

The development of Gas Ordering and Delivery Application for Chuan Huat LPG Sdn. Bhd.

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Abstract: The gas ordering and delivery application is a user-friendly application that helps Chuan Huat LPG Sdn. Bhd in organizing their order record and delivery process to run smoothly. When a consumer places a gas order thru a call to Chuan Huat LPG Sdn. Bhd., usually consumers expect to receive their order as soon as possible. But on the company side, they may have occurred some kind of obstacle such as their worker not available, their stock running out, or else. Therefore, it such a problem when the consumer does not know when their order will be received at home. This application could help customer to track their order. Other than that, the company can make prediction on the gas demand and lowering the risk for losing the invoice during delivery. The target user in this project are customers, seller, and staff. The module for the customer is Login, Register, Profile, Order, Order List, and Order History. While for the seller, the module is Login, Staff Record, Order Record, and Customer Record. The staff has Registration, Login, Profile, Task, Task List, and Task History as modules. The system process model used for this application is a structured approach. This application is using android technology and available for android user only. The programming language is JAVA as the front end is using Android Studio. While the database is using Firebase Firestore. This application is expected to make the ordering process becoming easier for the customer. The seller can easily manage the order record in systematic way. Moreover, this application helps the staff in organizing their task to that enhance their performance. Overall, this application will help Chuan Huat LPG Sdn. Bhd in improving their existing system and give a new business environment that is more systematic.

Keywords: Gas Ordering and Delivery Application, Structured approach, Android Technology.

1. Introduction

There is various way to buy gas which is walk-in to the gas store or any convenience store that provide gas. There is also a certain gas station that provide LPG gas. Petron Malaysia Refining & Marketing Bhd, for example, currently sells liquefied petroleum gas (LPG) under the "Petron Gasul"

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brand at five select service stations [1]. However, people prefer to make a phone call or message the gas supplier as this is the fastest way to make order. Plus, mostly supplier will have someone to deliver the gas over the house and they will also take the empty gas tank. Customers will not return to a business that delivers poor delivery service, according to surveys [2]. This system will help the company to organize their ordering to be more systematic and delivery process would be smooth.

The issue in this application is customer cannot track their order. Other than that, the company cannot make prediction on the gas demand and there is a high risk for losing the invoice during the delivery activity. The objective for this project is to design, develop and testing the application using structured approach and functional testing. The target user in this project are customer, seller and staff which is the module for customer are Login, Register, Profile, Order, Order List, and Order History. While for the seller, the module are Login, Customer Record, Order Record, and Staff Record. Lastly, the staff have Registration, Login, Profile, Task, Task List, and Task History as module.

The proposed system is expected customer can track the order and check the status order, help the seller to manage the order record in systematic way, and the staff can focus more on the delivery service with replacing invoice into e-Invoice. Without this application, the customer cannot track the order regularly to stay update on delivery process. Other than that, the gas prediction may be not so accurate due to data redundancy. Lastly, the lost invoice dragging the process of delivery.

2. Related Work

2.1 Background of Case Study

Chuan Huat LPG Sdn. Bhd. is located in Shah Alam's Mah Sing Industrial Park. Chuan Huat LPG began as a grocery store in Subang Jaya SS15 in 1981, and later acquired the Shell dealership and changed its name to Chuan Huat LPG Sdn. Bhd as a gas distributor [3]. Nowadays, Chuan Huat LPG Sdn. Bhd is officially operating as Mira gas distributor. They provide gas cylinders and other business-related supplies. Housing in Shah Alam, USJ, Subang Jaya, and select regions in Kota Damansara are the target customers [3].

The Chuan Huat LPG Sdn. Bhd business implements manual gas ordering and delivery system which is all the process is through phone calls and papers. The customer needs to wait for operator to answer the call-in order to place order. There is only a phone call made by the staff once they arrive at the customer place. Later, the invoice is sent to the customer along with the gas. Lastly, the payment is made by Cash on Delivery (COD). The staff will collect the payment and give to responsible staff at the office. Figure 1 show the flowchart of existing ordering and delivery system for Chuan Huat LPG Sdn. Bhd.

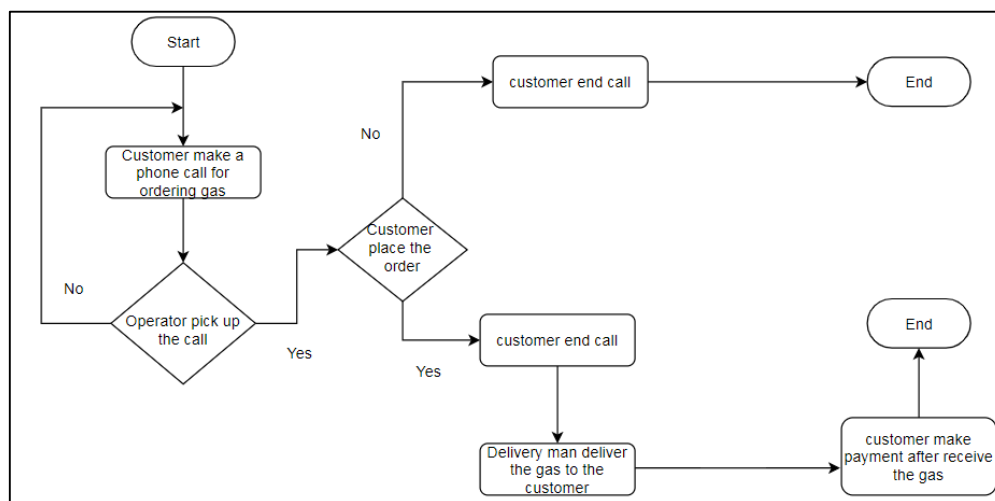


Figure 1: Flowchart of existing ordering and delivery system for Chuan Huat LPG Sdn Bhd.

