Usability Evaluation and Recommendation For It Change Web Application By Using User Centered Design Method

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Abstract— **User interface is an important component of software because it acts as an intermediary between machines and humans. The user interface is a means of communication between the user and the program. In this case a dialogue is created between the program and the user so that the expert system can receive instructions and information (input) from the user. The program provides information (output) to the user. In Telkom Indonesia IT change is a Web Application that is used to initiate, compile, and submit as a basis for a change request which includes the addition, replacement, or deletion of objects in the production environment. IT Change Web Application in ITGC Compliance Division at Telkom Indonesia Bandung has constraints on UI / UX. In IT Change still does not have applied the concept of modern UI / UX based on user centered design and its only have a deployment and process flow. To solve problems from the Web Application IT Change will use the UCD (user centered design) method and for the pre-survey will use questionnaires and interviews, the results of the questionnaire are based on usibility testing using the system usability scale (sus).**

Key Word— **User-centered Design, User Interface, Usability testing, System Usability Scale**

I. INTRODUCTION

A. Background

The IT Change web application is an website which is planned by the ITGC Compliance Division at Telkom Indonesia Bandung company with the aim of initiating, compiling, and submitting reports as the basis for requests for changes which include additions, replacements, or deletions of objects in the internally and externally. To validate the User interface design problem, a user interview is conducted to find out the user needs for building the IT Change web application. Interviews were conducted with 2 managers from the ITGC division as participants, and the results stated that they were require a design for this website according to the business process and previous design that only has a prototype for the homepage.

To be able to solve problems, the UCD (User Centered Design) method is used to find the user needs [1]. User Centered Design is a method that can be used for developing this website so it can help the user for deploying a document report. The methodology's goal is to gather and address information about the overall user experience, aimed to give the greatest possible user experience, increase the acceptance and effectiveness of interactive systems, reduce errors, support, and training requirements, and deliver the best possible of user experience.

After producing the User interface design, the author will conduct the Usability Evaluation. Usability Evaluation will be using questionnaires and interviews, the Usability Evaluation will be carried out using the System Usability Scale (SUS) [2]. This design method will be prioritizing the user in the Web Application IT Change when developing the user interface.

B. Topic and Scope

Based on the background that has been created, the following is defined by several problem formulation:

1. How to produce the user interface design for IT Change Web Application using the User Centered Design method?
2. What is the result of the implementation of the SUS method in evaluating the IT Change website?
3. How to improve the usability of IT Change Web Application through the use of User Centered Design?

C. Research Purpose

Based on the formulation of the problem that has been described, this study aims to:

1. To create a web whose user interface is in accordance with the flow of business processes and previous design.
2. To find out the result of implementation of the SUS method in evaluating the IT Change website.
3. To Implement UI/UX from website change that meets usability elements.

II. THEORITICAL REVIEW

A. Basic Theory

1. IT Change Web Application

IT Change is a Web Application that is used to initiate, compile, and submit as a basis for a change request which includes the addition, replacement, or deletion of objects in the production environment. In IT Change still does not have applied the concept of modern UI / UX based on user centered design and its only have a deployment and process flow.

2. User Interface

User interface is an important component of software because it acts as an intermediary between machines and humans. Three elements are required for a user interface in designing user friendliness, control, and interface consistency. These three elements can be used for application and program development [3].

3. Usability Testing

Usability Testing is a process learning for users to interact with prototype before the application was made. usability is a part of user experience and is in second place after the utility. Usability has three attributes: efficiency, effectiveness, and satisfaction. Efficiency refers to the user's accuracy and completeness to achieve a specific goal. Efficiency is based on the resources users use to achieve their goals, while satisfaction is usability and acceptability according to the ISO 9241-11. According to Nielsel, there are 5 quality attributes in usability testing from each attribute is defined as [4]:

a. Learnability

Learnability explains how simple it is for users of a website to navigate and carry out simple actions while using an application for the first time.

b. Efficiency

Efficiency refers to the resource's users use to achieve their goals. Efficiency can be measured using performance metrics over time, overall relative effectiveness, and professional relative effectiveness.

c. Memorability

Memorability explains the level of user comprehension of the website when the user has not used the app for a long time.

d. Errors

Errors shows how many errors were produced by application users, how serious the faults are, and how easily application users can fix errors that occur when using the application.

e. Satisfaction

Satisfaction explains the level of user satisfaction in using the application.

