*Original Article*

# Designing User Interface (UI) of KJP-Shop Application Using User-Centered Design (UCD) Method

According to some other definitions, User-Centered Design is the process of designing an interface that focuses on the purpose of application usability, user characteristics, user environment, and tasks & workflows in system design. Therefore, it can be said that User-Centered Design is an

iterative process from the initial stage to evaluation to create a system that fully meets user needs. [27]

The following is the theoretical basis for the application development process using the User-Centered Design method, which is divided into several stages.[13]
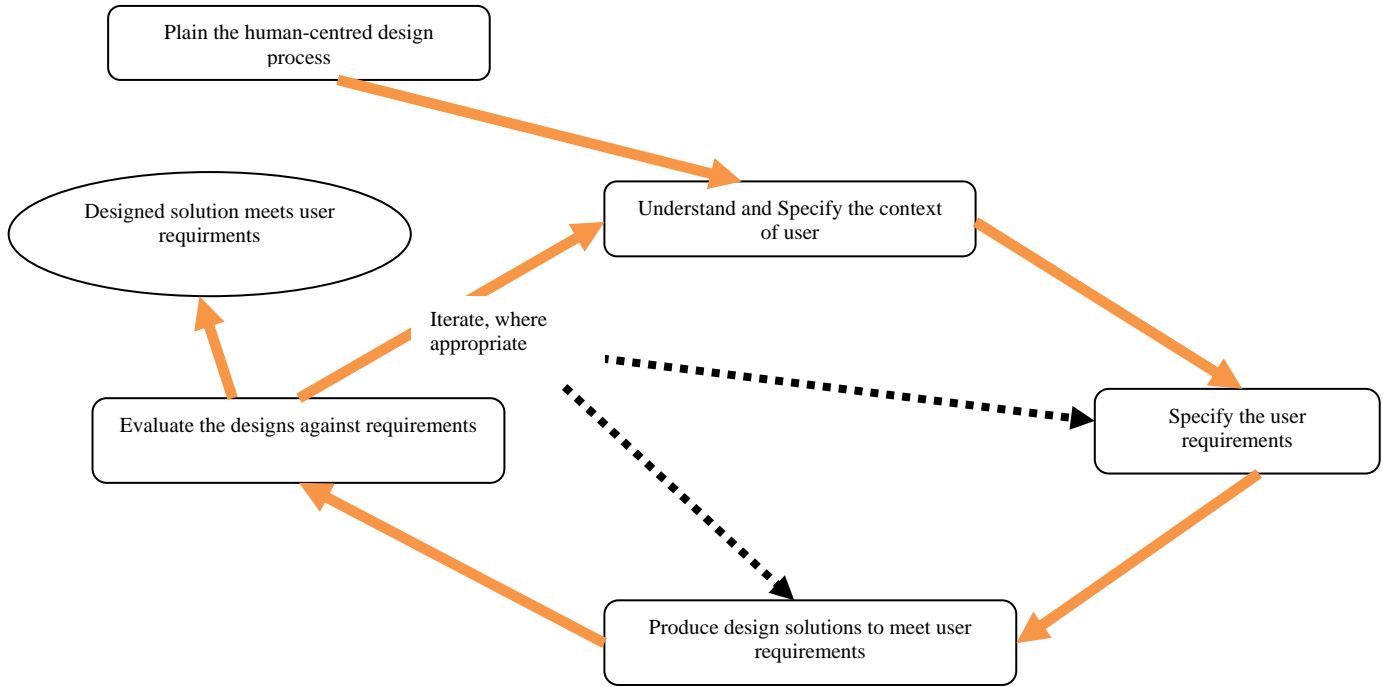


Fig 1 UCD Process According to ISO 13407:1999.[9]

The following is an explanation of the UCD stages shown in Figure 3:
1. Understand and Specify the Context of Use
   At this stage, identifying users focuses on what conditions cause users to need and use the application.
2. Specify the User Requirments
   At this stage, the process of identifying the needs of each user in the application is carried out.
3. Produce Design Solutions to Meet User Requirements
   At this stage, developing the display is a solution for the developed application.
4. Evaluate the Design Against Requirments
   At this stage, an evaluation process is carried out on the developed design based on an analysis of the context and user needs.