2.2 Mobile Technology

The existing system can be improved using mobile technology which is the manual system is transform into online system using android mobile application platform. People nowadays value mobile phones because of their ability to function as a PC [4]. Their size is small and easy to be carried away. In short, people always with their smartphone and they are more depends on it to complete their daily task.

Android is known as an open-source mobile OS developed by Google. However, according to Polygant, the OS was created by Android Inc. and based on Linux before being purchased and popularised by Google [5]. Because there is a bigger number of users, the Android mobile application technology is advocated. [6]. This is because, various type of android smartphone produces within a year by the dozens of manufacturers such as Samsung, Huawei, and Oppo.

The online method is more efficient in terms of time. [7]. Instead of consuming a lot of time waiting for the call to be pick up, the customer can make the order upon their fingertip and it will automatically record in the system. Plus, the ordering data is not redundant and systematic. This also can reduce time to making the sales report. Thus, the report can be generated in a single click.

2.3 Comparison with the Existing Systems

Comparison table is comparing the Gas Ordering and Delivery Application with other 3 existing system. The element that been study is the features of each system. The aim of study is developing an application that can much better than existing system that can help improve Chuan Huat LPG Sdn. Bhd system. Table 1 show the comparison existing system with the Gas Ordering and Delivery Application for customer side application while table 2 for business side.

Table 1: Comparison table existing system with the Gas Ordering and Delivery Application for customer side

Features	HaloGas [11]	BeliGas [13]	Auxci Gas [12]	Gas Ordering and Delivery Application
Register module	No	No	Yes	Yes
Login module	No	Yes	Yes	Yes
Profile module	No	No	Yes	Yes
Target customer	All	Home or business	Home or business	Housing
Order module	Yes	Yes	Yes	Yes
Product	Gas cylinder	Gas cylinder	Gas cylinder	Gas cylinder and accessories
Payment	Cash on Delivery (COD)	Cash on Delivery (COD)	Cash on Delivery (COD)	Cash on Delivery (COD)
Order status	Yes (by email)	Yes	Yes	Yes
History module	No	Yes	Yes	Yes
Platform	Website	Android	Android and IOS	Android

Table 2: Comparison table existing system with the Gas Ordering and Delivery Application for business side

Features	HaloGas [11]	BeliGas [13]	Auxci Gas [12]	Gas Ordering and Delivery Application
Register module	No	No	Yes	Yes
Login module	Yes	Yes	Yes	Yes
Profile module	Yes	No	Yes	Yes
Task module	Yes	Yes	Yes	Yes
History module	Yes	No	Yes	Yes
Platform	Android	Android	Android and IOS	Android

3. Methodology

3.1 Structured Process Model

The model implement for this project is the waterfall model as our system process model. This structured approach examines the system from the top down [8]. The waterfall model is easy to understand due to its linear framework. There would be impossible to having overlapping phases. This is due to the fact that each step must be finished before the next one can begin [9]. We will be able to undergo a systematic project development as we go detail one by one. Basically, there are five phases in SDLC which are Planning, Analysis, Design, Implementation and Testing shown in figure 2. The activity in each phase is conclude in table 3.

**Figure 2: Structured Approach Model [8]****Table 3: Activity Gas Ordering and Delivery Application Structured Approach Model**

Phase	Activity	Output
Planning	<ul style="list-style-type: none"> Choose the project title Gathering the data Identify the problem Identify the objective Identify the scope Decide the system process model Estimate the time for project planning 	<ul style="list-style-type: none"> Project proposal Gantt chart
Analysis	<ul style="list-style-type: none"> Analysis the existing system Determine functions and non-function requirements of the proposed system Determine hardware and software used in this proposed system Determine user requirement Design context diagram 	<ul style="list-style-type: none"> Table comparison existing system with proposed system Decided functions and non-function requirements Decided hardware and software Decided user requirement. CD, DFD and ERD

Phase	Activity	Output
Design	<ul style="list-style-type: none"> • Design data flow diagram • Design entity relationship diagram 	<ul style="list-style-type: none"> • Flowchart • Database design • User interface
	<ul style="list-style-type: none"> • Design flowchart • Design database design • Design user interface 	
	<ul style="list-style-type: none"> • Build the project prototype using development tool 	
Implementation	<ul style="list-style-type: none"> • Build the project prototype using development tool 	<ul style="list-style-type: none"> • Project prototype
Testing	<ul style="list-style-type: none"> • Testing the project using alpha testing. • Document the project • Evaluate the project 	<ul style="list-style-type: none"> • Test case • Final prototype • Final report. • Project evaluation form

3.2 Project Planning

This project conducted within 2 semester which is the first semester will focus on planning, analysis, design, and implementation phases. While, the second semester will continue on implementation and testing the project. In its most basic form, a Gantt chart is a timetable that depicts how the project will progress during the project management process [10]. Therefore, Gantt chart is use as visualization tool for this project planning. Figure 3 show a Gantt chart for this project.