4. User Centered Design

User-centered design is the process of developing interfaces in development that focus on usability goals, user characteristics, environments, tasks, and workflows. UCD is an iterative process in which the design and evaluation of is built from the initial stages to the current implementation [5]. Principles to be notes in UCD are:

a. Focus on user's goals
b. Integrated design
c. From the beginning continues user testing
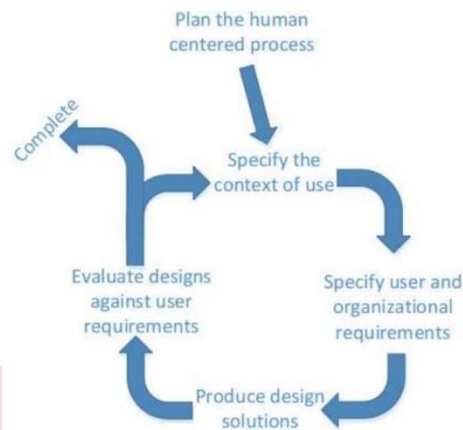d. Interactive design

FIGURE I.
User Centered Design Stages

The following is an explanation of the stages of user centered design:

e. Specify the context of use

Identify the person who will be using the system. This will explain what and under what conditions, they will use the system.

f. Specify User and Organizational Requirements

Identify user needs and organizational needs.

g. Produce Design Solutions

Build a design as a solution of the system being analyzed.

h. Evaluate Design

Defining specifically the methods, processes, timing, and responsibilities for completing an assessment is based on the assessment context.

5. System Usability Scale

System Usability Scale is a quality level of the system that is easy to learn and use and encourages users to use the system as a proactive tool to complete their tasks. Usability in this context can be understood as a way for users to effectively, efficiently, and satisfactorily access the functionality of the system to achieve a particular goal [6]. To measure usability depends on the ability to use complete a series of tests, there are 10 questions parameters to measure usability include[7]:

a. I think I will use this system again.
b. I find this system complicated to use.
c. I find this system easy to use.
d. I need help from other people or technicians in using this system.
e. I feel the features of this system are working properly.
f. I feel there are many things that are inconsistent.
g. I feel other people will understand how to use this system quickly.
h. I find this system confusing.
i. I feel there are no obstacles in using this system.
j. I need to get used to it before using this system.

6. Prototyping

Prototypes are often created for evaluation and testing new ideas and designs. Prototype can reveal design clarify and give weaknesses and technical requirements opportunity to try innovations and make sure they fit for the intended purpose. Prototyping is usually iterative process where the prototype is checked it will be changed repeatedly. Rapid prototyping the process of creating a trial version of a design early in the development life cycle [8].

III. METODE

A. Previous Research

In this study, researcher used literature of a pre-existing type. This is intended to evaluate literary works and find out the advantages and disadvantages of previous studies. The following table describes the result of research related to research variable.

