

Research Article

User Satisfaction Analysis of QGIS and CarryMap Using End User Computing Satisfaction and User Centered Design Methods

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Abstract: Using End User Computing Satisfaction (EUCS) and User Centered Design (UCD) methods, this study investigated user satisfaction with QGIS and CarryMap. The research objective was to deploy elements such as content, accuracy, ease of use, and timeliness. A survey of students and teachers showed that users were more satisfied with the latest versions of both applications. The findings show that the user interface and functionality have evolved, which indicates the direction of future development of mapping applications.

Keywords: CarryMap, EUCS, QGIS, UCD, User satisfaction.

1. Introduction

Mapping applications are one of the many new fields generated by the rapid development of information technology.[1] As users' needs for efficient geospatial data processing increase, tools such as CarryMap and Quantum GIS (QGIS) are gaining popularity.[2] The level of user satisfaction, however, varies depending on each user's experience, as well as the advantages and disadvantages of each application. User satisfaction, defined as the emotional response derived from a comparison between the perceived performance of an application and the user's expectations, is an important factor in determining the desirability of using an application. The purpose of this study is to evaluate the level of user satisfaction with QGIS and CarryMap using the EUCS and UCD methods.

2. Preliminaries or Related Work or Literature Review

To measure the level of user satisfaction with QGIS and CarryMap applications, this research uses two main methods: End User Computing Satisfaction (EUCS) and User Centered Design (UCD).[3]

Research shows that user satisfaction in the use of software applications is very important. According to Hidayati (2020), user satisfaction can influence their choice to continue using a particular application.[4] Risdiyanto & Kurniyati (2021) emphasize that aspects such as ease of use and accuracy of information affect user satisfaction.[5]

QGIS is a popular software for geospatial data analysis that is open-source. QGIS has the ability to process vector and raster data and supports various data formats. A study conducted by Norsyaheera et al. (2016) showed that QGIS users highly value the application's ability to be customized and flexible.[6]

CarryMap is a mapping application for mobile phones that allows users to access maps and geospatial data offline. According to research conducted by Armand (2003), CarryMap's advantages include an easy-to-use interface and a high level of user satisfaction.[7]

EUCS measures user satisfaction by comparing the experience of using an application with their expectations. EUCS contains many variables, such as:[8]

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2.1. Content Variable: This variable determines how relevant and quality the information provided by the app is.[9] **Accuracy Variable:** Research results show that accurate and timely content increases user satisfaction. Information accuracy is an important factor in geospatial data-based decision making. According to Bator et al. (2011), accurate information makes users more confident in the application.[10]

2.2. User Convenience Variable (User Convenience)

The overall user experience is strongly influenced by ease of use. According to research conducted by Kotler and Lee (2009), an easy-to-use and user-friendly web interface can increase user satisfaction.

2.3. Timeliness variable

Timeliness in presenting information is critical to user satisfaction, especially in mapping applications where data often has to be updated in real-time.[11]

Some important components of User centered design (UCD) is a design approach that prioritizes the needs and preferences of users during the application development process. Some important aspects of UCD include:[12]

Efficiency, which relates to how quickly and easily users can accomplish tasks with the application. Reliability refers to how consistently the application works to deliver the expected results.[13]

The extent to which an application can meet the specific needs of users through its features is called functionality.[14] This section provides an in-depth overview of the theory and previous research on user satisfaction analysis on QGIS and CarryMap applications. It also describes the methods used to thoroughly assess user satisfaction.[15]

3. Proposed Method

End-user satisfaction and user-centered design methods were used in general in this study.[16] The aim was to determine the level of user satisfaction and examine the constraints or factors that may affect user satisfaction with the QGIS version 3.36.2 and Carry Map version 56 applications. Furthermore, the research procedure was quantitatively adjusted at the research stage, as shown in Figure 1 below.

