

## **E-Commerce Group Buying Web-based System**

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**Abstract:** E-Commerce Group Buying Web-based System is a web-based system that is developed for Malaysian's user to make the online purchasing by group easily, and compatible for web and mobile application platform. Recently, in Malaysia, e-commerce group buying website are not familiar and not well-known as the other countries like China. The study has been conducted on existing group purchasing system in Malaysia, which is Groupon Malaysia. One of the problems encountered by the user that use this e-commerce website is the technology used by the system is incompatible for mobile platform user, make it having difficulties to growth well in e-commerce industry. Thus, the system should be able to develop a web-based system that enable Malaysian user to use it in pc or mobile to make it convenient for the user when dealing with online shopping. Furthermore, this study focusses on developing e-commerce group buying web-based system by using SCRUM agile methodology and object-oriented programming (OOP) approach for the system analysis and design. Therefore, the system is designed as a web-based online group buying platform that allows Malaysian users to make group purchases at a low-price rate with minimal effort without having to go to a physical store.

**Keywords:** E-commerce, Group Buying, Web-based

### **1. Introduction**

The concept of group buying is to promote or recommend products or services to others in order for them to get a better discount and, as a result, acquire a product at a much more appealing price. Origins of group buying can be traced to China, where it is known as Tuán Gòu (Chinese) or team buying. Online group buying, which is a system that offers daily discounts on a variety of services and products, is a modern form of marketing at the junction of promotion and pricing that has captivated the interest of practitioners and academia [1]. Starting in the United States in 2008, the method proved to be effective, and within a short period of time, lots of clone group buying websites sprouted and spread throughout the world. The major reason for this growth is that the approach delivers a win-win scenario for system stockholders, businesses, and customers [2].

According to the study data, global and local economic trends are driving consumers in middle-income nations like Malaysia to cut back on spending and look for ways to get items and services at discounted prices [2]. Furthermore, the government has recognized that e-commerce is critical to the growth of its economy. Currently, e-commerce plays a crucial part in sustaining Malaysia's economic

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growth. In addition, the country has realized that ecommerce plays a key role in the growth of its economy. Groupon is one of example of group buying that operates in Malaysia and owned by Joel Neoh which is the CEO of Groupon Malaysia. As reported in The Star recently, Groupon Malaysia has more than 1.5 million customers in the country, offering over 160 deals per week from some 3,000 over merchants. It was reported the US daily-deal site company Groupon Inc became profitable in less than a year. The main problem for the creation of this e-commerce system is that there are problems lack in managing business model on the existing system which is Groupon Malaysia having a drastic collapse because the problems facing makes the popularity of group buying in Malaysia drop. Research has suggested that online group-buying websites are a particularly effective form of buying.

Online Group Buying websites has therefore made rapid progress in recent years. Increasingly more online consumers are attracted to Online Group Buying and lack of exposure on group buying system in Malaysia, causing the idea of designing this E-Commerce Group Buying Web-based System (EGBWS). The idea can attract people who have an economic shopping orientation and are concerned with paying a low price to save money by using the EGBWS website. In this sense, buyers collaborate to achieve a given degree of demand that will translate into lower prices. By developing this online group buying system, it puts the power of substantial or considerable discount in the hands of the online buyers or customers. Thus, the customers no need to go to the physical shops or make a direct face to face bidding to get a product at a large discount price.

This project shows how a web-based online group buying platform can help user or customers to provides a win-win situation to the owner of the system and the customers. The report organization of this project is as follows. Section 2, which related work provide insights and identify more detail the system that will be developed based on the studies that have been done. The study of journal, books, articles, and existing system are used in the development process of this system. Next, section 3 which is the methodology part is focusing on the explanation the methodology used of prototype model in this project and the activities that had been carried out in each phase. The prototyping model used such for this system such as agile Scrum process model and why is it chosen will be the main information gathered in this phase. Then, in this chapter also describes on how each phase will works and the purpose of each phase, the brief explanation on each phase will be explained in the system development workflow, the system requirement analysis, user requirements, designing Use Case diagram, UML, class diagram, flowchart, the interface design and constructing the schema table from the database design. Furthermore, the results and discussion are being discussed in section 4 which focuses on system implementation and testing. Lastly, the final section is the section 5 which is the conclusion part. In this part, the overall results, recommendations and improvement has been discusses that can be made on the future system.

## **2. Related Work**

Online Group buying system had been expedited by the Internet and also easy, quick group coalition method brought by social networks. Then, the online group buying system can be divided into two types. Firstly, type of group buying is structured supported a dynamic pricing mechanism. For this type, lots of buyers are aggregated, and perform collective buying to experience the discounts price online which the discounts prices are decided by price-quantity functions or price-quantity tables outlined by the seller. Thus, every buyer is willing to make an effort to increase the chance of obtaining a lower price by expanding the group buying size. Throughout the process, the website acts as associate intermediary, creating the contact and composing group buying activities on the one hand, whereas spreading the word, attracting the shoppers to the website, and causation them to participate in group buying on the opposite hand. The models used by the existing group buying website like Groupon was the first type whereas Groupon deals are designed and managed by sellers. There are several existing E-commerce systems that includes the Group Buying Website and also the single purchasing sites and apps., this study will be focusing on describing and evaluate the method and approach use by the systems to determine the efficiency of each system that can be applied and modified into this proposed system.

## 2.1 Groupon

Groupon has become a household name among the bargain hunters. The increasing in online purchases with a new type of real-time information and deals has increased the demand in modern online retailing. Groupon which was founded in 2008, describes itself as a platform for online money-back discounted products and services that "give your money back" when the customer's request a deal. There are no costs for the use of an offer and as soon as a consumer makes a claim to an offer, the offer can be used unlimited basis during the offer period. Furthermore, Groupon is a two-sided global marketplace that connects consumers and merchants. Users can buy discounts locally and even get notifications when a retailer or business offers a discount that day or week, or consumers can get discounts in the US or even worldwide.

