

DESIGN THINKING APPROACH FOR OPTIMIZING TRANSACTION IN ANDROID-BASED CAMPUS CANTEENS

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Abstract

Android is extensively used by some startups for food ordering applications, such as go food, grab food, Shopee food applications. However, the application cannot be used in a small scope such as the canteen on campus. At STMIK Amik Riau, the existing canteens still use manual methods in ordering and payment, therefore to facilitate canteen transactions, innovation was carried out, namely by using the e-canteen application. This application was created to make it easier to order menus, find out what menus are on that day and to prevent purchases without making payments. The e-canteen application had several features such as the name of the canteen, selection of available menus, menu prices, and payment processing. The making of e-canteen used a design Thinking approach. Design Thinking is a creative approach that collects ideas directly from application users. Design thinking has several stages, such as: empathize, define, ideate, prototype and test. The testing process showed how the target users interacted with the prototype that had been created. The results obtained from this study demonstrated that the e-canteen application significantly facilitated canteen services by simplifying the ordering and payment processes. Specifically, users were able to place orders more efficiently and complete payments seamlessly, which improved overall user satisfaction and operational efficiency within the campus canteen.

Keyword: Android, Design Thinking, e-Canteen, STMIK Amik Riau, Usability Testing

INTRODUCTION

The canteen is a place which visitors can use to eat where there is a transaction between the seller and the buyer (Rachmadewi et al., 2021). Each school or campus in general has provided a canteen. The canteen is a mandatory facility in a school because its existence is needed (Fabre & Pacpaco, 2020). Usually, the canteen becomes a gathering place for students. Ordering, payment, and sitting are the principles of the users of the canteen facilities. Apart from being a place to buy food or drinks, most students consider it important that the canteen is a place to socialize or a gathering place for the whole batch (Agustini et al., 2022). Canteens in general still have substandard quality due to the lack of land area and narrow canteen buildings (Kandarina et al., 2020) and canteens still apply conventional methods from ordering to payment (Dali et al., 2020). The same is the case with canteens in universities in Indonesia.

A university cafeteria is a storefront rented out to merchants by campus administrators to provide a variety of foods for students, faculty, and staff. So far, the canteen service system still uses manual methods in ordering and must visit canteen outlets first to find out the menu that is on that day. However, sometimes the desired menu in the canteen has run out. To facilitate this, an innovation has been made to use the electronic canteen application.

The e-canteen is an electronic information-based application accessible online, providing a list of canteens, technical specifications, food types, menu lists, and food prices (Absari et al., 2023). Previous research designed the e-canteen application using waterfall stages in the form of a mobile application (Pratiwi et al., 2021). Another study developed the e-canteen with cashless payments to address the issue of inflexible payment transactions (Fonggo et al., 2020). The system was based on Android because this operating system is widely used today, and most students have Android-based mobile phones compared to other operating systems (Malhotra et al., 2020). In this study, researchers created a mobile-based canteen system using a design thinking approach.

Design thinking considers user needs for innovation and combines them with appropriate technological capabilities, resulting in a feasible and effective business product (Imanuela Putri & Dahlia, 2023). It consists of five stages: empathize, define, ideate, prototype, and test (Juniantari et al., 2023). During testing, it showed how target users interacted with the prototype created earlier.

The e-canteen application was designed to simplify menu ordering, provide daily menu information, streamline the ordering process, and prevent unpaid purchases. It includes features such as registration, login, canteen name, menu selection, menu prices, and balance information.

METODE PENELITIAN

The methodology used for this study was conducting a literature review by looking for theoretical references that are relevant to the case or problem found. Literature study is a research method used by collecting various kinds of information, theories and references that are in accordance with the research carried out to discuss and provide reviews on a problem (Snyder, 2019). In addition, this research used the research methodology of Design thinking which is a creative and practical way of thinking in solving problems or work. Design Thinking has five stages, namely: empathy, defining problems, determining ideas, making idea designs, and testing. The steps of Design thinking can be seen in figure 1 below:

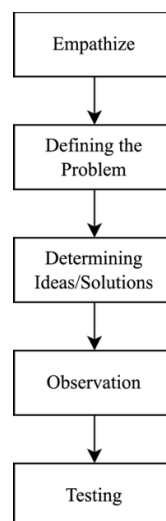


Figure 1. Stages of Design Thinking

The following is an explanation of figure 1.

Empathize

Empathize is a process of finding references that are relevant to the case because the problems that arise must be solved in a human-centered way. This method seeks to understand the problems experienced by users so that we can feel and find solutions to these problems. In this method there were several things that must be done, namely observation and interviews (Cleckley et al., 2021).

