

## **Development of Online Bakery Shop Web Application (e-Bakery)**

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**Abstract:** Coronavirus 2019 (COVID-19) has caused a huge economic shock to the public, especially those who do small businesses. During this period, most sellers will operate on work from home basis to generate income. Mama Reni Enterprise is a business operated by a private bakery seller who runs a homemade business. However, there are some problems encountered such as many people are unaware of the existence of this business due to lack of advertising and also do not know how to place an order. Therefore, the development of the e-Bakery system will double the benefits of acting such as the customer being able to make express orders meanwhile the admin can upgrade the quickness of managing ordered food while gives a better communication platform. The e-Bakery is a web-based application design with web-based structured approach. The purpose of developing an e-Bakery is to support an online system in expanding advertise on the products in Mama Reni Enterprise. The Prototyping model is used as the methodology to develop this system in which would be developed according to the phases of the model until the final system is deployed. This web application was developed in visual studio code using PHP programming language and supported by XAMPP web server. MySQL database is a database used on the website to record the customer and customer data. At the end of the project, e-Bakery will assist the administrator in handle homemade business with the online website. This system also can help Mama Reni Enterprise's customers to make an order with the new features developed. All the processes in Mama Reni Enterprise can be done easily as their activities have been computerized.

**Keywords:** ordering system, web-based application, programming language

### **1. Introduction**

Home-based businesses have become an important source for some families to generate income since the covid-19 pandemic sparked a new normal change that causes of reduces the income of many families [1]. This project presents the development of an online Bakery Shop Web Application (e-Bakery). This system is implemented based on the case study from the Mama Reni Enterprise that making homemade bakery businesses. The purpose of developing an e-Bakery is to expand advertising on the products and develop an online ordering system on Mama Reni Enterprise as currently Reni Enterprise only working their business via WhatsApp and Facebook. The problems they face are

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working on a manual process to advertise and run their business by using short message service (SMS) and WhatsApp as their medium. Then, customers are unsatisfied with the Mama Reni Enterprise operation because they have no image use to fits the scale of the advertisement and are unclear. Furthermore, due to the lack of a full-fledged application that can fulfilled the customer requirement, customers have no interest to buy their product. The developed e-Bakery would provide an application that can be used for this business.

The objective of this project is to analyse and design e-Bakery for Mama Reni Enterprise with a web-based structured approach. Next, to develop e-Bakery using prototype model and then test the e-Bakery system functionalities properly. In the scope project, some significant modules have been built to satisfy the customers and the admin. There are Login Module, Registration Module, Category Module, Menu Module, Search Function, Ordering Module, Tracking Number, and Invoice Module.

An e-Bakery offers the user convenience as they were able to search for a specific product after login and register to the website. Besides, the customers can view the menu according to the categories of products. Then, the customer can select a product and add it to the order. The most highlight feature is the customer can place the order in the system and be able to make payment through cash on delivery. The customers will receive a tracking number after the order is confirmed. An admin can manage categories, manage food and manage orders such as add, delete and modify the order. The Contact Us platform use to have ideas and suggestions of the customer to improve product and service. The e-Bakery has the dual advantage of operating as a digital catalogue that offers a product that helps customers to access it conveniently on the website and always keep up-to-date by introducing new items. The end-user, i.e. the customers of the bakery shop, will then have the maximum interaction with this system. Any of the conversations will take place via the website. Using web-based technology in marketing information systems, in addition to assists with running expenses, can also convince customers to use web technology more efficiently [2].

## 2. Related Work

### 2.1 Web-based Information System

A Web-based Information System is an information system that utilizes Web technologies to deliver information and services to users or other information systems. The Web-based system can be practiced for the e-bakery project because it brings convenience for users who work from home to access data. A web-based information system can be described as an application that runs in a web browser and has a very small component of the solution installed on the client PC [3]. The web-based application development is carried out based on of multi-stage services [4]. The user can access the web-based system as long as the user has an internet connection, internet browser, and login details [3]. The next advantage of a web-based system is easy data sharing and collaboration as the data store in one central location via HTML language programming [3]. Moreover, Web-based information system only needs to be installed in a computer that sets minimum specifications on the end-user workstation. This system is simpler to manage and upgrade as expected on a specification [5]. Thus, this technology is very suitable for a company that works in a private business such as homemade Mama Bakery Enterprise.