Table 2. User-Centered Design Approach.[13]

|  | Analyze | Design | Test |
|---|---|---|---|
| Card Sorting | ✓ | ✓ | ✓ |
| Contextual Interviews | ✓ |  | ✓ |
| Focus Groups | ✓ | ✓ | ✓ |
| Heuristic Evaluation | ✓ | ✓ | ✓ |
| Individual Interviews | ✓ | ✓ | ✓ |
| Parallel Design |  | ✓ |  |
| Personas | ✓ |  |  |
| Prototyping |  | ✓ | ✓ |
| Surveys(online) | ✓ | ✓ | ✓ |

| Task Analysis | ✓ | | ✓ |
|---|---|---|---|
| Usability Testing | ✓ | ✓ | ✓ |
| Use Cases | | ✓ | |
| Writing for the web | | ✓ | |

### *2.3. Usability*

Based on ISO-DIS:9241-11, usability is the level of effectiveness, efficiency, and satisfaction that can help users achieve their goals in using the application.[8, 9] Meanwhile, according to Nielsen, usability is an analysis of the qualitative assessment of the ease of use of an application; if users encounter difficulties they cannot handle, they will no longer use the application. The purpose of usability testing is to identify whether the application has been developed to meet user needs. Moreover, the number of evaluators in usability testing is only 5 people since doing usability testing on 5 evaluators has shown 85% of problems in the interface.[18]

According to ISO 9241-11, there are three criteria of usability, namely: [9]

1. Effectiveness - The completeness of features in the application will affect the process of meeting user needs in using the application.

2. Efficiency - The ease of use of the application will affect the user's interest in using the application.

3. Satisfaction - The effectiveness and efficiency of the application will affect the user's satisfaction in using the application.

Usability is calculated using the following average formula:[5]

$$\text{Usability Score} = \frac{\Sigma \text{ total score for each question}}{\Sigma \text{ ideal total score per factor}} \times 100\%$$

The following table shows the results of the usability percentage qualification to be used after obtaining the calculation score for each question.

**Table 3. Qualification Results of Usability Percentage.[9]**

| Percentage (%) | Qualification | Results |
|---|---|---|
| 85-100 | Very good | Successful |
| 69-84 | Good | Successful |
| 53-68 | Fair | Unsuccessful |
| 37-52 | Poor | Unsuccessful |
| 20-36 | Very poor | Unsuccessful |

### *2.4. Android*

Android has been equipped with various features to run seamless applications as a technology that supports mobile devices. A basic feature called Firebase supported as a backend service is a solution offered on Android mobile devices, allowing an application to run on mobile phones.[1, 13]

