Mobile Based Application Design of Management System "Travel Budget" Using Flutter

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Abstract
Nowadays, many people participate in traveling as their preferred leisure activity. When traveling, unexpected circumstances can arise, including changes in travel plans, unforeseen expenses, medical costs, or alterations to meal plans, which may require additional budgeting. Recording expenses during a trip allows travelers to allocate their budget effectively for transportation, food, lodging, tourist activities, and other expenses. To solve this problem, this study aims to design a mobile management system called "Travel Budget" using Flutter to assist users in recording their travel expenses while visiting a specific country. Both the qualitative method and the Research and Development (R&D) method using the 4D approach will be used in this study. With this research, it is hoped that it can bring benefits to the travelers who need to track their expenses, increase the knowledge of the public and readers about mobile based application, and become a reference for the next research.

Keywords: Flutter, Travel, Mobile

Introduction
Nowadays, numerous individuals partake in traveling as their primary form of leisure. Traveling is an activity that takes place outside of everyday routines and allows for the exploration of new places, interaction with different cultures, and the creation of lasting memories (Fauzi et al., 2023). In each journey, preparation is necessary to ensure a seamless travel experience. Planning an itinerary is a vital component of travel preparation, including the organization of finance or the creation of a travel budget.

When traveling, unexpected circumstances can arise, including changes in travel plans, unforeseen expenses, medical costs, or alterations to meal plans, which may require additional budgeting. All of these factors can significantly impact one's finances while traveling. Thus, it is vital for every traveler to engage in careful financial planning and prepare for unforeseen issues. This can be achieved by devising a budget and effectively managing one's finances (Sudirman et al., 2021).

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Money is a factor that is an important factor in everyday life because with money a person can fulfill their needs, including traveling (Trivaika & Senubekti, 2022). Managing finances, commonly known as budgeting, is a crucial step towards ensuring a smooth and well-planned trip (Pratiwi & Rani, 2023). Recording expenses during a trip allows tourists to better allocate their budget for transportation, food, lodging, tourist activities, and other expenses. This objective approach presents a clearer view of their spending. This helps to prevent out-of-control spending that may compromise financial stability while traveling.

With the advancement of technology, budgeting can now be done digitally from anywhere (Hanum & Saifudin, 2019). Travelers conveniently track their finances using a smartphone. Smartphones can already be categorized as one of the basic needs of today's society (Liang & Susanto, 2022). However, using apps such as *Notes* or any other similar-looking app may not be efficient and could be similar to manual note-taking. It can also lead to confusion upon reviewing the records. Thus, a financial note-taking application is necessary to simplify expense tracking for users.

The purpose of this research is to design a mobile management system known as 'Travel Budget' using Flutter to facilitate users to record their travel expenses while visiting a spesific country. Both the qualitative method and the Research and Development (R&D) method using the 4D approach will be used in this study. It appears that there is no current literature on mobile based budgeting management system applications in Indonesia. Therefore, this study is an interesting subject and will initially be tested on Batam City users.

Literature Review

This research will attempt to relate to several previous research papers. The scientific works referenced by the author are as follows:

Research conducted by (Trivaika & Senubekti, 2022) seeks to develop an Android-based personal finance management application that provides users with information and guidance on proper financial management. The research employs the qualitative research approach of Design and Creation, resulting in a system that displays both income and expenses data. The result of this research shows that users can easily manage their finance so it can become a management finance reference.

Another study by (Winarno et al., 2022) on the development of an android-based accounting information system application to help business people in Murtigading Bantul Village to make it easier to manage finances and record transactions. This research uses the applied method of the 4D model (Define, Design, Develop, and Disseminate) with the software used to develop this application is the Unity game engine. The results of this study show that the application made has a simple appearance with quite complete features.

There is a study conducted by (Hanyfah et al., 2022) on the use of descriptive qualitative methods for processing customer data at car washes. The goal of this study is to enhance employee performance in processing customer transactions and generating efficient, accurate reports. Descriptive qualitative methods were employed with the *waterfall* development approach. The findings of this study assist in the implementation of systematized data processing among employees, reducing the occurrence of data processing errors to a minimum.

Another study conducted by (Ashari & Muharram, 2022), investigates the development of the user interface for Kolepa Mobile App. The main objective of this research is to improve user comprehension of the system and enhance the interaction between the app and users. The design thinking method is employed in this study as a problem-solving approach. The results

are based on System Usability Testing, which rates the app's user interface design with an 'A' grade.

