DEVELOPMENT OF AN ANDROID-BASED BICYCLE AND SPARE PARTS SALES APPLICATION AT THE ADAN ADEN BICYCLE SHOP

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Article Info	ABSTRACT
	In today's digital era, the existence of Android-based mobile applications has become an integral part of daily life, especially in the context of business and marketing. This research focuses on the development of a spare parts and bicycle sales application implemented at the Adan Aden Bicycle Shop in Cianjur, West Java. The main purpose of this application is to facilitate the online sales and promotion process, expand market reach, and improve the efficiency and effectiveness of business transactions. The application developed consists of two main parts: the My ADD Bike application for customers and the ADD Bike application for store admins or employees. These two apps are connected through Google Firebase's data storage admin server. The methodology used in the development of this application is Extreme Programming, with Kotlin and XML as the programming languages. Application testing is conducted using the blackbox method to ensure all system functionality is running properly. The results of this study show that Android-based sales applications can be an effective solution to improve business performance in the retail sector, especially in bicycle and spare parts sales. With this application, Adan Aden Bicycle Shop can promote and sell not only directly through physical stores and social media, but also through a wider digital platform.

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1. INTRODUCTION

In today's digital era, smartphone penetration has changed the business landscape significantly. With the ease of internet access and the prevalence of mobile devices, consumers now prefer transactions that can be done instantly and conveniently from the palm of their hand. This encourages companies and retail stores to innovate in their sales strategies, including the transition to online platforms.

Adan Aden Bicycle Shop in Cianjur, West Java, is an example of a retail business that has great potential to develop its business through the use of information technology. Currently, the store still relies on direct sales and promotion through social media which has limited reach and effectiveness. Therefore, there is a significant opportunity to develop mobile applications that can facilitate the sale and promotion of bicycle products and spare parts online.

In developing an Android-based sales app, some of the key issues identified include:
1. Limitations in marketing and sales strategies that have not made full use of online platforms.
2. Difficulty in providing accurate and up-to-date information regarding product availability and specifications.
3. The need to create a more convenient and efficient shopping experience for consumers.

Based on the identification of the problem, the formulation of the problem to be studied in this article is:
1. How to design and develop an efficient and effective Android-based sales system for Adan Aden Bike Shop?
2. How can apps help stores reach a wider market and increase sales?
3. What are the features needed in the app to support promotional and sales activities?

In the modern business world, sales play an inseparable role in the success of a company. Sales can be interpreted as the process of delivering goods or services to consumers in exchange for money[1]. This aspect is an important indicator that reflects the company's progress and growth. With the development of technology, online sales have become a dominant trend. Various payment methods, ranging from online credit cards, electronic money transfers, to the Cash on Delivery (COD) system, provide convenience and speed in transactions, as well as open up wider market opportunities for companies[2].

On the other hand, spare parts have an equally important role in supporting the smooth production process. Each spare part is designed with a specific function, ensuring that machines and equipment can operate optimally. Efficient availability and management of spare parts is key to maintaining productivity and reducing downtime in production[3].

Bicycles, as an environmentally friendly means of transportation, have undergone a significant evolution. From just a simple means of transportation driven by human power, bicycles now come in various types and designs that are tailored to the needs of users and terrain conditions[4]. City bikes, for example, are designed for efficiency in short-distance urban commuting. Hybrid bikes offer a combination of comfort and stability, ideal for everyday use. For more challenging terrain, mountain bikes are a great choice with their ability to conquer rocky and muddy routes[5]. Meanwhile, attraction bikes are specifically designed for performing tricks and maneuvers, and folding bikes offer a practical solution with ease of storage and transportation[6].

Each type of bicycle has unique characteristics and is designed to meet the specific needs of its users. Thus, choosing the right bike can improve efficiency, comfort, and safety in cycling, while supporting a more active and sustainable lifestyle[7].