## 3. Research Methodology

The research method used is only up to the system analysis stage. The research methodology employed is the Soft System Methodology, namely:
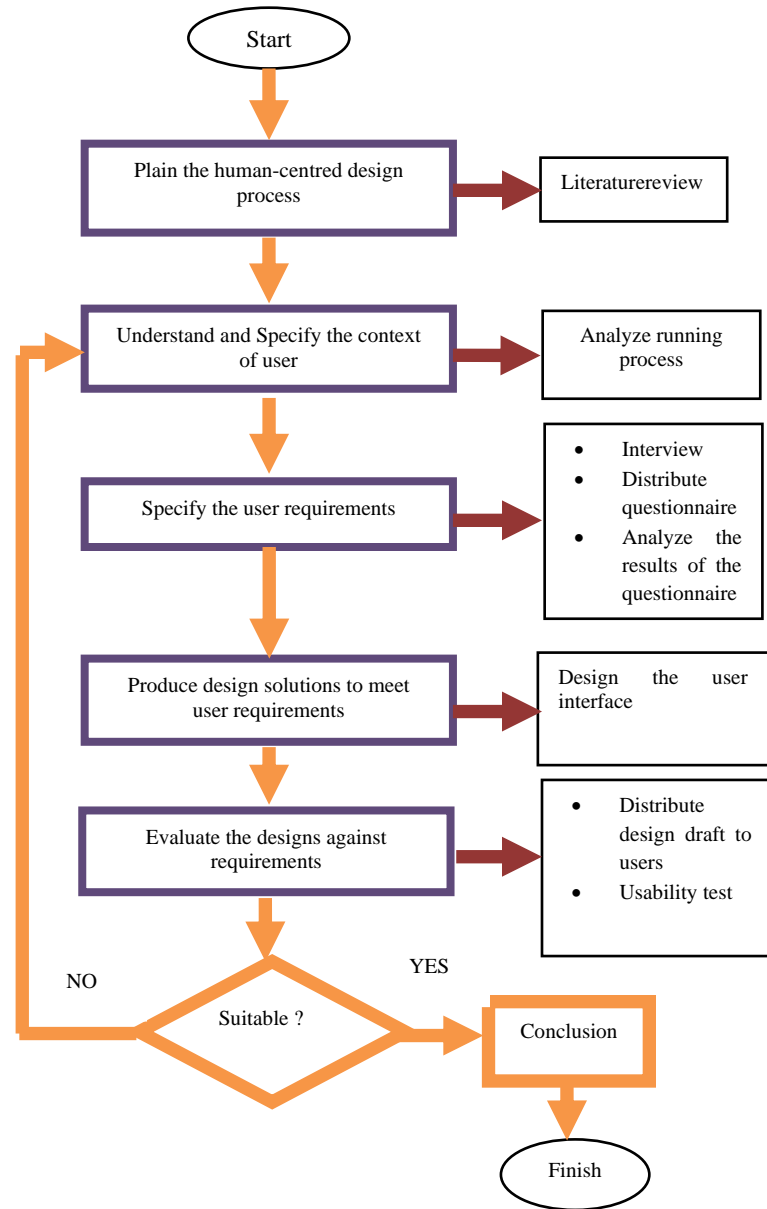


**Fig. 2 Stages of UCD-Based Research Methods**

# 4. Results and Discussion

## 4.1. Plan the human-centered design process

This stage consisted of preparing with the people who would work on the project to get a commitment that the project development process was user-centered, meaning that the process from start to finish was carried out according to user needs.[14] It confirmed that the application's User Interface design using the User-Centered Design (UCD) method could meet users' needs and expectations.[2] Therefore, project developers also needed to conduct a literature review and read journals & books related to application development using the User-Centered Design (UCD) method.

## 4.2. Understand and Specify the context of the user

By identifying the current process analysis, it can be seen who will use the application.[6] This section will explain under what conditions the user will use the application.[22] Based on the previous research, the authors have obtained the specifications of users, namely KJP users, sellers in the KJP supply market, P4OP, and KPKP.[28] This study focuses only on users who will make and are making purchase transactions for cheap foods in the KJP market. Therefore, the authors designed an Android-based User Interface specifically for KJP users and sellers in the KJP provider market. Meanwhile, for P4OP and KPKP, the researchers will collect data and report in the next research for web-based application design. To clarify the respondents involved in KJP shopping activities, the authors attach user personas as follows:



| Identity |
| --- |
| Name of Child     : Riris Nurtami |
| Name of Mother: Nursiah |
| Age of Child: 9 years old |
| Age of Mother: 44 years old |
| Child's job: 4-grade student |
| Mother's job: Housewife |
| Domicile: Pancoran |

**Behavior:**
- Cheap food packages are available from the 5th to the 10th month at the KJP food supply market.
- Receive KJP balance from DKI Jakarta government
- Have a Jakarta Smart Card (KJP) for KJP shopping.
- Parents of students are ready to purchase KJP cheap food

**Problems:**
Long queues, uncertain time to shop for cheap food, and lack of information about stocks of cheap food cause them to have to move to other markets

**Goals and Needs:**
- Need an application to simplify the KJP shopping process for easy KJP shopping.
- Able to choose KJP foods without worrying about running out of the foods and compete with other KJP members.