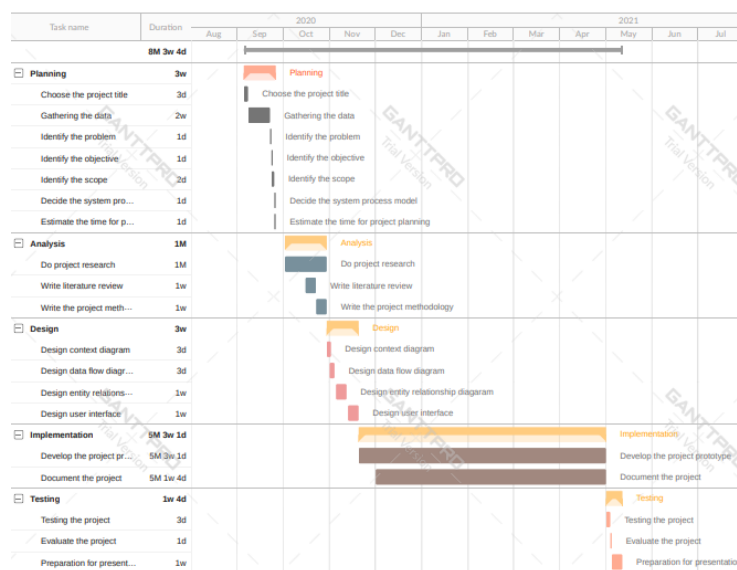


Figure 3: Structured Approach Model

4. Result and Discussion

4.1 System Analysis and Design

This chapter have two part which is analysis and design. The first part is analysis which is requirement analysis and system analysis. The second part is design which is system design and database design.

4.1.1 Requirement Analysis

The requirement analysis consists of functional and non-functional requirement and user requirement. Table 4 is functional requirement, while table 5 is non-functional requirement. Next, table 6 is software requirement for this project. Lastly, table 7 is user requirement.

Table 4: Functional requirements for the Gas Ordering and Delivery Application.

No.	User	Module	Functional Requirement		
1.	Customer	Login	<ul style="list-style-type: none"> The system shall allow user to login into their account. The system shall show error to user if username or password invalid before can proceed to account login. The system shall show notice to user for email verification when first time login. 		
		Registration	<ul style="list-style-type: none"> The system shall allow the user to register their account. The system shall not allow the user to register with the same existing username. The system shall show error to the user if the password is not strong before proceed to registration account. 		
		Profile	<ul style="list-style-type: none"> The system shall allow the user to add, edit or update their profile details. The system shall show error to the user if there is incomplete information or not following the requirement before proceed to save or update user information. 		
		Order	<ul style="list-style-type: none"> The system shall allow the user to view their profile. The system shall allow the user to make gas ordering. The system shall show the error to the user if there is any empty field before proceed to confirmation order. The system shall show the order detail to the user for confirmation before proceed the order to deliver. The system shall allow the user to make cancellation order before submit the order. 		
		History	<ul style="list-style-type: none"> The system shall allow the user to view their order history with e-Invoice report. The system shall allow user to give their feedback to seller. 		
		Order List	<ul style="list-style-type: none"> The system shall allow the user to view their order list with e-Invoice report. The system shall allow the user to check their status order. 		
		2.	Seller	Login	<ul style="list-style-type: none"> The system shall allow user to login into their account. The system shall show error to user if username or password invalid before can proceed to account login.
				Order Record	<ul style="list-style-type: none"> The system shall allow the user to view order record. The system shall allow the user to generate the sales report.
				Customer Record	<ul style="list-style-type: none"> The system shall allow the user to view their customer record.

No.	User	Module	Functional Requirement
3.	Staff	Staff Record	<ul style="list-style-type: none"> The system shall allow the user to view their staff record.
		Login	<ul style="list-style-type: none"> The system shall allow user to login into their account. The system shall show error to user if username or password invalid before can proceed to account login. The system shall show notice to user for email verification when first time login.
		Registration	<ul style="list-style-type: none"> The system shall allow the user to register their account. The system shall not allow the user to register with the same existing username. The system shall show error to the user if the password is not strong before proceed to registration account.
		Profile	<ul style="list-style-type: none"> The system shall allow the user to add, edit or update their profile details. The system shall show error to the user if there is incomplete information or not following the requirement before proceed to save or update user information.
		Task	<ul style="list-style-type: none"> The system shall allow the user to view their profile. The system shall allow the user to pick their task. The system shall allow the user to manage their task.
		Task List	<ul style="list-style-type: none"> The system shall allow the user to view their task. The system shall allow the user to manage their task.
		Task History	<ul style="list-style-type: none"> The system shall allow the user to view their task history. The system shall allow user to give their feedback to company.

Table 5: Non-functional requirements for the Gas Ordering and Delivery Application.

No	Non-functional Requirement	Functionality
1.	Operational	<ul style="list-style-type: none"> The system shall available for android mobile smartphone only. The system shall work with internet service. The system shall work well without any error. The system shall service with maintenance and stay updated.
2.	Performance	<ul style="list-style-type: none"> The system shall provide the accurate data. The system shall provide the validation email for enable only valid email is used for registration.
3.	Usability	<ul style="list-style-type: none"> The system shall provide user with user-friendly mobile application.
4.	Security	<ul style="list-style-type: none"> The system shall allow only owner can generate any report. The system shall allow user with correct password to login into their account.

Table 6: Software requirements of the Gas Ordering and Delivery Application.