Here are some literacy from our reseacrh:
1. Information Techonolgy and E-Commerce
   In the last decade, information technology has undergone rapid development and has become a key in business transformation. E-commerce, as one of the applications of information technology, has changed the way companies interact with their consumers. E-commerce platforms allow businesses to reach a wider market, reduce operational costs, and improve customer satisfaction through faster and more personalized service.
2. Mobile Application Development
   The development of mobile applications has become an inevitable trend in the information technology industry. The mobile application makes it easy for users to access information and services anywhere and anytime. In the context of retail sales, mobile apps allow stores to provide customers with easy product information, promotions, and purchase transactions.
3. Extreme Programming (XP)
   Extreme Programming (XP) is a software development methodology that emphasizes speed and flexibility in the development process. XP uses an iterative and incremental approach, allowing development teams to adapt to changing needs and requirements quickly. XP is perfect for projects that have unclear requirements or that tend to change.
4. Firebase and Cloud Computing
   Firebase is an app development platform provided by Google, which offers a variety of backend services such as realtime databases, user authentication, and hosting. Firebase allows developers to build scalable and secure applications without the need to manage server infrastructure. Cloud computing, as the foundation of Firebase, allows for efficient and flexible data storage and processing.
5. User Interface (UI) and User Experience (UX)
   UI and UX design is an important aspect of mobile app development. An intuitive and attractive UI can increase user engagement, while a good UX ensures that the app is easy to use and meets user needs. Effective UI/UX design can increase customer satisfaction and loyalty to the application[8].

2. METHOD

In the development of an Android-based spare parts and bicycle sales application for the Adan Aden Bicycle Shop in Cianjur, West Java, this study uses an Extreme Programming (XP) approach that emphasizes teamwork, customer feedback, continuous improvement, and the ability to adapt to changing needs. Here are the methodological steps adopted:

1. Data Collection: Data was collected through live observation at the Adan Aden Bike Shop and interviews with owners and customers to understand their needs and expectations for the app. Literature studies are also conducted to gain insight into the latest market trends and technologies.
2. System Design: Using the Kotlin and XML programming languages, the system is designed to meet the functional and non-functional needs that have been identified. The app database is built using Google Firebase to store product data and user transactions.
3. System Testing: The black box method is used to test the functionality of the system1. This testing ensures that all the features of the application run according to the specified specifications without requiring internal knowledge from the source code.
4. Implementation: The app is implemented on Android devices using Android Studio Chipmunk 2021.2.1 Patch 1 as the development environment2. This implementation includes installing the app on hardware and beta testing to ensure the app works properly in a real user environment.

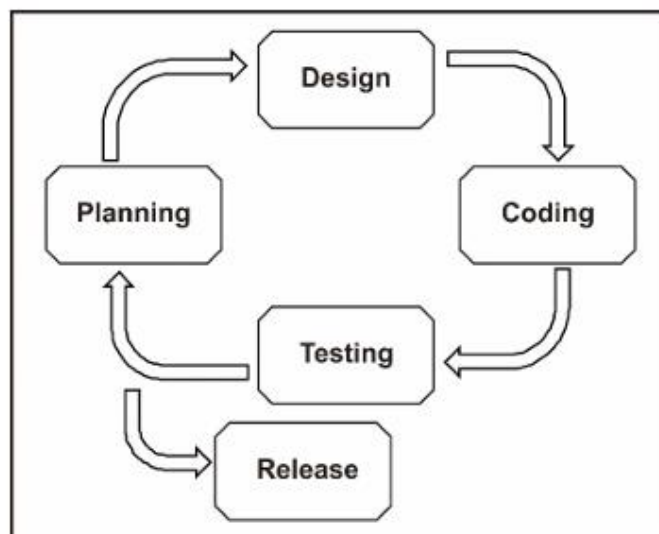Figure 1 Research Design

Extreme Programming Method

Figure 2 Extreme Programming Method Stages

In this study, we adopted the Extreme Programming (XP) methodology for the development of an Android-based spare parts and bicycle sales application system[9]. This methodology was chosen because of its flexibility in dealing with changing needs and its focus on the final quality of the product. Here is a detailed de of each stage in the XP methodology we applied:

1. Planning
    The planning stage is a crucial first step in the XP methodology. We started by identifying the needs of the system through in-depth interviews with key speakers. The information collected is then processed into user stories that serve as a reference for system development. These user stories cover various aspects of the desired functionality and form the basis for subsequent iterations of development.
2. Design
    After the planning stage, we move on to the system design. We use Unified Modeling Language (UML) to model the system architecture, including Use Case, Class Diagram, Activity Diagram, and Sequence Diagram. This modeling helps us in describing the relationships between data and system components. In addition, we also design database tables and interfaces/prototypes for application display analysis. The tool we used for modeling was Visual Paradigm for UML 6.3 Enterprise Edition.
3. Coding
    Next, we enter the coding stage. We use Android Studio as the primary development environment with Kotlin as the programming language of choice. For the database, we chose Firebase because of its ease of integration and scalability. This stage involves implementing pre-designed functionality, by ensuring that the code is clean and easy to maintain.
4. Testing
    The testing phase is the final stage in our XP methodology. We conduct thorough testing of the system using the black box method to ensure that all features work as expected. These tests are conducted in two versions: the alpha version, which is tested by researchers to stabilize the app and fix bugs, and the release version, which is tested by end users to ensure the app meets all user needs and feedback.
5. System Requirements Spesifiaction
    To support the development of the ADD Bike and My ADD Bike applications, we identified the specification of system requirements which are divided into two categories: software requirements and hardware requirements. Software requirements include Android Studio, Firebase Database, JDK, JRE, Android SDK, and JVM. Meanwhile, hardware needs include an Acer E5-476G-59C7 laptop with certain specifications and a Redmi 6 Android smartphone that meets the system requirements[10].

With this systematic approach, we hope to produce an app that not only meets the needs of users but also offers an intuitive and efficient user experience.

3.   RESULT AND DISCUSSION

System implementation and testing is the development stage from designing to a program code. In the first part, the hardware and software specifications that will be implemented in the program will be explained, which is the main part of the implementation of the program, namely the description of the design into a class written in the Kotlin programming language syntax. Then the *database* used is *Google Firebase*, with a *backend* written in *Json* format and the Adan Aden *Bike Application (ADD Bike)* has been implemented on *the Xiaomi Redmi 6 smartphone*.

3.1   Hardware Implementation
In the implementation of the design that has been described, then, some hardware is needed to be able to run this application as it should. And among the hardware are as follows:
1. Smartphones based on the Android operating system at least version 4.1 (Jelly Beans) The smartphone used in running the ADD Bike (Admin) and My ADD Bike (User) applications that will be Xiaomi Redmi 6 smartphones with the following specifications:
    a.   OS : Android 9 (Pie)
    b.   Chipset: Mediatek MT6762 Helio P22 (12 nm)
    c.   CPU : Octa-core 2.0 GHz Cortex-A53
    d.   GPU: PowerVR GE8320
    e.   RAM: 4gb
    f.   Storage: 64GB
    g.   Network: 4G
    h.   Resolution : 720 x 1440 pixels, 18:9 ratio (~295 ppi density)

2. One laptop unit used in the design and manufacture of the ADD Bike (Admin) and My ADD Bike (User) applications is using an Acer E5-476G-59C7 laptop with the following specifications:
   a. Processor : Intel(R) Core(TM) i5-7200U CPU @ 2.50Ghz 2.71Ghz
   b. Memory : 16GB DDR4
   c. SSD : NVMe M2 ADATA SX8200 Pro 256 GB
   d. Hard Disk : 1TB
   e. Graphics Card : NVIDIA GEFORCE 940 MX

In this part, the system implementation stage will be carried out, namely the process of creating a system from the design stage to the coding stage using a programming language. The main part of the implementation is the implementation of the designs from the previous chapter described in the form of interfaces.

3.2 Software Implementation

In the implementation and implementation of the design that has been made previously, several software is needed to make the ADD Bike (Admin) and My ADD Bike (User) applications, including the following:

1. Android Studio & SDK: used as the main tool and a kit for developing Android applications.
2. Firebase: a webserver that will be used to store data and can perform other activities such as sending notifications and monitoring application performance.
3. JDK (Java Development Kit): used to perform the compilation process from java code to bytecode that can be understood and executed by
4. JRE (Java Runtime Envirotment).
5. JRE (Java Runtime Environment): an application package that contains the JVM (Java Virtual Machine) as well as some additional program code libraries required to run Java applications.

3.3 Interface Implementation

For application installation on an Android smartphone, with the following steps:
1. Select the file named addbike.apk if for an admin and myaddbike.apk if for a user in the folder on the smartphone's storage.
   1) Select the file named addbike.apk if for an admin and myaddbike.apk if for a user in the folder on the smartphone's storage.

