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Application of User-centred Design Method in Laundry Management Application Development

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Abstract

In the current era, the laundry business is growing, especially in big cities like Purwokerto. However, through a survey conducted on 18 laundry entrepreneurs in Purwokerto, they encountered problems in managing laundry transaction data that still used physical media. At the same time, collecting data in electronic format offers several conveniences, such as saving storage space. Seeing the problems and advantages of archives in electronic form, We made a laundry management application. However, from the user's point of view, the system is often difficult to use, so it is not easy to use (user friendly). Based on these problems, developing a laundry management application using the User-Centered Design (UCD) method has two stages: Specify the Context of Use and Specify User and Organizational Requirements to identify and determine who the users are and user characteristics. The next stage is Produce Design Solution, which is the stage where the system design is converted into a system that users can use. The results of the existing system are given Evaluate Designs Against User Requirements using Usability Testing. Black Box testing is done to test the interface and functionality of the system. Usability Testing results get a feasibility value of 79.8%.

Keywords: Android, Blackbox, Laundry, Usability, User Centered Design

Abstrak

Pada era sekarang ini bisnis laundry semakin berkembang terutama di kota-kota besar seperti Purwokerto. Namun melalui hasil survey yang dilakukan terhadap 18 pengusaha laundry di Purwokerto mengalami kendala dalam mengelola data transaksi laundry yang masih menggunakan media fisik. Pada saat yang sama, pengelolaan data dalam format elektronik menawarkan beberapa kemudahan, seperti menghemat ruang penyimpanan. Melihat permasalahan dan kelebihan arsip dalam bentuk elektronik, dibuatlah sebuah aplikasi manajemen laundry. Namun pada suatu sistem dari sisi pengguna, seringkali sistem tersebut sulit digunakan, sehingga tidak mudah digunakan (*user friendly*). Berdasarkan permasalahan tersebut, pembangunan aplikasi pengelolaan laundry menerapkan metode *User-Centered Design* (UCD) terdapat dua tahap yaitu *Specifiy the Context of Use* dan *Specify User and Organiztional Requirements* untuk melakukan identifikasi, menentukan siapa penggunanya dan karakteristik pengguna. Tahapan selanjutnya *Produce Design Solution* yaitu tahap dimana rancangan sistem diubah menjadi sistem yang dapat digunakan oleh pengguna. Hasil system yang ada diberikan *Evaluate Designs Againts User Requirements* dengan menggunakan *Usability Testing*. Pengujian *Black Box* dilakukan untuk menguji antarmuka dan fungsionalitas sistem. Hasil Usability Testing mendapatkan nilai kelayakan sebesar 79,8%.

Kata Kunci: Android, Blackbox, Laundry, Usability, User Centered Design

I. Introduction

Electronic formats have quickly replaced records management that primarily uses paper. Records management in electronic format offers several conveniences and advantages that are not archives in physical format. Electronic archives make it very easy and save time to carry out sending or sharing compared to archives in physical form. In addition, electronic archives make it easier for many institutions to save physical storage space while making it easier for users to access documents [1].

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According to the advantages of electronic form documents, this research aims to implement current technology, especially small or medium industries, such as laundry service businesses, that manage their consumer data daily. However, according to [2] not every application development is successfully implemented if the system development does not pay attention to the factors that support its success; one indication is the satisfaction of stakeholders or application users. One of the problems that often occurs is a system that is not user friendly and not compatible with users, which causes difficulties in operation and dissatisfaction caused by failure to carry out tasks, even though the interface design is accessible and uncomplicated. It will make it easier for users to operate it.

Several software development methodologies can be used in this research, including the Prototyping Model and Iterative Model. According to [3] Prototyping Model defines overall objectives and identifies known requirements, but developers are not sure about algorithm efficiency, operating system adaptation, or system interface form. While the Iterative Model is implemented iteratively, the project is divided into small parts. This allows the development team to demonstrate previously workable results and obtain valuable feedback from system users.

In the Iterative model, there is a user-centred Design software development method. User-centred design is a term used to describe a design philosophy, with the user as the centre for the purpose and process of system development [4]. The salient features of the user-centred design approach are firstly involving stakeholders directly during the development process and secondly a process that is carried out in an iterative cycle until the project objectives with a high level of quality (usability) have been achieved. This method accurately reflects the actual user profile [5]. The principle that must be considered in this method is to focus on users, integrated design, from the beginning to user testing and interactive design [6]. In the user-centred design method, there is an evaluation stage after the system has been developed. This stage aims to evaluate the system by looking at it from the user's point of view. The results of this evaluation stage will determine whether an iteration will be carried out for system improvement or not. In this study, usability testing will be used to measure the level of user experience when using the application in the evaluation stage.

This user-centred Design method will later be applied to the laundry management application. This research aims to use the user-centred Design method to overcome various problems of user inability to use a system after using the user-centred Design method in developing software to find out the system functions only in one use [7]. This research's users or stakeholders are laundry business owners because this application was created to facilitate the management of laundry transaction data every day. In addition, the development of this application will focus on the primary needs of laundry business owners. Based on the results of the survey, there is no laundry application that fits the user's needs, so an application that supports the user's needs for laundry is needed. It can be seen that although each situation deserves appropriate adjustments for the profile especially for laundry apps, the best design is still the user-centred that offers flexibility and gains of design projects oriented by user needs and desires.

