Analysis and Design of Internal Information Systems of the APU-PPT Education and Training Center Using the User-Centered Design Method

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Abstract— PPATK established the APUPPT Training Center to increase the knowledge and competence of PPATK stakeholders and human resources through education and training in Anti Money Laundering (AML) and the Prevention of Terrorism Funding. It is able to develop and improve service quality, manage education and training through standardization of competent institutions and conduct training on certification of expertise and competence in AML and Terrorism Financing Prevention. In order to fulfill the needs of the Education and Training Center, this study design information system using the user-centered design (UCD) method that will be used internally by Education and Training Center employees called the Internal Information System of the Education and Training Center APUPPT (SINPU-PPT). SINPUT-PPT has the main goal of automating business processes and reducing the use of office stationery. The design identifies system requirements using the Unified Modeling Language (UML), designs the user interface using a Graphical User Interface (GUI) and designs the database. The results of this research is an information system design. The information system have 9 main menu tabs Home, Room Scheduling, Class Settings, Access Rights and Users, Master Data, Catering Arrangements, Training Program, Adding Letters and Receiving Letters. The results of this design can be used as a structured reference for coding programming and testing the development of the SINPU-PPT information system.

Keywords—information system, unified modeling language (UML), graphical user interface (GUI), user-centered design

I. INTRODUCTION

Efforts to improve work performance by increasing employee performance are carried out by organizations because they are related to the sustainability of the company [1,2,3]. In order to produce competent human resources in Anti Money Laundering and Terrorism Funding (AML-CFT), PPATK builds the APU PPT Training Center to conduct education and training in the AML-CFT field, and become coaches for certification of expertise and competence in AML-CFT [4]. Technological developments are needed to solve problems in the Education and Training Center environment. Researchers are interested in making changes to systems that have not been computerized. The new information system is expected to maintain consistency and quality of data because the workflow of the training is carried out by the system, so that data can be used quickly in the form of reports and to assist in the management of training facilities and infrastructure. Analysis of information system design has been carried out in several different studies [5,6]. Both studies carried out the design stages according to SDLC, requirements analysis, model design, software requirements analysis and design without using the user-centered design method.

In previous research [7,8,9] using the user-centered design (UCD) method was able to handle the problem of user difficulties in reading and translating documents in any information system development process. [10] research on the application of an Android-based e-learning application using a UCD, this method refers to the user experience so that it can make this e-learning application have a good usability value for both student and teacher users. In research [11], the google design sprint method as a UCD approach was used from analysis to test, to assist in overcoming user-related problems and improving user experience. Another study was conducted by [12] from the University of Hong Kong. This study did not produce an application, but a website design recommendation for the Nine-Year Integrated Curriculum in Taiwan. This research was conducted because the previous system was not used properly because it was not complete and the users did not understand the "professional" language of the system. The users of this system are teachers and students at the primary and secondary school levels.

By applying the UCD approach to information systems, it makes it more user-friendly and has a high level of usability. UCD is an approach method with a user concept that is optimized for end-users and emphasizes the needs or desires of each end-user, and is designed according to end-user behavior so that users do not force them to change their behavior when using the product to be built.

Based on observations and interviews that researchers conducted in the field, researchers had the opportunity to design SINPU-PPT for three work units. The users will be the employees from these three work units. This system is designed to simplify the notification of education and training programs to be held by the Education and Training Center, simplify the registration of training participants, run the workflow of the selection of training participants,

automate the workflow for the implementation of education and training, manage pre-test and post-test questions and their results, evaluate training, user management and master data and automation of Education and Training internal business processes electronically, so that paperless and data are integrated, and reporting becomes faster and more valid. Previous research, many researchers have not made a comprehensive Unified Modeling Language diagram in the stages of making information systems, so this study will discuss the shortcomings of previous research by answering 2 questions: Making analysis and design of the Internal Information System of the APU PPT Education and Training Center and how to apply UCD in making the system information.