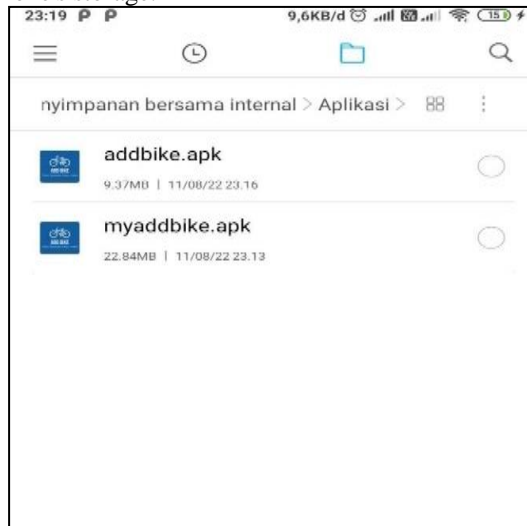
Figure 3 Selecting an APK file

2) Click on the addbike app file.apk if for an admin and myaddbike.apk if it is for a user, then select Install.

Figure 4 Installation Verification

3) Wait until the installation process is complete.
4) The display of the application icon is complete, the installation process is complete

Figure 5 Application Icon Display

Application Menu, this menu consist of
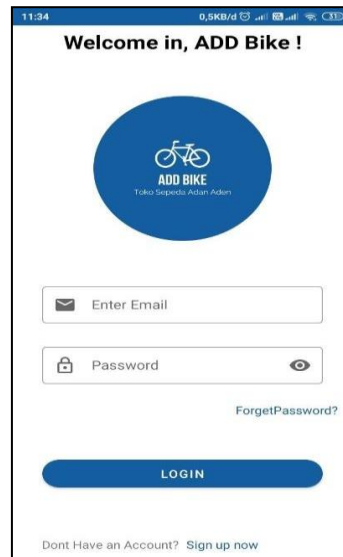1. SplashScreen
2. OnBoarding View
3. Login Display

Figure 6 Login Display
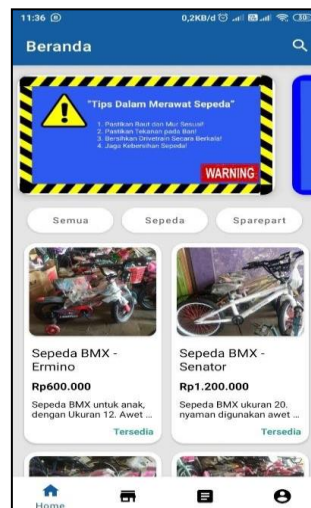
4. Register
5. Home Display

