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Android Apps for Laundry using Model View Presenter Pattern

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Abstract— **Universitas Darussalam (UNIDA) Gontor is a boarding-based campus that requires its professors and students to live 24 hours a day in the dormitory. To support UNIDA Gontor's household needs, one includes washing clothes; the campus has created the Unit Usaha UNIDA (U3) laundry service. This laundry service provides cleaning services based on weight and processing time, divided into three packages: regular, express, and special. Currently, the laundry service runs its administrative process using books, paper notes, and social media, Whatsapp, for communication with customers. As the laundry service grows, customers need help determining their clothing status. The same is true for employees who need help dealing with the increasing number of orders and answering the status of customer clothing one by one. This research aims to speed up the administrative process of the U3 laundry service, especially in terms of order status. The method used to help solve the problem is an Android-based mobile app that implements the Model View Presenter pattern. The black-box method and a questionnaire to customers and laundry employees were used to test this research. The results of the black-box test showed that all the features provided are running smoothly without errors. Meanwhile, the results of a random questionnaire to ten customers and four employees regarding ease, design, information, and benefits showed high satisfaction. The results of all tests prove that this application is easy for customers, especially in determining the status and cost of laundry. In addition, employees also find it easy to update and store order data, making it faster, neater, and safer. The suggestion for future research is to add a cost feature for clothing that uses hangers and plastic and to add real-time notification features using firebase.**

Keyword— **Unit Usaha UNIDA Gontor, Laundry Service, Laundry Android Apps, Model View Presenter, MVP Pattern**

Abstrak— ***Universitas Darussalam (UNIDA) Gontor merupakan kampus berbasis asrama yang mengharuskan dosen dan mahasiswanya tinggal 24 jam sehari di asrama. Untuk menunjang kebutuhan rumah tangga UNIDA Gontor antara lain mencuci pakaian; kampus telah menciptakan layanan laundry Unit Usaha UNIDA (U3). Layanan laundry ini menyediakan layanan pembersihan berdasarkan berat dan waktu pengerjaan yang terbagi dalam tiga paket: reguler, ekspres, dan spesial. Saat ini pihak laundry menjalankan proses administrasinya dengan menggunakan buku, kertas catatan, dan media sosial Whatsapps untuk berkomunikasi dengan pelanggan. Seiring berkembangnya layanan laundry, pelanggan membutuhkan bantuan dalam melihat status pakaiannya. Begitu pula dengan karyawan yang membutuhkan bantuan dalam menangani pesanan yang semakin banyak dan menjawab status pakaian pelanggan satu per satu. Penelitian ini bertujuan untuk mempercepat proses administrasi jasa laundry U3 khususnya dalam hal status pemesanan. Metode yang digunakan untuk membantu menyelesaikan permasalahan tersebut adalah mobile app berbasis Android yang mengimplementasikan pola Model View Presenter. Metode black-box dan kuesioner kepada pelanggan dan karyawan laundry digunakan untuk menguji penelitian ini. Hasil pengujian black-box test menunjukkan bahwa seluruh fitur yang diberikan berjalan dengan lancar tanpa error. Sedangkan hasil kuesioner acak kepada sepuluh pelanggan dan empat karyawan mengenai kemudahan, desain, informasi, dan manfaat menunjukkan kepuasan yang tinggi. Hasil seluruh pengujian membuktikan bahwa aplikasi ini memberikan kemudahan bagi pelanggan terutama dalam menentukan status dan biaya laundry. Selain itu, karyawan juga mendapatkan kemudahan dalam mengupdate dan menyimpan data pesanan sehingga lebih cepat, rapi, dan aman. Saran untuk penelitian selanjutnya adalah menambahkan fitur biaya pada pakaian yang menggunakan gantungan dan plastik serta menambahkan fitur notifikasi real-time menggunakan firebase.***

Keyword— ***Unit Usaha UNIDA Gontor, Layanan Laundry, Aplikasi Android, Model View Presenter, MVP Pattern***

I. INTRODUCTION

Document As one part of a boarding school education institution, the Universitas Darussalam Gontor (UNIDA Gontor) implements a dormitory system [1]. This system organizes the mosque, dormitories, classrooms, sports facilities, U3 (Unit Usaha UNIDA) or UNIDA Gontor business unit, housing for teachers, and other facilities to be located within an integrated campus to create a conducive environment for learning and intensive interaction between students and teachers. Thus, it is necessary to maintain good communication and information exchange.

Communication is an inseparable part of human life, as every step we take is accompanied by communication [2]. With many academic communities, obtaining information

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between one party and another is difficult [3]. Therefore, media is needed to serve as an intermediary in exchanging information that is accessible to all parties in order to obtain the required information massively, quickly, and accurately. The device that meets this need is a widely used smartphone, the Android smartphone.

The laundry service is a business that provides clothing washing services using automatic washing machines and dryers, as well as special cleaning agents and fragrances. This business can be found in many large cities with many boarding houses and rental houses where tenants are too busy or not accustomed to washing and ironing their clothes due to their daily activities as students or workers [4].

The case study selected by the researcher in this study is the U3 laundry business located at UNIDA Gontor. This U3 laundry business provides washing services based on weight and processing time, divided into three packages.

1. Regular package with a processing time of 3-4 days and price of IDR 3,500/kg,
2. Express package with a processing time of 2 days and price of IDR 6,000/kg,
3. Special package with a processing time of 1 day and price of IDR 8,000/kg.

The U3 laundry service does not offer doll washing due to drying limitations. This laundry service provides relatively low prices with satisfactory quality and delivery service to customers, including students, staff, and lecturers at UNIDA Gontor. The laundry service administration process has been using bookkeeping, the transaction of collecting laundry delivery still uses chat via WhatsApp, and the records still use regular paper notes (Figure 1). As a result, searching for data is complex and requires a slow process, and customers can only know the price once the laundry is finished and ready for pick up or delivery. To ensure that customers of laundry U3 receive satisfactory service and that laundry U3 employees receive orders more efficiently. With complete, effective, and efficient data, system information must be created to handle existing problems. This research designed an Android-based application for Laundry U3 by implementing the Model-View-Presenter (MVP).