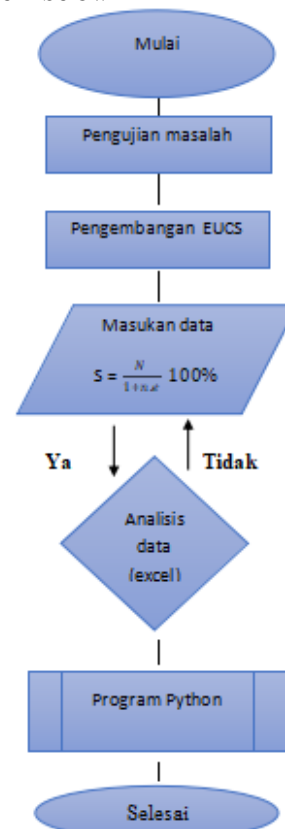


Figure 1: Research Stages Based on the Computer User Satisfaction Method

Several stages were taken in this research. The first stage is problem testing. This stage includes preliminary analysis of information and current system conditions. The researcher must understand the background of the problem, find a specific problem, formulate the problem clearly, and set limits so that the research does not expand too much. To provide a clear path for the entire research process, the research objectives must also be determined.

Describing the End-User Computer Satisfaction (EUCS) Research Model Currently, researchers are creating an EUCS model that will be used to measure end-user satisfaction with computer systems. The EUCS model includes various dimensions of user satisfaction, such as user interaction, system quality, and information quality. To provide a clear framework for data collection and analysis, the development of this model is essential.

Data Collection: Several methods, such as observation, interviews, literature review, and questionnaires, can be used to collect data. The methods used are tailored to the type of information to be obtained and the needs of the research. Effective data collection will provide relevant and in-depth information, which can be used for future research.

Creating and Checking the Research Questionnaire Using the developed EUCS model, questionnaires were designed to measure various aspects of user satisfaction. Before the questionnaire is used for data collection, it is important to conduct a pilot test first to ensure that the questions are clear and can be understood by the respondents.

Analyzing the Collected Data: The next step is to analyze the collected data. This can be done using qualitative or statistical techniques to find patterns and relationships in the data. The purpose of this analysis is to gain a better understanding of user satisfaction with the system under study.

Discussion and Interpretation of Results At this point, the researcher provides an explanation of the results of the data analysis and interpretation of the results. This discussion includes comparing the findings with theory or previous research as well as explaining the meaning of the findings. This discussion is important to understand the context and relevance of the findings in the field of study in question.

Using a Python program to input the collected and analyzed data into the program created to calculate the level of user satisfaction. Using this program, researchers can perform calculations automatically and produce accurate results. In addition, it makes visualizing the data in the form of graphs or reports easier.

Drawing Conclusions and Offering Suggestions from the Research In the final stage, the researchers summarize the main results and provide a clear conclusion on the problem formulation. They may also make suggestions for additional research or system improvements. To make a significant contribution to the researcher, these conclusions and recommendations are very important.[17]