Figure 7 Home Display

6. Item Detail Display

Figure 7 Item Detail Display

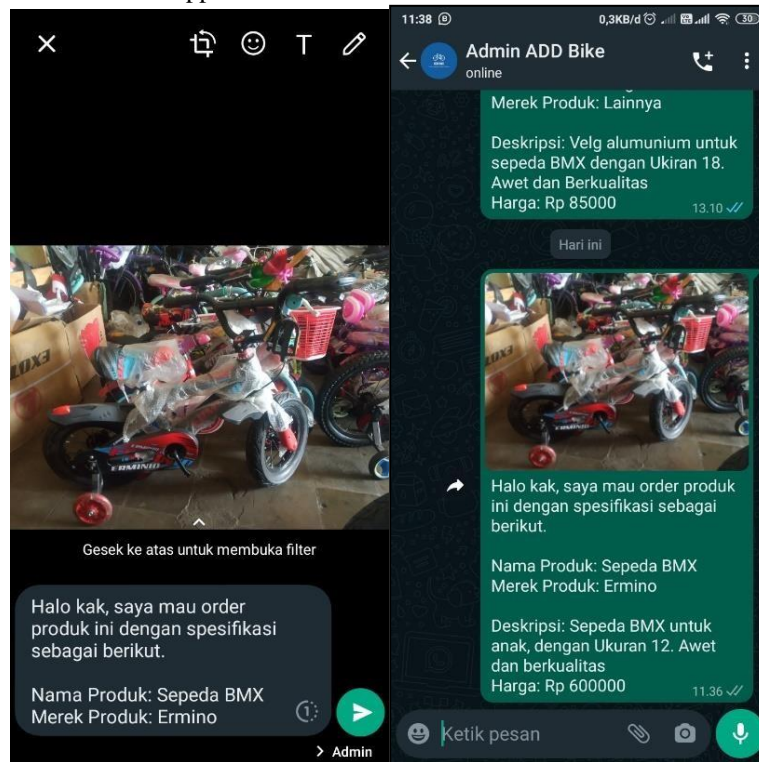7. View of Checkout to Whatsapps Admin

Figure 8 View of Checkout to Whatsapp Admin

8. Store Page View

Figure 9 Info Page Display
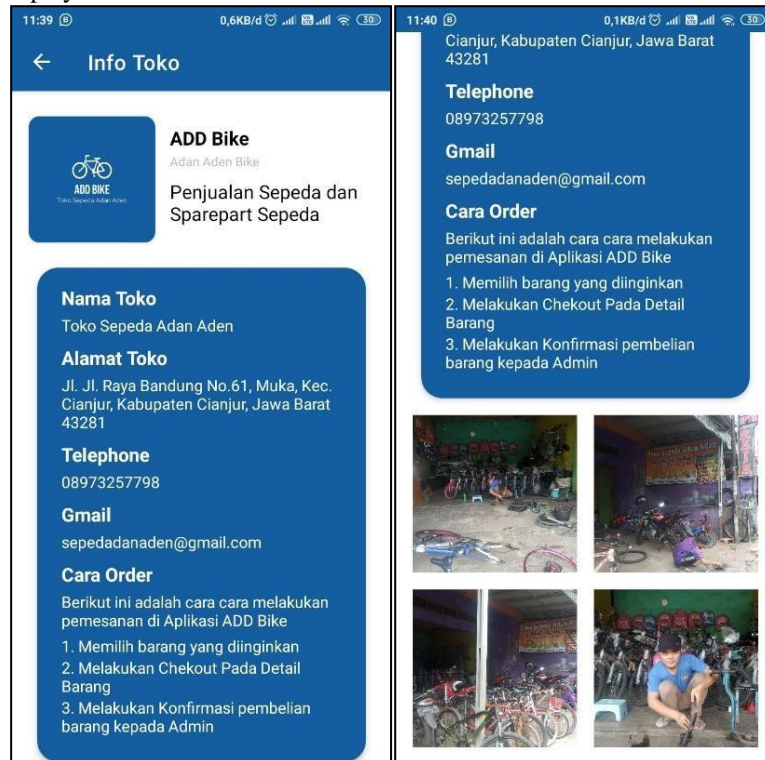
9. Store Info Display

Figure 10 Store Info Display
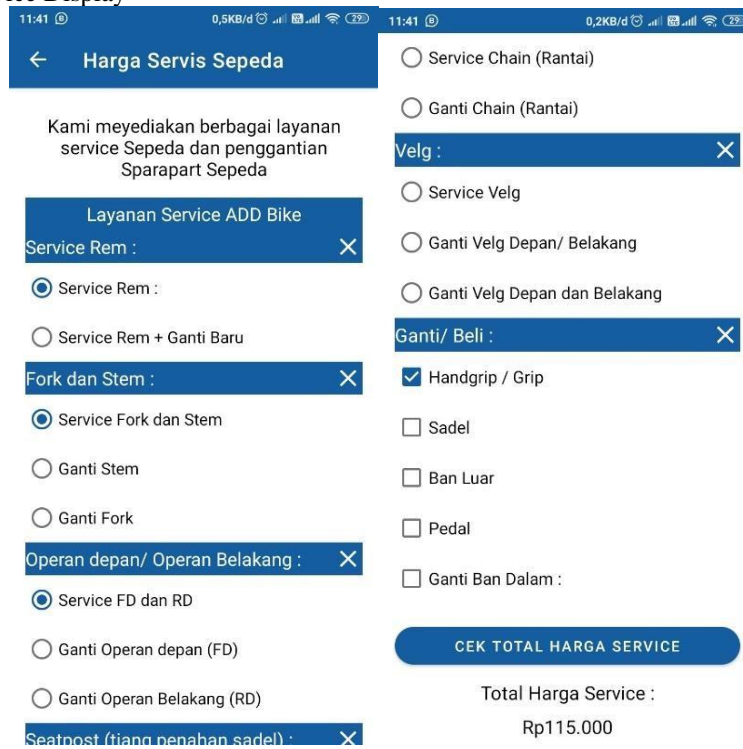
10. Bicycle Service Display