TABLE I.
Literature study

NO	Research Title	Researcher	Year	Research Result
1	**PERANCANGAN USER INTERFACE APLIKASI MOBILE PEMANTAU KELUHAN KESEHATAN PADA ANAK DESIGNING USER INTERFACE MOBILE APPLICATIONS IN CHILD HEALTH MONITORING CASES**	[9]	2015	achieve the effectiveness and efficiency of both users of the organization and individuals. To achieve this goal, managers and developers must have knowledge of the interactions between users, tasks, task contexts, information technology (IT), and the environment in which the systems are used.
2	**Penerapan Metode UCD (User Centered Design) Pada E-Commerce Putri Intan Shop Berbasis Web**	[1]	2017	user centered design adalah sebuah proses desain interface (antarmuka) yang fokus terhadap tujuan kegunaan, karakteristik pengguna, lingkungan, tugas, dan alur kerja di dalam desainnya.
3	**Designing a Web-Based Online Tutoring Application in Palembang City Using the SUS (System Usability Scale) Method**	[2]	2021	The research method used SUS (System Usability Scale), data collection used a questionnaire consisting of 100 respondents and had 10 questions with 5 answer choices from 0 to
4	**Evaluasi UsabilityAplikasi Mobile BankingDengan Menggunakan Usability Testing**	[10]	2019	The questionnaire will be distributed to respondents using the Standard System Usability Scale (SUS) which has ten questions that contain positive and negative questions related to the application.
5	**Prototyping materials experience: Towards a shared understanding of underdeveloped smart material composites**		2019	In product and interaction design, the role of sketching and prototyping in supporting the designers' understanding of user experiences and exploring the design space

B. System Built

The following is the modeling flow depicted in Figure 2. namely, the stages of the method based on UCD. Researchers used five stages: Plan the Human-Centered Process, Specify the Context of Use, Specify User and Organizational Requirements, Produce Design Solution, and Evaluate Design.
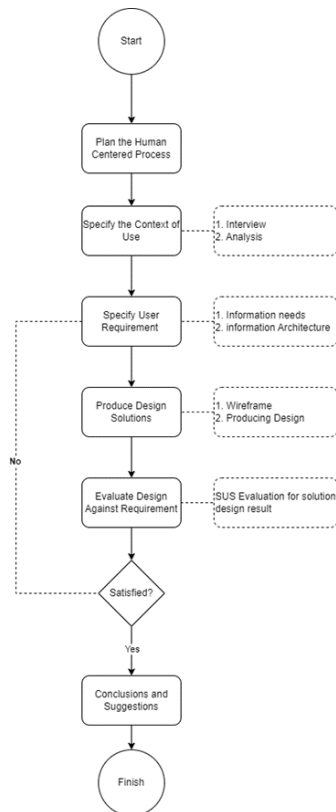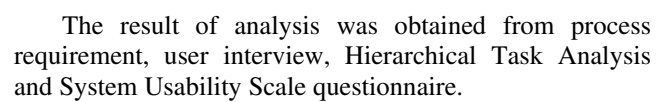
FIGURE 2.
Modelling Flow

C. IT Change Web Application Existing Evaluation
1. Participant

In this study, based on the User-Centered Design method in the Plan the Human-Centered Design Stage, the participant involved are users of the IT Change Web Application, namely employees in the ITGC Compliance division at Telkom Indonesia. Participant in this study consisted of 20 employees of user based on different position.

2. Method of Collecting Data

In the following stages, the author used 3 methods to obtain the evaluation results, namely Process Requirement, Interviews and System Usability Scale Questionnaire.

a. Process Requirement

In this case of process requirement, the author will be collecting data from process requirement of IT Change Web Application to be able make the pre-design of IT Change website application.

b. Interview

In this case of interview, the author will conduct online interview via online video conference with 2 users, the user will be from the division information technology of ITGC Compliance.

c. System Usability Scale Questionnaire

To get the result of an evaluation of the current state IT Change Web Application. The author provides a questionnaire containing 10 questions based on the System Usability Scale. The result of this questionnaire is in the form scores that will be used because of data analysis [11].