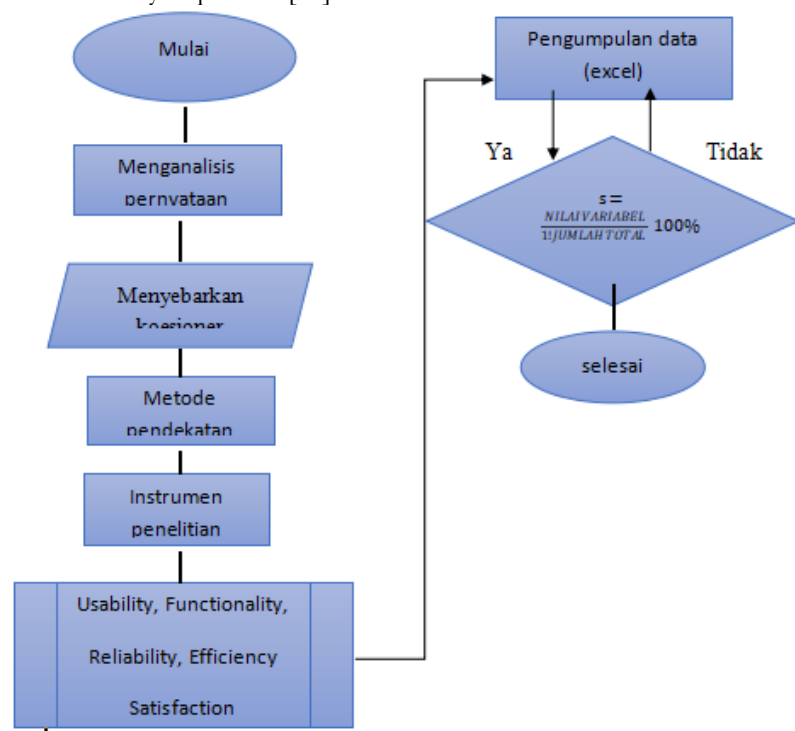


Figure 2. User-Centered Flowcart Design

The following is an explanation of the diagram according to the arrow:

- 1) **Process Begins:** The research begins here, marking an important first step. At this point, the researcher must establish the purpose of the study, the focus, and the procedures to be taken. This will serve as the basis for the entire subsequent stages of the research.
- 2) **Analyzing the Statements** At first, the researcher analyzes the statements pertaining to the research problem. The purpose of this analysis is to find important information that will be used to make inferences about the research problem. By understanding the current context and statements, researchers more easily set their research objectives.
- 3) **Distributing the Questionnaire:** At this stage, the prepared questionnaires were distributed to respondents to collect data. Distributing questionnaires is an effective way to get information from many people at the same time. The source of research data comes from respondents' answers.
- 4) **Approach Technique** Research objectives are achieved through the use of specific methods. Depending on the type of data required and the objectives of the research, the approach can be quantitative, qualitative, or mixed. The success of the research depends on choosing the right method.
- 5) **Research Instruments:** At this stage, the researcher determines the tools that will be used to collect data. These may include questionnaires, interviews, or relevant measuring tools. indicates that the use of valid and reliable tools is essential for obtaining accurate data.
- 6) **Data Collection (Excel)** Once the data is collected, it will be organized in Microsoft Excel format, which makes it easier for researchers to manage and analyze the data. By organizing the data systematically, researchers can perform statistical analysis or data visualization easily.
- 7) **Decision (i.e., yes or no)** At this point, the researcher must make a decision whether the data they have collected is sufficient to continue the research. If the answer is YES, the researcher can proceed to the next step, but if the answer is NO, the researcher must make changes or adjustments in data collection to ensure quality research results.
- 8) **Enter Values into Pyhton:** Once enough data has been collected, the values will be entered into the appropriate system or analysis. This process is important to start data analysis, as it allows you to get important information from the previous data collection results.
- 9) **Completed** Once all the steps have been performed, the research comes to an end. In the final stage, the researcher will compile a research report that includes findings, conclusions, and recommendations. The cover is important to provide a complete overview of the research process and results. The process of data collection, analysis, and decision-making are all parts of the research, which is depicted on this diagram. If one step does not meet the criteria, the researcher can go back to the previous step to improve it.

4. Results and Discussion

Data was collected at White Elephant University Takengon for two months. The analysis results show that user satisfaction with the assessed application features is positively correlated. Based on the variables studied, the frequency of user satisfaction is shown in the following table.