No.	Software	Functionality	Application
1.	Development tool	Platform to create, edit, debug, maintain or testing application.	Android Studio
2.	Programming language	Type of programming language use to write the application code.	Java
3.	Server application	A cross platform to access the database.	Firebase
4.	Database	Design and build the database.	Firestore
5.	Mobile OS	Supported mobile OS for the application	Android 4.1 (Jellybean) and above
6.	USB Driver	To enable the Android Studio, install the application direct to the smartphone.	Samsung USB Driver for Mobile Phones
7.	Designing tool	Platform to create and edit the flow chart, data flow diagram and entity relationship diagram.	Draw.io

Table 7: User requirements for the Gas Ordering and Delivery Application.

No.	User	Module	User Requirement		
1.	Customer	Login	<ul style="list-style-type: none"> User need to enter a correct username and password to login into their account. User need to verify email before login for the first time. 		
		Registration	<ul style="list-style-type: none"> User need to pick a different username from existing username. User need to pick a strong password to register account. 		
		Profile	<ul style="list-style-type: none"> User can add, edit or update their profile details. User need to fill in the information according to the requirement to save or update their information. 		
		Order	<ul style="list-style-type: none"> User can view their profile. User can make gas ordering. User need to fill in all empty field before proceed to confirmation order. User need to check their order detail then confirm the order before proceed the order to deliver. User can make cancellation before submit order. 		
		Order List	<ul style="list-style-type: none"> User can check their status order. User can view their order details. 		
		Order History	<ul style="list-style-type: none"> User can view their order history with e-Invoice report. 		
		2.	Seller	Login	<ul style="list-style-type: none"> User can give their feedback to seller. User need to enter a correct username and password to login into their account.
				Order Record	<ul style="list-style-type: none"> User can view their order record. User can generate the sales report.
				Staff Record	<ul style="list-style-type: none"> User can view their staff record.

No.	User	Module	User Requirement
		Customer Record	<ul style="list-style-type: none"> User can view their customer record.
3.	Staff	Login	<ul style="list-style-type: none"> User need to enter a correct username and password to login into their account. User need to verify email before login for the first time.
		Registration	<ul style="list-style-type: none"> User need to pick a different username from existing username. User need to pick a strong password to register account.
		Profile	<ul style="list-style-type: none"> User can add, edit or update their profile details. User need to complete the information and follow the requirement before proceed to save or update user information.
		Task	<ul style="list-style-type: none"> User can view their profile. User can pick their task. User can manage their task.
		Task List	<ul style="list-style-type: none"> User can view their task. User can manage their task.
		Task History	<ul style="list-style-type: none"> User can view their task history. User can add feedback to company.

4.1.2 System Analysis

The system analysis consists of context diagram (CD), data flow diagram (DFD), and entity relationship diagram (ERD). Figure 4 is CD, while figure 5 is DFD level 0. Next, figure 6 and 7 are DFD level 1. Lastly, figure 8 is ERD.

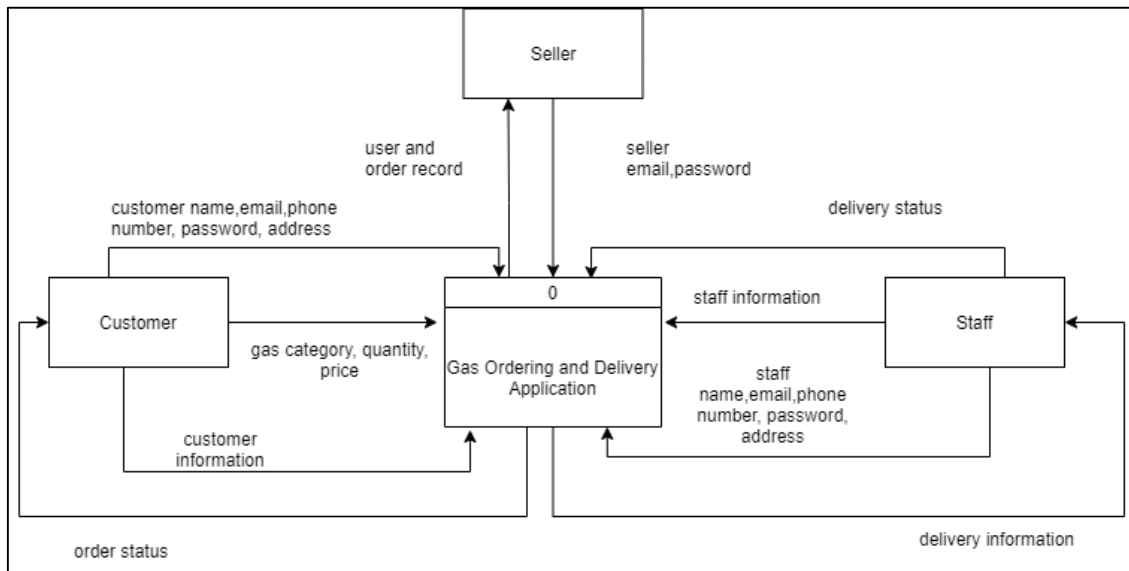


Figure 4: Context Diagram (CD)