3. Analysis of Evaluation Result

The result of analysis was obtained from process requirement, user interview, Hierarchical Task Analysis and System Usability Scale questionnaire.

a. Evaluation Result

After the research, at this stage is analysis the existing data, identifying the existing data and the user that will be using the IT Change website application. The result will be evaluated which will be the result for process of creating IT Change website application.

b. Hierarchical Task Analysis (HTA)

Making HTA is done to analyze work processes related to users in interacting, working on, and completing tasks and user needs of a system. The analysis obtained in the previous stage is converted into the form of an HTA diagram [12]. The result of this stage can be seen at this Figure III.
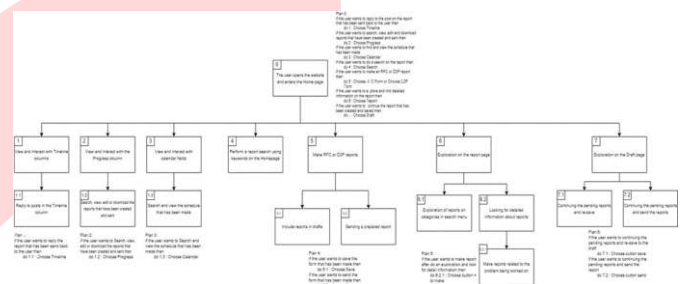

FIGURE 3.
Hierarchical Task Analysis (HTA)
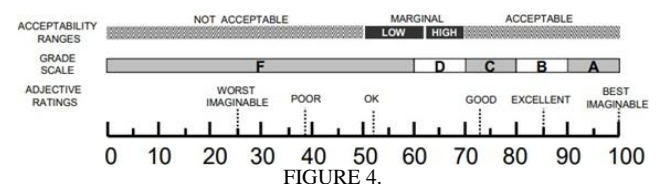
4. Produce Design Solution

At this stage, the design solution is created based on the analyzed result that has been done previously. After identifying the usability issues, the recommend for producing design are made which is created in the form of a prototype where the author will be creating the Low Fidelity. After that, the High-Fidelity prototype is created using Figma application[13].

5. Evaluate Design

At this Evaluate Design stage, based on the method used, namely Usability Testing and System Usability Scale, the user of IT Change web application will be given the test questionnaire to see the result of the users successful in this usability testing and see the result of the design improvement are accordance and satisfactory with the users needs.

6. System Usability Scale

System Usability Scale is a form of a questionnaire by Johne Brooke in 1986. This survey exists 10 questions that provide a comprehensive overview and subjectively evaluate from a usability perspective. The prototype usability values based on user needs and desires is determined based on the number of points achieved by System usability Scale (SUS)[7].

FIGURE 4.
Determine the result of average SUS Score.

IV.   RESULT AND EVALUATION

A. Produce Design Solution

Produce Design Solution At this stage, design solution is created to constructed and enhance usability on this IT Change web application. In constructing a design solution, we are able to make it into 2 forms:

1. Low Fidelity

Low Fidelity is an early stage of designing an idea for website or application. It's also have the flexibility to create sketches or storyboards and it's allows to explore and test the basic design elements design of website or application's tasks and flows[13].

2. High Fidelity

in this stage the design the actual design is going to be tested, the detail interaction will be evaluated such as with operational mock-ups and computer-based simulations, High Fidelity is already capturing the look and feel of a final product, and often include the essential part of an information and functionality. And it's also can be handled like a real product[15].

Because the design solution is already given by the manager at ITGC Compliance Division, we can use this as a reference to ensure the design improvements for an appropriate and increasing the usability value of IT Change website application. In the given design solution, there is only prototype for the homepage section. The given design solution can be seen in Figure 5.
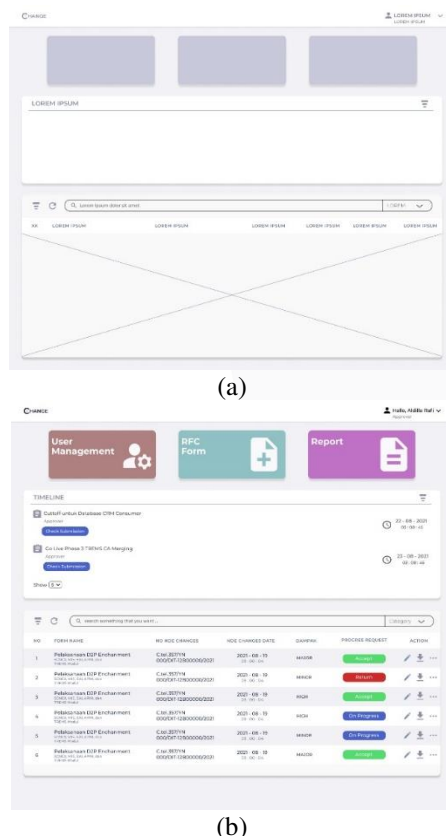