### 2.2 Comparison of Existing System

This comparison was made with three equivalent systems to be developed. The existing system that has been chosen to make comparisons is Love A Loaf web application system, MAMASAB Bakery web application system, and Secret Recipe Web application system. All three bakeries have advantages and disadvantages. Based on the advantages and disadvantages the developer uses as a schedule in developing system modules and applications. Table 1 shows the comparison between the existing system and e-Bakery.

**Table 1: Comparison between existing system and e-Bakery system**

Module	Love A Loaf	MAMASAB Bakery	Secret Recipe	e-Bakery
Register	Yes	No	Yes	Yes
Login	Yes	No	Yes	Yes
Categories	Yes	Yes	Yes	Yes
Menu	Yes	Yes	Yes	Yes
Order	Yes	No	Yes	Yes
Delivery	Yes	No	Yes	Yes

In order to combine all the module into the e-Bakery system and achieve successful result, implementing an orderly and planning website is importance to ensure top quality and wide selection of bakery good catered specially for the customers. Every system have the advantages and disadvantages of the system can be provided depends on the client's requirement to develop the system.

### 3. Methodology/Framework

This section discusses the methodology as well as the technique used in order to achieve the project objectives. The purpose of the methodology is to clearly outline the methods used and analyze information gather to help the development process.

#### 3.1 Prototyping Model

For the development and implementation of e-Bakery System, the methodology used is prototype Model. A prototyping model is a partial implementation of a system created before the production of the final system is made. Users and developers will provide feedback during the process of project implementation [6]. It is one method of reducing design failures and eliminate failure causes in the original design process. "Prototyping" is the method involving test-refining of designs using prototypes [7]. There are four types of prototyping and this project used extreme prototyping where this type is mostly used for web development. Table 2 below shows the phases and the actual activities in e-Bakery System according to the prototyping phase.

#### 3.2 The Phases and the Actual Activities in e-Bakery System

Table 2 shows the phases and the actual activities carried out by e-Bakery system in order to complete the system development.

**Table 2: The Phases and the Actual Activities in e-Bakery System**

Phase	Task	Output
Requirements Gathering and Analysis	<input type="checkbox"/> Interview and discuss the need for the e-Bakery system <input type="checkbox"/> Business analyst <input type="checkbox"/> Allocate functions to systems elements <input type="checkbox"/> Quick decisions are made	<input type="checkbox"/> New system requirements according to the e-Bakery <input type="checkbox"/> Expectations of the system <input type="checkbox"/> Each requirement will represent one function
Preliminary Design Phase	<input type="checkbox"/> The design part of the prototype <input type="checkbox"/> Plan the processes that happened in the system	<input type="checkbox"/> Basic requirements are showcased <input type="checkbox"/> User interface model <input type="checkbox"/> Context Diagram <input type="checkbox"/> Data flow diagram (DFD) <input type="checkbox"/> Entity-Relationships Diagram(ERD)

**Table 2: (cont.)**

Phase	Task	Output
Built a Prototype	<input type="checkbox"/> Develop an initial prototype of the e-Bakery system <input type="checkbox"/> Built the system design locally <input type="checkbox"/> Code and develop design prototype	<input type="checkbox"/> Local building prototype gives a look and similar feel like the final system <input type="checkbox"/> A Scaled-down system that tentatively gives an approximation to the final system
Initial User Evaluation	<input type="checkbox"/> Presenting the initial prototype to the client. <input type="checkbox"/> The client checks the working functionality of the prototype <input type="checkbox"/> Give feedback to the developer	<input type="checkbox"/> Collect the feedback <input type="checkbox"/> Find out the strength and weaknesses of the working system <input type="checkbox"/> Further enhancement of the product
Refining prototype	<input type="checkbox"/> Refine and enhance the prototype on the client feedback until the client satisfied with the developed prototype <input type="checkbox"/> Negotiation with the client	<input type="checkbox"/> Phase keep repeat until the final system is developed <input type="checkbox"/> Final prototype
Design	<input type="checkbox"/> Elaborate core specifications, function and features <input type="checkbox"/> Design and integrate database	<input type="checkbox"/> User interfaces <input type="checkbox"/> System interfaces <input type="checkbox"/> Define solution system
Implementation	<input type="checkbox"/> Implement the design into source code through coding <input type="checkbox"/> Start developing the system based on programming knowledge. <input type="checkbox"/> Produce functional of the system	<input type="checkbox"/> System functional outcome <input type="checkbox"/> Programs, database and a complete system. <input type="checkbox"/> New system is programmed and installed.
Testing	<input type="checkbox"/> Test the outcome of the system to the customer <input type="checkbox"/> Fixing defect	<input type="checkbox"/> Test and evaluation the system <input type="checkbox"/> Review test case