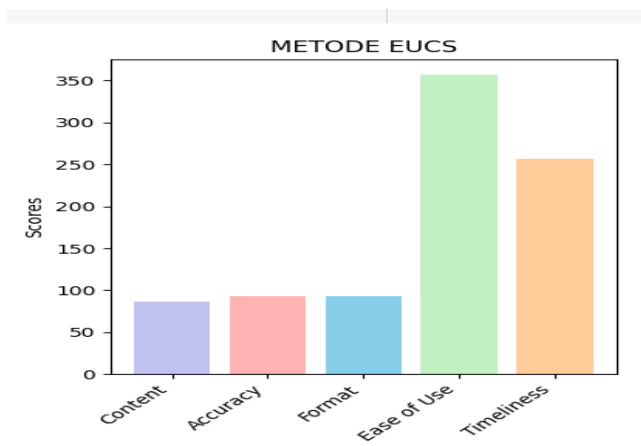
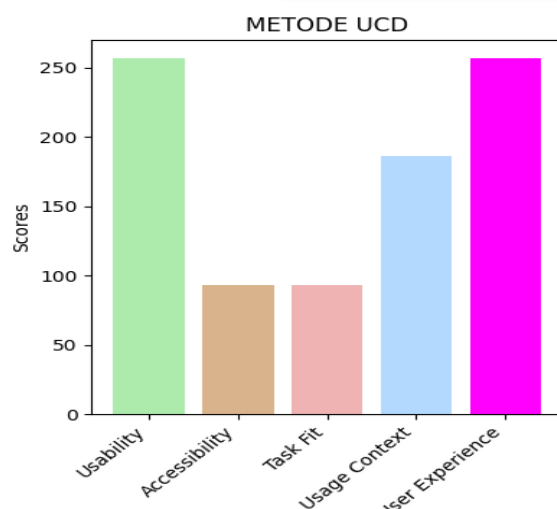


Figure 3. User satisfaction with QGIS application

Based on the EUCS Method: The results of the EUCS (End User Computing Satisfaction) method show that ease of use strongly influences user satisfaction, with the highest score of 350. This indicates that QGIS is easy to use. Accuracy and timing also affect satisfaction.

Content (100) indicates that the content of the QGIS application is sufficient, but may not meet all user needs. Precision (150) indicates that users feel QGIS data and information is reasonably accurate, although there is still room for improvement. Form (80) indicates that the format of QGIS data is less than satisfactory for users, perhaps difficult to understand or not in line with expectations. Ease of Use (350) The highest score indicates that users are very satisfied with the ease of using QGIS. This is the main factor contributing to general satisfaction. Timeliness (200) indicates that the application can send data and information quickly, but users may experience delays.

**Figure 4.** User Satisfaction with QGIS Application Based on UCD Method

As a result of the UCD Method, the user experience element is very important, with User Experience and Usability each receiving a high score (250). This indicates that QGIS has a good user experience and outstanding functionality. Usability (250) indicates that QGIS is very simple to use and teach. Usability is an important component that supports a positive user experience. Accessibility (100) indicates that although many users can use QGIS, there are some issues with feature accessibility. Task Appropriate (180) indicates that the QGIS application fulfills the user's task well, but there are some areas that may need improvement to support different types of tasks. QGIS Context of Use (100) indicates that the context is not always ideal. Users may feel that the application is not suitable for all situations or workplaces. Consumer Experience (250). This indicates that the overall user experience with QGIS is very good. This includes satisfaction with the interface, capabilities, and interaction with the application.

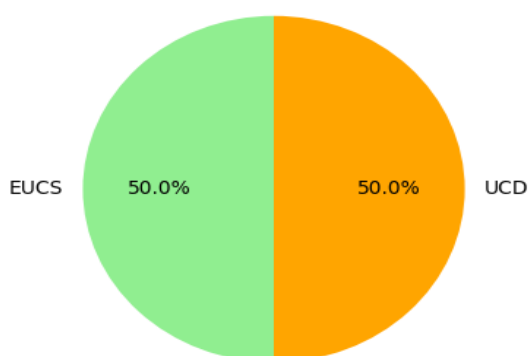
HASIL PERBANDINGAN APLIKASI QGIS

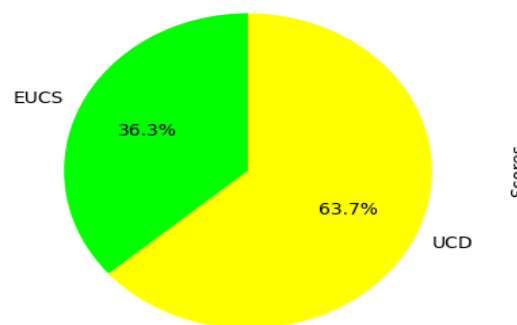
Figure 5. Comparison of EUCS and UCD Methods for Qgis Application