Figure 11 Bicycle Service Display
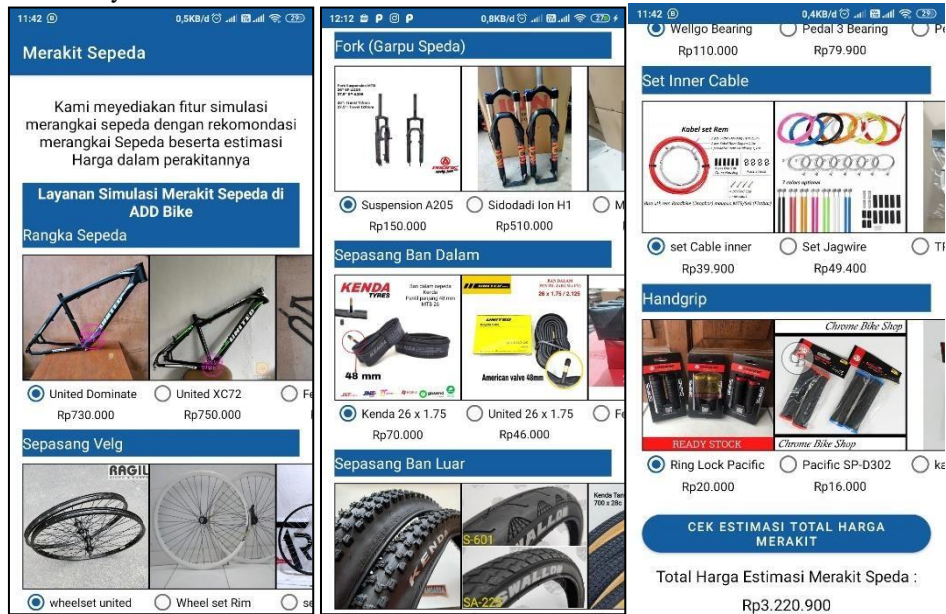
11. Bike Assembly View

Figure 12 Bike Assembly Display
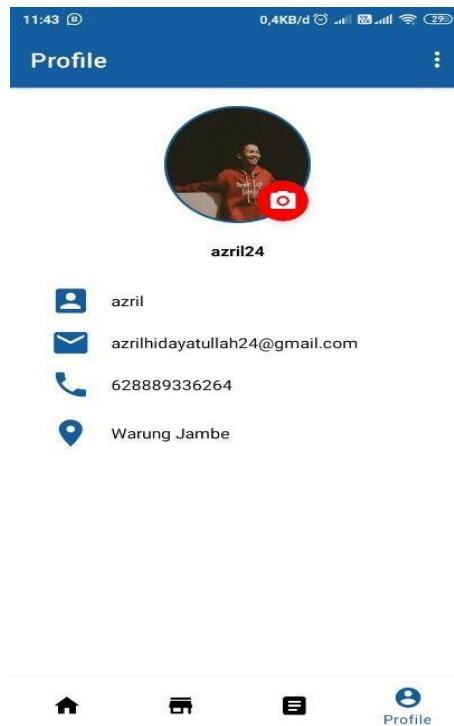
12. User Profile Display

Figure 12 User Profile Display

Application For Admin
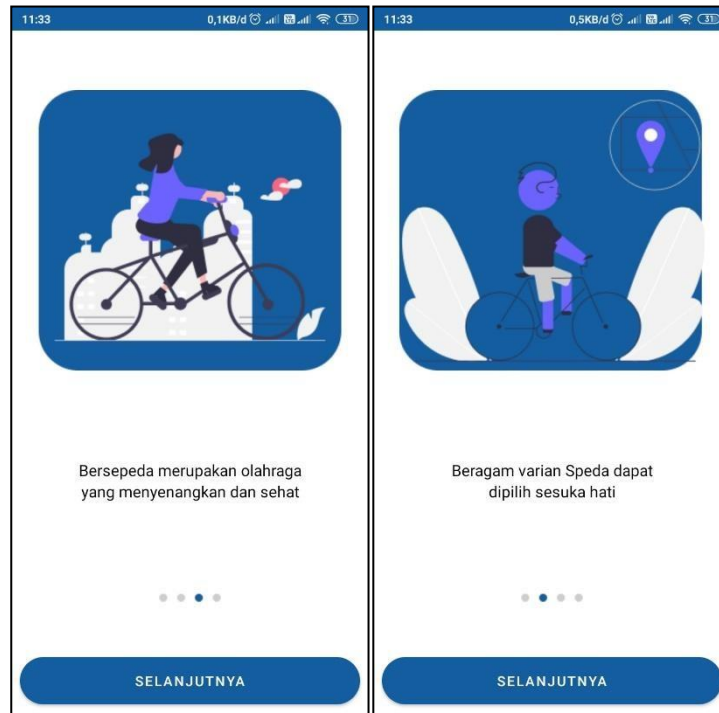1. Splashscreen App
2. OnBorading View