II. LITERATURE REVIEW

Research develops Dupak Perekayasa Online (DUPER) through the UCD approach, and the applications developed are easy to learn and easy to use. The DUPER application is a web application for submitting and assessing the Proposed List of Credit Scores. This research combines the user-centred Design method with Iterative Evaluation in the DUPER application development process. There are several iterations in the development of this application, starting from the first iteration, which is making the interface design and menu arrangement of the web application, to the n iteration, which is the following evaluation and is continuously running as part of system development and maintenance. The Business Process for Submission of DUPAK in the second iteration [2].

The research developed a Mobile Assisted Language Learning (MALL) application using the user-centred Design (UCD) method. The MALL application is an m-learning application that deals with mobile technology for the language learning process (all languages). This application was made for the English Intensive Course (EIC) in the Department of English Education, State University of Gorontalo. Previously, a Web-Based

Computer-Assisted Language Learning (WBCALL) application had been developed; however, this WBCALL application has drawbacks because this application can only be used on a desktop PC or laptop. That makes it difficult for students when they are studying outside the classroom. In addition, the development process does not involve students and lecturers as collaborators. In the process of developing the MALL application, five teaching lecturers and 25 students took EIC courses to find out what needs were in the application; then, a system design was made, which would later assist the application development process. After the application has been developed, an evaluation is carried out on the user [4].

Research on the design of Iqra learning applications by applying the concept of user-centred design. The development process begins with collecting data sourced from users, namely elementary school students and literature, then an analysis consisting of the characteristics and needs of users is carried out. After getting the data and analysis, a flow of the Iqra learning multimedia application design process is made, containing UML diagrams such as use case diagrams, activity diagrams, Sequence Diagrams, and Collaboration Diagrams. Then there is an interface design or design solution to describe the form of the Iqro learning application will be designed until the application is completed and enters the usability testing stage by asking several questions after the user has finished using the application. This study discusses the design of a web-based renovation information system at PT. Alfa Goldland Realty. The company is concerned with the property business by providing residential areas. The method used in designing this web-based licensing information system is user-centred Design (UCD) [7]. System development starts from planning at UCD and determining the user context by discussing system design with the management office to determine the needs of the system to be built. Then analyze user needs, namely analyzing the needs of the applicant who will apply for a renovation permit and analyzing the needs of the service department, which is the manager of the licensing application and then making a design solution that describes the process of the system that will be made [5].

Another research conducted in User-centered design method in developing e-commerce website at the Putri Intan Shop beauty product company. At the beginning of the development, the researchers collected test data through a closed questionnaire with a sample of 30 respondents. They carried out systems architecture, Use Case Diagrams, Class Diagrams and Enhanced Entity Relational Diagrams (EERD) [6]. The research discusses the development of a cultural diversity learning website in Asahan using the user-centred Design method. The system designed is intended to attract high school students in grades X-XII in Asahan Regency so that they want to learn their own culture. Before developing the system, the researcher analyzed the problems in the Asahan District High School, one of which was the absence of a curriculum or local content (mulok) at the school. After getting all the necessary data, proceed to the analysis stage, which includes system analysis, work process flow, problem analysis, UCD concept analysis, users and the data and technology used. User analysis is divided into two, namely, user needs and user characteristics. After completing the analysis stage, proceed to the implementation stage of system development [8].

III. Research Method

The stages of research and development of laundry management applications using the user-centred Design method consist of several stages. These stages are depicted in Figure 1.

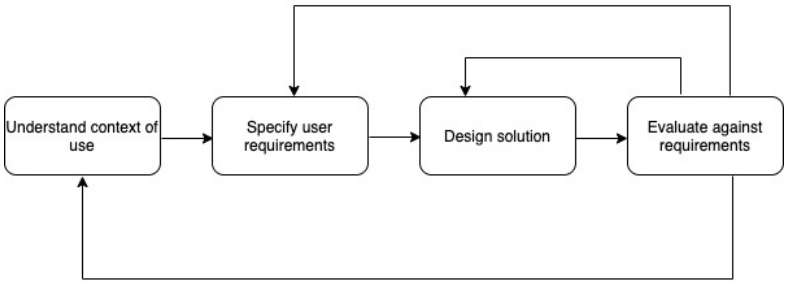

Fig 1. Research methodology

A. Understand and specify context of use

Researchers carried out context analysis to obtain information on the needs needed for the system to be built using the user-centred Design (UCD) method. This needs analysis was conducted through interviews with ten laundry entrepreneurs in the city of Purwokerto. There are two stages of the UCD method in the needs analysis: Specify the Context and Specify User and Organizational Requirements. Quoted in research [4], Specify the Context of Use is the identification stage, determining the characteristics of the system users and the environment in which the system will operate.

B. Specify User and Organizational Requirements

The Specify User and Organizational Requirements stage is an explicit statement about the needs of users and organizations, which includes the quality of human and computer interaction design, the quality of the functions that users will use, the transparency of applications to users, and effective collaboration and communication between users.

C. Design Solutions

After completing a requirements analysis, the design is divided into two stages, namely system design and software design. This design is included in the third stage of the UCD method, namely Produce Design Solutions. According to [4], Produce Design Solutions is making prototypes as a reference in system development and conducting and showing the system trials to users. This design is based on object-oriented programming using the Unified Modeling Language modelling. Unified Modeling Language (UML) arises because of the need for visual modelling to specify, describe, build, and document software systems [8]. The design is made in Use Case Diagrams, Class Diagrams, Activity Diagrams, and application interface designs.