- Able to choose a KJP market that provides complete items, so they do not have to spend time shopping for cheap food just because the first market they visited is out of stock or other KJP members have bought the items they need.
- No need to go early for KJP shopping because of worrying about getting into a long queue.



| Identity |
| --- |
| Name of Store    : Toko Agung |
| Age              : 40 years old |
| Shop location : PD Mampang Prapatan |
| Domicile         : Mampang Prapatan |

**Behavior:**
- Supplied with cheap food from KPKP every month
- Provide goods for KJP members who shop at the store
- Calculate how many KJP members shop at the store
- Calculate the remaining and sold cheap food items to be reported to the KPKP

**Problems:**
Lack of information on how many KJP members will shop, and the reports of the remaining and sold cheap food items are not well organized.

**Goals and Needs:**
- Need an application for easy KJP shopping
- Know the number of KJP members who will shop at the store
- Ease of reporting KJP shopping transaction
- Need queue management for KJP members to easily serve the KJP members

## 4.3. Specify the user requirements

Information or data collection was collected regarding the user's needs at this stage. After the information/data have been collected, they were compiled, while user requirements will be described in various forms, such as narratives, pictures, diagrams, etc.[2] In addition to using questionnaires to collect information related to user needs, the authors also conducted interviews with users. The following features are the functional requirements based on the results of interviews with users:
- Feature to sign in to the KJP-Shop application by two profiles, namely KJP users and KJP sellers
- Feature of forgot password
- Feature to change password
- The feature containing the main menu consists of several sub-menus to be selected by the users
- Feature to view the profiles of both KJP users and KJP cheap food sellers
- Feature to check KJP balance
- Feature to view the history of receiving KJP funds during KJP membership
- Feature for making KJP shopping transactions

- Feature to take KJP shopping queue number according to KJP shopping transaction
- Feature to view KJP shopping history during KJP membership
- Feature to view KJP shopping details
- Feature to view the list of KJP members who will shop at the store
- Feature to update KJP member's shopping data
- Feature to fill in the report of the remaining and depleted items
- Feature to make an annual report on the cheap food

- A feature that contains the use of the application by both KJP users and KPJ sellers

### 4.4. Produce design solutions to meet user requirements

This stage was designing a solution, where the researchers made a design as a solution for application users [21] in the form of an Android-based application; thus, the user interface that will be built was a mobile application. The following is an illustration of the KJP-Shop application design diagram according to the third stage:



**Fig. 4 Use Case Diagram of Application Needs**

Based on the use case diagram, a sitemap for the KJP-Shop was made. The following is the sitemap of the KJP-Shop application, which shows the different menu appearances to be accessed by KJP users and KJP sellers. Several menus can be accessed together and specifically by each user and seller.
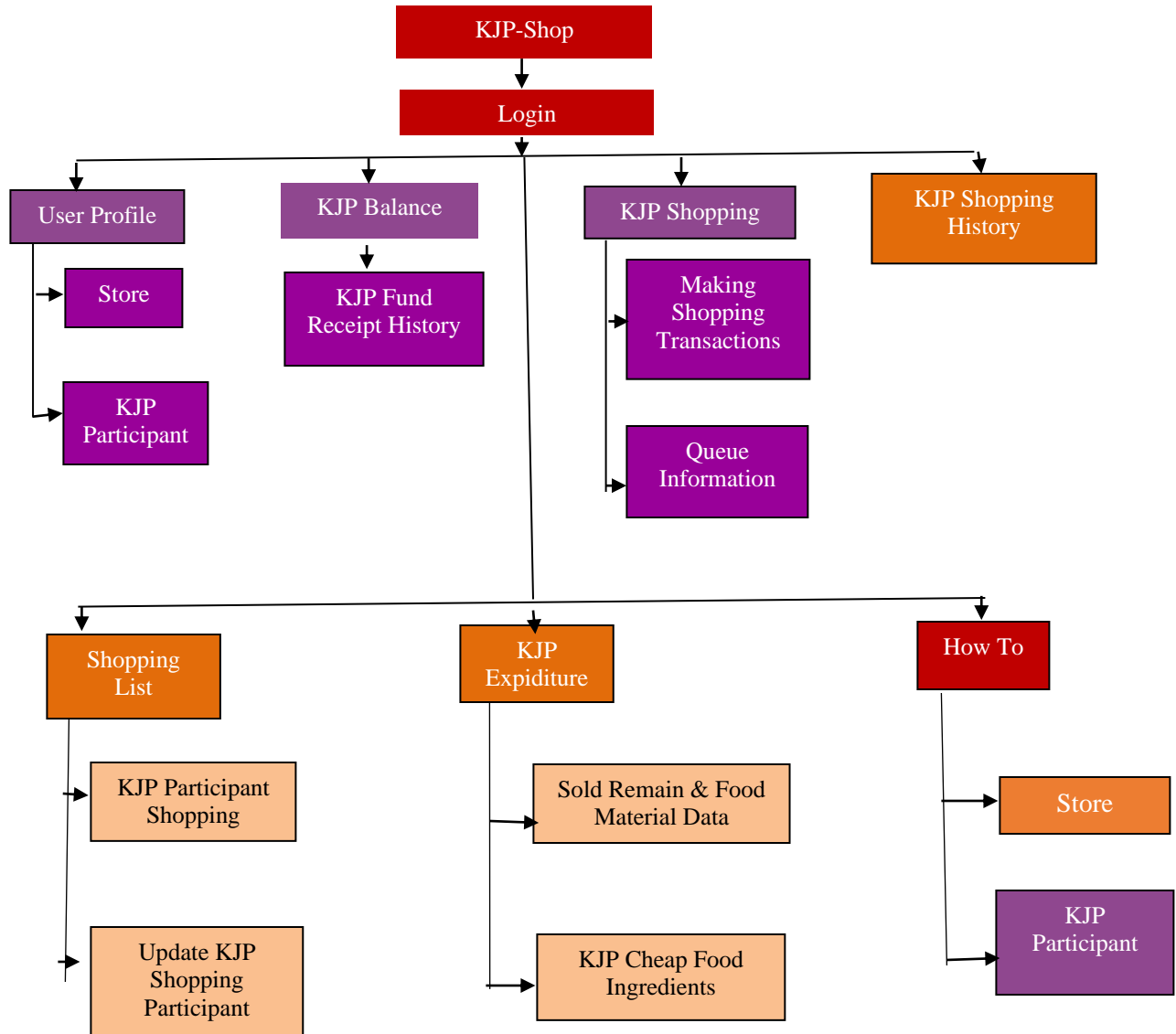


**Fig. 5 SiteMap of KJP-Shop Application**

Based on the description of the KJP-Shop application sitemap, the researchers provide several examples of wireframes used to prototype the KJP-Shop application.