As shown in Table 2, the prototype methodology approach starts with a requirements gathering and analysis, during which the system's first needs are defines in detail. The client is interviewed for collecting the requirements and discussing the need for the system. Once the requirement is known, a quick design of e-Bakery prototype is made. The developer starts planning the process while including the important aspects for the system such as the functional module and the layout of mockup user interface specification.

Next, the first output of e-Bakery prototype model is made from the output of the preliminary design. In this phase, a designed prototype is coded through a programming language, which is Hypertext Pre-Processor (PHP). This initial prototype gives a similar environment and feels like a complete system.

After building the initial prototype, developer presents the prototype to the client for evaluation. The clients check the primary output of the system, which is the ordering process. Then, the client noting the weakness, provides feedback and gives suggestions of the things which need to be carried ahead in the next steps to the developer.

The developer must modify the prototype in response to the feedback and recommendations provided by the client if the client is dissatisfied with the present version of the prototype. This phase will continue until all of the client's needs have been met. Once the prototype has been authorized by the client, a final e-Bakery system is developed on the basis of the authorized final prototype.

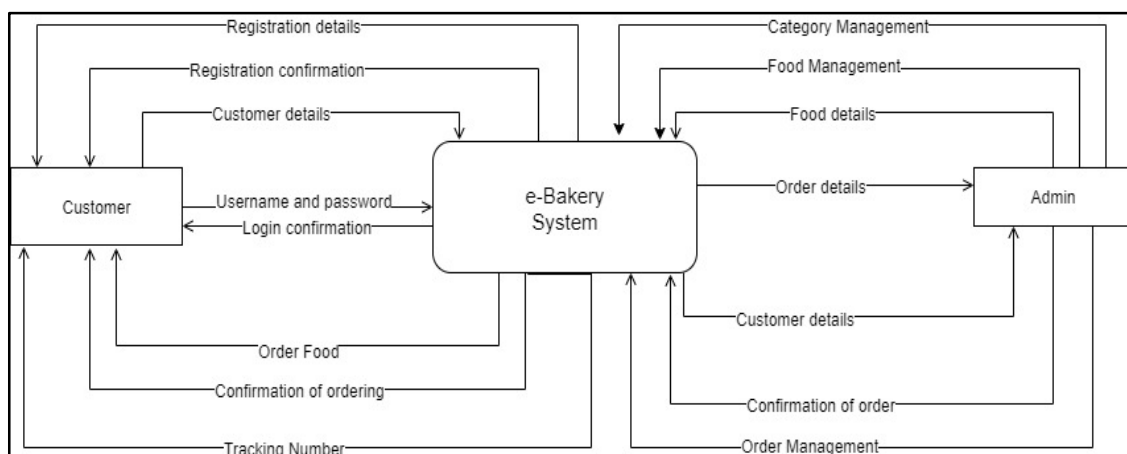
Once the final prototype has been completed by the developer, the final e-Bakery system is created. The developer designs the system in accordance with the final prototype, then implements the design into source code using programming skills which are PHP. Additionally, it is rigorously tested and defect-repaired to ensure that no errors remain in the final system. The completed e-Bakery is reviewed thoroughly. Last but not least, the whole e-Bakery system is subjected to periodic maintenance to ensure that it continues to function and operate profitably.

### 3.3 Analysis and Design

This section discusses the study of the system analysis and design, which are used during the generic framework activities of modeling. Proper system analysis offers an effective path to web application development by minimizing future IT requirements.