(a)

(b)

FIGURE 5
Low Fidelity(a) and High Fidelity(b)

B. First Evaluation

Produce Design Solution—At this stage, design solution is created to constructed and enhance usability on this IT Change web application. In constructing a design solution, we are able to make it into 2 forms.

Based on TABLE 2, the pre-survey result is still relatively low with the score of 62 which obtained from 20 respondent and need to be improved. Can be seen in Figure V, a score of 62 indicates that this website is in the low category, the improvement will be using the Process Requirement and User Centered Design method to fulfill the user wish.

TABLE 2
First evaluation result

1. Specify Context of Use.

Respondent	Rating Result	Sus Score
1	25 x 2.5	63
2	18 x 2.5	45
3	26 x 2.5	65
4	22 x 2.5	55
5	28 x 2.5	70
6	26 x 2.5	65
7	28 x 2.5	70
8	24 x 2.5	60
9	23 x 2.5	58
10	21 x 2.5	53
11	26 x 2.5	65
12	26 x 2.5	65
13	30 x 2.5	75
14	25 x 2.5	63
15	30 x 2.5	75
16	29 x 2.5	73
17	25 x 2.5	63
18	28 x 2.5	70
19	19 x 2.5	48
20	20 x 2.5	50
Average		62

The group of users of IT Change website application is people that the person who makes a report on improvements or changes to the request, which will be sent to the report reviewer for approval, after the report has been reviewed and approved the report will be sent to the supervisor for approval on the change request or improvements.

2. Specify Requirement.

The user needs specification phase is performed using the method of interviewing, two users are selected from 20 respondents during the initial evaluation phase.

TABLE 3
Web User

IT Change User	Purpose
Manager	The records of the report that will be changed and have been approved or not by superiors

The summary result of the interview can be seen at table 4:

TABLE II
Interview Result

Interviewers	Summary

Respondent 1	For the form creation maybe will be great if there's afeature that which can save a document if the user doesn't send or accidentally presses the back button so that users don't have to create a new documentagain.
Respondent 2	The UI design for the homepage is need more featuresuch as menu button still needs to be added and changed for a user with different authority, the website looks a little plain maybe its will be great to add a table for notification which can be seen at a glance or can be seen in detail or a calendar, and the color selection is still not suitable for viewing and less aesthetic.

After conducting an interview to the users of IT Change web application, the result of the interview will be analyzed to obtain the information needs that will be used as material for web application needed by the user. Based on the results of the interview, it can be stated that the User Requirements will be formed as in TABLE 5.

TABLE 5.
User Needs Analysis

Needs	Description	Requirement
The option to create theform report	Creating a new form deployment based on the user	On the left bar, a button feature forcreating a new form report and creating the form page which contain number NDE, date of changes, title of changes, downtime, date of execution, Affected apps, apps D2P, status changes, PIC changes, type of changes
Can view the report whichhas been deployed	Can view all the detail information report that has been completed	On the left bar, a button feature forthe report page and provide the list of the report
Can save the document report	Can save the previous form that has been made before the document is sent and the document can be edited	On the homepage, added "draft page" icon and provide the list ofthe document report that has beensave to the draft
Can view and edit the employee data (Approvers)	Can view and edit theemployee data	On the left bar, a button feature forthe user management page and provide the list of the employee

C. Improve Design Solution

The score that has been obtained is still below the average value. Therefore, an improvement is created based on the result from the interview. One of the improvements is to Create Form Page, Report Form Page, Draft Page, and User Management Page. The reason for the addition of the page is because the pages have not been created. Therefore, the pages that have been modified and created using the UCD method are:

1. Homepage

Several changes were made for user information in homepage, the design UI on the main page has been changes to make it more look elegant, comfortable and easy to use for the user, also adding more features for the navbar to easier for user to see the schedule that has been made.