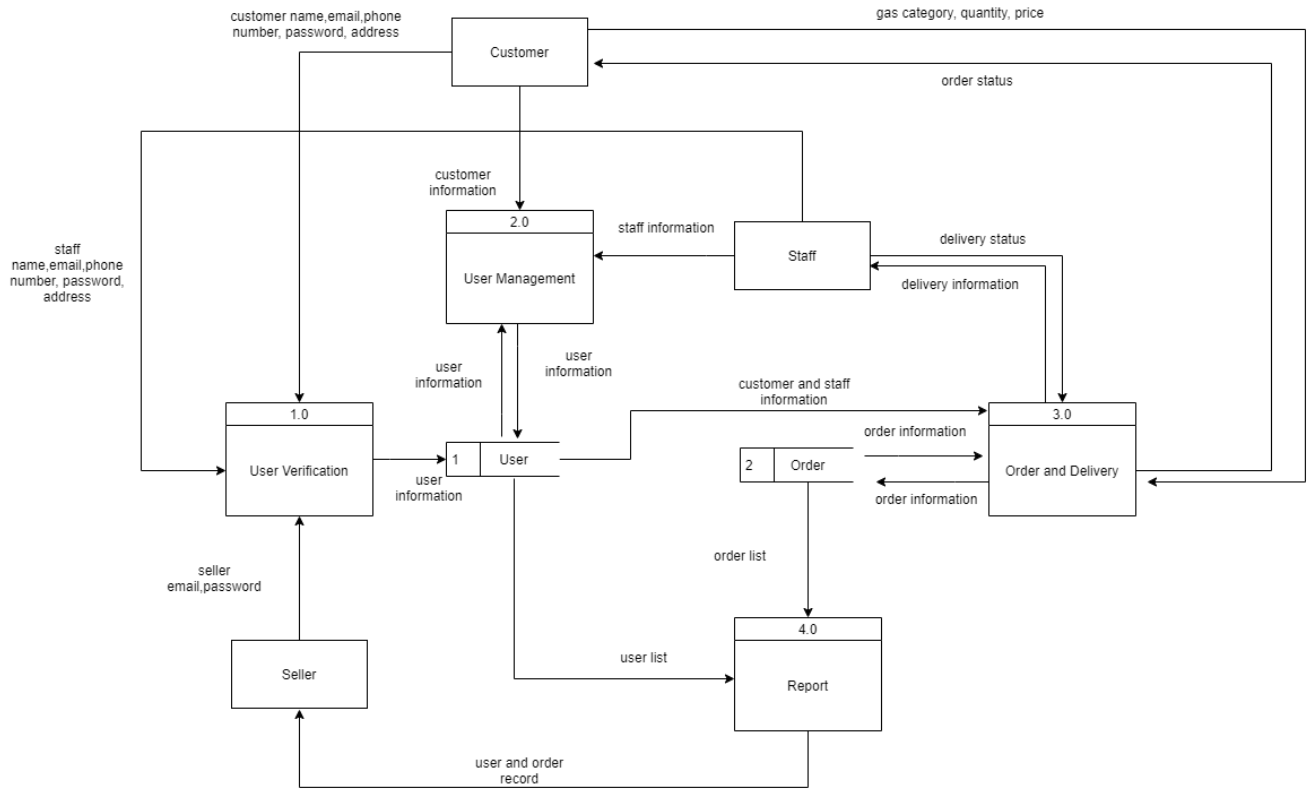


Figure 5: Data Flow Diagram (DFD) Level 0

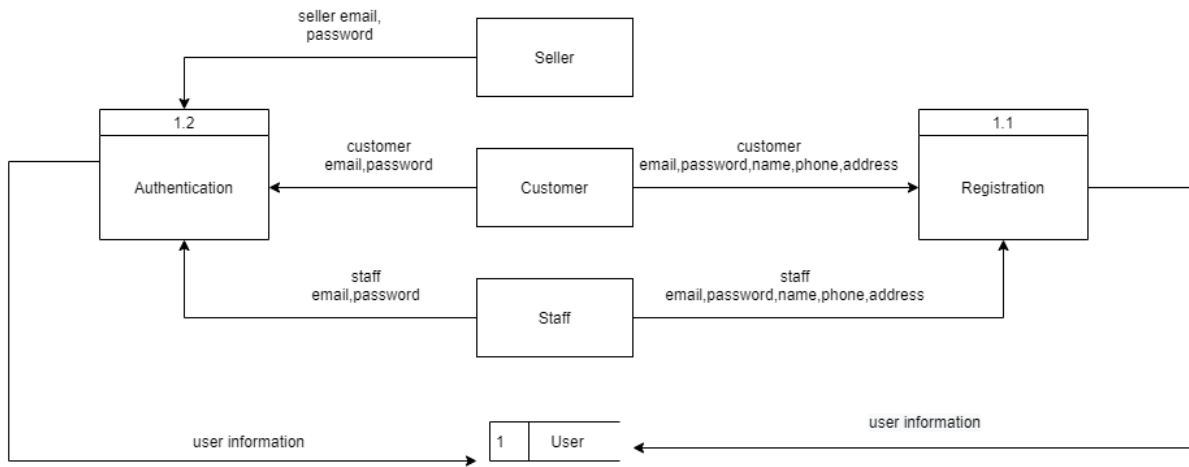


Figure 6: Data Flow Diagram (DFD) Level 1 for Process 1.0

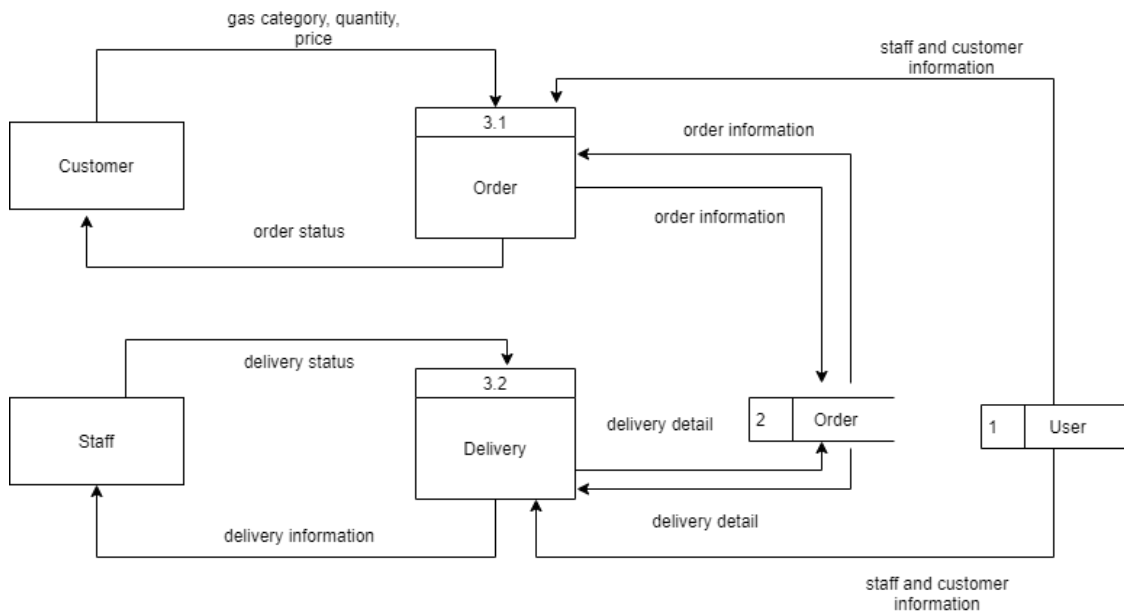


Figure 7: Data Flow Diagram (DFD) Level 1 for Process 3.0

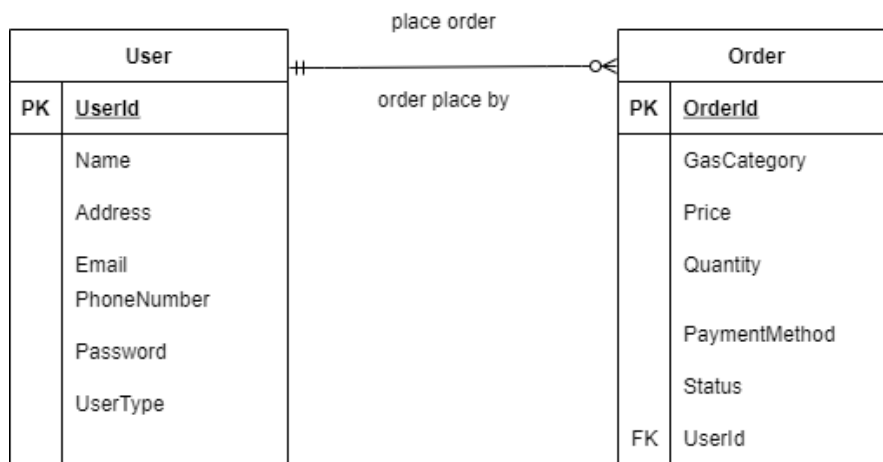


Figure 8: Entity Relationship Diagram (ERD)