### 3.4 Context Diagram of the e-Bakery system

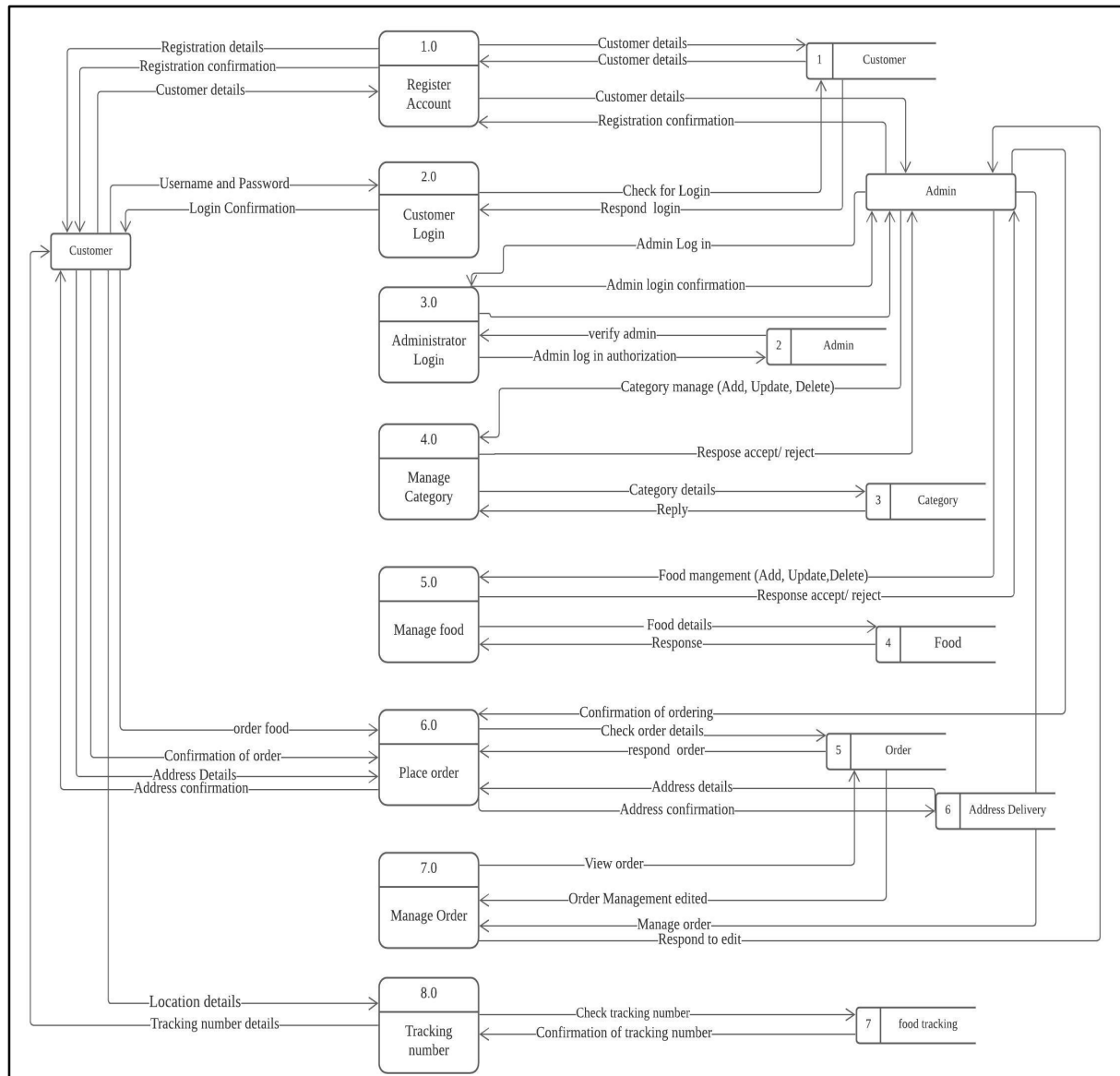
Figure 1 shows the context diagram of the e-Bakery system representing the whole system indicate the input and output of the system. There are two types of entities shown in this system which are customers and administrators, as well shows the flow of data in general on the e-Bakery system.