Currently, there are many uses for Android smartphones to support human needs. Among them is an Android feature for elearning [5], Android application for early prevention of MSDs [6], Application for Searching for Domestic Service Workers Around Using the Android-Based Radius and Rating Methods [7]. Previous research on Android mobile applications to support laundry transactions in Indonesia. The first is from Evan Susanto, who developed an Android App for ordering laundry in the city of Palembang [8]. The second is from Alda, who developed the Android App on Simply Fresh Laundry so that customers can quickly obtain the status of their laundry clothes [9]. The third is by Abdul Rosyi, who designed an Android-based laundry information system to make it easier for cashiers to manage services at Green Lab Laundry [10]. Fourth by Hasanah, who designed an Android-based laundry information system for Laundry Houses in Banten [11]. Fifth by Widyastuti, who designed an Android-based laundry information system for Laundry Express in 10 Jabodetabek cities [12].

There are three types of program code architectures developed in making Android-based applications, namely: Model-View-ViewModel (MVVM), Model-View-Controller (MVC), and Model-View-Presenter (MVP) [13]. Among the research using the MVVM architecture is by Maulana, who developed a laboratory management application [14], by Syakir Arif, who developed an academic information system in Universitas Darussalam Gontor [15], and by Aryanto who developed the Marketplace application [16].

Apart from that, some use the MVC architecture, including Versase, which created the Cambre.id online shop website [17] and by Akib, who developed an application for the assessment of laboratory assistants [18]. Meanwhile, those implementing MVP include Sahrial, who can display real-time Covid-19 data [19] and Kartarina helps send Android Context object references to the Model and analyzes further to find out the comparative results of object coupling metrics from manual and automated Dependency Injection implementations in Android applications [20]. Whereas in this study, implementing MVP to help speed up and simplify data management at Laundry U3 at UNIDA Gontor.

II. RESEARCH METHODS

This research has several stages such as Figure 2.

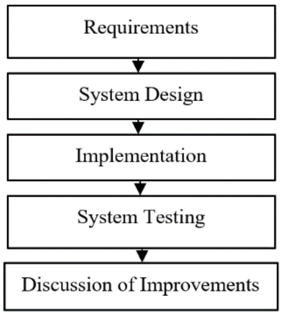

Figure 2. Research stages of Android Apps Laundry U3

A. *Requirements*

At this stage, the researcher plans the features and records the needs of each feature. To obtain data on application needs, researchers conducted interviews, surveys, and discussions with Laundry U3 administrators for the 2017/2018 period. The information obtained will be analyzed first before proceeding to the next stage. Based on the results of the analysis, this stage has three aspects, namely aspects of data requirements, hardware, and software to build an Android-based information system.

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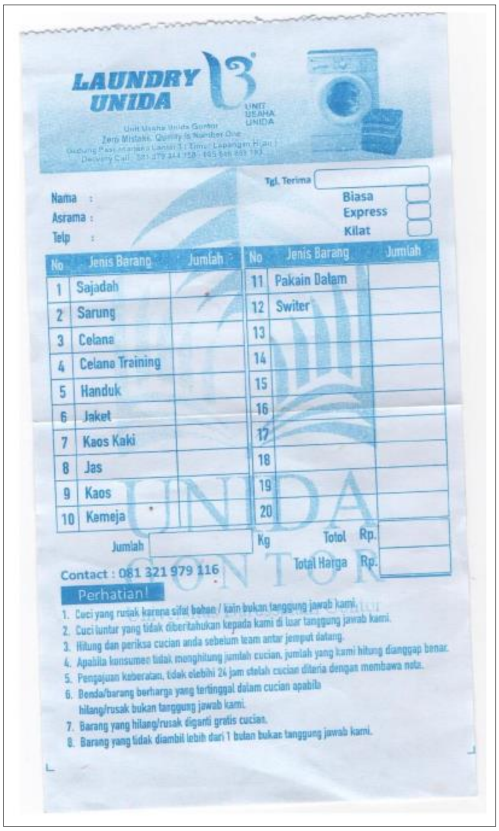
For hardware requirements, it consists of a Notebook or Laptop with 8GB RAM specifications, Core i3 Processor, minimum 4GB Harddisk capacity, 512MB minimum VGA, and recommended 14-inch screen size used for code creation of User Interface and User Experience (UI) design programs. UX) and emulator connections; one Android Smartphone device with minimum specifications of Ice Cream Sandwich (4.0.1), which is used for direct application debugging; USB data cable to connect between Laptop and Android Smartphone and Modem for internet connection.

For software requirements, namely the Java Development Kit (JDK), at least version 8 as a tool for the Java programming language; Android Studio, at least version 2.3 as the program code editor; Android Emulator as temporary app debugging; Google Chrome browser to check internet connection; Firebase for storing data, Adobe XD (Free Access) for creating UI/UX designs and Microsoft Office Home and Student 2019.

For U3 Laundry data needs include customer data consisting of customer code, customer name, telephone number (WhatsApp), room and room address; customer status (students, staff, lecturers), clothing data (type, amount); order transaction data (order number, number of clothes, weight of clothes, transaction date, selected package); and U3 laundry team member data (code, name, telephone number, gender, address, status (student, employee).



LAUNDRY UNIDA

U3 UNIT USAHA UNIDA

Unit Usaha Unida Gontor
Zero Mistake, Quality is Number One
Gedung Pasi [illegible] Lantai 1 | Timur Lapangan Hijau |
Delivery Call : [illegible]

Tgl. Terima □

Nama :
Asrama :
Telp :

Biasa □
Express □
Kilat □

No	Jenis Barang	Jumlah	No	Jenis Barang	Jumlah
1	Sajadah		11	Pakain Dalam	
2	Sarung		12	Switer	
3	Celana		13		
4	Celana Training		14		
5	Handuk		15		
6	Jaket		16		
7	Kaos Kaki		17		
8	Jas		18		
9	Kaos		19		
10	Kemeja		20		

Jumlah □ Kg

Totol Rp. □

Total Harga Rp. □

Contact : 081 321 979 116

Perhatian!