4.1.3 The System Design

The system design is a flowchart in figure 9.

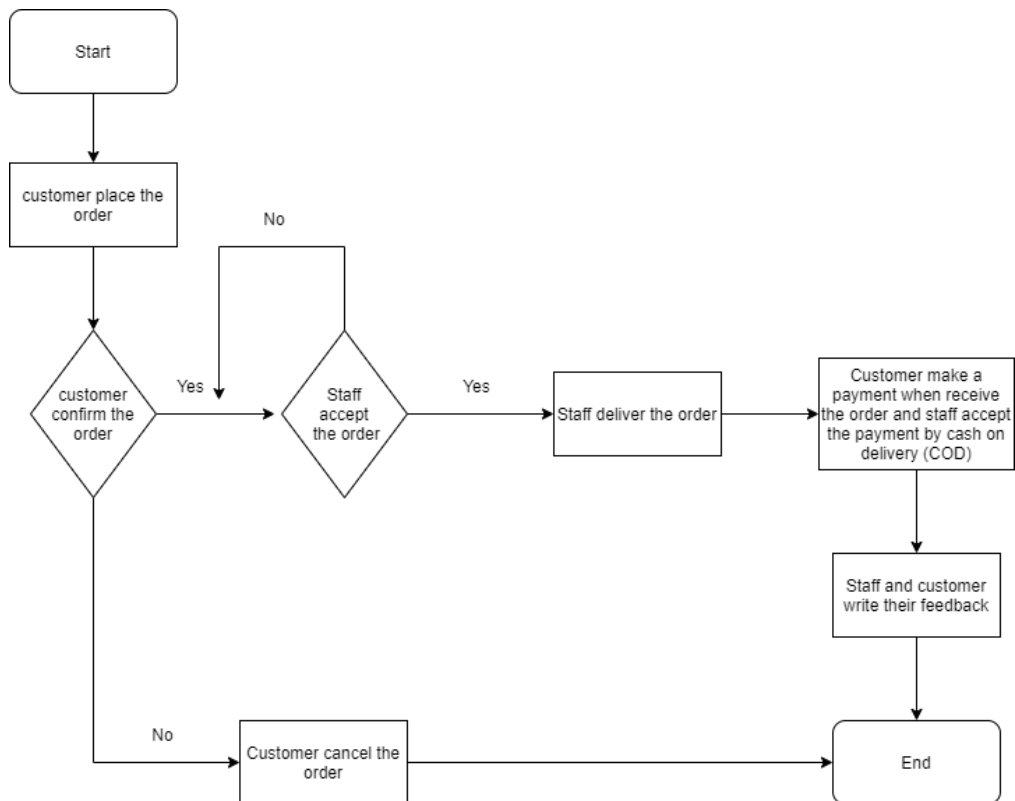


Figure 9: Gas Ordering and Delivery Application Flowchart

4.2 Implementation

4.2.1 User Interface

4.2.1.1 Customer

Figure 10 show customer interface which is consist of navigation menu, profile module, order module and order history module.