Figure 13 Admin OnBoarding View

3. Login
4. Register
5. Forgot Password
6. Home
7. Item Details
8. Edit Article

Fiigure 14 View of Admin Article

3.4 System Testing

Testing a system is one of the most important parts of the application creation cycle. With the aim of guaranteeing that the application created has a good quality of the application itself. The following is a system test using the black box method from the ADD Bike Application (Admin) and My ADD Bike (User).

Table 1 System Testing for Users

Test Class	Test Scenario	Expected results	Result Testing
Splashscreen	Open *the My ADD Bike app*	The app displays a *splashscreen page* containing the ADD Bike logo and caption	Succeed
Onboarding	Displays 4 Onboarding pages	When you press the next button, onboarding will move to the page *Subsequent onboarding*	Succeed
Onboarding	Go to the Home page or Login Page	When the system displays *a splashscreen* and validates that the account has *logged in*, it will immediately enter the main page and if it is not *logged in*, it will be directed to the 4 *onboarding* pages	Succeed
Register	*Enter full name, username, Email, Password,* Address, and Mobile Number.	When the *register* button is clicked, the input data will enter the *database*, after success it will move to the main menu.	Succeed
Register	Clearing any or all of your data including *email* and *password*.	Displays the message "Data should not be empty".	Succeed
Register	Fill in *the form password* less than 6 character	Displays the message "Password too short, min 6 characters"	Succeed
Register	Fill in *the password form* and *retype the password* with the fill in different	Displays the message "*Password* must be the same"	Succeed
Login	*Input Email* and *Password*	When *the user* enters the email and *password*, if it fails, an email message or *password* is incorrect, and if successful, the message "*Login Succes*" will appear then enter the main menu.	Succeed
Login	Clearing any or all of your data including *email* and *password*.	Displays the message "Email or password should not be blank".	Succeed
Forget *Password*	*Address Input Email*	If the email entered is correct, it will appear in the *inbox* in the form of *a link* to *reset the password* and display the message Please check *the inbox* on your *email*. If incorrect, it will display a message that occurs error.	Succeed
Display *Slider*	Display *discount information/tips* slider Tips	The app displays *sliders* On the *home page*	Succeed
List of item data	Displays *a list* of goods data consisting of *spare parts* and bicycle.	The application displays a list of goods in the form of type, brand, image, 2 rows of item details and item status. And can be *scrool* to the last data	Succeed

Button all	Do a click on the *all button*	The app displays all items	Succeed
Button Bicycle	Clicking on *Button Bike*	The app displays bicycles only	Succeed
Button Spare Parts	Clicking on *button* all	The app displays *spare parts* just	Succeed
Icon search	Click on the *search icon* and search for item data.	When *the user* searches for the type of item. If there is data on the item that matches what is being searched, the application will display the data that is listed, and if there is no data searched, the application will not displays item data.	Succeed
Item details	Click on one of the *items* list	The application displays detailed data of goods consisting of type, brand, image, color, size, condition, material, de, and the price of goods.	Succeed
Item details	Show the checkout button	If the status item is available, the *user* can checkout, if the status item runs out, the user does not can checkout.	Succeed
Button checkout	Click on the checkout button	The application will move the page to the *whatapp admin chat*, and send the item data through *the whatapps chat*	Succeed

3.5 Beta Testing

Table 2 My ADD Bike App Beta Testing Table

NO	Question	STS	TS	N	S	SS
1	Does the My ADD Bike App work smoothly ?			1	7	6
2	Does the information provided preface that this app is about bicycles?			1	3	10
3	What are the menus of the My ADD Bike application easy to understand ?				10	4
4	Is the registration process (Account Registration) in The application is easy to understand?				6	8
5	Is this application helpful enough in Looking for Bicycles and Spare Parts ?				6	8
6	Is the store information page clear and easy to understand?				5	9
7	Is the profile display clear and comfortable views?				7	7
8	Are there any bugs or errors in the application?			3	9	2
9	How do you rate the page? home (Home) ?				6	8
	Total			5	59	62
				126		

Description: SS: Strongly Agree (value 5), S: Agree (value 4), N: Neutral (value 3), TS: Disagree (value 2), STS: Strongly Disagree (value 1).