## 2.2 Alibaba

Alibaba.com is the e-business integrated system that frequently cited as one of the top five websites in the world. Comparing to the others websites, [www.alibaba.com](http://www.alibaba.com) is a pinnacle rated business-to-business (B2B) in addition to business-to-consumer (B2C) website. This website is beneficial to both buyers and sellers [4]. This website has been designed on the basis of waterfall model under the processes of System Development Life Cycle. Alibaba's e-commerce technology has made it so much convenient to SMEs to conduct their business anywhere in the world efficiently. Next, Alibaba provides products within the same range. As this website deals with real trade, pretend peoples aren't allowed to enter here me range with different prices depending on the suppliers to offer buyers a wider choice of variety. Lastly, Alibaba chairman and CEO Daniel Zhang, in a conference call with analysts last month after the firm reported its latest financial results, said the company aims to develop a community group buying model that does not sabotage consumer experience and business sustainability [5].

## 2.3 Shopee

Shopee is one of Southeast Asia's leading eCommerce platforms. It offers a diverse range of products in categories such as consumer electronics, home & living, health & beauty, baby & toys, fashion, and fitness equipment. It was launched in 2015 and Chris Feng as the chief executive officer of Shopee July 2015 and owned by Sea Group, Garena, and SeaMoney organizations [6]. The app-based platform launched a website in order compete with other e-commerce websites. It also has an in-app chat feature that allows buyers to communicate with sellers, as well as a rewards section where users can redeem Shopee Coins and exchange them for vouchers.

Shopee uses 17 technology products and services including HTML5, Google Analytics, and jQuery, according to G2 Stack. Shopee is actively using 69 technologies for its website, according to BuiltWith. A look at the Shopee homepage shows that the market is pulling in brands, promotions like Huawei brand day and Blackmores, making its normal B2C transactions easier. Furthermore, the one of the main features of Shopee instead of others e-commerce website or apps is approach of secure payment solution. Shopee users, can pay for items within the app using a secure payment solution known as "Shopee Guarantee." When a transaction is confirmed, the startup places the funds in an escrow account and does not release the funds to the seller until delivery is confirmed. In addition, it also includes a social component, with users able to follow one another, use hashtags, and even have a sort of news feed and this strategy appears to be working.

E-commerce Group Buying Web-based system competitive advantage is in its "C2M" model, which it can build into the rural infrastructure and entrench this advantage further compared to others existing e-commerce single and group purchases [7].

**Table 1: Comparison Table of Existing System and E-Commerce Group Buying Web-based System**

System/ Features	Groupon	Alibaba	Shopee	E-Commerce Group Buying Web-based system
Registration & Login page	✓	✓	✓	✓
Shopping cart module	✓	✓	✓	✓
Process Order	✓	✓	✓	✓
Business models	B2C	B2C	C2C	C2M
Team formation module	✓	X	X	✓
Scope of Products offered	<ul style="list-style-type: none"> <li>Local Sellers to their locations</li> </ul>	<ul style="list-style-type: none"> <li>All across the world starting in China</li> </ul>	<ul style="list-style-type: none"> <li>Southeast and East Asia, Latin America.</li> </ul>	<ul style="list-style-type: none"> <li>Local Seller in Malaysia</li> </ul>
Limitation time of group purchases formation	X	X	X	✓

### 3. Methodology

Project Methodology is a set of a strictly defined combination of logically related practices, methods and processes that determine how best to plan, develop, control and deliver a project throughout the continuous implementation process until successful completion and termination.

The prototyping model used for this project development is Scrum Agile process model. It focused on having small time-boxed sprints of new functionality that are integrated into an integrated product baseline. Sprints is a short, repeatable phases, typically one to four weeks long. Furthermore, Scrum is based on a self-organizing, multi-functional team. The scrum team is self-organizing in the sense that there is no overall team leader who decides who does what task or how a problem is solved. These are decisions made by the team as a whole. Scrum is an agile development methodology that is used in software development and is based on iterative and incremental processes. It considers that the system development process is an unpredictable, complex process that can only be represented in broad strokes as an overall evolution. Scrum replaces a programmed algorithmic approach with a heuristic method and self-organization to deal with unpredictability and solve difficult complex issues [3].

#### 3.1 Sprint 1: Planning

In this phase, information will be gathered from existing group buying system in mostly in Malaysia for background information, what is the current technology they used and gather the information in order to develop the group buying system and to ensure the flow of the system development is well managed. In this phase all information and sources will be gather via research on the articles, journal

and project study on the concept of online group buying website development phase. The information about the existing group buying platform in Malaysia and the other countries.

**Table 2: Software development activities and their task.**

Phase	Task	Output
Sprint 1: Planning	<ul style="list-style-type: none"> <li>Propose project title</li> <li>Prepare proposal</li> <li>Determine the project schedule, activities, and the output for the project</li> </ul>	<ul style="list-style-type: none"> <li>The proposal of E-Commerce Group Buying Web Based System</li> <li>Gantt Chart</li> </ul>
Sprint 2: Analysis	<ul style="list-style-type: none"> <li>Analyze problem research</li> <li>Identify hardware and software requirement</li> </ul>	<ul style="list-style-type: none"> <li>Software Requirement Specification</li> <li>Hardware Requirement Specification</li> <li>UML diagram</li> <li>Class diagram</li> <li>Flowchart</li> </ul>
Sprint 3: Design	<ul style="list-style-type: none"> <li>Interface design</li> <li>Database design</li> </ul>	<ul style="list-style-type: none"> <li>Database design</li> <li>System interface design</li> </ul>
Sprint 4: Implementation	<ul style="list-style-type: none"> <li>Interface design implementation.</li> <li>Implement database design to the system.</li> </ul>	<ul style="list-style-type: none"> <li>Completed the interface and database design.</li> <li>Test case interface.</li> </ul>
Sprint 5: Testing	<ul style="list-style-type: none"> <li>Test on domain website.</li> </ul>	<ul style="list-style-type: none"> <li>Test report</li> </ul>

### 3.2 Sprint 2: Analysis

Based on the previous information obtained, all data will be evaluated to determine the problems that Malaysia's online group purchasing website is now facing. The analysis conclusion includes how to enhance their system from current methods in order to make the system ideal for Malaysian users and make Malaysian users select this online group buying system over others are required in order to achieve and solve the difficulties.