1. Cuci yang rusak karena sifat bahan / kain bukan tanggung jawab kami.
2. Cuci luntur yang tidak diberitahukan kepada kami di luar tanggung jawab kami.
3. Hitung dan periksa cucian anda sebelum team antar jemput datang.
4. Apabila konsumen tidak menghitung jumlah cucian, jumlah yang kami hitung dianggap benar.
5. Pengajuan keberatan, tidak olebihi 24 jam stelah cucian diteria dengan membawa nota.
6. Benda/barang berharga yang tertinggal dalam cucian apabila hilang/rusak bukan tanggung jawab kami.
7. Barang yang hilang/rusak diganti gratis cucian.
8. Barang yang tidak diambil lebih dari 1 bulan bukan tanggung jawab kami.

Figure 1. U3 Customer Order Note

B. *System Design*

At this stage, researchers designed use case designs, activity diagrams, application architecture based on the Model-View-Presenter pattern, and system interface designs (mockups). Figure 3. is a Use case to explain how the customer can use menus. The menu includes nine features: register, login, ordering, history, profile, edit profile, logout, order detail, and call admin. While Figure 4. is a use-case menu that employees use. The menu includes login, orders, logout, customer call, and update status orders.

Figure 5. and Figure 6. is a more detailed explanation of all processes and activities that employees and customers can do. Figure 5. Show when the user opens the application, the user will be faced with a splash screen (SplashScreen); if the user has previously logged in using this application, then after the splash screen, the user will be directed directly to the main page (MainActivity). If the user has never logged in, the user will be redirected to the login page (LoginActivity). Where the user can then fill in the email and password or select the register button if the user has not registered, or select the forget password button if the user forgets the password.

When on the login page, the user has entered his email and password and also pressed the login button, then it will be authenticated whether the email and password match; if they are appropriate, then the user will be directed to the main page (MainActivity). If the email and password do not match, the user will be redirected to the login page and notified that the email and password do not match. If, on the login page, the user selects the register button, then the user will be directed to the registration page, and the user will input the email, password, and confirm password. If all data is valid, then the user is directed to the profile page to fill in the required personal data. If all data has been filled in validly and the user presses the save button, the data will be saved, and the user will be directed to the main page (MainActivity). If on the register page, the user selects the login button, then the user will be directed to the login

Figure 6. show when the user opens the application, the user will immediately be confronted with a login page, and the user enters the username and password; after the username and password are entered, and the user presses login, it will be authenticated whether the password is valid or not. If the password is invalid, it will be redirected back to the login page, and the user will get a notification warning that the password is invalid. Suppose the user chooses to view ordinary type order data. In that case, the application will fetch ordinary-type order data from the database and display them on the ordinary order page (ordinary order fragment) in list form. After the standard type order data is displayed, if the user selects one of the data on the list, the application will retrieve data from the database and display it on the order detail page (detail order activity).

On this page, the user can do several things, namely, viewing order details from the customer. It confirms that

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the order has been taken, confirms that the order has been paid, confirms it has been delivered back, and contacts the customer for communication purposes. Suppose the user presses the confirmation button. The order has been taken; the database will be updated immediately that the courier has taken the order. The user presses the confirmation button that the order has been paid. The database will be updated immediately that the customer has paid for the order. If the user presses the confirmation button, the order has been delivered. The database will be updated immediately to confirm that the courier has delivered the order. If the user presses the contact customer button, the user will be directed to the WhatsApp application chat page. If, on the main page, the user chooses to exit the application, the user can simply press the back button on the mobile device

Figure 7. is a VMP pattern that consists of:

- View: This is part of the app that renders the UI and receives interaction from the user. Activity, Fragment, and CustomView are these parts.
- MVPView: This is an Interface that is implemented by View. It contains methods that are exposed to the Presenter for communication.
- Presenter: This is the decision-making counterpart of the View and is a pure java class with no access to the Android APIs. It receives the user interaction passed from its View and then makes decisions based on the business logic, finally instructs the View to perform specific actions, and communicates with the DataManager for any data needed to perform the business logic.
- MvpPresenter: This is an Interface that the Presenter implements. This Activity contains methods that are exposed to the View for communication.
- Interactor: this is a class that is used to connect the Presenter and the Repository
- Repository: Database management and all data handling related to the database are done in this part of the application.
- MVP Repository: This is an Interface that is implemented by the Repository. This Activity contains methods that are exposed to the Presenter for communication.
- EventBus: EventBus is a library created by GreenRobot, which is a lightweight library for facilitating communication between components with the pub register-subscribe pattern. With EventBus, it is easy to exchange data between the presenter component and the model running behind the scenes

Figure 8. is a code program architecture of Laundry Apps, which consists of:

- Inside the events, the package is one file, namely the "OrderDetailEvents" file; in this file, there is source code that is useful for helping the process of sending data from the Model to the Presenter.
- Package "View," in which there are two files, namely "OrderDetailActivity" and "OrderDetailViewMvp" in the file "OrderDetailActivity," there are source code methods related to the view that will be seen by the user, such as displaying buttons, text, loading. In contrast, the "OrderDetailViewMvp" file is an Interface file from the "OrderDetailActivity" file.
- "Presenter" package, in which there are two files, namely "OrderDetailPresenter" and "OrderDetailPresenterMvp" in the "OrderDetailPresenter" file, there are source code methods related to the logic in this activity, such as logic for displaying status indicators, button logic. In contrast, the "OrderDetailPresenterMvp" file is an Interface file from the "OrderDetailPresenter" file.
- "Model" package, in which there are two files, namely "OrderDetailRepository" and "OrderDetailRepositoryMvp" in the "OrderDetailRepository" file, there is source code related to methods for retrieving and registering data into the database (database using firebase). In contrast, the file "OrderDetailRepositoryMvp" is the Interface file of the "OrderDetailRepository" file.
- "Interaktor" package, in which there are two files, namely "OrderDetailInteraktor" and "OrderDetailInteraktorMvp" in the "OrderDetailInteraktor" file, there is source code related to the method used to connect between the "Presenter" file and the "Model" file, while "OrderDetailInteraktorMvp" file is an Interface file from "OrderDetailInteraktor" file.