Fig. 6 Wireframe to Shooping KJP
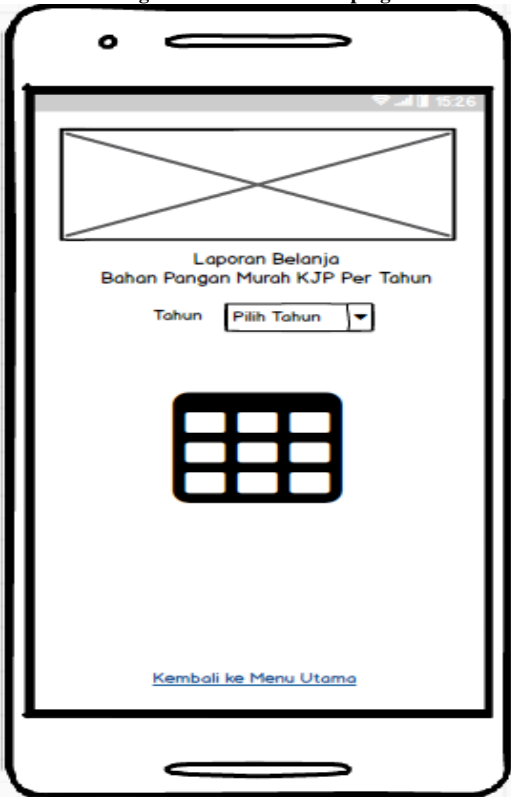


Fig. 7 Wireframe for report KJP

The following is a description of Hi-Fi in the form of a prototype that will get feedback from the respondents prepared by the researchers. The prototype for the KJP-Shop is divided based on two profiles, namely KJP users and sellers in the KJP market. The prototype for KJP-Shop users is designed as follows:



Fig. 8 Homescreen of KJP-Shop Application
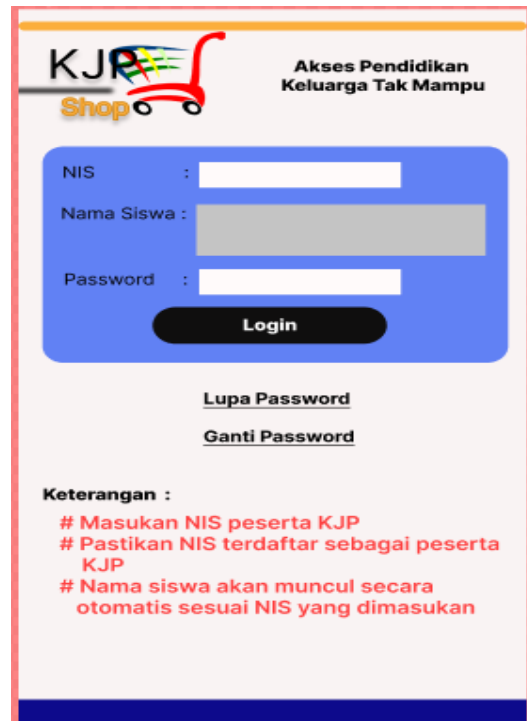


Fig. 9 Login Appearance for KJP Users

**Fig.10 Menu Appearance for KJP Users**



**Fig.11 Menu Appearance of Cheap Food Shopping**

### 4.5. Evaluate the designs against requirements

Evaluating the design that has been designed showed that the user's goals have been achieved.[17] At this stage, the continuation of the design solution has been made by the application developer to be shown to users.[24] The users will evaluate the application's features through a usability test using USE questionnaires. From the USE questionnaire, the application developer got input from the user to improve the user interface. This evaluation process was carried out repeatedly to get the appearance desired by each user.[20] This study conducted usability tests on 30 KJP users and 5 sellers in the KJP market.

**Table 4. Profile of Respondents by Sex**

| No. | Sex | Number | Percentage (%) |
|-----|-----|--------|----------------|
| 1. | Male | 5 | 14% |
| 2. | Female | 30 | 86% |

According to the Ministry of Health in 2009, age is divided into 9 groups: toddlers, kids, early teens, late teens, early adults, late adults, young-old, middle-old, and oldest-old. Age is a necessary criterion in making applications.[23] In this study, the distribution of the respondent groups is as follows:

**Table 5. Profile of Respondents by Age**

| No. | Age Range | Number | Percentage (%) |
|-----|-----------|--------|----------------|
| 1. | 26-35 (early adult) | 10 | 29% |
| 2. | 36-45 (late adult) | 25 | 71% |

To examine the ability to use the KJP-Shop application, the authors needed to know the education level of the respondents, so a table of respondents' profiles was made based on their education level.