D. Evaluation against requirements

After the implementation is complete, proceed to Evaluation, which is the fourth stage of the UCD method, namely, Evaluate Designs Against User Requirements, where the results of the applications that have been made are given to prospective users to be tested and evaluated. If the result is still less, then iteration will occur. Evaluate Designs Against User Requirements is used to improve the design and then assess whether the user and organizational goals have been achieved or not [4]. At the evaluation stage, the researcher uses Usability Testing to measure user experience when using this system. Usability is the quality of a system that is easy to use and easy to learn [9]. Usability measurement is done by using the USE Questionnaire, which is a tool used to prepare questions that will be made in the form of a questionnaire. The Likert scale is used to measure attitudes, opinions, and perceptions of a person or group of people about social events or phenomena [10].

E. Testing and Iteration

Testing is carried out after no more iteration processes. This test is carried out using the Black Box Testing method. Black Box testing is a testing strategy that pays attention to software specifications and functionality factors and identifies types of interface errors, malfunctions, data modelling errors, and access to external data sources. There are several testing techniques in Black Box Testing, including Boundary Value Analysis, one of the black box testing techniques by testing the upper and lower limits of a value inputted into the application [11]. Equivalence Partitioning technique is a test based on the input of each menu contained in the system. Each input menu is tested through classification and grouping based on its function [12].

IV. Results And Discussion

1. Results of requirements Analysis

The needs analysis process was carried out through interviews with ten laundry entrepreneurs in the city of Purwokerto. Table 1 is the definition of actors who will use the laundry management application.

TABLE I
ACTOR IDENTIFICATION

Actor	Description
Laundry Entrepreneur	Laundry entrepreneurs are system users who can use the features provided by the application to manage transaction data in their laundry business. The selected laundry entrepreneurs are in Purwokerto, which is where this research was conducted.

The conclusions obtained from the process of collecting data through interviews to determine user needs are as follows:

a. When recording transaction data in a notebook. Respondents often experience writing errors. Therefore, the system that will be made later must have good data validation to avoid writing errors.
b. Most of the laundry businesses run by the respondents are kilogram laundry.
c. The respondents each have a laundry package with their price. Therefore, the system must be able to manage laundry packages from the respondents.
d. The data required from customers to manage laundry transactions is the majority of the customer's name and mobile number: customer address and full laundry.
e. The system to be created has a total transaction price calculation.
f. There is a grouping of completed and unfinished transactions in the system.
g. Create a system that is easy to use and understand.

2. Design Results

After completing the needs analysis, the data is then processed to make system designs such as Use Case Diagrams, Class Diagrams, Activity Diagrams, and system interface designs.

a) Use Case Diagram

Use Case Diagram is a technique to determine the functional requirements of a new system or a modified system. Each use case consists of scenarios that explain how the system interacts with other users or systems to achieve a specific goal [5]. Figure 2 is a Use Case Diagram design for a laundry management application. Users are system users, namely laundry entrepreneurs who can register and log in to manage laundry transactions, manage their laundry packages and change their data.

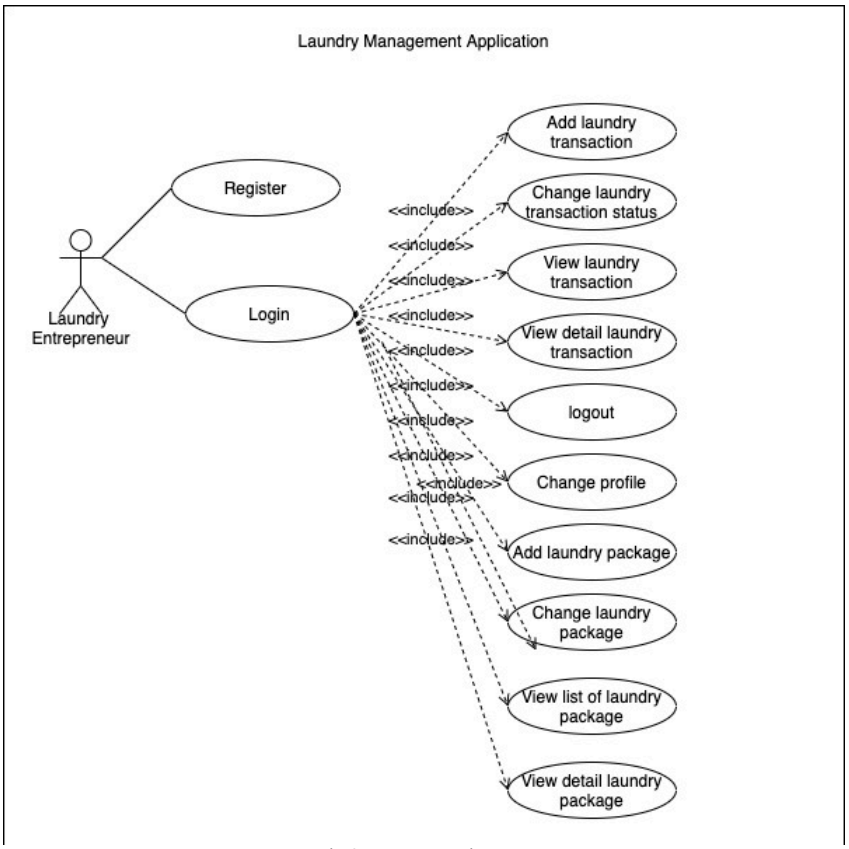

Fig 2. Use Case Diagram

b) Activity Diagram

Activity Diagram describes the workflow (workflow) or activities of a system or business process or menu in the software [13]. Here are some Activity Diagrams on laundry management applications:

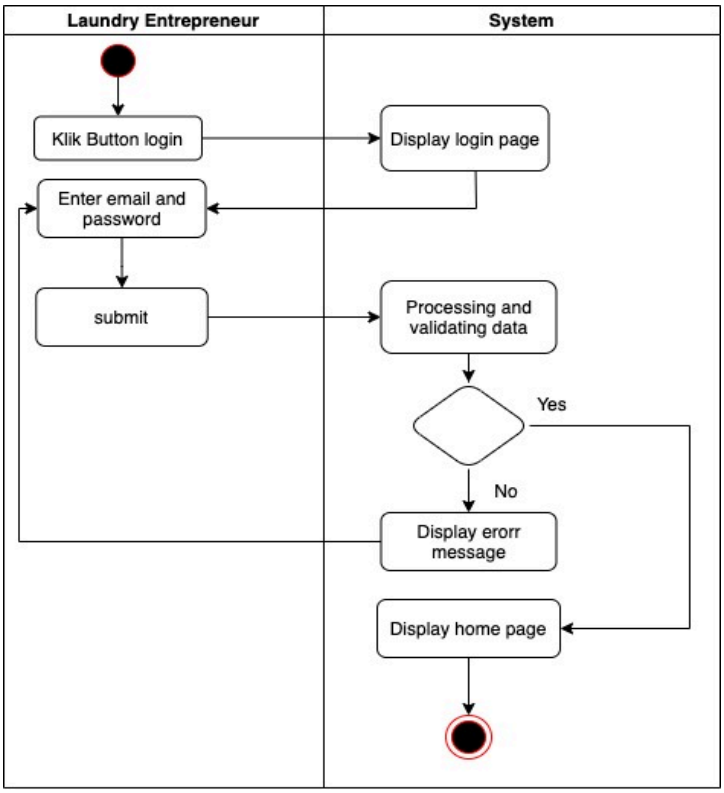

Fig 3. Activity Diagram Login

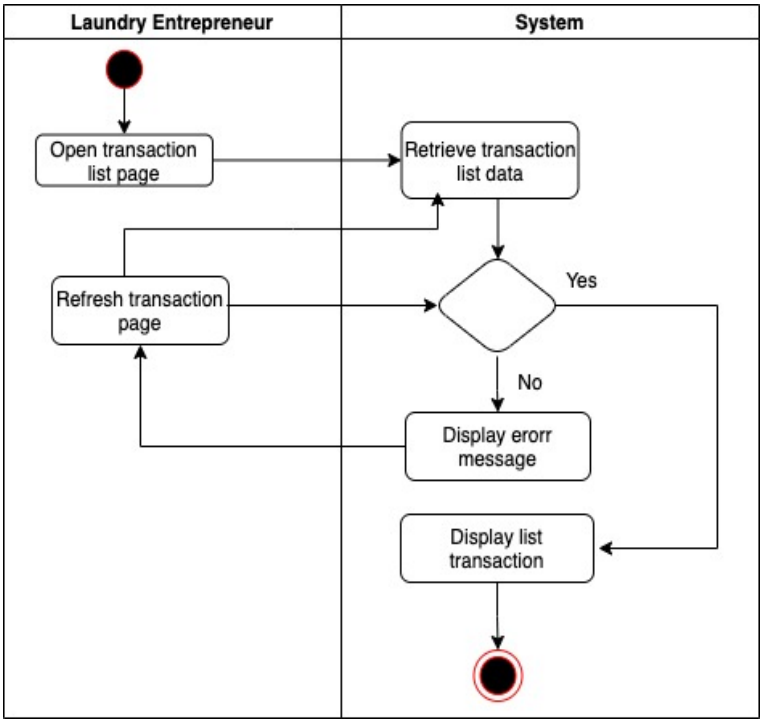

Fig 4. Activity Diagram transaction list

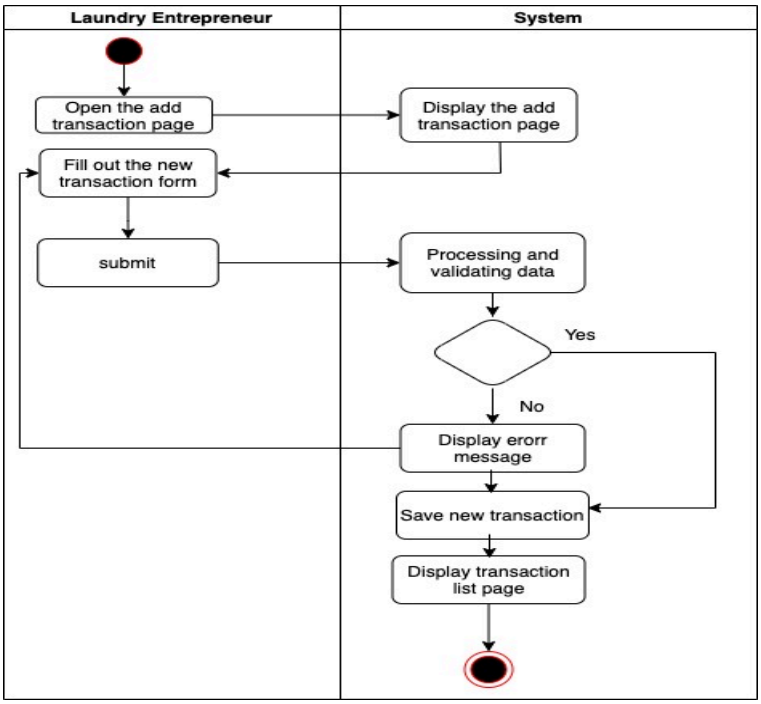

Fig 5. Activity Diagram add transaction

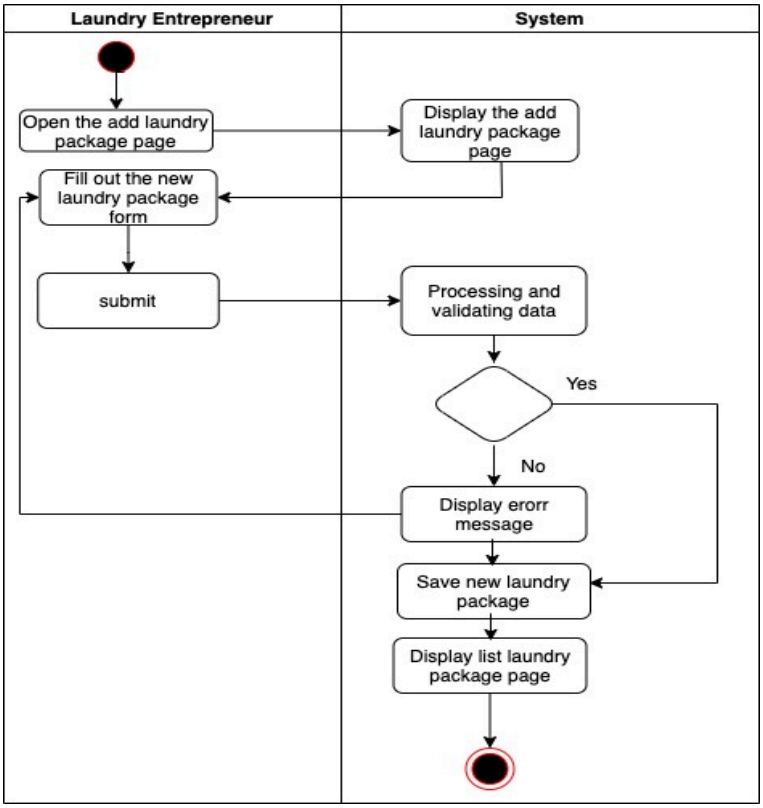

Fig 6. Activity Diagram add laundry packages

c) Class Diagram

Class Diagram describes the system's structure in terms of defining the classes that will be created to build the system [13]. The class diagram in Figure 7 explains the relationship between the database model classes, namely User, Transaction and Laundry and their respective service classes, which contain methods for retrieving data from the database.