1. Observation

Field observation is a technique that directly observes the actual situation in the field. This observation also aims to understand the problems facing canteen owners and users. In this case, observations were made on the canteens in STMIK Amik Riau.

2. Interview

Interview is a question-and-answer process to canteen owners and canteen users to find out the obstacles and problems in the canteen, as well as to find out the inputs from their statements. This interview also aims to understand the problems faced by canteen users. Table 1 is a list of questions asked with customers of the STMIK Amik Riau canteen.

Table 1. Interview Questions

No	Questions
1.	Are you among the customers who like to buy food/drinks in canteen?
2.	Are you among the customers who like to eat in canteen?
3.	Are you having trouble buying food/drinks in canteen? Name what difficulties you're going through?
4.	Do you have any difficulties when you want to pay for your order? Name what difficulties you're going through?
5.	Do you find it helpful to have an app for ordering and canteen payments?

The questions contained in table 2 were then distributed via the Google form to students and asked directly to the canteen owner. The results of this questionnaire are used to define the problem at a later stage.

Defining the Problem

After understanding the problem from the results of distributing questionnaires and interviews at the empathy stage, then the process of defining the problem was carried out in the STMIK Amik Riau canteen. then determine the problem statement as the research topic to be raised. The problems found from the results of interviews and distributing questionnaires revealed that the actors (students and canteen owners) needed a application system that could solve their problems. With this system, it is hoped that buying and selling activities in the canteen can run effectively and efficiently.

Determining Ideas/Solutions

Ideate is the process of looking for solution ideas that are used to solve existing problems. This process concentrated on generating ideas as a basis in making prototype designs to be made (Eftekhari et al., 2021). The application system built in this study is the e-canteen. The e-canteen application is designed to make it easier to order menus, find out what menus are on that day and can simplify the ordering and payment process and prevent purchases without making a payment. The E-Canteen application has several features such as registration, login, canteen name, selection of available menus, menu prices, and balance info.

Observation

After the idea or solution had been determined at the previous stage, the next step was to make a design of the idea or solution. Detailed design was necessary to explain the workflow of a system in detail. With the construction of this detailed design, the shape of the application display was known.

1. Software Design

This research on software design used Unified Model Language (UML) to describe all existing processes and objects. One of the UML tools used in this study was the Use Case. Use cases

were used in system analysis to identify, classify and regulate system requirements (Voutama & Novalia, 2022; Widyawati et al., 2023).

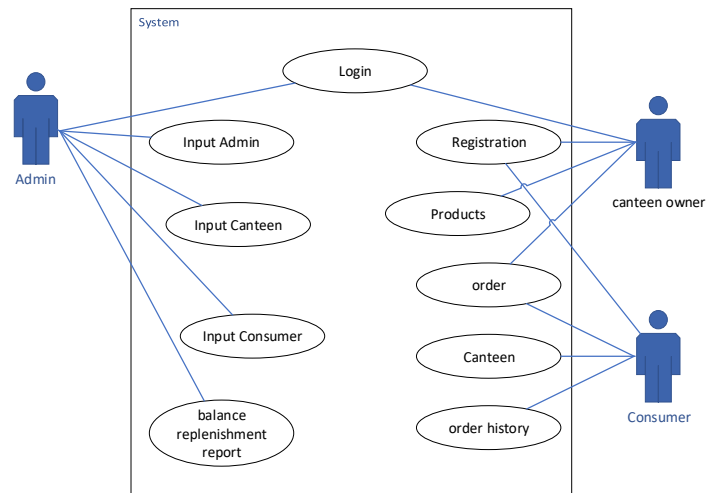


Figure 2. Use Case Diagrams

The following is a description of figure 2.

- The admin logs into the e-canteen application, then carries out the input process for admin, canteen, consumers.
- The owner of the canteen registers in the e-canteen application, after being successful then logs in. On the product menu, the canteen owner will input a list of available food and drinks.
- Consumers or students also register on the e-canteen application. After successfully logging in and selecting a canteen to order food or drinks without having to come to the canteen first. Before making the order process, consumers are required to fill in the balance first. Then process orders and make payments by cutting the balance in the application.
- The canteen owner will see the order menu and prepare the ordered food or drink and receive payment through the application.
- Consumers can view order history through the order history menu.
- Admin can view transaction reports.