2. Form IT Change Page

The form page was created for the user to make a new document report.

3. Report Form Page

Report form page was created for the user can view all of the report that has been submitted and the user can also download the document.

4. Draft Page

Draft page is made to save the previous form that has been created so the users can edited their form before submitting.

5. User Management Page

The user management page was created to edit the employee data which is only accessed by the approvers.

D. Low Fidelity

Low fidelity are created at this stage with the intention of serving as an early design sketch. There are 1 page that will be repaired based on task and there are 4 main pages that will be created, including the Homepage, Form IT Change page, Report Form page Draft page and User Management page.
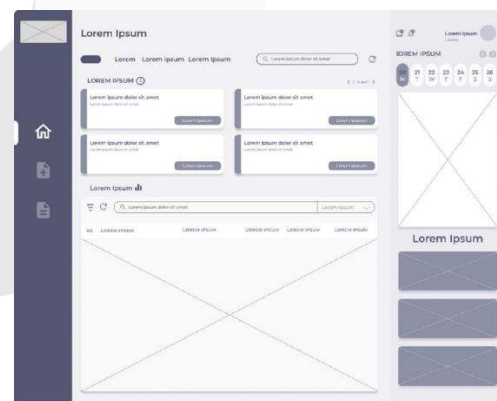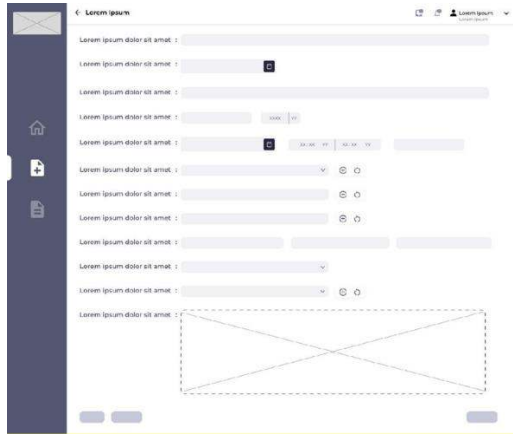

FIGURE 6
Low Fidelity of Homepage

FIGURE 7.
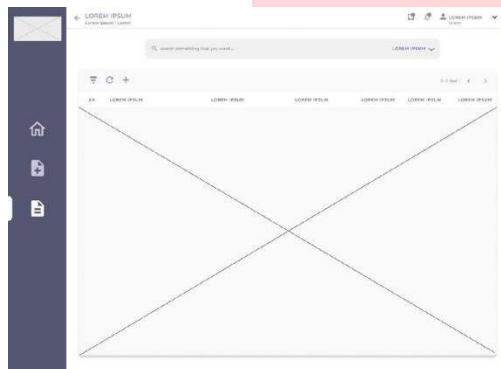Low Fidelity of Form IT Change Page
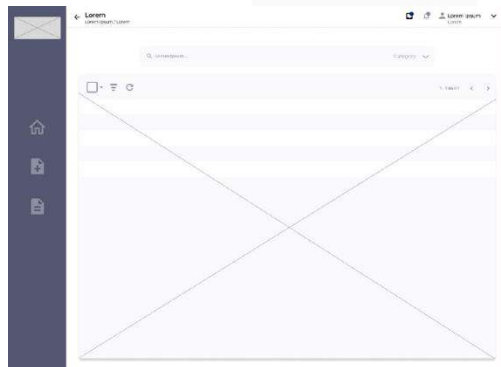