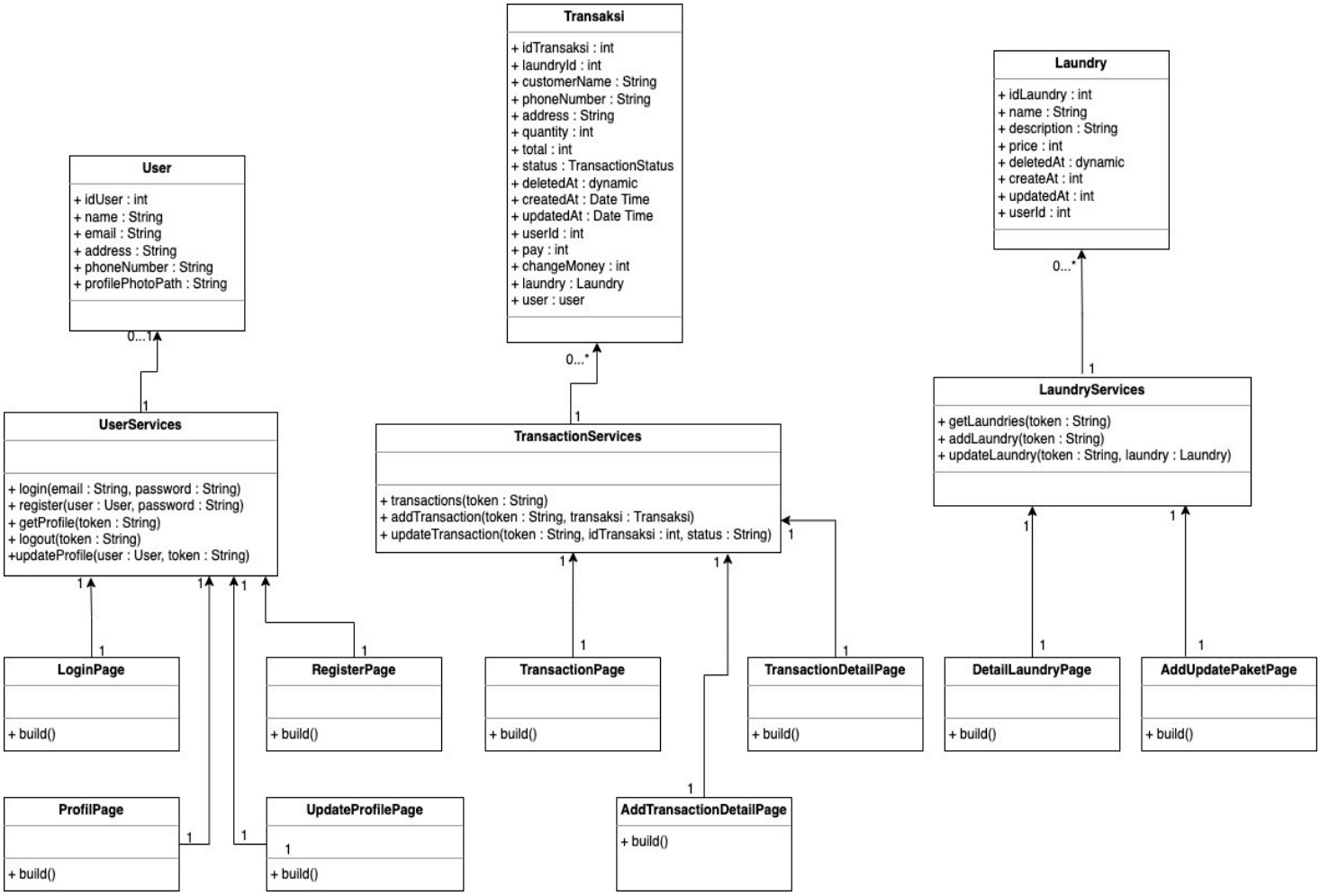

Fig 7. Class Diagram

3. Interface Design

The interface design or design solution from analysis is made to describe the form of the laundry management application. The interface design is made to facilitate the creation of the system display and improve the User Experience of the system. User Experience is the interaction between the user and the product, such as the user experience in using the product, is it easy to use, how simple it is to operate the product or service, to the experience of finding, absorbing and understanding available information [14].