As for the table Based on the table above, it can be seen that the tendency of the respondents' answers to each of the research variables, using the Likert scale assessment. The tendency of respondents' answers can be seen from the descriptive statistical form of each variable. The results of 14 respondents for each variable studied in the table above. To get the total score from the questions to the respondents using the formula: T (Number of respondents who voted) x Pn (Choice of likert score). Then the total satisfaction score of each variable can be produced. From the results of the satisfaction score, the average satisfaction will be obtained using the index formula % = total score / Y x 100, where Y is the highest value of likert x number of respondents. Y = 5 x 14 = 70.

Table 3 Table of Score and Average Satisfaction

NO	Question	Total Score TxPn	Average Total Score/ Y x 100
1	Is the My ADD Bike App running smoothly?	N: 1x3 = 3 S: 7x4 = 28 N: 6x5 = 30 Total Scores: 61	61/70*100 = 87%
2	Does the information provided indicate that this application is about bicycles?	N: 1x3 = 3 S: 3x4 = 12 N: 10x5 = 50 Total Score: 65	65/70*100 = 93%
3	Are the menus of the My ADD Bike application easy to understand?	S: 10x4 = 40 N: 4x5 = 20 Total Scores: 60	60/70*100 = 86%
4	Is the application registration process easy to understand?	S: 6x4 = 24 N: 8x5 = 40 Total Score: 64	61/70*100 = 91%
5	Is this application helpful enough in searching for Bicycles and The spare parts?	S: 6x4 = 24 N: 8x5 = 40 Total Score: 64	61/70*100 = 91%
6	Is the store information display clear and easy to understand?	S: 5x4 = 20 N: 9x5 = 45 Total Score: 65	61/70*100 = 93%
7	Is the profile display clear and comfortable to see?	S: 7x4 = 28 N: 7x5 = 35 Total Score: 63	61/70*100 = 90%
8	Are there any bugs or errors in the application?	N: 3x3 = 9 S: 9x4 = 36 N: 2x5 = 10 Total Score: 55	61/70*100 = 79%
9	What is your assessment of the home page?	S: 6x4 = 24 N: 8x5 = 40 Total Score: 64	61/70*100 = 91%
	Average Overall Query		89%

4. DISCUSSION

Based on the research conducted on journals available in the researcher's institutional repository and observationsusing the Google searchengine, no similar studies have been found to date. There are some studies with corresponding approaches and methods, but they are applied to different types of research and research objects.

Suggestion

To improve the utility and effectiveness of the ADD Bike app, some suggestions that can be considered are:

1. Server Development and Website Admin: Currently, apps use Google Firebase as a server and database platform. Further development may include the creation of a dedicated website for admins, which will make it easier to manage the application database.

2. Other Platform Support: The app is currently only available for the Android mobile platform. It is expected that further development will include support for other platforms such as iOS, thus expanding the reach of users.
3. Payment Features: To facilitate the transaction process, it is recommended to add payment features that support virtual accounts, midtrans, or similar methods.
4. User Feedback: Support from users and admins is highly appreciated for providing feedback related to the ease of use of the ADD Bike and My ADD Bike apps, which will contribute to improving the quality of the app.

5. CONCLUSSION

This research has successfully designed and implemented two Android-based applications, namely ADD Bike for Admin and My ADD Bike for User. The app is designed to facilitate the sale of bicycles and spare parts, with both apps integrated through Google Firebase's data storage servers. This implementation has made it easier for the public to order products and access information on the Adan Aden Bicycle Shop, both for sales and service services. The analysis and design of the system have been implemented effectively, as evidenced by the running of the features that have been designed. The app can be installed on mobile devices with the Android operating system, showing good compatibility and accessibility.

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