FIGURE 8.
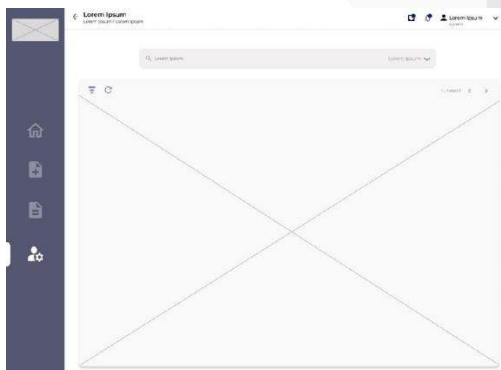Low Fidelity of Report Form Page

FIGURE 9.
Low Fidelity of Draft Page

FIGURE 10.
Low Fidelity of User Management

E. High Fidelity

The next step is to determine the design specifics based on the outcomes of the completed low fidelity and to

continue creating the design as a layout in the form of a high-fidelity design. Using system colors and icons that have been set in accordance with user needs, high-fidelity designs are produced.
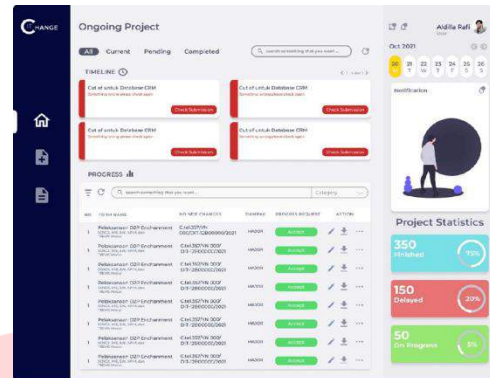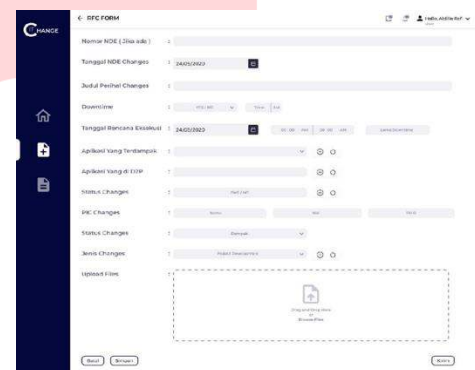

FIGURE 11.
High Fidelity of Homepage
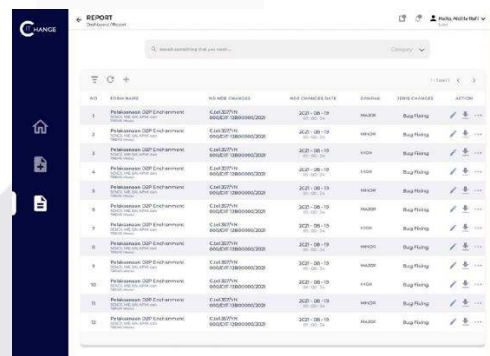

FIGURE 12.
High Fidelity of Form IT Change Page
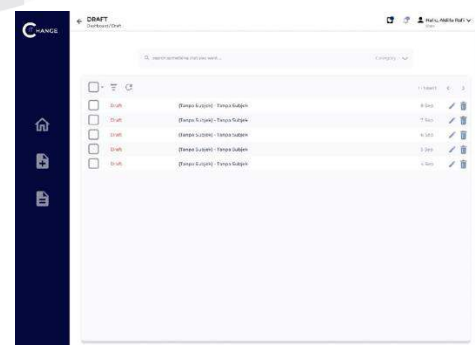

FIGURE 13.
High Fidelity of Report Form Page

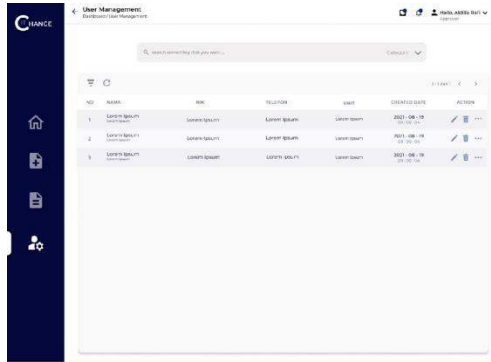FIGURE 14.
High Fidelity of Draft Page

FIGURE 15.
High Fidelity of User Management Page

Figure 11 shows the result of the high-fidelity design for the homepage. The first feature is the timeline which is a feature that servers as a reminder for the user must do. The second feature is progress which is used for users to view the progress of report that have been deployed, on the table of the progress that also contains the action button for the users to view the detail report, download, and edit the document report.