**Table 3: Functional System Requirements**

No	Module	Description
1.	Registration & Login	<ul style="list-style-type: none"> <li>• The system should allow the user to sign up and log into the system using email and password.</li> <li>• The system should only allow the user to log in with valid email and password.</li> <li>• The system should alert the user that their account is not verified if their registration has not been verified by admin.</li> <li>• The system should redirect user to that respective main menu upon login process is successful.</li> </ul>
2.	Team formation	<ul style="list-style-type: none"> <li>• The system should allow the customers to add their product into their cart or just buy it.</li> <li>• The system should allow the user to initiate a new group purchase or join an existing group purchase.</li> <li>• The system should allow only 1 customer can initiate team purchases within 24 hours, the others only can join the existing group buying.</li> <li>• The system should alert that the user of confirmation team formation within 24 hours.</li> </ul>
3.	Payment & Confirmation of payment received	<ul style="list-style-type: none"> <li>• The system should notify the user of their successful payment.</li> <li>• The system should allow the user to receive their payment receipt and they can view their payment details.</li> </ul>
4.	Homepage	<ul style="list-style-type: none"> <li>• The system should allow the admin to add, update and delete the products and edits the customers details.</li> </ul>
5.	Report	<ul style="list-style-type: none"> <li>• The system should generate a report of all the transactions and sales.</li> </ul>
6.	Notification	<ul style="list-style-type: none"> <li>• The system should notify the user of all transactions made through the website such as payment receipt, latest promotions, and team formation confirmation.</li> </ul>

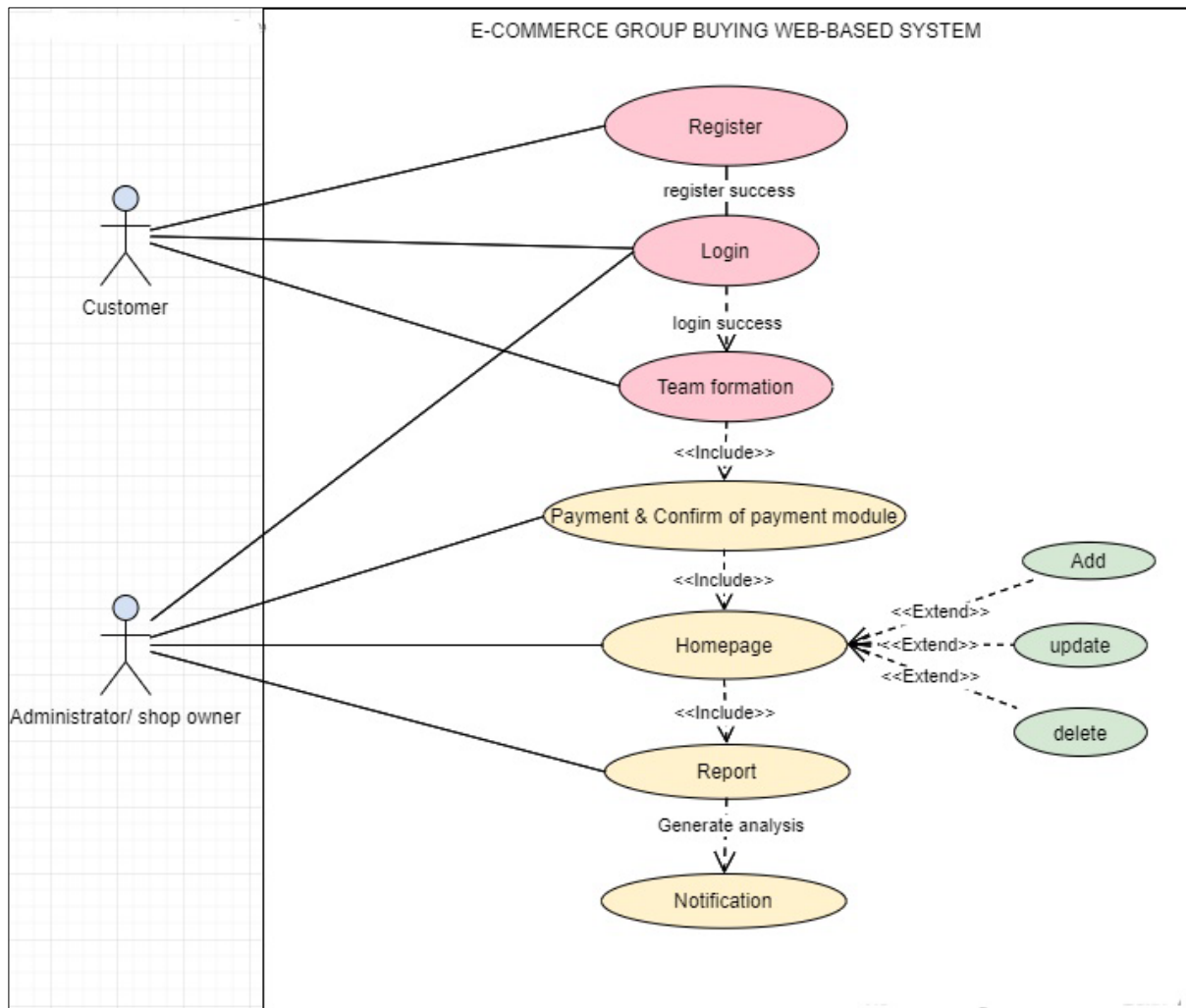
**Table 4: Non-function System Requirements**

No	Requirements	Description
1.	Operational	<ul style="list-style-type: none"> <li>The system is must be understandable and user's friendly.</li> <li>The system can easily update.</li> </ul>
2.	Implementation	<ul style="list-style-type: none"> <li>The system can be accessible for the pc and android which run Window OS.</li> </ul>
3.	Security	<ul style="list-style-type: none"> <li>The system allow approved user can log in into the system that only can verified by administrator.</li> <li>One email is only restricted for only one user.</li> <li>Administrator can add, update, and delete any details and activities involved in the system.</li> </ul>

**Table 5: User requirements of developed system**

No.	User Requirements
1.	Customer should be able to input email and username for login purpose respectively.
2.	Customer should be able to choose either single purchase or group purchase.
3.	Customer should be able to choose either to initiate new group buying or join the existing one.
4.	Customer should be able to view, edit, delete or add their items in their cart.
5.	Customer should be able checkout the items in their cart.
6.	Customer should be able to view the transaction details and payments details.
7.	Customer should be able to view the other people that join the group buying.
8.	Customer should be able to logout from the system.
9.	Administrator should be able to input the admin email and password to login.
10.	Administrator should be able to monitor all the customers activities in the system.
11.	Administrator should be able manage all the customers details.
12.	Administrator should be able to edit, update dan delete the products, promotion, and latest updates.