**Figure 1: Context diagram of the e-Bakery system**

Figure 1 shows the customer must register the details such as username and password to enable them to sign into the system. Then, the system will receive the registration detail and be confirmed by the admin. Next, the admin manages the category through the system. Besides that, the admin manages the food with add, update and delete the food in the system. After the order is confirmed, the admin will receive confirmation. The admin is also required to manage the order in the system as the data of ordering transferring in the admin panel. After the ordering is successful, the customer will receive a tracking number for delivery. Lastly, the admin needs to update food data and status information for each product in the system.

Figure 2 shows the Data flow diagram (DFD) includes describing processes or actions graphically, which gather, manipulate, store and distribute data between a system and its environment among the system component.



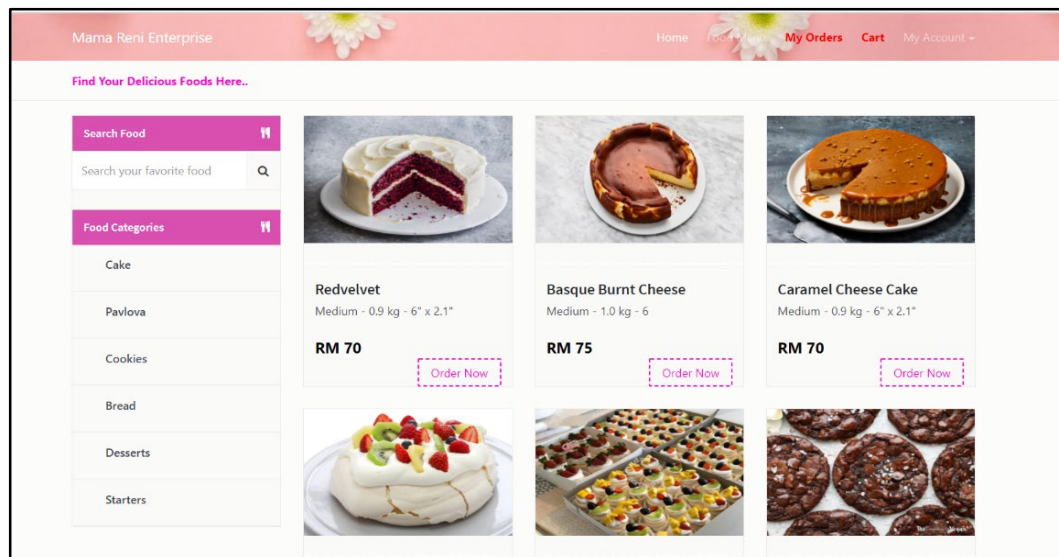
**Figure 2: Data Flow Diagram Level 0**

The Data Flow Diagram Level 0 for the e-Bakery system has eight processes which are Register Account, Customer Login, Admin Login, Manage Category, Make Food, Place Order, Manage Order and Tracking Number. In this DFD, the customers and the admin are the entities that will interact with the system. At this level, the input and output of the e-Bakery system are shown in Figure 2 explains the data flow that indicates the existence of information exchange between the entities and the process in the system.

### 3.5 Implementation of Application Interface

Implementation is the process of deploying the design into source code through coding. In this chapter, the coding is implemented for the nine system modules which are Log in, Registration, Place Order, Manage Category, Manage Food, Manage Order, Tracking Number, Invoice and Report. After the system is implemented, the final phase is the system testing where user acceptance is conducted.