Figure 12 shows the result of the high-fidelity design for the Form IT Change page. The form IT Change page is for users to create the new document report. The users can also save the document report before sending the report by pressing the button "simpan", and the document report will be saved on the draft page.

Figure 13 shows the result of the high-fidelity design for the Report Form page. The Report Form page is for users to view all historical document report, view the detailed report, and download by pressing the available the action button.

Figure 14 shows the result of the high-fidelity design for the Draft page. The draft page is containing the previous document report that has been saved by the users which was not sent and will be edited again by the users by pressing the available action button.

Figure 15 shows the result of the high-fidelity design for the User Management page. The draft page is containing the employee data which is only accessed by the approvers. The approvers can also edit the employee data by pressing the available action button.

F. Final Test Result

The final test result is the same as the first evaluation the initial survey is conducted using the System Usability Scale (SUS) questionnaire, the questionnaire will be shared to the 20 respondent that are the same as the first evaluation. Respondent must test the prototype of IT Change website developed using User Centered Design (UCD) method. The final test result can be seen in TABLE 6:

TABLE 6.
Final evaluation result

Respondent	Rating Result	Sus Score
1	38 x 2.5	95
2	34 x 2.5	85
3	35 x 2.5	88
4	34 x 2.5	85
5	32 x 2.5	80
6	32 x 2.5	80
7	33 x 2.5	83
8	35 x 2.5	88
9	34 x 2.5	85
10	31 x 2.5	78
11	33 x 2.5	83
12	34 x 2.5	85
13	38 x 2.5	95
14	35 x 2.5	88
15	37 x 2.5	93
16	33 x 2.5	83
17	33 x 2.5	83
18	35 x 2.5	88
19	34 x 2.5	85
20	35 x 2.5	88
Average		86

Based on the result of final usability test the sus score was obtained is 86 which includes on the grade B and the grade is Acceptable. From the results of the usability testing above, the total number of results obtained from 20 respondents is 685 which then the total score is multiplied by 2.5 to obtain the total score of 1712.5. Then the total score is divided by 20 respondents, so the average score obtained is 86.

G. Analysis of Final Test Result

Based on the final test result, the SUS score has been increased into 86, which from the first survey the result is 62. Before the improvement was made the value obtained at the Acceptability Ranges level is low because still does not meet the needs of users so the score is obtained below 68. Changes made with the addition of form pages, draft pages, and user management pages provide very significant results to the System Usability Scale score. As for improvements in the homepage such as changes in terms of layout, color, buttons, icons, and the addition of other features can increase the previously lower SUS value. Therefore, UCD Method can give significant results compared to the first result.

V.   COCLUSION

A. Conclusion

In the early stages, the survey was involving 20 respondent using System Usability scale (SUS) and the average score is 62 with the grade of D and the Acceptability Ranges is in low category. The main problem was obtained from observation, interview and questionnaire that has been conducted to measure the usability for IT Change website, that the layout of the website was less attractive, and many features must be added to make it easier for users. After making an improvement with the same respondent in the first evaluation, the IT Change website had improved its usability. Doing re-survey after making an improvement with the same respondent the SUS score has been increased to 86, which means the acceptability ranges from the sus score grade is also had improvement from grade D to B. Therefore, by using the User Centered Design to improve the IT Change web application that meet the user's needs by modifying the homepage with the layout, colors,

buttons, and icon changes with the wishes of the users so the users can be comfortable and satisfied with the web application. The addition of other pages such as Form page, Report Page and Draft Page provides convenience for users in using web applications such as forming reports easily and providing access to save reports that have not been sent by users. User Management Page also helps approvers to manage data from users that have been entered into the web application.

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