Implementation of User Centered Design methodology for designing information systems introduction to culture based on mobile applications

Y S Dwanoko* and F F S Arin
Universitas Kanjuruhan Malang, Faculty of Science and Technology, Information System Study Program, Jl. S. Supriadi no 48, Malang 65148, Indonesia.

*yoyokseby@unikama.ac.id

Abstract. Design and build an information system really require a method that can produce a reliable information system, this is evident from the system design process that comes from the user's needs. The design of information systems that are not based on the needs of users directly involved will result in a software crisis. The purpose of this research is to implement an information system design method based on user needs that can produce a software requirements specification document (SRS). The research method used in making this information system design is User Centered Design (UCD) which consists of 5 stages, namely the human centered Process, Specify the content of use, specify the user and organization requirements, produce design solution, and evaluating the design. The results of this study are the SRS document information system introduction to culture based on mobile applications with the UCD method, it is hoped that this research can also be used as a reference for designing information systems.

1. Introduction
Building information systems in the current era requires the right strategy in preparing the system needs to be made. Often the design of information systems is not based on the needs of users in making them according to their needs, but only relies on information systems developers so that the design of information systems is not in accordance with the targets that result in a software crisis.

In this research, to make a software requirements specification document (SRS) a cultural introduction information system requires a method used to analyze its software requirements. Information systems whose analysts are based on user needs are very important to use a methodology for designing information systems namely the User Centered Design (UCD) method [1]. The UCD framework is widely used by researchers in designing information systems, this is made according to ISO 13407: 1999 concerning Human Centered Design for Interactive Systems [2,3].

Previous studies only focused on the design of information systems making based on user needs without following the steps that should be in accordance with the UCD method [4]. In this study, the process of making SRS follows the stages in accordance with the UCD method. The purpose of this study is to implement the stages of the UCD method in designing information systems about the introduction of mobile-based Sumba culture that can be used as knowledge for the people of Sumba in the province of East Nusa Tenggara, the Republic of Indonesia.
The User Centered Design (UCD) method consists of 5 stages, namely the plan the human centered process, specify the content of use, specify the user and organization requirements, produce design solutions, and evaluate the design [5]. The results of this study are the creation of SRS documents using the UML approach to the introduction of Sumba culture information systems based on the UCD method.

2. Methods

The method used in this study is UCD which has 5 stages, for details of the stages can be seen in Figure 1 below. The design at each stage uses the Unified Modeling Language (UML) approach to create SRS Documents, the subjects used are interview and observation techniques, use case diagrams, activity diagrams, sequence diagrams and class diagrams to make the design of the database. While for the graphical user interface using the application GUI designer. The following is the UCD method used:

![Figure 1. User Centered Design (UCD) method.](image)

The steps in Figure 1 above can be described as follows:

- Plan The Human Centered Process, at this stage the researcher prepares a document to conduct interviews and observations as well as prepare a schedule of meetings and discussions with student organizations from Sumba NTT.
- Specify The Content Of Use, this stage makes the analyst needs of the system requirements, analysis of functional and non-functional requirements of the system and make the hardware and software needs to be used.
- Specify the User and Organization Requirements. This stage determines the user / actor with access rights who will use the software.
- Producing Design Solutions, this stage researchers who do system design with UML such as Use case Diagrams, activity diagrams, sequence diagrams, class diagrams and Graphical user interfaces [6,7].
- Evaluate Designs again users Requirements, this stage the researcher and user conduct an evaluation of the SRS document until it is declared complete and fixed, if complete the application will be made, if not it will be revised and make a new SRS document evaluated.

3. Results and discussion

3.1. Plan the human centered process

There are several steps to identify problems with Sumba students of Malang who are under the IKAWASBA organization. The first step is the study of literature by collecting data or information related to research. Then the next step is conducting a field study by interviewing and observing through the distribution of questionnaires to find out the system that is suitable for identifying problems.
3.2. Specify the context of use
At this stage it is a stage to describe user needs based on system description and system requirements analysis.

3.2.1. System description. Where the design of this application contains various Sumba cultural content such as customs, traditional houses, traditional clothing, musical instruments and traditional weapons and is equipped with a quiz that contains questions about Sumba culture.