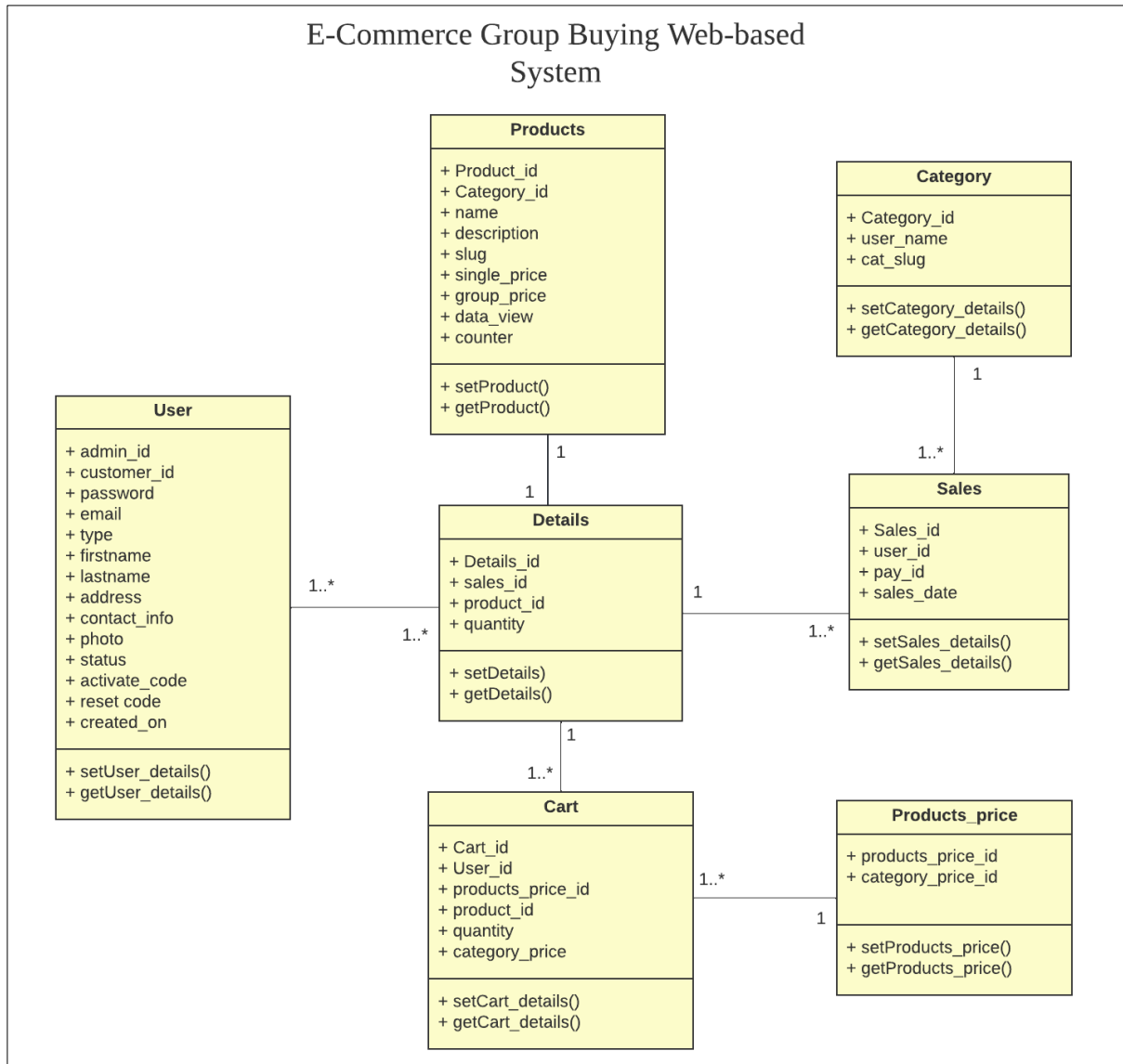
Furthermore, Object Oriented Programming approach is used for analysis and design for this project. Thus, UML use case diagrams is used to specify the model system behavior and describe the functionality of a system in horizontal way. Use case diagrams describe the high -level functions and scope of the system. Figure 1 shows a case diagram of the use of the developed web-based system [8].



**Figure 1: Use Case diagram**

The class diagram below in Figure 2 shows classes excluding the notification: Product, User, Details, Sales, Category, and Cart. Customer actor are able to register, login, and involve in team formation process while the Administrator are able to manage team formation, manage payment and confirmation of payment module, manage homepage where the admin able to add, update and delete the products, users, price, and category. After that, Administrator also able to generate the sales report and notify the customer via their emails.





**Figure 2: Class diagram of E-Commerce Group Buying**

### 3.3 Sprint 3: Design

A diagram that representing a process using different symbols that contains information about step of events called as flowchart is designed. Figure 3 shows the flow chart for the process that perform by Administrator. While Figure 4 shows the Customer flowchart that represents the activities performed by customer for the E-commerce Group Buying website.