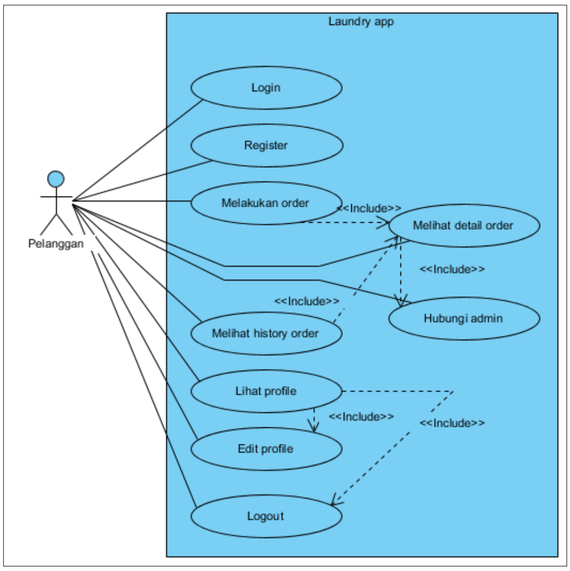

Figure 3. Use Case Laundry U3 for Customer

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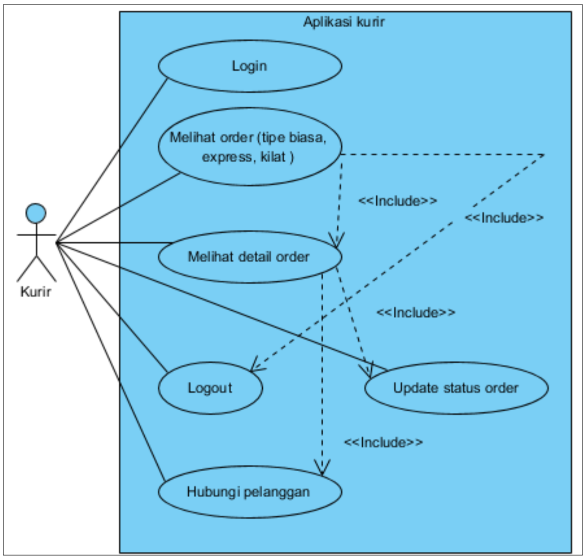


Figure 4. Use Case Laundry U3 for Employee

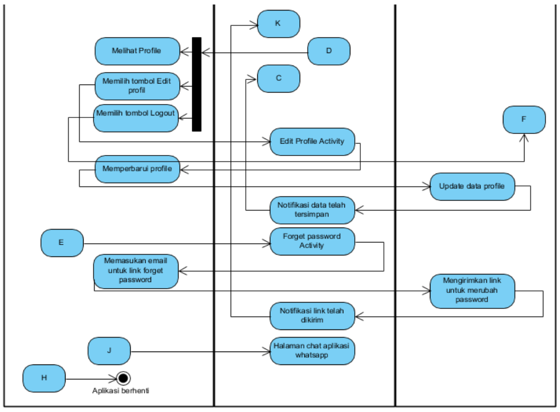
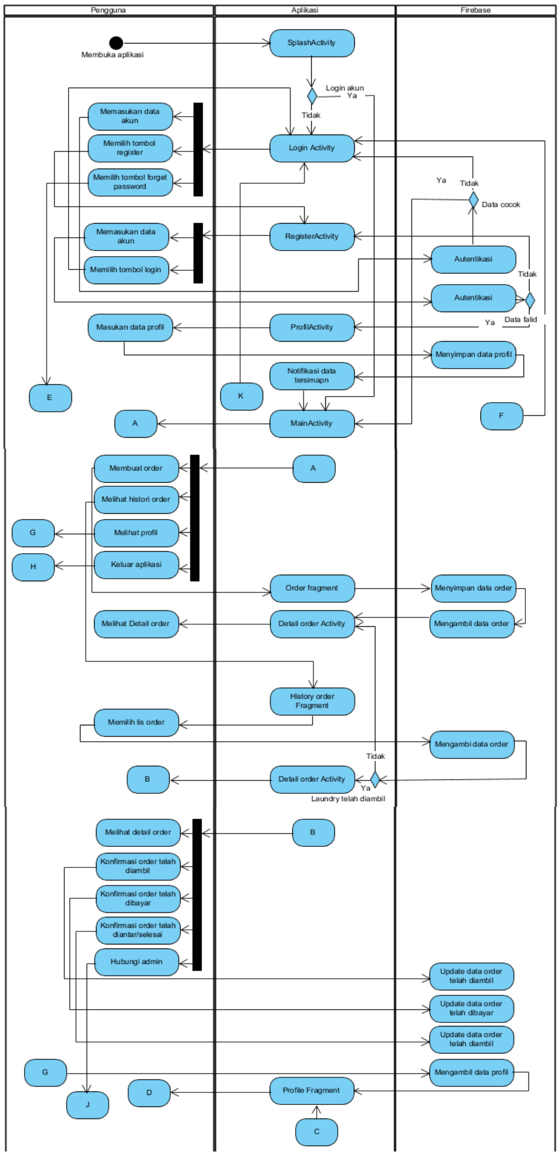
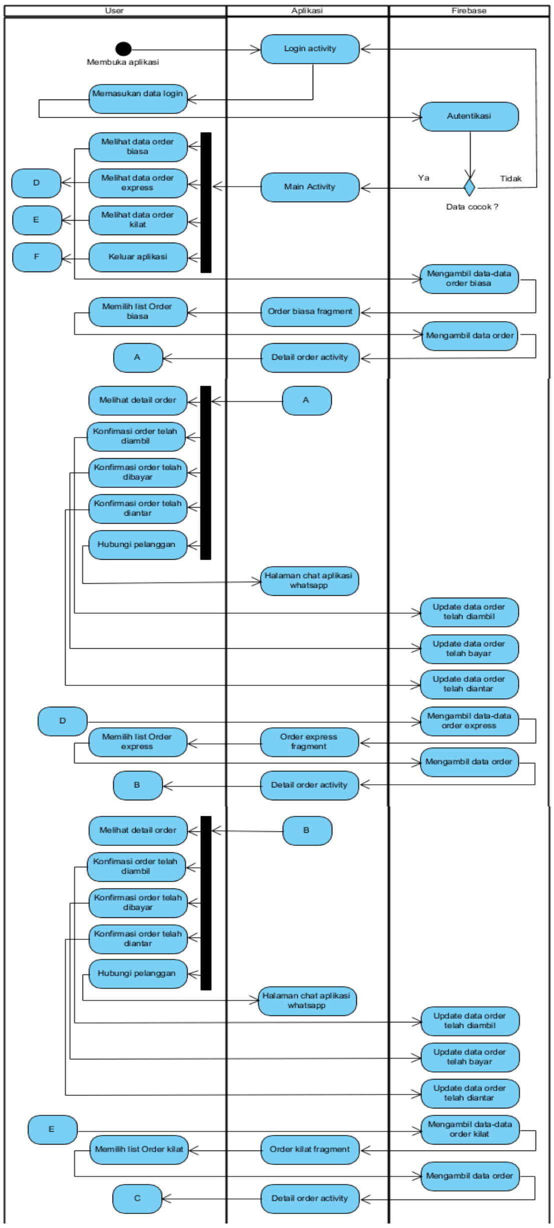