Explanation of the graph showing the comparison results of QGIS applications using the EUCS (end user computing satisfaction) and UCD (user-centered design) methods. A pie chart comparing the results of the two methods.

Table 1. comparison results between EUCD and UCD methods on QGIS application

Hasil	Nilai
EUCS	50,0%
UCD	50,0%

The graph shows that the results of both methods have the same value, 50% each. This indicates that QGIS is considered equal from both the user satisfaction (EUCS) and user-centered design (UCD) points of view. This balance indicates that the QGIS application successfully meets user expectations from both aspects of immediate satisfaction (EUCS) and user-centered design (UCD).

HASIL PERBANDINGAN APLIKASI CARRY MAP**Figure 6.** comparison of Carry Map application using EUCS and UCD methods

A pie chart comparing the results of two approaches:

Table 2. comparison results between EUCD and UCD methods on the Carry Map application

EUCS (End User Computing Satisfaction) and UCD (User-Centered Design).

Hasil	Nilai
EUCS	36,3%
UCD	63,7%

According to the chart caption, the UCD result (63.7%) is higher than EUCS (36.3%), indicating that users have a better experience with user-centered design than direct user satisfaction.

5. Comparison

A comparative analysis of user satisfaction between QGIS and CarryMap can be conducted by utilizing user satisfaction measurement methods based on the concept of user-centered computing and design. This research will explore aspects of functionality, ease of use, and satisfaction levels of users of both geographic information system applications.

- a. Functionality Aspects
 - QGIS: Known as free software that provides a wide range of features for spatial analysis and mapping. Customization through plugins allows users to design the tool according to their specific needs.
 - CarryMap: Oriented towards accessibility and use on mobile devices, with features designed to assist users while in the field.
- b. Ease of Use
 - QGIS: While it has a more challenging learning curve, many users appreciate the flexibility and ability to run complex analyses. Support from an active community is also very helpful for users who are just starting out.
 - CarryMap: Created for users who need a quick and effective solution, with an easy-to-understand interface. This makes it more accessible to those without a technical background.
- c. User Satisfaction Level
 - QGIS: Many users report high levels of satisfaction regarding the analysis and customization capabilities, although some struggle with the complexity at the start of use.
 - CarryMap: Users are generally satisfied with the ease of access and use, although they may feel there are limitations to the more in-depth analysis features.
- d. Research Methodology
 - User Computing Satisfaction: Conducted a survey to obtain information on user experience, including functionality, ease of use, and technical support.
 - User-Centered Design: Include users in the development and assessment process to ensure the application meets their needs and expectations.

6. Conclusions

According to the analysis conducted on QGIS and Carry Map applications using the EUCS (End User Computing Satisfaction) and UCD (User-Centered Design) methods, it can be concluded that: 1. This study shows that QGIS and Carry Map applications have different results in terms of user satisfaction. QGIS shows a good balance between the EUCS and UCD methods, with a score of 50%, indicating that it successfully meets user expectations.

Ease of use QGIS scored the highest in the EUCS method, indicating that ease of use is a major factor in user satisfaction. Although Carry Map has easy-to-use features and a good user experience, the lower scores for content and accuracy indicate that the presentation of information needs improvement.

Both apps can still be improved, especially in terms of content, accuracy, and ease of access to features. An increase in overall customer satisfaction will be achieved through improving these components.

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