3.2.2. Requirements analysis. The needs analysis phase is carried out to determine the system requirements that are in accordance with the needs of the system user, which includes user access rights (actors), namely analysis of functional requirements and non-functional requirements. The results of the needs analysis are identified into each of the pieces which can be seen below.

| No | Function                          | Information                                                                 |
|----|-----------------------------------|-----------------------------------------------------------------------------|
| 1  | Login                             | Displays the login page for admin and user in the form of a username and password. |
| 2  | Main Menu                         | Display the main page of the Sumba culture introduction application.          |
| 3  | Category culture Menu             | Displays the culture category page.                                          |
| 4  | Cultural Introduction Menu        | Displays an introduction page for Sumba culture.                            |
| 5  | Cultural introduction data menu   | Displays data page introduction to Sumba culture.                            |
| 6  | Quiz Menu                         | Display the Quiz page about an introduction to Sumba culture.                |
| 7  | Logout                            | Shows the logout page after the administrator and user make a access system. |

3.3. Specify user and organizational requirements
This stage identifies the system itself which is related to supporting devices that are used as a medium in designing Android-based Sumba culture recognition applications, both software and hardware. While the user identification of the system includes the user and stakeholders, the user's goals and tasks, and the user's environment. at this stage it is done by describing the results of several stages of Specify the Context of Use, namely: (1) users and stakeholders; (2) user objectives and tasks; (3) user environment.

| No  | Actor                                      | Description                                                                 |
|-----|--------------------------------------------|-----------------------------------------------------------------------------|
| 1   | Admin (Art and culture division)           | The access rights that can be operated by the actor (Admin) are login, input, update, and delete Sumba culture category data, input, update and delete Sumba culture introduction data, and input, update, and delete Sumba culture introduction data quiz, and logout. |
| 2   | User (IKAWASBA Member)                     | The access rights that can be operated by the User actor are login, viewing data on Sumba culture categories, introducing culture and answering quiz questions about Sumba culture of introduction, and logging out. |

3.4. Produce design solution
This stage is used in System Design, namely (Unified Modelling Language) UML to make it easier to design every system process that is created, starting with the manufacture of the main use case diagram, sub-use case, sub-use case description, activity diagram, sequence diagram and class diagram. Use Case
Main Diagram presents all the functional requirements arranged according to functional requirements as follows.

3.4.1. **Main use case diagram system**

![Main use case diagram system](image1)

**Figure 2.** Main use case diagram system.

3.4.2. **Sub use case quiz and result menu.** Examples of sub-use case menu quiz diagrams that have been inputted by the admin that will be viewed by the user and can do the process of answering questions that have been provided based on their level.

![Sub use case quiz and result menu](image2)

**Figure 3.** Sub use case quiz and result menu.
3.4.3. Class diagram. The following class diagram design consists of 5 classes that display names, attributes, operations (for database tables) that will be used in related systems, including: (1) class categories to store data on cultural categories; (2) introduction class to store introduction data by category; (3) class quiz to store data quiz based on its level; (4) class level for storing quiz level data (5) class score for storing quiz scores, which are described in the figure below.

![Class Diagram](image)

**Figure 4.** Class diagram system.

3.5. Evaluate design against user requirement

The Evaluate Design Against User Requirement stage is the final stage in the design of an Android-based Sumba culture introduction application. At this stage an assessment and improvement of the design of the display system is carried out through the stages of implementation (programming) and system testing conducted according to the design requirements of the user.

3.5.1. Implementation (programming). At the programming stage the program code is generated according to the results of the product design stages. Stages of programming implement the design results into an Android-based Java programming language. To make the Sumba culture introduction application used firebase and SQLite database to store data. Then do database implementation, class implementation, program code implementation.

3.5.2. System testing. System testing in this study is divided into two tests, namely functional testing and non-functional testing.
Table 3. Black box testing function user.

| Function | User   | Testing Scenarios | Expected Results                                      | Test Results | Information |
|----------|--------|-------------------|-------------------------------------------------------|--------------|-------------|
| F1       | Login  | Enter your username and password | The system successfully validated the correct / wrong login input. If true, go directly to the main page of culture introduction | The system successfully validated the correct / wrong login input. | Corresponding |
| F2       | See cultural introduction data | Select the culture introduction data menu to select a category | The system successfully validates the menu command | The system successfully validates the menu command and displays a culture introduction data menu to select the selected category | Corresponding |
| F3       | Quiz Process | Select the quiz process menu to fill out quiz questions on the system | The system successfully validates the menu command | The system successfully validates the menu command and displays the quiz process menu to fill quiz questions on the system | Corresponding |
| F4       | Logout | Click the logout menu | The system successfully validates the menu command | The system successfully validates the menu command and displays the logout menu | Corresponding |

4. Discussion
UCD method is very good to be used to design an information system, this is evidenced by the results of this study to get an SRS document that suits the needs of users. This method is also very fast in helping to complete the design phase because only 2 users are involved, but if there are many users, it will take longer to complete the design phase, this is the weakness of this method.

5. Conclusion
Based on the design results of the application, it can be concluded that the Design of Introduction to Sumba Culture Based on Android mobile applications Using the User Centered Design (UCD) Method can produce a good Software Requirement specification (SRS) according to user needs, in addition it can produce a software that presents information about the complete introduction of Sumba culture to Android users, especially Sumba students, which contains content about Sumba culture, which includes customs, traditional houses, traditional dances, traditional clothing, traditional weapons and traditional musical instruments as a cultural unit on Sumba Island. In addition, this design becomes a vehicle for knowledge that can be passed on to the next generation, so that knowledge about culture can be embedded early on.

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