K
D
C
F
Melihat Profile
Memilih tombol Edit profil
Memilih tombol Logout
Edit Profile Activity
Memperbarui profile
Update data profile
Notifikasi data telah tersimpan
E
Forget password Activity
Memasukan email untuk link forget password
Mengirimkan link untuk merubah password
Notifikasi link telah dikirim
J
Halaman chat aplikasi whatsapp
H
Aplikasi berhenti

Figure 5. Activity Diagram Laundry U3 for customer




User
Aplikasi
Firebase
Membuka aplikasi
Login activity
Memasukan data login
Autentikasi
Melihat data order biasa
D
Melihat data order express
Main Activity
Ya
Tidak
Data cocok ?
E
Melihat data order kilat
F
Keluar aplikasi
Mengambil data-data order biasa
Memilih list Order biasa
Order biasa fragment
Mengambil data order
A
Detail order activity
Melihat detail order
A
Konfimasi order telah diambil
Konfirmasi order telah dibayar
Konfirmasi order telah diantar
Hubungi pelanggan
Halaman chat aplikasi whatsapp
Update data order telah diambil
Update data order telah bayar
Update data order telah diantar
D
Mengambil data-data order express
Memilih list Order express
Order express fragment
Mengambil data order
B
Detail order activity
Melihat detail order
B
Konfirmasi order telah diambil
Konfirmasi order telah dibayar
Konfirmasi order telah diantar
Hubungi pelanggan
Halaman chat aplikasi whatsapp
Update data order telah diambil
Update data order telah bayar
Update data order telah diantar
E
Mengambil data-data order kilat
Memilih list Order kilat
Order kilat fragment
Mengambil data order
C
Detail order activity

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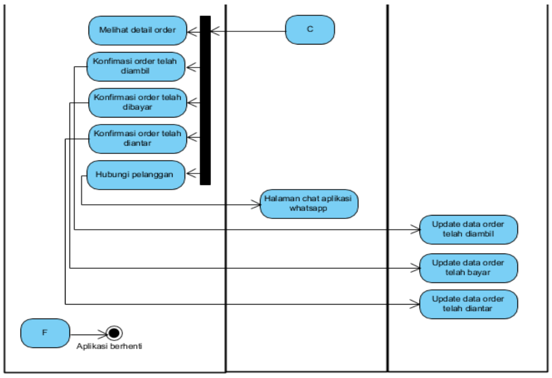

Melihat detail order
C
Konfimasi order telah diambil
Konfirmasi order telah dibayar
Konfirmasi order telah diantar
Hubungi pelanggan
Halaman chat aplikasi whatsapp
Update data order telah diambil
Update data order telah bayar
Update data order telah diantar
F
Aplikasi berhenti

Figure 6. Activity Diagram Laundry U3 for employee

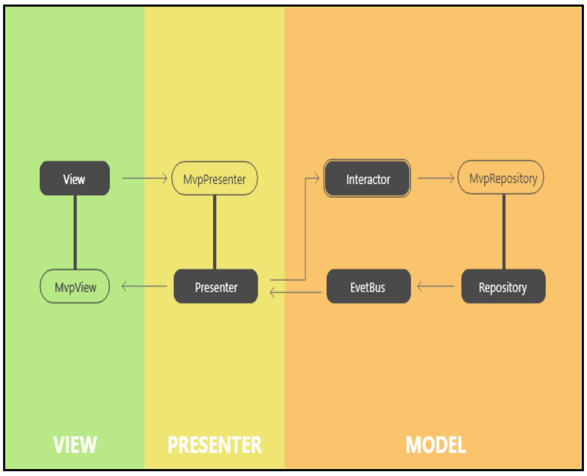
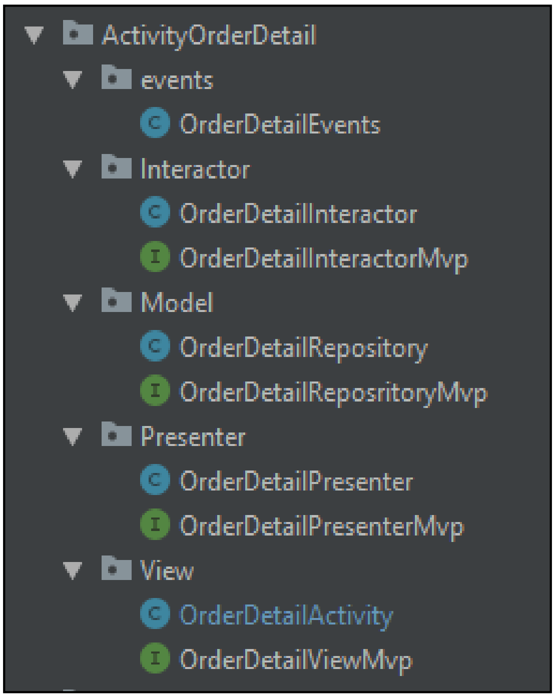