Research by (Marimuthu et al., 2023) explores the development of Android-based College Application utilizing Flutter Dart to address educational institution's needs in supporting all devices. The application development was facilitated through the integration of Flutter Dart with Firebase integration. This research resulted in an application that guarantees privacy and security by only allowing access to authorized users associated with the institute.

Following the previous studies, the authors were inspired by (Trivaika & Senubekti, 2022) to design an android-based budgeting management system. An applied approach with a 4D model will be utilized in this study, similar to the method employed by (Winarno et al., 2022). For data collection, a qualitative approach will be employed in this study, using data collection techniques through interviews, similar to the research conducted by (Hanyfah et al., 2022) and the questionnaire provided by (Ashari & Muharram, 2022). Additionally, (Marimuthu et al., 2023) provide support for designing an android-based system using Flutter, which involves Flutter and Firebase. Therefore, the research about an android-based management system app is highly relevant.

Research Methods

In this research, the author will make a research flow as the main framework of the topic discussed by the author. The function of this research flow is to explain the stages and flow of the system design process from the beginning of problem formulation to system testing. The outline in Figure 1 illustrates the research flow.
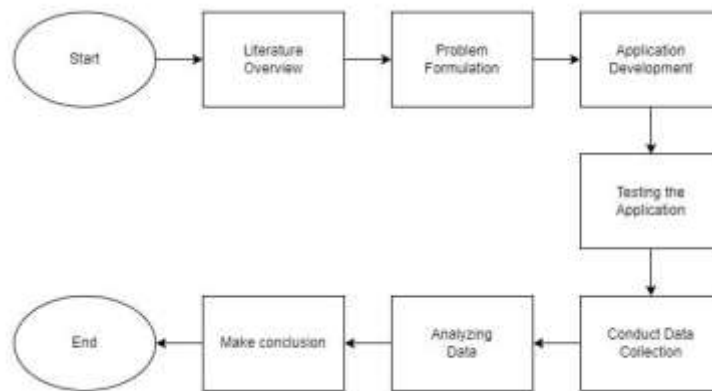

Figure 1. Research Flow

The author develops and tests travel budget applications through the implementation of the 4D method (Define, Design, Develop, Disseminate) in support of research efforts. The 4D method consists of four stages, depicted in Figure 2 below.
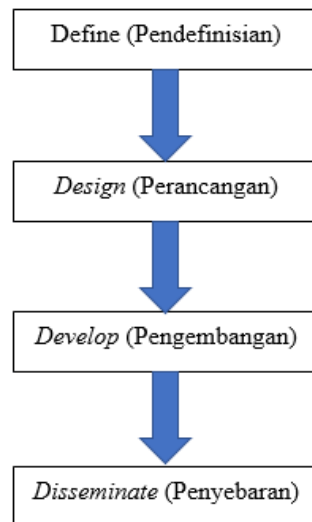
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Figure 2. 4D Model

The following is an in-depth explanation of the 4D approach (Define, Design, Develop, Disseminate) illustrated in Figure 2 above.

First is the *Define* stage, wherein the 4D model starts with pinpointing the development necessities. In this stage, the author will determine budgeting needs and gather relevant information for the budget application. The second stage in this 4D model is the *Design* stage. The author will utilize the Figma application to design the application and clearly depict its flow and outcomes. The third stage in this 4D model is *Develop*. It involves producing a development product. The author will design and assess the existing application by utilizing black box testing techniques. Additionally, implementation of the 4D model will include the *Disseminate* stage as its final phase, where the author will circulate the application to 30 individuals who are passionate about traveling.

For data collection, the author will gather 30 data points using interview questions adapted from (Ashari & Muharram, 2022) research. Presented below are the interview questions.

Table 1. List of Interview Questions

No.	Interview Question
1	Do you think that in the future you will definitely use this system again on an ongoing basis?
2	Do you feel the system is quite difficult to use?
3	Do you find this system user-friendly and easy to develop?
4	Do you need advice and help from people to be able to use this system?
5	Do you feel that the features in this system are integrated and can run as they should?
6	Do you feel that there are inconsistencies in this system?
7	Do you believe that people other than you can understand and use this system quickly?
8	Do you feel that the system is difficult to understand and confusing?
9	Do you encounter any obstacles while using this system?
10	Do you need adaptation before using the system?

