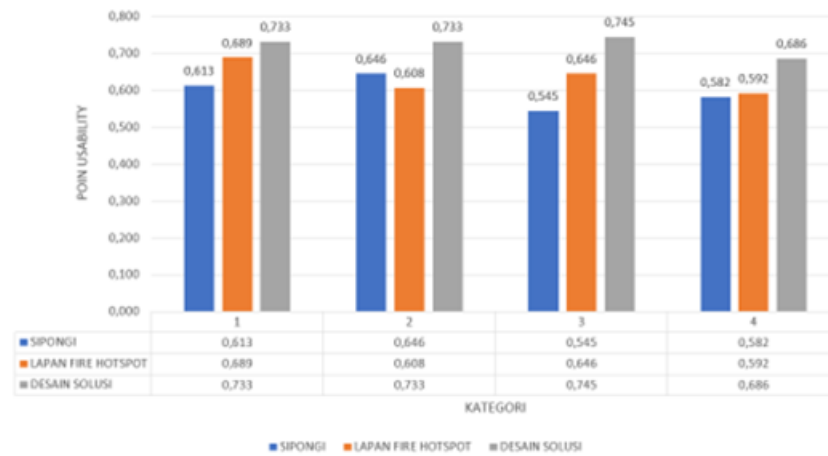Figure 5. Comparison of Usability Points Per Attribute

Figure 6. Comparison of Usability Points per Category

4. CONCLUSION

After designing UI/UX improvements using the User Centered Design method in prototype form, a higher score is obtained when viewed from usability points per attribute and usability points per category compared to other applications. Comparing 24 attributes, the highest solution design is at attribute ten, and the lowest is at attribute 24. However, this does not give a negative meaning because the solution design is still higher compared to the initial design. This also applies when compared with the results of evaluation points per category. The value of a solution design is always higher than that of a SIPONGI application design. This means the UCD method is suitable for developing designs focusing on user needs. In addition, UCD can quickly provide an overview in the form of a prototype so that users can judge directly from the design used. Using the WEBUSE method in previous research is also an important point that is very helpful in redesigning as needed. In conclusion, the use of the UCD method will be better if it is accompanied by the WEBUSE method in improving the design of an application.

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6. DECLARATIONS

AUTHOR CONTIBUTION
Helen Sastypratiwi: Main Author, determines the research topic, designs the research concept, and writes abstracts. Yulianti: Assisting the main author in backgrounds, research methods, and analysis of research results. Hafiz Muhardi: Assisting the main author in coding based on the result of recommendations and finalizing published scientific articles. Desepta Isna Ulumi: Assisting the main author in the literature study as well as finalizing published scientific articles.

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