Figure 7. Laundry U3 architecture design with Model-View-Presenter pattern



```
▼ ActivityOrderDetail
  ▼ events
      OrderDetailEvents
  ▼ Interactor
      OrderDetailInteractor
      OrderDetailInteractorMvp
  ▼ Model
      OrderDetailRepository
      OrderDetailReposritoryMvp
  ▼ Presenter
      OrderDetailPresenter
      OrderDetailPresenterMvp
  ▼ View
      OrderDetailActivity
      OrderDetailViewMvp
```

Figure 8. Implementation of the Laundry U3 program code architecture with the Model-View-Presenter pattern

C. *Implementation*

In this stage, the application is split into several small modules to facilitate development. In addition, the researcher also checks the modules that have been made and whether they fulfilled the desired function. Researchers implement the system using the JAVA programming language and Firebase as the Database.

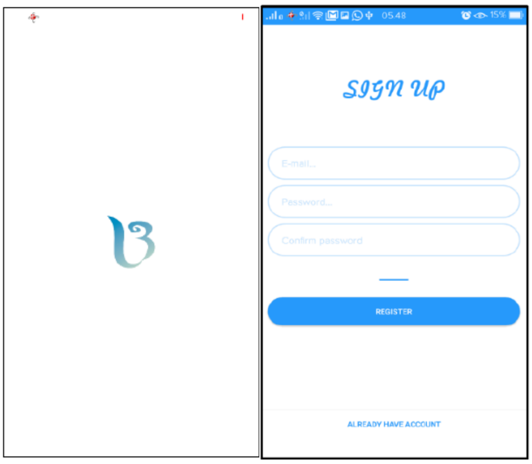


Figure 9. Splash Screen and registration page of Laundry U3 customer

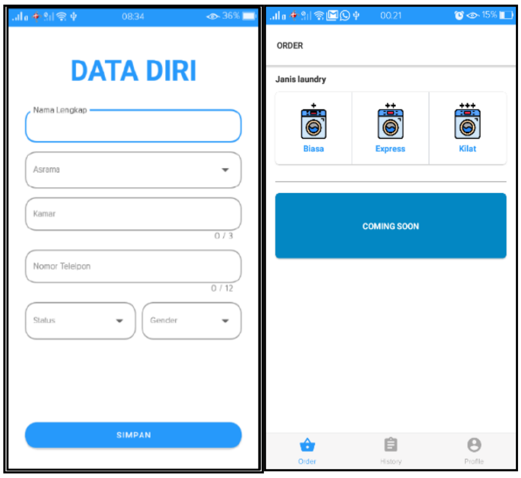


Figure 10. Main Menu for filling in customer data and ordering clothes for Laundry U3 customer

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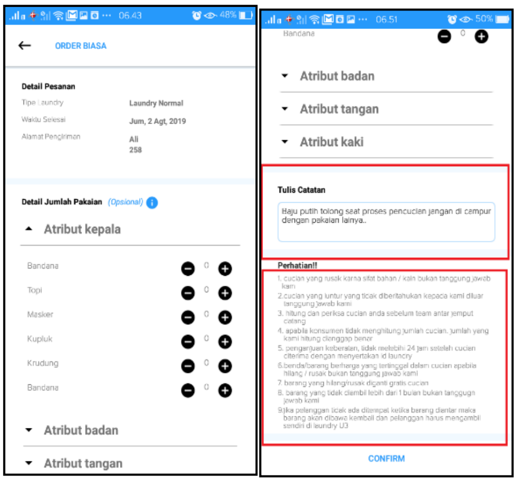


ORDER BIASA

Detail Pesanan

Tipe Laundry	Laundry Normal
Waktu Selesai	Jum, 2 Agt, 2019
Alamat Pengiriman	Ali 258

Detail Jumlah Pakaian (Opsional)

Atribut kepala

Bandana	0
Topi	0
Masker	0
Kupluk	0
Krudung	0
Bandana	0

Atribut badan

Atribut tangan

Atribut kaki

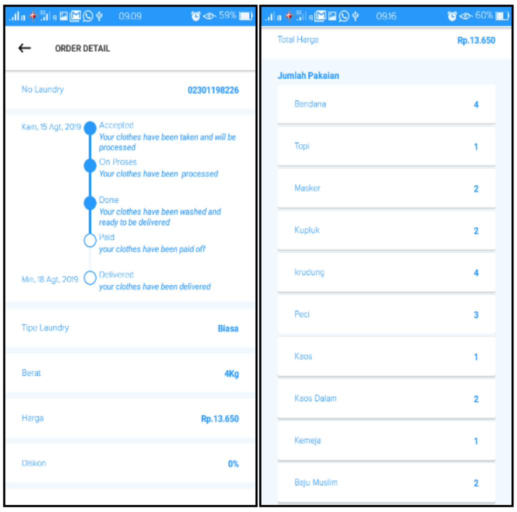
Tulis Catatan

Baju putih tolong saat proses pencucian jangan di campur dengan pakaian lainya..