2. User Interface Design

After knowing the users of this application, the next step is to design the interface. This interface design is done by providing a prototype to the user so that the deficiencies of the application design are known before it is built. In addition, this design can also be changed according to the user's wishes if the design presented is still considered not to meet the user's wishes. By carrying out this process, it is expected that the application that is built can run well and be used on an ongoing basis. The following is the interface design or prototype in this study.

- Canteen Registration Page

The registration page is a page where users register a new account into the system which can later be used to log into the system to then be able to carry out activities in the application. The display can be seen as shown below.

- Canteen Login Page

The canteen login page is the page where the user will first enter the system. In this login display there are two buttons, namely the login button and the registration button.

- Home page
 On the home page, there is information on the name, cell phone number and balance amount of the account owner as well as transaction history information.
- Product Input Page
 The product input page is a page where users with canteens can input product data into the application.
- Order Menu Page
 Users with canteens can see a list of orders entered through the e-canteen application. In this menu users can change the order status to completed orders. The appearance of the order menu page can be seen as shown below.

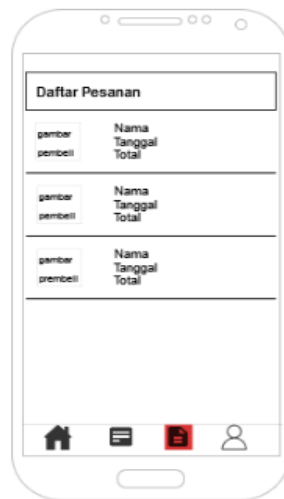


Figure 3. Order Menu Page

- Transaction History Menu Page
 The transaction history page is a page where customers can look back at product orders that have been made before. The appearance of the history page can be seen as shown below.

After the prototype is complete, the next step is to create the application.

3. Observation

Testing is the last stage in the thinking method design. The e-canteen application that had been created was conducted an experiment with the user. The e-canteen application was tested in two phases: questionnaire usability testing and black box testing. At this stage, it was known whether the user finds it difficult or not to use this e-canteen application. All depend on the user's ease of using the application. Usability testing has 4 variables, namely learnability, Efficiency, Errors, and Satisfaction (Anam et al., 2021). To make a questionnaire, this study refers to previous research (Cimpago & Kusuma, 2024). The following are questions on usability testing.

Table 2. Usability testing questionnaire questions

Variable		Questions
Learnability	1	Is the appearance of the e-canteen application easy to understand?
	2	2 Is the e-canteen app menu easy to use?
Efficiency	1	Is the button feature easy to use?
	2	Does the application respond quickly?

Errors (Errors and security)	1	Are there any problems when the application is used?
	2	Is there any indifference in using this application?
Satisfaction	1	Are you satisfied with the appearance of the e-canteen application?
	2	Are the features of the e-canteen application suitable with what you want?

RESULT AND DISCUSSION

The result of the design created was the combination of programs into applications. During this phase, the designed application worked and what the performance of this application was known and investigated. The results of this application come from the design and phases of the previous chapter. The prototype was made with figma. This application was built using Android Studio, Visual Studio Code as a page flow, and using a button when building the application. The application has several menu pages, an administrator side view, a user application side view, and a cafeteria owner application view. This study also used two types of testing to refine the e-canteen application. The first testing method was black box testing, which was used to identify program errors. The second testing method was usability testing, which involved distributing a questionnaire to 20 students from the sixth semester or higher at STMIK Amik Riau. This group was chosen because they have already studied various programming and UI/UX courses.

User Interface

This stage was the user interface design analysis. The design was used as a reference in the creation of pages in this application. On the display of the STMIK Amik Riau e-canteen page, there are several views, as follows:

- Admin list page
 On the admin list page there is the name of the registered admin and admin information, such as: name, cell phone number, address, username, password and button to add an admin.
- Canteen List Page
 On the admin menu page, you can see the canteen data in the system, such as name, mobile phone number and email.
- Customer List page
 On the customer list page, the admin can see a list of customers in the system, such as name, mobile phone number, email, balance and the action to add balance.
- Balance Input Page
 On the customer list page, there is an add balance action and when accessed, inputs will appear to add balance such as: buyer's name, mobile phone number, balance amount, date, and description. Here the amount of balance to be added has been determined by the amount of Rp.20000, Rp.50000, Rp.100000, Rp.120000, and Rp.150000. The display of the added balance can be seen in the picture below.
- Balance Replenishment Report page
 The balance replenishment report page is a display where the admin can see the balance replenishment report. The balance replenishment report can be displayed based on date, month and year, the display of the balance replenishment report can be seen as shown below.
- Canteen sales report page
 The canteen sales report page is a display where the admin can see the sales report. The sales report can be displayed based on the canteen, date, month and year; the balance replenishment report display can be seen as shown below.