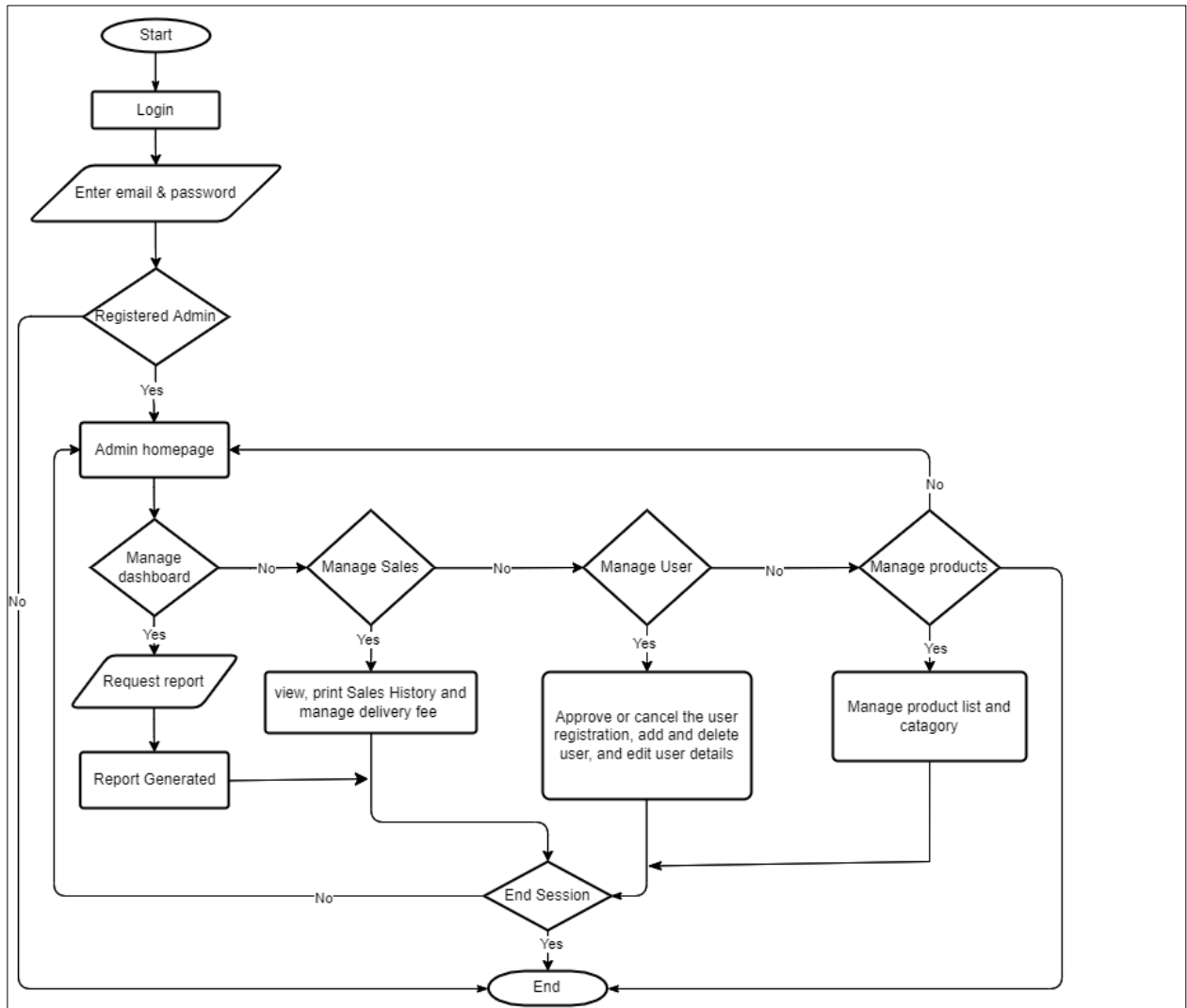


Figure 3: Flowchart for Administrator

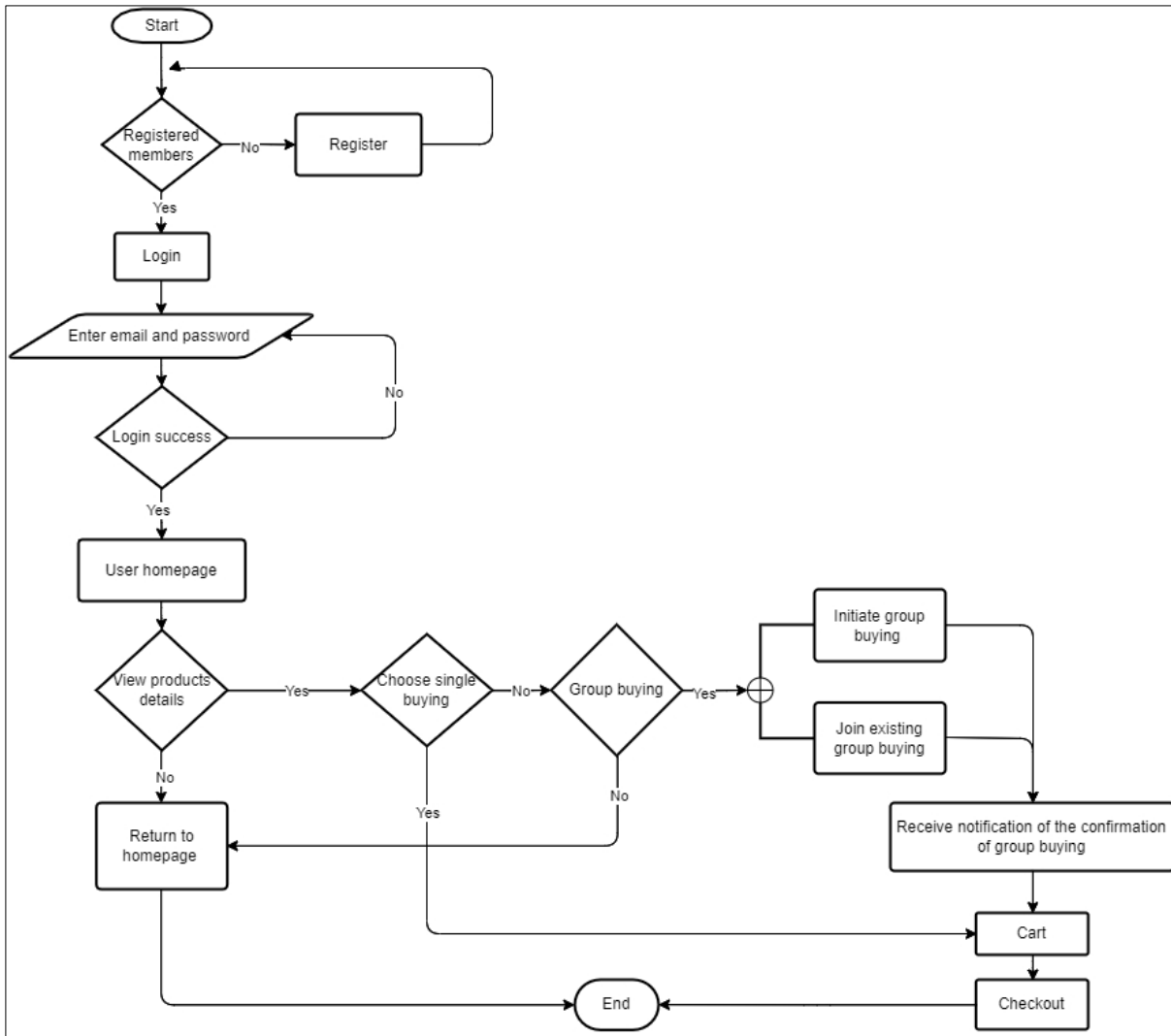


Figure 4: Flowchart for User(customer)

On the other part, the following is the database schema that involves the preparation of data dictionary and database scheme.