Source : Author

The interview results will be analyzed using the descriptive exploratory technique, generally presenting the overall findings.

Results and Discussion

First stage is define stage or material collection stage, author starts identifies and articulates the key requirements essential for the successful development of the 'Travel Budget' application. This involves a comprehensive examination of the budgeting process to ascertain the specific functionalities and features crucial for meeting the diverse needs of users engaging in travel-related financial planning.

To guarantee the application's effectiveness, the author will examine travel budgeting intricacies, aiming to comprehend expense categorization nuances, currency conversion, and real-time tracking. This thorough exploration will establish a solid foundation for the application to cater to the unique challenges and demands of budget management during travel.

Simultaneously, the author will conduct a thorough investigation into user preferences and expectations regarding budgeting applications for travel. The research will utilize academic rigor and extend beyond anecdotal evidence by incorporating data gathered from reputable sources on the internet. By using this methodological approach, the author aims to identify not only the explicit needs of users but also to gain a nuanced understanding of the broader landscape of expectations surrounding budgeting tools during travel. This exploration ensures that the 'Travel Budget' application meets both immediate requirements and broader user experience and industry trends, contributing to overall effectiveness and user satisfaction.

Following this, the author will utilize the Figma application to design the application, outlining its flow and initial design. Using Figma, the author will create a preliminary design for the 'Travel Budget' application, starting with the Login, Register, Home, Add Notes, Converter, Profile, Notes Detail, and Add Expenses pages. This design will provide an overview of the layout of the features to be included and will facilitate the development of the application. Presented below are the outcomes of designing the 'Travel Budget' application using Figma.
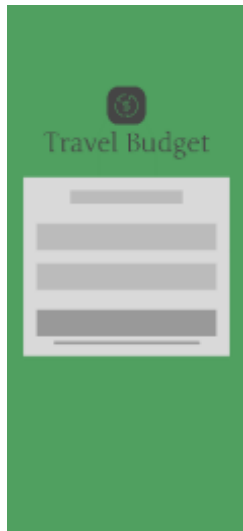

Figure 3. Login Page   **Figure 4. Register Page**   **Figure 5. Home Page**   **Figure 6. Add Notes Page**

| **Figure 7. Converter Page** | **Figure 8. Profile Page** | **Figure 9. Notes Detail Page** | **Figure 10. Add Expenses Page** |

The next stage is the implementation stage. This stage aims to produce a development product. The author will use the Dart programming language with the Flutter framework, Firebase as the application database, and the Visual Studio Code editor to develop the application. Here are some result snapshots of the 'Travel Budget' app that has been developed with Flutter Dart with Firebase integration and the 4D Method:

In Figure 11 and 12, shows the appearance of the login page and register page for the user if user doesn't have an account yet.

Figure 11. Login Page

Figure 12. Registration Page

Figure 13, 14, and 15 illustrate the appearance of the main page in this application, which consists of three main pages: the Converter Page, the Home Page, and the Profile Page. The Converter Page enables users to convert currency amounts to another currency. The Home

Page displays any notes added by the user. The Profile Page offers a list of currencies and a logout button for the user to sign out.

Figure 13. Converter Page   **Figure 14. Home Page**   **Figure 15. Profile Page**

As for Figure 16, it displays the interface of the Add Notes page, where users can input their travel plans and budget. Once submitted, they will be redirected back to the Home Page with their added notes (Figure 17). Clicking on the notes will direct the user to the Notes Detail page, as shown in Figure 19.

Figure 16. Add Notes Page   **Figure 17. Home Page (with notes)**

In Notes Detail Page, user offered an Add Expenses Page (Figure 18) where user can input their expenses when traveling. As for Figure 20 is a Edit Budgeting Page, user can modify their budgeting plan for the trip.

Figure 18. Add Expenses Page   **Figure 19. Notes Detail Page**   **Figure 20. Edit Budgeting Page**

After completing the implementation, the author strategically distributes the 'Travel Budget' application via Google Drive. Following the distribution, a targeted interview process is conducted with 30 individuals who exhibit a keen interest in travel. The interviews aim to provide valuable insights into the user experience and perceptions surrounding the application.

The results of the interviews are presented below using an affinity diagram, which is a method used to systematically collect, categorize, and organize diverse facts, opinions, and ideas (Rozi & Nugroho, 2022). The diagram, derived from the structured interview questionnaire, outlines key themes and patterns, providing insight into user perspectives, preferences, and potential areas for improvement for the 'Travel Budget' app.