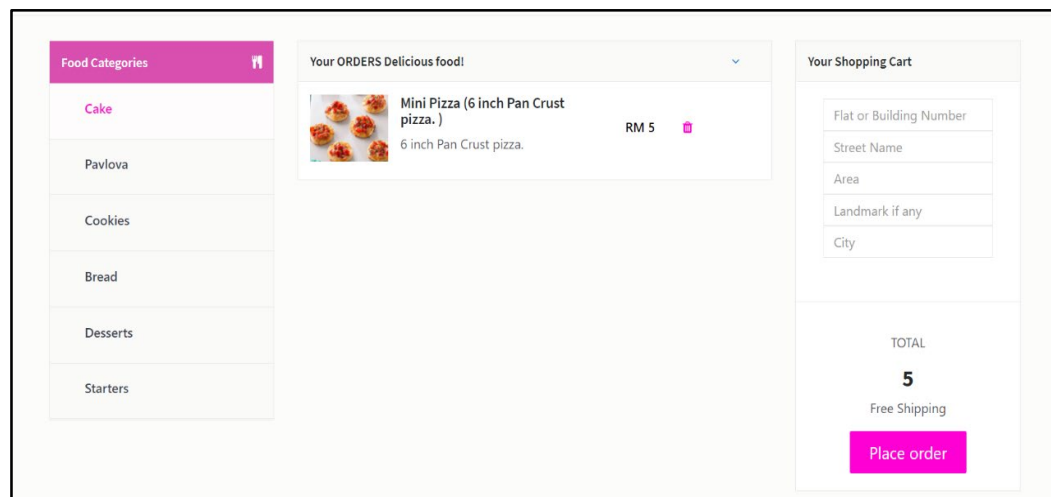
Figure 3 shows the Food Category interface implemented on e-Bakery system page. Clicking on a Food Categories type will redirect to a slide in place according to a chosen category, making it extremely simple to discover about the other food kinds.



**Figure 3: Menu Category Interface**

Customers can make an order by selecting food categories or search food instantly as it would directly display in the webpage. After that, the customers can make an order by clicking on the “Order Now” as shown in Figure 3.

Figure 4 shows the interface of a shopping cart of e-Bakery system. A shopping cart stores a record of the food that a customer has ‘add’ from the Menu section while browsing. A shopping cart acts as a digital catalog for online shops, enabling customers to choose and evaluate food, make changes or add extras, and finally place an order.



**Figure 4: Add item to shopping cart**

Figure 4 shows the adding item to the shopping cart of e-bakery system. After the customer selected the food from different categories to the shopping cart and was able to remove the order. Before place an order, the customer has to fill in address details in the shopping cart for the delivery process. After the customer fills in the address details and clicks the “Place Order” button, the customers need to wait for the admin to clarify for order confirmation meanwhile at the same time “Waiting for Restaurant Confirmation” is displayed on the customer pages.

Figure 5 shows the interface of Manage Food on the admin's panel for business management. Admin can manage or add food by entering item, quantity and price. Furthermore, the admin can test various menu placements to determine which ones attract customers the most.

The screenshot shows a web form titled 'Food Items' with a breadcrumb trail 'Home / Item Name / Update'. The form contains several input fields: 'Food Category' with the value 'Cake', 'Item Name' with 'Redvelvet', 'Description' with 'Layers of red velvet cake frosted with vanilla', 'Image' with a cake photo and an 'Edit Image' link, 'Quantity' with 'Medium', and 'Price' with '70'. A green 'Update' button is located at the bottom right of the form.

**Figure 5: Interface of Manage Food Module**

Figure 5 shows the interface of Manage Food module for the admin. The admin can add new items to the menu page such as food category, name, descriptions image of the food, quantity and price.

### 3.6 System Testing

The developed system would be evaluated and tested by the developer and customer to ensure the system meets the requirements stated by the customers. During this phase, formally controlled and focused testing is performed to uncover errors and bugs in the system. Testing involves two aspects of the system which are the management panel for the admin and customers functions. Functional testing is to ensure all the system features runs smoothly.

### 3.7 Test Case of Module Function and Actual Result

Table 3 shows the test case of the module function following with expected result and the actual output of the system:

**Table 3: Test Case of Module Function and Actual Result**

No.	Test Cases	Expected Result	Actual Output
<b>Registration Function</b>			
1.	The customer clicks on "Registration" tab	The system will redirect to the customer's login page.	Success
2.	The customer does not fills up all the field requirements.	The system will display an "uncompleted" message to indicate an unfilled field. The customers need to fill up all details in the field before they can register	Success
3.	The customer enters the wrong value on repeat password field.	An alert message appears if the value input password and the confirmation of password are not match	Success
4.	The customer fill up the field then clicks on "Register" button	The system will display the message regarding successful registration	Success