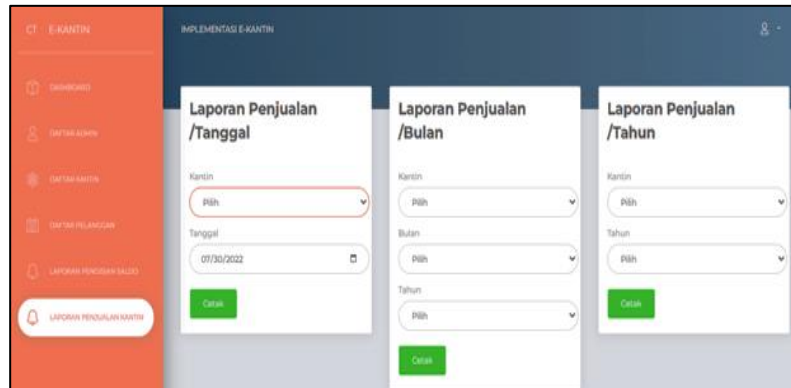


Figure 4. Sales report page view

- Login page
On the login page there are 2 inputs such as: email and password.
- Home page
On the home page, there is information on the name, cell phone number and balance amount of the account owner as well as transaction history information.
- Product input page
On the product input page there are food or beverage menus that have been inputted and on this page the canteen account owner can input product data, edit and delete the data in the canteen through the smartphone application.
- Incoming order list page
The entry order list page contains a list of orders that are entered through the e-canteen application. In this menu users can change the status of the order to complete order. The display can be seen as shown below.
- Order history page
On the order history page, users can see back product orders that have been made before. The appearance of the history page can be seen as shown below.

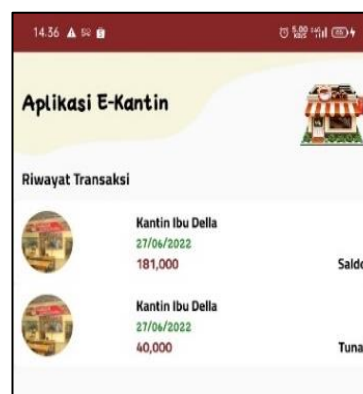


Figure 6. Order history page

- Account page
On the user account page, you can see the photo, name, mobile phone number, email, and password that have been entered when registering, and can edit it. The appearance of the user account and the owner of the canteen is still the same.

Black Box Testing

Black box trials were carried out in order to find out whether the application created can run well in terms of logic and functions to be feasible to implement (Maulana & Voutama, 2023; Sekarwati et al., 2021). The testing technique used a black box, which aims to find programming and functional errors and ensure that all parts are tested (Sholeh et al., 2021). The test can be seen in the following table:

Table 3. Testing Using Blackbox

No	Testing Items	Good	Poor	Very Poor	Descriptions
1	Register Page	√			Successful
2	Login page	√			Successful
3	Product Input Page	√			Successful
4	Login Order List page	√			Successful
5	Canteen List page	√			Successful
6	Order history page	√			Successful
7	Details of canteen	√			Successful
8	Account Pages	√			Successful

For black box testing, testers also tested on Android devices. The application was tested directly on mobile phones with versions 8.0, 9.0, 10 and 11. The testing technique used an android device, which aims to find out whether the device version can use this application or not. The test can be seen in the following table:

Table 4. Testing Using Android Devices

No	Device Type	Android Version	Successful	Unsuccessful
1	Xiaomi Redmi 4X	8.0	√	
2	Samsung Galaxy A30	9.0	√	
3	Xiaomi Redmi 10a	10.0	√	
4	Oppo A5 2020	11.0	√	

The Test Usability Testing

Before testing usability, first the researchers conducted a validity and reliability test. Validity test refers to the consistency and accuracy of scores on questionnaire tests used to measure the validity or invalidity of a questionnaire (Dyon et al., 2024). Each questionnaire question was tested into an r value formula with the provision of criteria if the r value > the r table then it can be said to be valid. If the r value < the r table, then it can be said to be invalid (Anam & Ulayya, 2020). In this study, respondents numbered 20 from canteen owners and canteen users. The results of the validity test can be seen in the table below.