- i. User (admin\_id, customer\_id, email, password, type, firstname, lastname, address, contact\_info, photo, status, activate\_code, reset\_code, created\_on)
- ii. Products (product\_id, category\_id, name, description, slug, single\_price, group\_price, date\_view, counter)
- iii. Sales (sales\_id, user\_id, pay\_id, sales\_date)
- iv. Details (Details\_id, sales\_id, product\_id, quantity)
- v. Category (Category\_id, user\_name, cat\_slug)
- vi. Products\_price (products\_price\_id, category\_price\_id)
- vii. Cart (Cart\_id, User\_id, products\_price\_id, product\_id, quantity, category\_price)

An application or website interface is designed to provide a realistic view of how the real application is going to be develop. While, a graphical user interface (GUI) is a type of user interface in which users interact with electronic devices through the use of visual indicator representations and it is also a blueprint for the system as what the system will look like when the project begins. Thus, there are 4 main interface design for this system which includes Registration interface, login interface and Admin mainpage, and user mainpage. Figure 5(a) to Figure 5(d) show the design interfaces for the system.

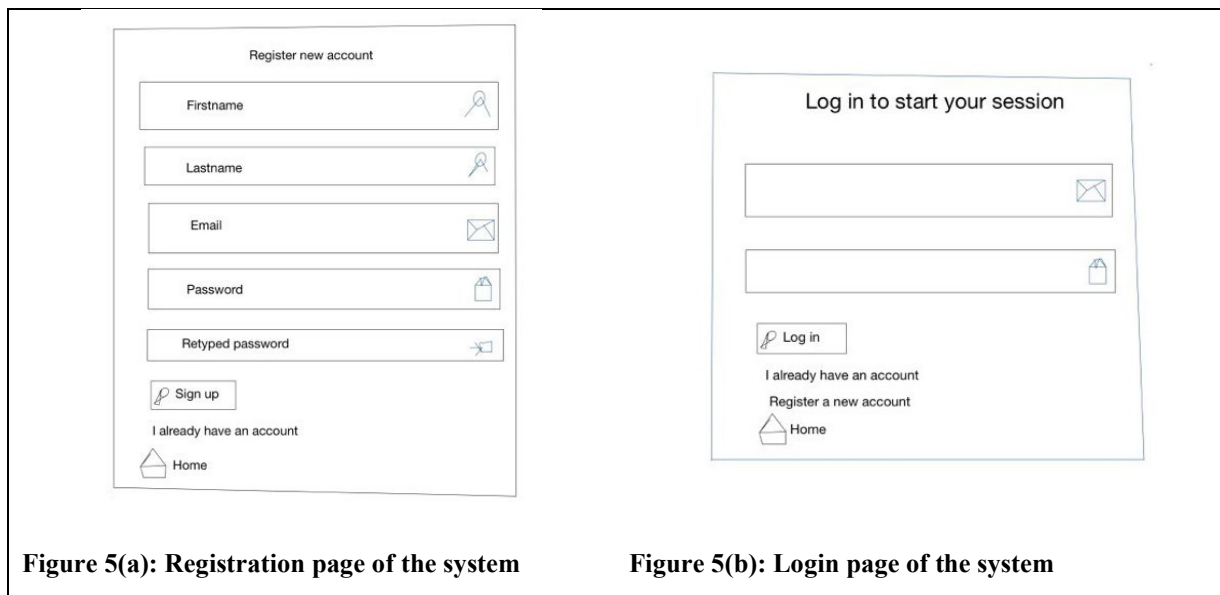


Figure 5(a): Registration page of the system

Figure 5(b): Login page of the system

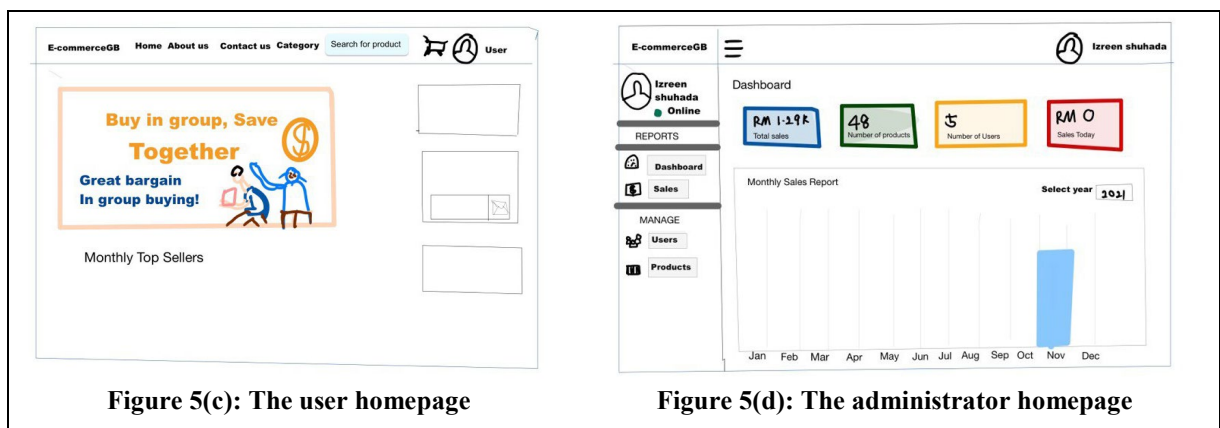


Figure 5(c): The user homepage

Figure 5(d): The administrator homepage

### 3.4 Sprint 4: Implementation

Based on the design that have been done previously, the system prototype for E- Commerce Group Buying Web Based System will be develop. Localhost in phpMyAdmin will be generated to the website system server.

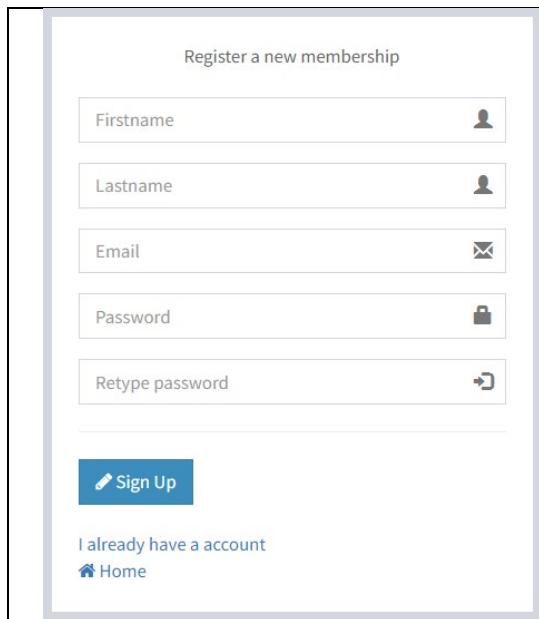
### 3.5 Sprint 5: System Testing

Once the system development is complete, the system’s features will be demonstrated and validated. The test will be conducted on the e-commerce web-based system to ensure the system meet the functional and non-functional requirements. This is to ensure that each module for this system is functional effectively and the data is accurate. All result will be recorded for further assessment.