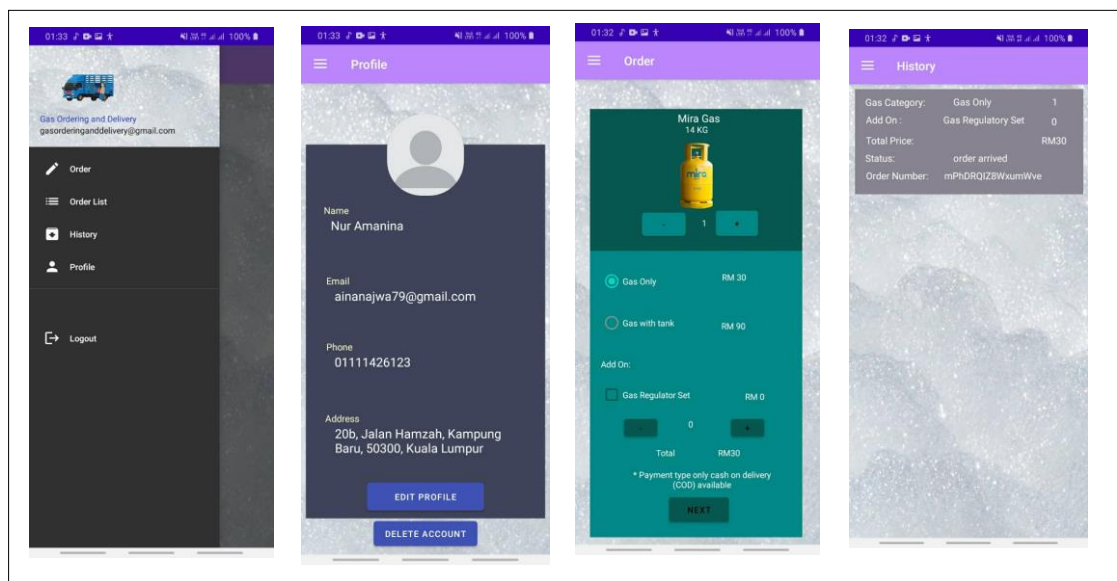


Figure 10: Customer User Interface

4.2.1.2 Seller

Figure 11 show seller interface consist of navigation menu, order record module, staff record module and customer record module.

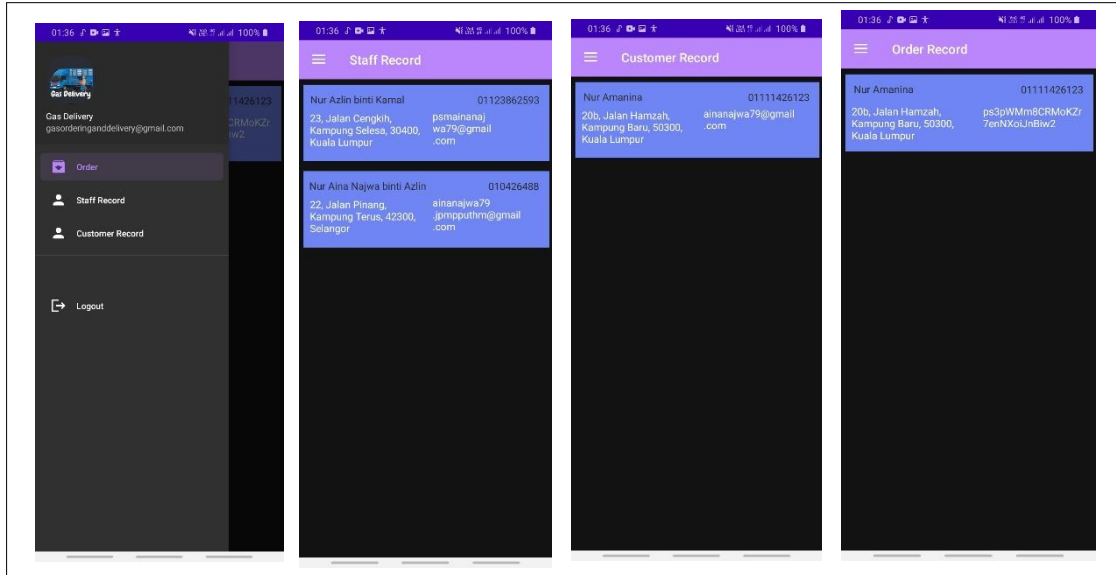


Figure 11: Seller User Interface

4.2.1.3 Staff

Figure 12 show staff interface consist of navigation menu, order record module, staff record module and customer record module.