II. STUDY OF LITERATURE

A. User-Centered Design

According to [13,43], user centered design is an interface design process that focuses on usability objectives, user characteristics, environment, tasks, and workflow in its design. UCD is an iterative process (iterative), design and evaluation is built from initial steps to continuous testing. In research [9,40] using UCD, there are principles that must be considered in UCD, focus on users, integrated design, user testing, and interactive design. According to [15, 42] there are several benefits of using UCD, saving time, reducing costs, increasing sales and revenue, reducing training costs and support costs, increasing user satisfaction and providing added value to a product.

B. Black Box Testing

According to [14] Black Box Testing is a testing method that focuses on the functional requirements of software. The test will attempt to find errors in improper or missing functions, interface error, or performance error.

C. UML (Unified Modeling Language)

In research [16,17,18] it is stated that UML is a set of diagrams to design or model how the system works, how users can interact with the system, how the system works, and the features contained in a system that will be implemented. . [16] In UML consists of many diagrams but there are 2 (two) fundamental diagrams, use case diagrams and class diagrams. Research [17] added an explanation of commercial and open source tools that can be used to make diagrams easier.

D. Usability Testing

Usability refers to how users can learn about and use a product to achieve its goals and how satisfied they are with its use [19]. The study of usability is part of the multi-disciplinary science of Human Computer Interaction (HCI). According to Nugroho (2009: 2) Human Computer Interaction is a science that has developed since 1970 which studies how to design a computer screen display in an information system application so that it is convenient for users to use [20]. In the study [21] used 4 factors from USE questionnaire and consisted of 16 statements. Research [22] mentions the criteria in web usability.

III. RESEARCH METHODOLOGY

This section describes systematic steps in the process of developing the SINPU-PPT system. This is the figure of research methodology using the UCD method.
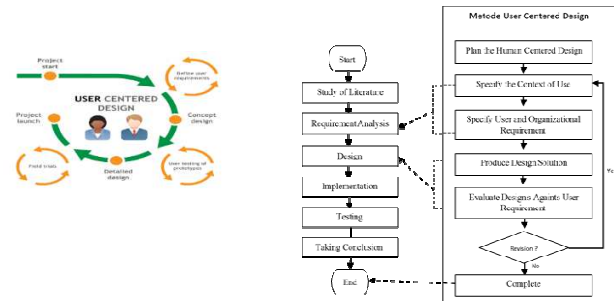

Fig. 1. Methodology Research

A. Study of Literature

Studying the theoretical basis as a reference in the development of information systems and documentation of its development. The theoretical basis used is related to the information system that will be developed, including User-Centered Design, UML (Unified Modeling Language), and Black Box Testing.

B. Requirement Analysis

Conducted by interviewing 2 users from each field at the Education and Training Center, the following stages:

- Specify the context of use, to identify and determine potential users of this application.
- Specify user and organizational requirements to identify the needs of potential application users.

C. Design

Using the UCD method, by producing a design solution and evaluating design against user requirements. In the design solution, the researcher made an interface design based on the results of the requirement analysis that can describe in figure 2:
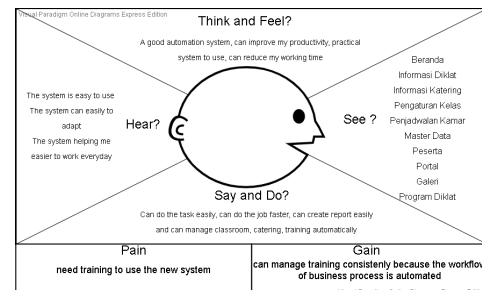

Fig. 2. Empathy Map

The goal of using UCD Method is to make it easy for users to better understand how the product will be in the form of a wireframe, which describes in general the description and work of the system to be created. After the design solution is complete, the results of the design are given to prospective users to evaluate their suitability. If it is not suitable, the researcher must fix the system based on the

evaluation results provided by the prospective user. The design consists of:

- Designing system architecture
  The diagrams are based on object-oriented programming using UML (Unified Modeling Language) modeling. UML Diagram will be created using Visual Paradigm For UML. The design includes functional, structural, and behavioral modeling diagram.
- Designing database.
- Designing the system interface using a wireframe.