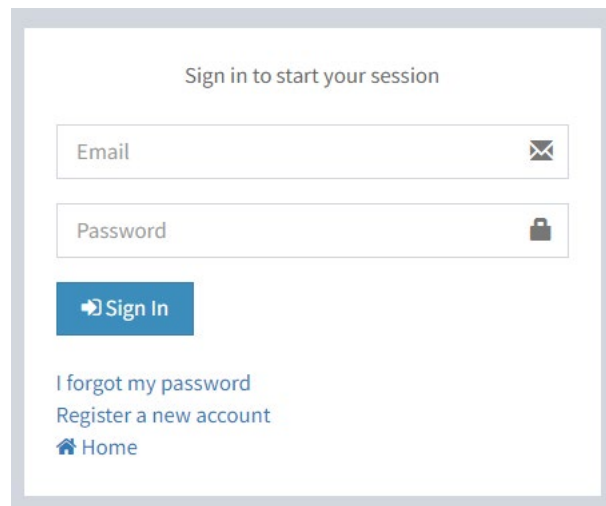
## 4. Results and Discussion

E-commerce Group Buying Web-based System is a system that aimed to leverage the experience of group buying online purchasing and make it easy and compatible for Malaysian’s user to use in various platform. The following interfaces in figure 9, figure 10, figure 11, figure 12 are the expected interfaces for the system. User will be able to login and register into system to make a purchase while the administrator is able to manage dashboard, sales, users, and products in the admin homepage.

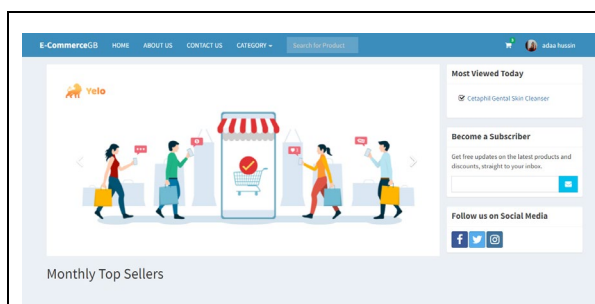
In conclusion, E-commerce Group Buying Web-based system has been successfully implemented and developed and is able to achieve all the goals and objectives that have been set out at the beginning of the chapter. For the future system development, E-commerce Group Buying Web-based system can be improved by including more products category in the system like children’s toys, baby clothes and many more. Through this entire development of this system, various knowledge has been learned and experienced and hope to benefits the users. Lastly, this system is tested in terms of its functionalities to eliminate the error before deliver as end product. Figure 6(a), figure 6(b), figure 6(c), and figure 6(d) shows the expected output for each main interfaces for the system.



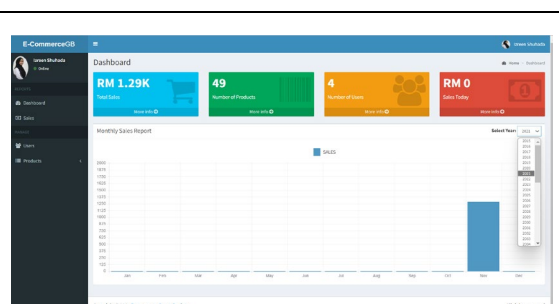
**Figure 6(a): Registration page of the system**



**Figure 6(b): Login page of the system**



**Figure 6(c): The user homepage**



**Figure 6(d): The administrator homepage**

#### 4.1 Test Plan

Test plan is carried out after the proposed application implemented to test the functionality of all six modules. It can be used to check the application whether it meets the project requirements. The test plan for all the modules in E-Commerce Group Buying Web-based System are shown in table 6 to table 11.

**Table 6: Test Plan for Register**

No.	Test cases	Expected Output	Actual Output
1.	Register using correct email and password.	Registration successful and display login page.	As expected
1.	Use the same email as existing user.	Error message is displayed on top of the banner "Email already taken" to enter a different email.	As expected
3.	Insert the different password and retyped password.	Error message "Password did not match" is displayed to re-enter the password.	As expected

**Table 7: Test Plan for Login**

No.	Test cases	Expected Output	Actual Output
1.	Register using correct username and password.	Registration successful and display login page.	As expected
2.	Incorrect password.	Error message is displayed on top of the banner "Incorrect password".	As expected
3.	Incorrect email.	Error message id displayed to enter a valid email.	As expected
4.	Forgot password	A forgot password link provided below the sign in tab to provide the email for reset password.	As expected

**Table 8: Test Plan for Team Formation**

No.	Test cases	Expected Output	Actual Output
1.	Click the Group buying price button.	"Item added to cart" and the numbers of users had joined the group buying message is displayed.	As expected
2.	Display the users joined the group buying.	Display the "User joined the Group Buying" message of saved users is displayed.	As expected
3.	Insert the same item with the single purchase price.	"Item already exist in cart" message is display. Error to choose the different price for same item at one time.	As expected
4.	Click the cart tab to view the added items.	Added items is displayed with the group buying price.	As expected

**Table 9: Test Plan for Payment and Confirmation of payment**

No.	Test cases	Expected Output	Actual Output
1.	Click the checkout button in cart page.	Cart page will redirect to the proceed payment page.	As expected
2.	Click the “ok” button on localhost prompt message.	Redirect to Proceed payment tab.	
3.	Click the proceed payment tab.	The page was redirected to confirmation of payment tab.	As expected
4.	Choose the selected bank	Payment success alert message was displayed.	As expected
5.	Click “continue with transaction” button.	Redirect to the homepage.	As expected

**Table 10: Test Plan for Report**

No.	Test cases	Expected Output	Actual Output
1.	Select the year tab button.	A list of year from 2015 until 2065 was displayed.	As expected
2.	Choose the respective year.	Monthly sales report by year is displayed in bar chart form.	As expected
3.	Click the bar chart.	The total sales of the selected bar chart in the respective month were displayed.	As expected