**Table 6. Profile of Respondents by Education Level**

| No. | Educational Stage | Amount | Percentage (%) |
|-----|-------------------|--------|----------------|
| 1. | High School | 20 | 57% |
| 2. | Diploma III (D3) | 4 | 11% |
| 3. | Bachelor's Degree (S1) | 6 | 17% |

Data of the dimensions of the variables analyzed in this study were shown to respondents using a scale of 1 to 5 to obtain ordinal data and scored as follows:

**Table 7. Score Table**

| | PK | KMS | KM | CM | M | SM |
|---|-----|-----|-----|-----|-----|-----|
| Score | | 1 | 2 | 3 | 4 | 5 |

Description:
| | |
|---|---|
| PK | = questionnaire question |
| KMS | = very difficult |
| KM | = rather difficult |
| CM | = rather easy |
| M | = easy |
| SM | = very easy |

The first step in usability testing was to give the users some tasks prepared when interacting with the prototype of the tested system. The tasks were given to 35 respondents from the KJP user community and sellers who already knew the design of the KJP-Shop application to prepare themselves. These tasks were used as a means of interaction in measuring usability, and the tasks in this test were divided into two for KJP users and sellers in KJP markets.

**Table 8. Tasks of Usability Testing for KJP User**

| | Tasks Description |
|---|---|
| Task 1 | Open the KJP-Shop application and pay attention to the home screen of the application |
| Task 2 | Go to each accessed page, pay attention to the main menus |
| Task 3 | Go to the user profile menu |
| Task 4 | Open the KJP balance menu and check the KJP funds that have been received |
| Task 5 | Open the KJP shopping application, make shopping transactions by selecting the market area, selecting the pick-up time, selecting the market, and finally selecting the cheap food items to be purchased, and then the data are stored; and take the queue number |
| Task 6 | Select the queue button to proceed to the next page, which contains information on the food purchased, time, place, and appearance of the queue number |
| Task 7 | Open the history of KJP spending that has been done so far, and it can be searched by year |
| Task 8 | Open How to the menu (how to use the application) |
| Task 9 | Trying the logout menu to exit the application of each access space |

**Table 9. Tasks of Usability Testing Tasks for Cheap Food Sellers**

| | Tasks Description |
|---|---|
| Task 1 | Open the KJP-Shop application and pay attention to the home screen of the application |
| Task 2 | Go to each accessed page, pay attention to the main menus |
| Task 3 | Go to the user profile menu |
| Task 4 | Open the Shopping Participants List menu to see a list of participants who will shop for KJP according to the selected time. This list can be printed to match the queue number and the selected item list |
| Task 5 | Open the Detail Link on the shopping list to see cheap food items selected by KJP users |
| Task 6 | Open the KJP Member Shopping Update menu, which functions to update the KJP participant data, which initially has not completed a transaction to a completed transaction by checking the box provided |
| Task 7 | Open the KJP cheap food data input menu, which functions to input the amount of cheap food sold and the remaining ones |
| Task 8 | Open the annual Cheap Food Ingredients Report menu, which functions to provide information on the list of cheap foods that have been input |
| Task 8 | Open How to the menu (how to use the application) |
| Task 9 | Trying the logout menu to exit the application of each access space |

Questionnaires were given to respondents who had completed the tasks above to obtain user experience on the appearance of the application being tested. The questionnaire contains 13 questions that represent the five aspects of usability. By calculating the average score of each component on the USE questionnaire, if it has reached the resolved value of 85%, it is declared to have met the user's needs. Each question in the questionnaire aims to indicate the level of usability according to user acceptance which will be assessed on a scale of 5. According to ISO, usability is the extent to which users can use a product to achieve their goals effectively and efficiently. According to Jacob Nealson, usability has five quality attributes, namely:

1. Learnability shows how easily users can learn key system functions and achieve the skills to do the task.
2. Efficiency shows how quickly users can do their tasks using the system after learning about it.
3. Memorability is very important so that users who do not regularly use the application can use the system without having to study again. This feature helps users remember how the system works after a certain period of use.
4. The error shows several user errors and how easily they can rectify them.
5. Satisfaction indicates whether the user is happy or not in using the system.