Perhatian!!

1. cucian yang rusak karna sifat bahan / kain bukan tanggung jawab kami
2.cucian yang luntur yang tidak diberitahukan kepada kami diluar tanggung jawab kami
3. hitung dan periksa cucian anda sebelum team antar jemput datang
4. apabila konsumen tidak menghitung jumlah cucian. jumlah yang kami hitung dianggap benar
5. penganjuan keberatan, tidak melebihi 24 jam setelah cucian diterima dengan menyertakan id laundry
6.benda/barang berharga yang tertinggal dalam cucian apabila hilang / rusak bukan tanggung jawab kami
7. barang yang hilang/rusak diganti gratis cucian
8. barang yang tidak diembil lebih dari 1 bulan bukan tanggugn jawab kami
9.jika pelanggan tidak ada ditempat ketika barang diantar maka barang akan dibawa kembali dan pelanggan harus mengambil sendiri di laundry U3

Figure 11. Order Details Menu and Order Notes for U3 Laundry Customer



ORDER DETAIL

No Laundry	02301198226

Kam, 15 Agt, 2019 — Accepted: *Your clothes have been taken and will be processed*

On Proses: *Your clothes have been processed*

Done: *Your clothes have been washed and ready to be delivered*

Paid: *your clothes have been paid off*

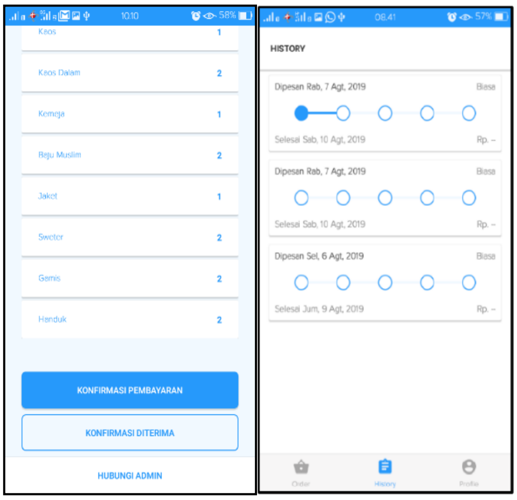
Min, 18 Agt, 2019 — Delivered: *your clothes have been delivered*

Tipe Laundry	Biasa
Berat	4Kg
Harga	Rp.13.650
Diskon	0%
Total Harga	Rp.13.650

Jumlah Pakaian

Bandana	4
Topi	1
Masker	2
Kupluk	2
krudung	4
Peci	3
Kaos	1
Kaos Dalam	2
Kemeja	1
Baju Muslim	2

Figure 12. Order Status Detail Menu and the number of U3 Laundry customer clothes



Kaos	1
Kaos Dalam	2
Kemeja	1
Baju Muslim	2
Jaket	1
Swetcr	2
Gamis	2
Handuk	2

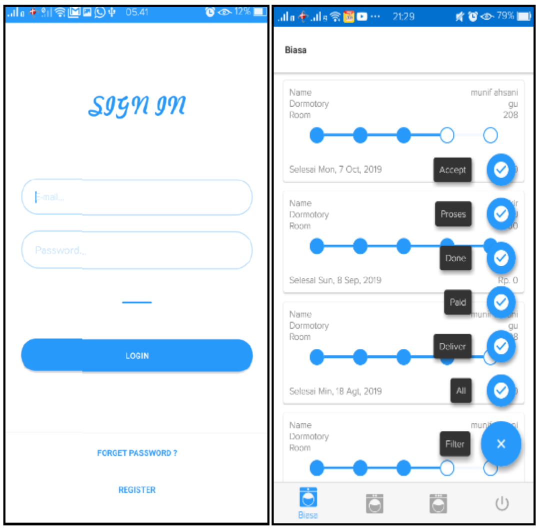
HISTORY

Dipesan Rab, 7 Agt, 2019 — Biasa — Selesai Sab, 10 Agt, 2019 — Rp. -

Dipesan Rab, 7 Agt, 2019 — Biasa — Selesai Sab, 10 Agt, 2019 — Rp. -

Dipesan Sel, 6 Agt, 2019 — Biasa — Selesai Jum, 9 Agt, 2019 — Rp. -

Figure 13. Order Confirmation menu and detailed order history for Laundry U3 customers



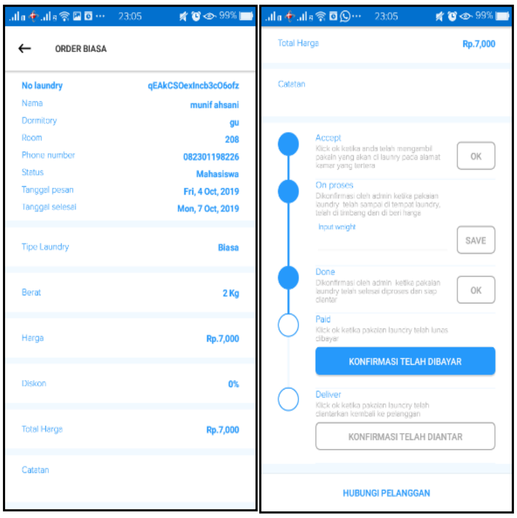
Name munif ahsani — Dormotory gu — Room 208 — Selesai Mon, 7 Oct, 2019

Name — Dormotory — Room — Selesai Sun, 8 Sep, 2019 — Rp. 0

Name — Dormotory — Room — Selesai Min, 18 Agt, 2019

Name — Dormotory — Room

Figure 14. Employee Login Menu and Order Confirmation of orders by Laundry U3 employees