**Table 11: Test Plan for Notification**

No.	Test cases	Expected Output	Actual Output
1.	Insert the user’s email, message, and subject to notify.	Successful message was displayed.	As expected
2.	Insert the incorrect email.	“SMTP error. Failed to authenticate” message was displayed.	As expected

## 4.2 User Acceptance Testing

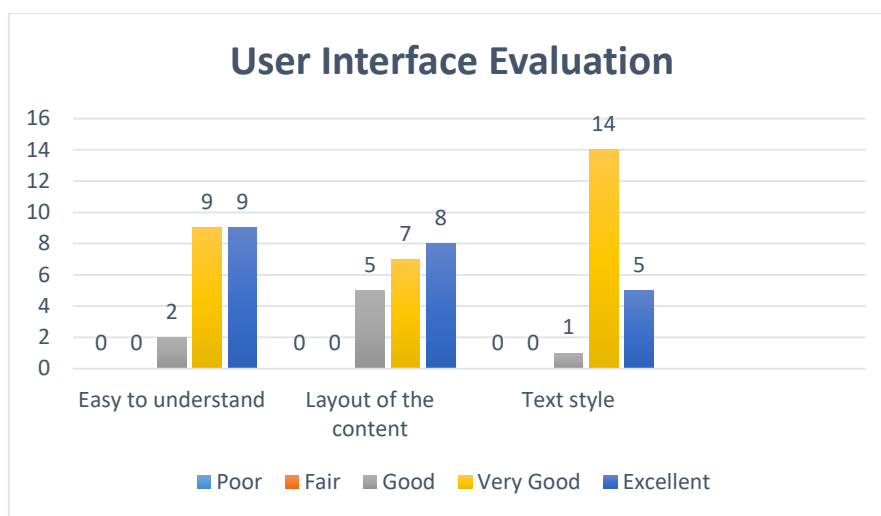
User acceptance testing was conducted by inviting UTHM students from various state backgrounds from all over Malaysia and the course to evaluate the E-Commerce Group Purchasing Web-based System. The total of 20 respondents will participate in the acceptance testing. Table 12 and 13 shows the results of User interface evaluation and application features evaluation respectively. While the Figure 7 and Figure 8 is illustrating the result in form of bar chart.

**Table 12: Results of User Interface Evaluation**

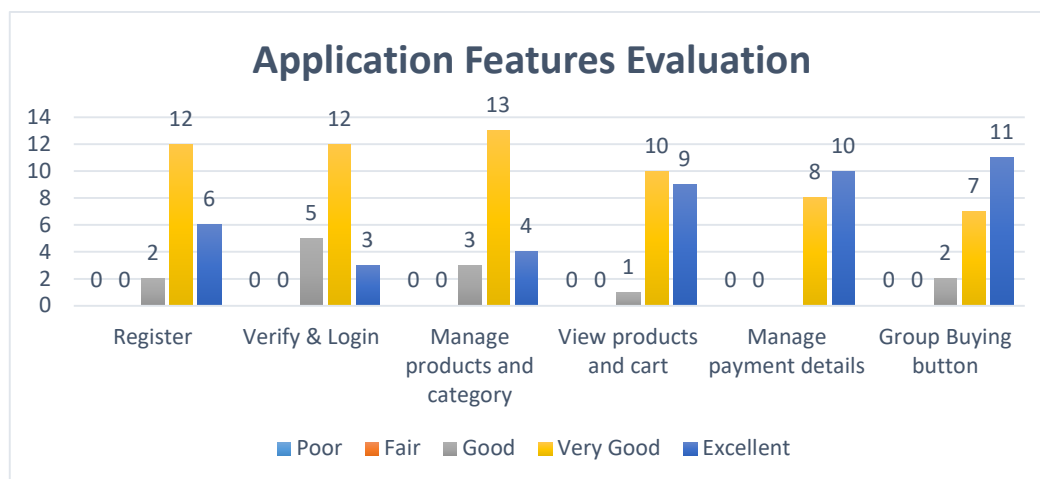
No	Features	Rate					Total
		1 (Poor)	2 (Fair)	3 (Good)	4(Very Good)	5 (Excellent)	
1	Easy to understand	0	0	2	9	9	20
2	Layout of the content	0	0	5	7	8	20
3	Text style (font size, color, type)	0	0	1	14	5	20

**Table 13: Results of Application Features Evaluation**

No	Features	Rate					Total
		1 (Poor)	2 (Fair)	3 (Good)	4 (Very Good)	5 (Excellent)	
1	Register	0	0	2	12	6	20
2	Verify & Login	0	0	5	12	3	20
3	Manage Products and category	0	0	3	13	4	20
4	View products and cart	0	0	1	10	9	20
5	Manage Payment details	0	0	2	8	10	20
6	Group Buying button	0	0	2	7	11	20



**Figure 7: Results for User Interface Evaluation**



**Figure 8: Results for Application Features Evaluation**

From the table 12, we can conclude that 9 out of 20 respondents agree that the proposed system is excellent for features that is easy to understand while 9 people find it the layout of the content is excellent and 14 out of 20 respondents has rate very good for the text style used for this system interface



features. So as the result, 2 out of 3 features for user interfaces evaluation has the highest rate which is excellent shows that the overall user interface of the system is excellent.

For the application features evaluation, 12 respondents have rate very good for the register features while remaining 6 respondents vote for excellent. Next for the verify and login features, only 3 respondents have rate excellent rate while the others rate for good and very good. Furthermore, for the manage products and category, view products and cart, and group buying button application feature, majority of the respondents have chosen to rate as scale 4 which very good while for the Manage payment details, majority of the respondents have chosen excellent rate for the that feature. Above all of the testing results, it determines that the system is well developed and the system functionalities are fulfilling system requirements as well as user requirements. Besides, it also has minor improvements for the system in order to ensure the system is well functioning for the future developments.

## 5. Conclusion

At the end of this project, a web-based group buying system for Malaysian users is expected to be well developed that can be benefits to the shop and individual customers in order to experience a better group purchasing technology and increase this modern firm of marketing approach to next level. For the suggestion, the countdown timer for the user can be added to view the remaining time of confirmation of group buying to make it easy for user to view whether they able to join the existing the group buying or initiate a new one.

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