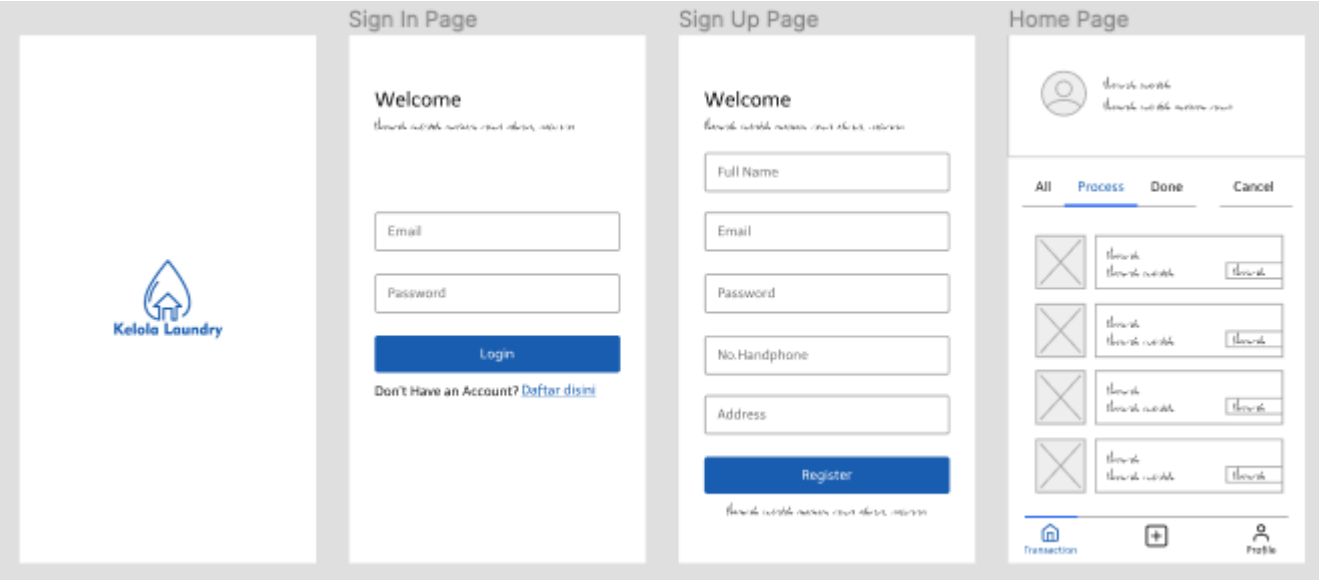

Fig 8. User Interface Menu Register

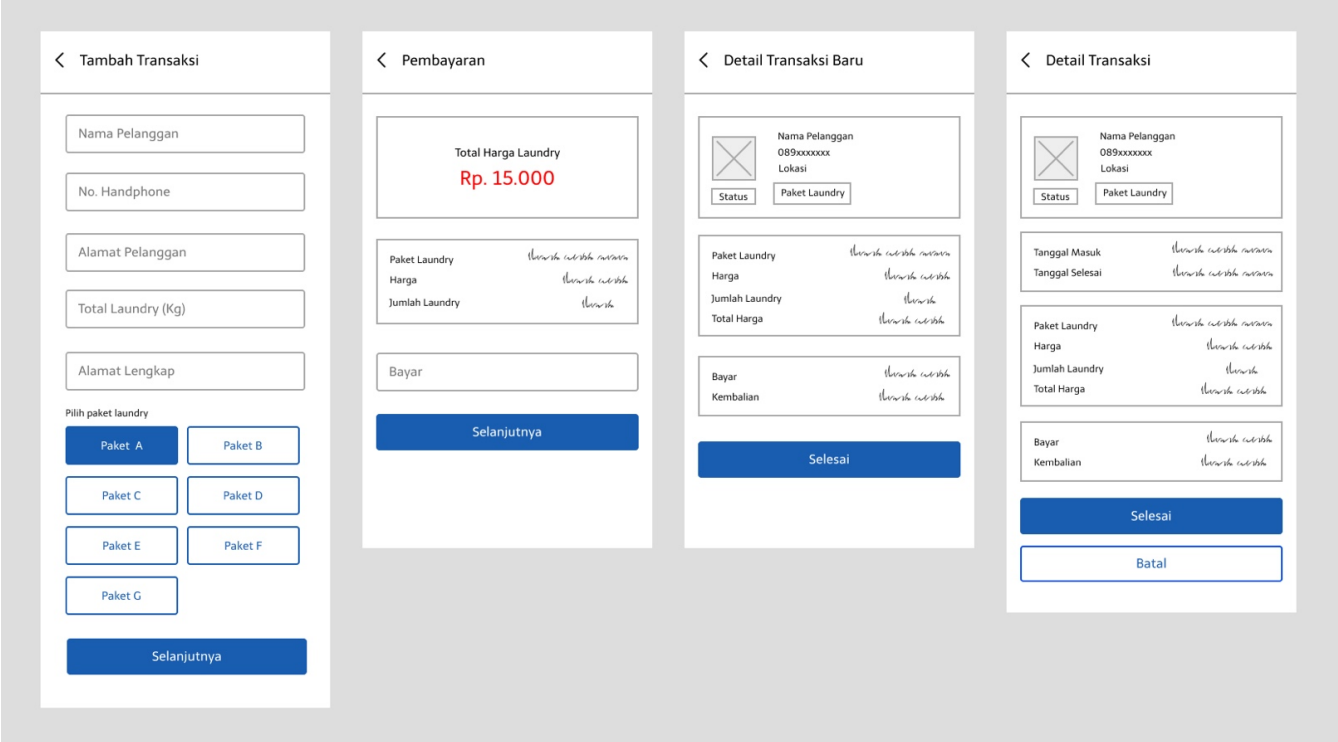

Fig.9 User Interface Main Menu

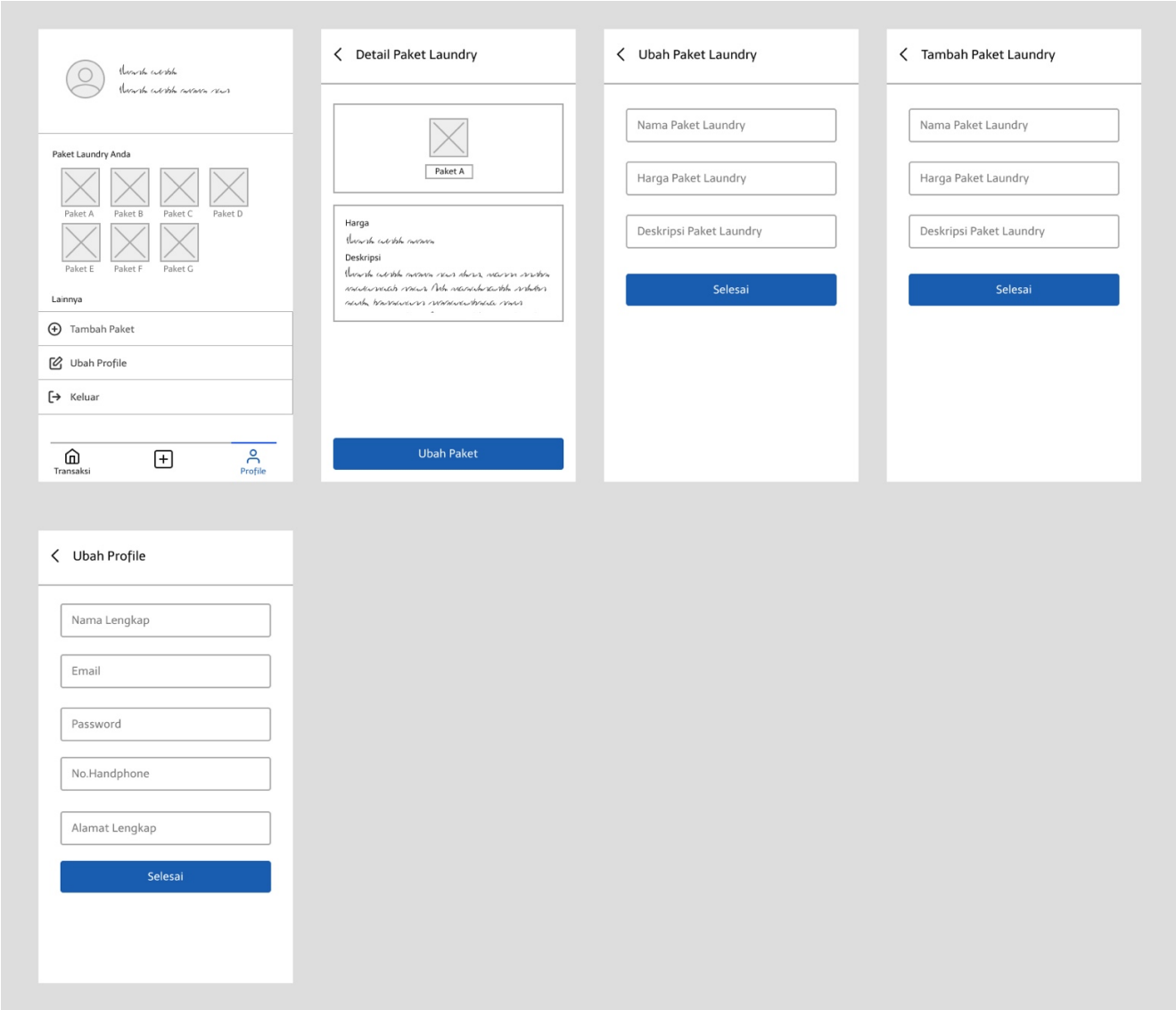

Fig. 10 User Interface Menu Laundry

4. *Application Development Results*

After designing the system, the design that has been made is implemented into a system that users can use. Laundry management application development uses the Flutter framework, a toolkit framework that can be used to make mobile applications. The implementation process also utilizes the Visual Studio Code and Android Studio code editors. As for data storage and web admin system creation using the Laravel framework. some views of the applications that have been developed showed below:

Fig 11. Transaction Page

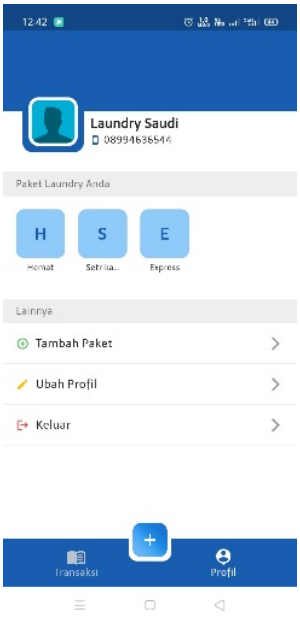

Fig 12. Profile Page

Fig 13. Transaction Detail Page

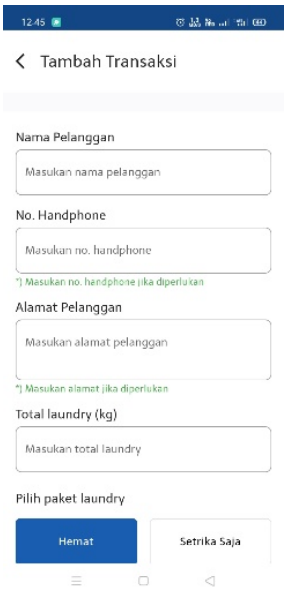

Fig 14. Add Transaction Page

Fig 15. Payment Page

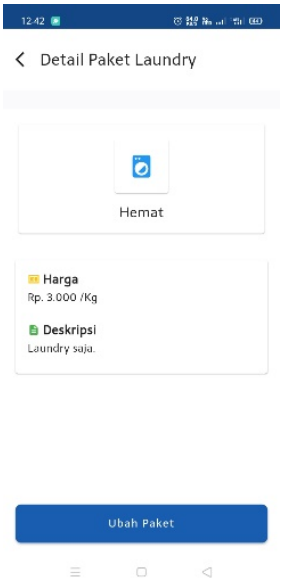

Fig 16. Laundry package Details Page

5. Test Results

Tests are carried out using the Usability and Black Box Testing methods. Usability Testing is used to measure user experience when using this system by using a questionnaire. The questionnaire used is the USE Questionnaire and a Likert scale of 1 - 4 as a measuring tool to get the usability value. Based on research [15]. The observation score was obtained from the respondent's overall answers on the usability aspect multiplied by the score according to the Likert scale. At the same time, the expected score is obtained from the highest value of the Likert scale multiplied by the number of respondents multiplied by the number of questions for each usability aspect [15]. To determine the usability level of the practical application and determine the feasibility level of each usability aspect being tested, it can be seen in Table 2. In table 3 are the questions and the results of the percentage of answers that the respondents have carried out. There are several aspects tested, namely aspects of Usefulness, Ease of use, Ease of learning and Satisfaction.

TABLE II
FEASIBILITY CATEGORY

Range (%)	Classification
Nilai < 21	Very unworthy
21 - 40	Not Feasible
41 - 60	Enough
61 - 80	Worthy
81 - 100	So worth it

TABLE III
RESPONDENT ANSWERS

No	Question	Evaluation				Observation Score
		STS	TS	S	SS	
	Usefullness					
1	This app helps you to be more effective?	0	0	7	3	
2	This app helps you to be more productive?	0	0	8	2	
3	This application is useful?	0	0	4	6	
4	This application can save time when you use it?	0	1	6	3	
		0	**1**	**25**	**14**	**133**
	Ease of use					
5	This application is easy to use?	0	2	5	3	
6	This application is simple to use?	0	1	6	3	
7	You use it without written instructions?	0	5	4	1	
8	Can you recover quickly and easily when you make a mistake?	0	4	5	1	
		0	**12**	**20**	**8**	**116**
	Ease of learning					
9	Did you learn how to use it quickly?	0	1	7	2	
10	You easily remember how to use it?	0	2	3	5	
		0	**3**	**10**	**7**	**64**
	Satisfaction					
11	Are you satisfied with this application?	0	1	5	4	
12	This app is fun to use?	0	1	6	3	
13	How does this application work the way you want it?	0	1	1	8	
14	This app is awesome?	0	4	4	2	
15	This application is convenient to use?	0	0	4	6	
		0	**7**	**20**	**23**	**166**

The observation score from Table III is then calculated using formula 1, and the results of the feasibility of each aspect can be seen in Table IV.

TABLE IV
RESULTS OF EVERY ASPECT

Aspect	Result
Usefullness	83.1 %
Ease of use	72.5 %
Ease of learning	80 %
Satisfaction	83 %
Total *Usability*	**79.8 %**

Overall, the usability testing results obtained feasibility of 79.8%. Based on table 2, the feasibility category scores between 61-80 scale, which means that overall, the laundry management application is feasible to use because this application is easy to use, easy to learn. In this research, there is no iteration performed on the user-centred Design method. Black Box Testing method conducted in this research included the added features of laundry transactions to changing user profiles. Overall, the scenarios that have been created and tested have worked well.

V. CONCLUSION

Based on the results of developing a laundry management application using the user-centred Design method, it can be concluded that the stages in the user-centred Design method assist researchers in building a good laundry management application. When analyzing user needs through interviews, researchers get specific and clear details about the needs and functionality that must exist in the system to be developed. The process and results of this needs analysis are fundamental because they will affect the results and whether or not the system is feasible. The laundry management application is proven to be feasible to use and follow user needs; this is proved by testing every aspect of usability that has been carried out by obtaining a feasibility score of 79.8%. In further research that will be carried out, the results of the needs analysis and applications made can be developed again into a website-based system so that users have a choice regarding which platform they prefer.

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