D. Implementation

Researchers use XAMPP and Mysql software for data storage. Researchers built a system consisting of software specifications and hardware specifications

E. Testing

To ensure that the information system built is running as desired. Tests carried out in this study are:

- Black box testing, to test the suitability of all functional requirements on the system.
- Usability testing, to learn how to design a computer screen display in an information system application so that it is convenient for use by the user, which will be calculated using the SUS scale. The test is by providing a number of tasks (tasks) that have been prepared for the user to interact with the system. This assignment will be assigned to respondents from fields involved in the use of the SINPU-PPT information system.

F. Taking Conclusion

IV. ANALYSIS AND DISCUSSION

The researcher will analyze and discuss in more detail the steps in the research methodology.

A. Requirement Analysis

At this stage, specify the context of use, to specify potential application users. Specify user and organizational requirements to determine needs by conducting interviews with prospective users. The actors and descriptions of the system user actors are as follows:

- Training Organizers: This actor is a user who can use all the functions provided by the system, including managing portals, changing room scheduling, changing class settings, managing access rights and users, managing master data, changing catering settings, managing training programs, add and receive mail.
- General Operators: This actor is a user who can use the functions for the General Section is to change catering settings and add letters.
- Leadership: This actor is a user who can use the function for the leader is to receive letters.

After identifying actors, the next step is to specification functional and non-functional requirements, the results obtained are 35 functional requirements including 32 functional requirements for training providers, 2 functional needs for general operators and 1 functional needs for leaders. The specifications for non-functional requirements are as follows:

- Operational requirements are systems that can be accessed by several browsers such as IE, Mozilla and Chrome.
- Performance requirements are the login process can be done within 1 second and the process of storing, changing and adding data can be done within 5 seconds.
- Security requirements are user role settings, it is impossible for users who do not have roles in accordance with the provisions to be able to delete, edit or add data.
- The cultural and political requirement is that the system uses Indonesian and the currency used is Rupiah.

B. Design

1). System Architecture

Fig. 3. Information Systems Architecture

System architecture is a structured mapping or planning of more specific system requirements. In Figure 3, there are users who access the server via a web browser. The user will fill in the data in the web browser then send it to the server. On the server, the data will be stored in the database (MySQL). On the server there is a web server that contains PHP. PHP is used as a programming language.

2). Use Case Diagram

Based on [23,24,25] use case diagrams are used to help users understand the system design visually. The use cases in this study are:
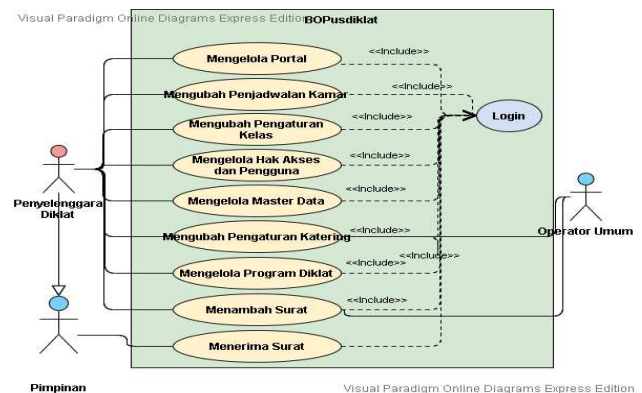

Fig. 4. Use Case Diagram System

3). Activity Diagram

Activity Diagrams [26,27] are used to describe different dynamic aspects of the system. Activity Diagrams not only present sequential or concurrent activities, but also present conditional and parallel activities. Figure 5 shows an example of an activity diagram regarding the activity of changing the gallery in the information system.

Fig. 5. Activity Diagram Changing the Gallery

4). CRC Cards

Class Responsibility Collaboration (CRC) Card is a tool to define the behavior and responsibility of each class and the collaboration relationship between these classes [28]. The example of CRC Cards from this research is about Gallery class:

Fig. 6. CRC Cards Gallery

5). Class Diagram

Class diagram is a static class and is used to model the static appearance of a system [29]. Research [30] using class diagrams in designing information systems. Figure 7 on the above shows a class diagram of this information systems research

Fig. 7. Class Diagram

6). Object Diagram

Object diagram is a diagram that produces a model structure description of a system within a certain period of time, used to describe how the system will look like at a certain time. The object diagram in this study is shown in Figure 8 on the below picture.