Table 5. Validity Test

Variable	Indicator	r value	r table	Description
X1: Learnability	X1.1	0,927	0,433	Valid
	X1.2	0,933	0,433	Valid
X2: Efficiency	X2.1	0,938	0,433	Valid
	X2.2	0,923	0,433	Valid
X3: Errors	X3.1	0,870	0,433	Valid
	X3.2	0,860	0,433	Valid
X4: Satisfaction	X4.1	0,801	0,433	Valid
	X4.2	0,865	0,433	Valid

Based on Table 5 above, we find four variables to study. Each variable question item has a value of r value than r table. From this it can be concluded that the questionnaire data collected has been declared valid. The r table value is 0.433 because the number of respondents is 20 people. After the validation test was carried out using SPSS, all r values were above 0.433 ranging from 0.801 to 0.938.

After conducting the Validity test, the next step was to conduct a reliability test. The reliability test of the questionnaire instrument is a test used to determine whether the questionnaire used in a study is reliable or not. A variable can be said to be reliable if the Cronbach Alpha value is > 0.60 (Erlinda et al., 2020). The results of the reliability test by using SPSS can be seen in

table 6 with the Cronbach Alpha value was $0.960 > 0.60$ which means that the e-canteen application research can be said to be reliable.

Table 6. Reliability Table

Reliability Statistics	
Cronbach's Alpha	N of Items
,960	8

After doing the two tests above, the next step was to do a usability test. Usability testing was carried out to find out whether the e-canteen application had obtained results that suit the needs of users or not (Anam et al., 2023). In table 8 it can be seen that learnability, efficiency, and satisfaction get an average value of 8.65 to 9.30. While the error value gets an average value of 3.40, this is because the user does not get any significant problems in using this e-canteen application. This result is obtained from equation 1.

$$P = \frac{f}{N} x 100 \tag{1}$$

Where:

P: Presentation Figures

f: frequency

N: number of frequencies

100: constant number

Table 7 is the result of formula 1.

Table 7. Answer Recapitulation Results

Variable	Number of Respondents	Min Value	Max Value	Sum of Values	Average
Learnability	20	5	10	173	8,65
Efficiency	20	6	10	173	8,65
Error	20	2	6	68	3,40
Satisfaction	20	7	10	186	9,30

After the results of the recapitulation of answers from respondents were obtained, then a questionnaire calculation was carried out to obtain percentage results from each usability testing category. The following is the percentage of results obtained using formula 2.

$$\bar{x} = \frac{x}{n} \tag{2}$$

Where:

\bar{x} : Calculation average

x: Total number of answers

n: Total answer results

Table 8 is the result of formula 2.

Table 8. Percentage Result

No	Variable	Average value
1	Learnability	87%
2	Efficiency	87%
3	Error	34%
4	Satisfaction	93%

In the table above, it can be seen that learnability has an average value of 87%, which means that respondents strongly agree that the e-canteen application is easy to use. Efficiency has an average value of 87% which means respondents strongly agree that the e-canteen application is easy to use. An error with an average value of 34% means that respondents do not agree with any constraints on the application. Meanwhile, the average satisfaction value is 93%, which means that respondents are very satisfied with the e-canteen application. Eligibility categories are based on the following criteria (Riduwan, 2020):

Table 9. Eligibility Categories

No.	Value Percentage	Category
1.	0 – 21 %	Very Poor
2.	21 – 40 %	Poor
3.	41 – 60 %	Quite Good
4.	61 – 81 %	Good
5.	81 – 100 %	Very Good

The average percentage for each usability test variable can be determined for all variables by summing the variable's total average percentages and dividing by the number of variables. This gave us the sum of all variables, or 75%. This means that most respondents agreed that her e-canteen application was feasible. The result is the critical part of the research article containing research findings and hypothesis testing results. A table and graphics are highly recommended to visualize the result. Discussion is an essential part of the overall content of scientific articles. The objectives of the discussion are: To answer research problems, interpret findings, integrate findings from research into existing knowledge sets, and develop new theories or modify existing methods.

CONCLUSION

After seeing and observing the application from the results and discussions obtained on the completed application, it can be concluded that the e-canteen application was created to make it easier for canteen owners and users to order menus, find out what menus are on that day and can facilitate the order process and prevent purchases without making payments. Then the results of the Black box test on the e-canteen application were declared successful. In the *Usability Testing* test on the e-canteen application, learnability was obtained to have an average value of 87%, which meant that respondents strongly agreed that the e-canteen application was easy to use. Efficiency had an average value of 87% which implied respondents strongly agreed that the e-canteen application was easy to use. An error with an average value of 34% showed that respondents did not agree with any constraints on the application. Meanwhile, the average satisfaction value was 93%, which indicated that respondents were very satisfied with the e-canteen application.

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