Table 2. Interview Question 1

Do you think that in the future you will definitely use this system again on an ongoing basis?
"...Yes for the future, with mediocre income if not managed it will be chaotic."
"...Yes, because this system is useful in managing my finances."
"...I don't think I'll use it continuously, but I might need it when I travel abroad."

Source: Author

On first question, average users answered that they will use the app in the future. They find the system can be useful on daily basis.

Table 3. Interview Question 2

Do you feel the system is quite difficult to use?
"...I think the system is quite easy to understand, but it would be better if there are improvements in the UI section, for old people like me."
"...No, I think this system is already user friendly"
"...No, this system is simple enough to be used by ordinary people."

Source: Author

On second question, average users answered that the system is quite easy to use. Most of people can understand the system easily.

Table 4. Interview Question 3

Do you find this system user-friendly and easy to develop?
"...The system is quite easy to understand but still gets a fairly complete summary, just need to adapt it."
"...Yes, the system is easy to use and develop"
"...Yes, the system is already user-friendly"

Source: Author

On third question, in term of user-friendly system, most of users answered yes the application is user-friendly.

Table 5. Interview Question 4

Do you need advice and help from people to be able to use this system?
"...No need, maybe for the uninitiated it would be better if there is a guide that can be followed."
"...For now not yet, so far I can use this system easily"
"...No, I can easily understand and use this app without anyone help"

Source: Author

On fourth question, most of users who tried this app doesn't need help from other people to use the system.

Table 6. Interview Question 5

Do you feel that the features in this system are integrated and can run as they should?
"...As far as I'm concerned, the features meet my needs."
"...Yes, during use there have been no errors and bugs."
"...As far as I use this app, there is no errors and the features is already meet my needs."

Source: Author

On fifth question, average users answered there are no errors and bugs when they use the application. As for the application is already meet their needs.

Table 7. Interview Question 6

Do you feel that there are inconsistencies in this system?
"...So far, there is nothing that looks mismatched, but in the future, hopefully there will be additional features that can be even more helpful."
"...For now there is none."
"...No, so far I haven't found it."

Source: Author

On sixth question, most of the users said they have not found any inconsistencies in the application.

Table 8. Interview Question 7

Do you believe that people other than you can understand and use this system quickly?
"...For people who are techenthusiasts yes, but for ordinary people, they might need help."
"...Yes, because when I first used this system I did not find it difficult, especially the appearance of the system according to me is user friendly."
"...Yes, I think the application isalready easy enough to use."

Source: Author

For seventh question, average users believe other people can also understand when using this application and understand the system quickly.

Table 9. Interview Question 8

Do you feel that the system is difficult to understand and confusing?
"...So far the existing system is easy to understand"
"...No, I think this system is easy to understand and easy to use."
"...No, I already understand the system."

Source: Author

As for eighth question, most of users said the system is easy to understand and use.

Table 10. Interview Question 9

Do you encounter any obstacles while using this system?
"...During my usage, I did not encounter any obstacles."
"...I don't encounter any obstacles when using the app"
"...So far, I don't encouter any obstacles"

Source: Author

On ninth question, during their usage, most of users said there are no obstacle when they use the application.

Table 11. Interview Question 10

Do you need adaptation before using the system?
"...Yes, I need to adapt, because this is the first time I use the money management system."
"...Yes I do, but does not require long time"
"...No, because the system is designed in a simple and easy to understand way."

Source: Author

On last question, some of the users need adaptation when using the application but does not require long time to adapt.

Based on the interviews conducted, users reported high levels of satisfaction with the Travel Budget application. Specifically, users appreciated the user-friendly interface, ease of navigation, and functionality that effectively assisted them in planning and managing travel budgets. Additionally, users found the informative financial reports and seamless integration with digital payment methods to be valuable features. Overall, the interview results indicate that 'Travel Budget' offers a satisfactory experience for users, demonstrating the app's added value in supporting financial planning during their travels.

Conclusions

The study demonstrates that the 4D Model and Flutter Dart are suitable for developing an Android app. The research results, obtained using qualitative methods and displayed in categorized affinity diagrams, indicate a positive reception of the 'Travel Budget' app.

To enhance the comprehensiveness and thoroughness of the research on travel budgeting apps, future work will entail analyzing a wider range of users and ensuring security.

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