Fig. 8. Object Diagram

7). Sequence Diagram

Sequence diagrams used in [31, 32] are one of the diagrams in UML, this sequence diagram is a diagram that describes the dynamic collaboration of number of objects. Its purpose is to show a series of messages sent by objects and object interactions. The figure below is a sequence diagram for changing the gallery:

Fig. 9. Sequence Diagram Changing the Gallery

8). Communication Diagram
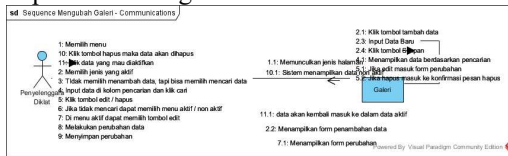Use this diagram to model dynamic behavior in use cases [33]. Example of this diagram is shown:

Fig. 10. Communication Diagram Changing the Gallery

9). Behavioral State Machine
State machine diagrams are techniques commonly used to model the behavior/method (life cycle) of a class or object and show the sequence of instantaneous events (state) that an object passes through, the transition from one state to another. It is used to help analysts, designers, and developers understand the behavior of objects on the system. Research [30] described the status of the system over time. As for this research, one of the state machineries is as follows:
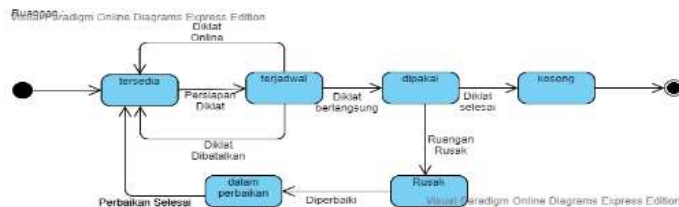
Fig. 11. Behavior State Machine Room Diagram

10). Design Database
Entity Relationship Diagram (ERD) is used in this study to show the relationship between entities or objects seen with their attributes that shows in Figure 12.

11). Interface Design
At this stage, the solution is made by making a more concrete design by using a wireframe. Users will see and observe when information systems are used to perform certain functions and use feedback to improve designs. The following are the main menus in the system, including the Home Menu, Room Scheduling Menu, Class Settings Menu,

User and Access Rights Menu, Master Data Menu, Catering Settings Menu, Training Program Management Menu, Adding Mail Menu and Receiving Mail Menu. The design is carried out in two iterations of the system interface development until a design solution is obtained that is really in accordance with user needs. Here is a two-time development iteration.
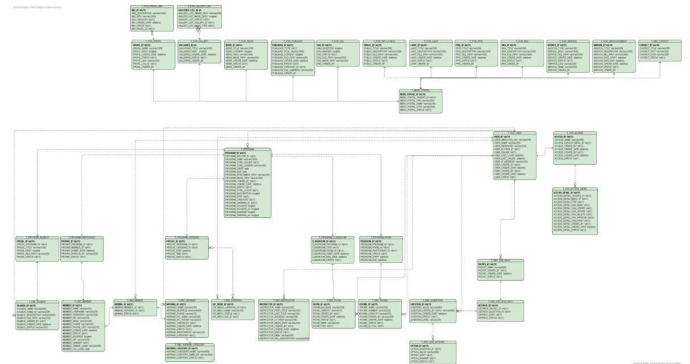

Fig. 12. ER Diagram of the System

- Development of Stage 1 System Interface
Based on the questionnaire distributed to respondents, the results of the system interface development stage were obtained. This first iteration has been carried out by usability testing, the results based on the Likert scale calculation are 75.6% indicating the system is useful (usefulness), 75.2% of the system is easy to use, 67.8% of the system is easy to learn and 75.2% of the system can satisfy users. In Figure 13, you can see the initial menu when the user successfully logs into the information system.

Fig. 13. Home

The test results are add the Education and Training Center bar in each system interface page, gives a more attractive color but does not cause eye fatigue, create vertical tabs for menus under the main menu, give an icon that matches the menu on each system interface, add notes on the homepage to find out about existing activities.
- Development of Stage 2 System Interface.