ORDER BIASA

No laundry	qEAkCSOexIncb3cO6ofz
Nama	munif ahsani
Dormitory	gu
Room	208
Phone number	082301198226
Status	Mahasiswa
Tanggal pesan	Fri, 4 Oct, 2019
Tanggal selesai	Mon, 7 Oct, 2019
Tipe Laundry	Biasa
Berat	2 Kg
Harga	Rp.7,000
Diskon	0%
Total Harga	Rp.7,000
Catatan	

Accept: Klick ok ketika anda telah mengambil pakain yang akan di launry pada alamat kamar yang tertera — OK

On proses: Dikonfirmasi oleh admin ketika pakaian laundry telah sampai di tempat laundry, telah di timbang dan di beri harga — Input weight — SAVE

Done: Dikonfirmasi oleh admin ketika pakaian laundry telah selesai diproses dan siap diantar — OK

Paid: Klick ok ketika pakaian laundry telah lunas dibayar — KONFIRMASI TELAH DIBAYAR

Deliver: Klick ok ketika pakaian laundry telah diantarkan kembali ke pelanggan — KONFIRMASI TELAH DIANTAR

Figure 15. Menu Checking orders by employees and Confirming payment of orders by Laundry U3 employees

Figure 9. is the splash screen and signup page for the customer. The splash screen page is the initial page when the user opens the application. On this page, the system will run the algorithm if the user has used the application, which means the user has created an account and has logged in; after the splash screen page, the user will be directed to the main page. The application is a page to make an order. The register page is the page that is displayed when the user selects the register button on the login page. On this page, the user can carry out the registration or registration process to be able to use the features in the application by entering the E-mail data and password, and also confirming the password, and pressing the register button.

Figure 10. The page is displayed after the user registers on the register page. On this page, the user can enter the data needed to use this application, namely data on name, dormitory, room, cellphone number, status at UNIDA Gontor (Student, Lecturer, Staff or Guest), and also gender

data as male or girl. The ordinary, express, and express laundry order pages will be displayed when the user selects a specific laundry order menu while on the main application page.

Figure. 11, Figure. 12 and Figure 13. are customer pages. The order detail page is the page that is displayed when the user selects an item in the history list. This page will display some of the information the user needs to find out things related to the clothes being processed, such as indicators to show the process carried out by the U3 laundry. In addition, this page also displays information on the type of laundry selected, weight, price, and detailed data on which clothes are washed and their quantities.

Figure 14. and Figure 15. shows employee pages. Figure 14. the login page for this courier application is the same as the laundry application. The difference is that the login page for this courier does not have a feature to reset the password if the user forgets the login password and does not have a feature to go to the register page. This login page can only be entered by a particular courier account created by the developer. If the user uses an account other than a courier account, the application will show a warning, and the user will be redirected back to the login page. This page also contains the usual order page, express order page, and express order page on the courier application. This page is used to display all existing orders in list form and also displays brief information about existing orders. On this page, a filter feature is used to display orders based on the order status of each order.

Figure 15. is a detailed order to display various information relating to orders that customers have made. This page will display various detailed information from the order, including the laundry number or laundry id, name, hostel, room, telephone number, customer status, and other information. On this page, some buttons function to update the order status

III. Results and Discussions

A. *System Testing*

At this stage, the researcher conducted tests with two aspects: a black-box test at the interface of customers and employees of U3 and questionnaires by respondents from customers and employees of Laundry U3. In the aspect of the customer interface, there are 15 pages tested with black-box, and all are valid and without errors. In the aspect of the employee, the interface has five pages that were tested with a black box, and the results are valid and without errors. Table 1. Shows the details

The questionnaire results from customers and employees of U3 laundry gave the highest average value of 4 out of 5 points. Aspects assessed by customers include six statements, namely: The information provided by this application is easy to understand, The use of application features is easy to use, The design of this application is attractive, This application is according to needs, This application is valid, and This application provides accurate and detailed information. While the aspects assessed by employees consist of 7 aspects, of which six aspects are the same as the customer, one additional aspect, this application, can assist in the order data collection process. The results of the respondent's questionnaire show that the Android mobile-based U3 laundry application has fulfilled user needs.

B. *Discussion of Improvements*

The laundry U3 was built to solve collecting customer order information. Such as names of the clothes, clothes number, time order, and the time the clothes were delivered back after they were finished. This application is built using the JAVA programming language for application logic and Model-View-Presenter (MVP) as an architectural pattern like[19], [20]. While application users see the display, registrants use the XML language, and database researchers use BaaS (Backend as a Service) technology called firebase to make it easier to develop applications. Suggestions for further research are to add a cost feature for clothes that use hangers and plastic and add a real-time notification feature for customers to find out the status of their clothes.

Table 1. UI/UX Laundry U3 Black-box testing

No.	UI/UX Pages	Page Type	Result
1	Splash Screen	Customer	Valid
2	Login	Customer	Valid
3	Register	Customer	Valid
4	Forgot password	Customer	Valid
5	Customer Data	Customer	Valid
6	Main Menu	Customer	Valid
7	Order Laundry (Reguler, Express, Special)	Customer	Valid
8	History	Customer	Valid
9	Customer Profile	Customer	Valid
10	Order Detail	Customer	Valid
11	Edit Profile	Customer	Valid
12	About Apps	Customer	Valid
13	Terms and Conditions	Customer	Valid
14	Suggestion	Customer	Valid
15	Contact Us	Customer	Valid
16	Login	Employee	Valid
17	Reguler Order	Employee	Valid
18	Express Order	Employee	Valid
19	Special Order	Employee	Valid
20	Details Order	Employee	Valid

IV. Conclussion

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The results of this study indicate that Android-based mobile applications have been implemented at UNIDA Gontor and have been uploaded to Google Playstore (https://play.google.com/store/apps/details?id=com.tiunida.laundry0). The black box testing and questionnaire methods show that the Laundry U3 application is valid and without errors. It speeds up and makes it easier for customers and employees to view and update the status of clothing orders. Suggestions for further research are to add a cost feature for clothes that use hangers and plastic and add a real-time notification feature for customers to find out the status of their clothes

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