The questions that will be asked refer to 3 aspects: System, User, and Interaction.

**Table 10. List of Questions for Respondents**

| SYSTEM | |
|---|---|
| No. | Questions |
| 1. | Is it easy to recognize the KJP-Shop application interface? |
| 2. | Is it easy to operate KJP-Shop? |
| 3. | Does the color display on the KJP-Shop |

| | application look comfortable and not boring? |
|---|---|
| | **USER** |
| 4. | Is it easy to understand symbols, icons, and images? |
| 5. | Is it easy to find information on the KJP-Shop application? |
| 6. | Is it easy to download the KJP-Shop application? |
| 7. | Is it easy to recognize the menu display in the KJP-Shop application? |
| 8. | Is the text easy to read? |
| | **INTERACTION** |
| 9. | Is the data security of all information in KJP-Shop guaranteed? |
| 10. | Is it easy to access the information offered? |
| 11. | Do the functions offered to match the purpose of the application? |
| 12. | Is it easy to access the shopping transactions? |
| 13. | Is it easy to remember the KJP-Shop menu and display? |

The questions were then distributed to the respondents. The following is data from respondents, with 13 questions and 35 respondents.

**Table 11. Data Processing Respondents Response**

| Criteria | Usability calculation | Score | Description |
|---|---|---|---|
| System | 525 | 91,05% | Suitable |
| User | 1050 | 89,048% | Suitable |
| Interaction | 700 | 91,14% | Suitable |

Using the formula to calculate, the score of each factor (System, User, and Interaction) was obtained. The System factor score is 91.08%, the User factor score is 89.05%, and the Interaction factor score is 91.14%. Based on the same formula, the total Usability score is 90.15%. The following is the usability value as outlined in the form of a graph:
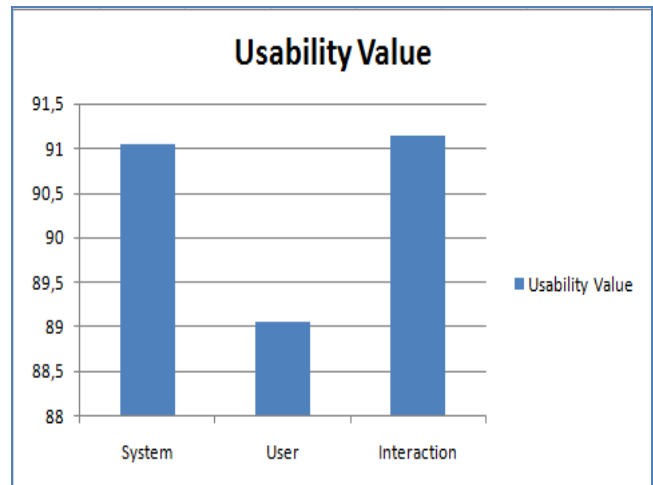


**Fig. 12 Usability Value Graph calculation results**

## 5. Conclusion

Based on the results of the respondents' responses in the table above, most respondents answered "easy" and "very easy" that the KJP-Shop application has very good functionality. Based on the results of the respondents' responses in the table above, most respondents answered "easy" and "very easy" that the KJP-Shop application has very good functionality. The percentage of respondents' response scores is 90.15%, which is in the "Very Good" category. Thus, based on the table above, it can be concluded that the level of functionality of the KJP-Shop application is included in the "Very Good" criteria, with a percentage of 90.15%.findings and implications of the work, highlighting its importance and relevance.

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