The following is a display of the system interface after correcting the results of the first iteration test.
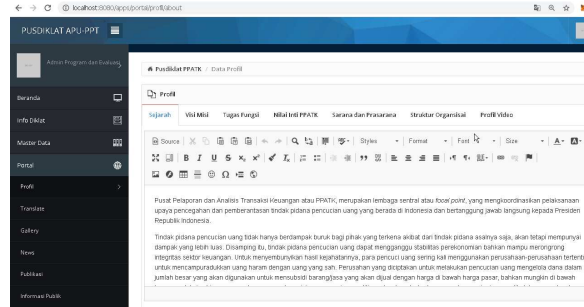

Fig. 14. Portal Interface

Figures 14 display has been made more attractive by creates a vertical bar for each menu item and give an icon that matches the menu on each system interface. According to[38] blue is a calming color and [39] people with normal vision tends to be better with light mode so that don't cause eye fatigue. After the improvement, the stage 2 usability testing was carried out with an average value of 85.9%.

C.   Implementation

Hardware and Software Specifications is an operating system using Windows Server 2008 R2, XAMPP and Adobe Reader. Hardware required is Core 4, Memory 8 GB, Storage 60 GB.

D.   Testing

   1). Black Box Testing

The test focuses on the functional requirements of the system based on the functions and menus available. There are 35 scenarios tested. Based on the results of black box testing that has been carried out, it is found that all functional requirements of the system being built have been met and are running well.

   2). Usability Testing

The test is by giving a number of tasks that have been prepared for the user to interact with the system. This task will be given to all employees from three work units. The 38 respondent consists of 15 man employees and 23 women employees. These questions refer to USE Questionnaire. The questions are divided into 4 factors according to the factors on the USE questionnaire namely usefulness, satisfaction, ease of use, and ease of learning. The questionnaire contains 30 questions.

For the purposes of quantitative analysis of the research, the respondents will be given five alternative answers using a Likert scale on a scale of 1 to 5. The data obtained is then converted based on the eligibility category. The range is, <21% is very inappropriate, 21-40% is so not feasible, 41-60% is neutral/undecided, 61-80% is so eligible, and 81-100% is very eligible.

Usability measurement is done by calculating the percentage of answers from respondents using the formula eligibility percentation stated in [35]. The data obtained were converted using the feasibility category table [36]. Usability measurement was done by calculating the percentage of answers from all respondents. Usability measurement consists of 4 aspects according to the results of data tracing using a questionnaire, namely Usefulness, Ease of Use, Ease of Learning and Satisfaction. Based on the results of descriptive data analysis, the calculation results obtained by combining the percentage eligibility formula with the eligibility category for each iteration. In first iteration, usefullness has 75.6, ease of use has 75.2, ease of learning has 67.8, and satisfaction has 75.2. In second iteration, usefullness has 87.5, ease of use has 85.4, ease of learning has 85.7, and satisfaction has 84.8

It shows that iteration 2 has the increase in usability results after iteration 1. The average value in second iteration is 85.9. Based on the System Usability Scale (SUS) [37], the range of usability values in an excellent range so that it can be said that the system is an user friendly system with a high level of usability.

V. CONCLUSION

The Internal Information System of the APU-PPT Education and Training Center is designed to maintain data consistency and quality because the workflow of the training is carried out by the system so that data can be used quickly in the form of reports and to assist in the management of training facilities and infrastructure. Same with [41] In its design, it uses the user centered design method which refers to the user experience, so that this information system has a usability value that is good enough for its users to use. The design process uses the Unified Modeling Language (UML) in making the required diagrams, designing the user interface using the Graphical User Interface (GUI) and designing the database. The results of this Information System design have 9 main menu tabs.
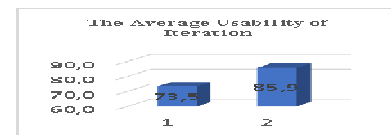

Fig. 15. The Average Usability of Iteration

The test was conducted using the USE Questionnaire. From figure 15, can be seen the comparison of the average value between the iteration, the result is 85.9% as an excellent range. These results indicate that this information system is very useful, very easy to use, very easy to learn and very satisfying.

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