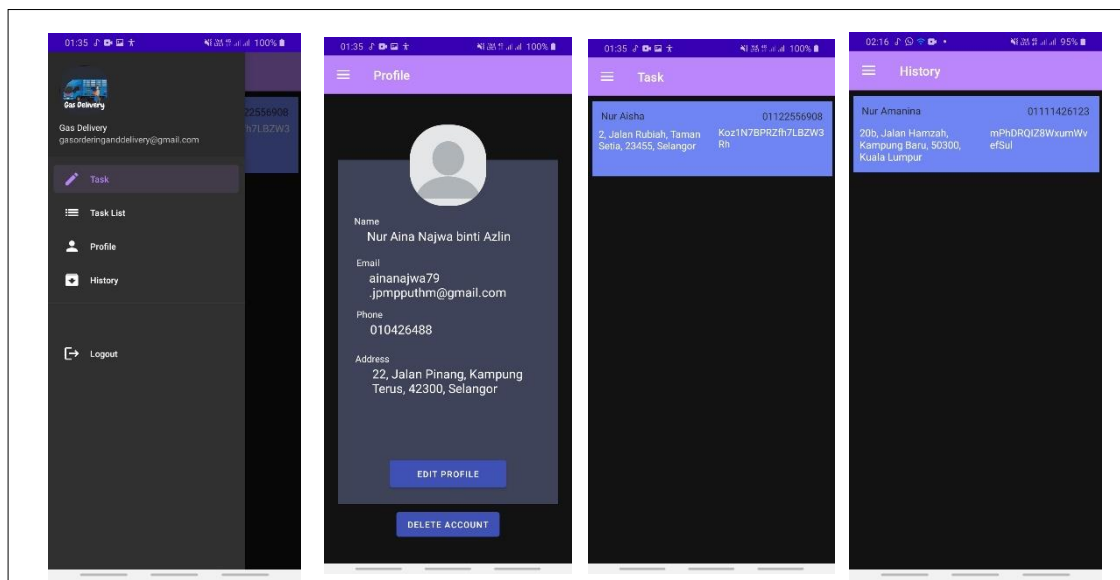


Figure 12: Staff User Interface

4.3 Testing

One of functional testing is an alpha test carried out by the developer to test the function of each features in the application. One of the methods is carried out test plan. The test plan is to make sure the project outcome is same as expected outcome. If not, the function is considered as fail.

There are four test plans carried out in this project based on the main function in both application which is the test plan for register module, login module, profile module and order module. The table 8 is test plan for register module. Then, table 9 is test plan for login module. Table 10 is test plan for profile module. Lastly, table 11 is test plan for order module.

Table 8: Test Plan for Register Module

No.	Test Cases	Expected Output	Actual Output
1.	Show error message if press button with empty field	Show error message	Pass
2.	Show error message if register using existing email	Show error message	Pass
3.	Show error message if password is not 6 characters and above	Show error message	Pass
4.	Show message when success register the account	Show message	Pass
5.	User information store in database when click register button	User information add on database	Pass

Table 9: Test Plan for Login Module

No.	Test Cases	Expected Output	Actual Output
1.	Show error message if press button with empty field	Show error message	Pass
2.	Show error message if register using existing email	Show error message	Pass
3.	Show error message if password is not 6 characters and above	Show error message	Pass
4.	Show message when success login the account	Show message	Pass
5.	Show error message if email and password not match	Show error message	Pass
6.	Show validate email message when user login in for the first time.	Show validate message	Pass
7.	Send email to user for forgot password	Sent email	Pass
8.	User authentication recorded in database	User authentication recorded in database	Pass

Table 10: Test Plan for Profile Module

No.	Test Cases	Expected Output	Actual Output
1.	Show error message if press button with empty field	Show error message	Pass
2.	Show user detail same as register or update	Show user detail	Pass

No.	Test Cases	Expected Output	Actual Output
3.	User information store in database when click save button	User information update on database	Pass

Table 10: Test Plan for Order Module

No.	Test Cases	Expected Output	Actual Output
1.	Change quantity based on button plus minus	Show accurate quantity number	Pass
2.	Show price for each category with quantity	Show accurate price	Pass
3.	Show quantity null if not checked the checkbox for add on	Show quantity null	Pass
4.	Show price for add on with quantity	Show accurate price	Pass
5.	Show total price automatically without refresh the total price with click category button	Show accurate price	Fail
6.	Show total price if refresh the total price with click the category button	Show accurate price	Pass
7.	Show error message if press confirm button with empty field	Show error message	Pass
8.	Show user detail same as register or update	Show user detail	Pass
9.	Show order detail on confirmation page	Show order detail	Pass
10.	Delete the order data from database when click cancel button on confirmation page	Delete order data from database	Pass
11.	Order information store in database.	Order information store in database.	Pass

5. Conclusion

Firstly, the customer can track their order by the order status which is the order is accepted when there is a list in the order list module with the label of status like “order accepted”. Then, the order is successfully paid and deliver to the customer when the order is on the list of order history.

Next, the gas demand now can be predicted more accurate based on the Order Record. The total price is generated automatically which is already lowering the human error factor in preparing the sales report.

Lastly, the high risk for losing the invoice during delivery has been lower down as the seller is using e invoice. The staff can always check the order information on their smartphone in one single click. The staff no need to give the invoice to customer by hand anymore as the e-invoice is generated automatically direct to the customer.

However, even the project success to solve the problem statement and archive the project goal. There are a few disadvantages such as there is no live tracking function to track the order, the Order Record, Customer Record, and Staff Record does not have a search and filter function. the e invoice is not generated in proper PDF file, and there is not online payment method such as e-wallet or online banking.

Based on the limitations listed, the developer may add on live tracking function to track the order, add search and filter function in the Order Record, Customer Record and Staff Record, generated e-invoice in PDF file and email customer the e invoice, and add on online payment method such as e-wallet or online banking as a recommendations for the future improvement.

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