**Table 3: (cont.)**

No.	Test Cases	Expected Result	Actual Output
<b>Login Function</b>			
1.	The customer clicks in "login" tab	The system will redirect to the customer login page.	Success
2.	The customer does not fill up all the field	The system will display an "uncompleted" message to indicate an unfilled field. The customer needs to fill up the field before they are able to login to the system	Success
3.	The customer enters the wrong email or password	The system will display "invalid" message, thus the customer needs to enter back the correct email or password.	Success
4.	The customer clicks on "Forgot Password" button	The system will redirect to forget password page and the customer needs to reset the password.	Success
5.	The customer clicks on "Login" button.	The system will display success login message and directly to the Homepage.	Success
<b>Place Order Function</b>			
1.	Customer selects category by clicking on the category name	The system will redirect to the item page and all available food of selected category will display including the food name description and price.	Success
2.	The customer clicks on the "Order Now" button.	The system will notify the customer and redirect to My Cart and display the food selected by the customer.	Success
3.	The customer clicks "My Cart" tab.	The system will redirect to the My Cart page.	Success
4.	The customer clicks on "dustbin" (remove) button	The system will remove the food and calculate the current total price.	Success
5.	The customer fill up the shopping cart field (address details)	All the real-time data is uploaded and stored in MySQL.	Success
6.	The customer clicks on the "Place Order" button	The system redirect to the bakery admin panel for order confirmation then the admin will remark the status as order confirmed.	Success
7.	The customer clicks on "My Order" tab	The system will redirects to a list of food that has been ordered.	Success
8.	The customer clicks on "Cancelled Order" button	The system will display a cancel message and the order will automatically be canceled.	Success
<b>Tracking Number Function</b>			
1.	Customer clicks on the "Track Order" button.	The system will redirect to the history of the tracking order using the order number.	Success
2.	The customer enters order number on the track search field.	The system will display the order status and the time of the remarks whether order confirmed, food being prepared, food pickup and food delivered.	Success
<b>Invoice Function</b>			
1.	The customer clicks "Invoice" button.	The system will redirect to the Invoice page.	Success
2.	The customer clicks on "print" button	The system will redirect to print settings if the customer wants to print the invoice.	Success

**Table 3: (cont.)**

No.	Test Cases	Expected Result	Actual Output
<b>Manage Category Function</b>			
1.	The admin clicks on “Add Category” button	The system will redirect to the Category page and add new food.	Success
2.	The admin clicks on “Manage Category” button	The system will redirect to the manage category where the admin needs to update new category.	Success
<b>Manage Food Function</b>			
1.	The admin clicks on the “Add Food” button	Admin is able to add food in the system with the required information and new items will update on the webpage.	Success
2.	The admin clicks on the “Manage Food” button	Admin is able to update or modify the existing food in the system.	Success
<b>Manage Order Function</b>			
1.	The admin clicks on “Not Confirmed Yet” button.	The system will display the list of food that has not been confirmed yet.	Success
2.	The admin clicks on “Order Confirmed” button	The system will display the list of orders that have been confirmed to proceed with the next process.	Success
3.	The admin clicks on “Food being prepared” button	The system will display the list of foods that are being prepared and once the food is ready, the admin can update the status in the remark field.	Success
4.	The admin clicks on the “Food Pickup” button	The system will display a list where the status of the order changes to be picked up once the dispatcher is ready to deliver the food.	Success
5.	The admin clicks on “Food Delivered” button	The system will display the list of food after the dispatcher delivered the order.	Success
<b>Report Function</b>			
1.	The admin clicks on “Report” button	The system directly to the Report page	Success
2.	The admin select date either monthly or yearly	The system will exhibit the between dates report and request type either All, Not confirmed, canceled order, food being prepared order, food pickup order or food delivered order.	Success
3.	The admin clicks on “Order Count” button	The system redirects to order count following the selected date	Success
4.	The admin clicks on “Sales Reports” button	The system redirects to the sales report regarding the selected date.	Success

Tests on e-Bakery system are conducted to assure its security as well as to ensure there are no errors or defects within the developed system. For example, “place order function” only can be performed once the customer login to the system. This is done in order to guarantee that individual who placed the order already has a legal account on the system. Furthermore, it is easier for the admin to retrieve customer information for the delivery process and future event. Next, the customer also has two options either want to use email or phone number to login into the system. Moreover, “place order function” is the key for the admin to retrieve the order and allow them to respond to the customer request.

To ensure the admin has the best performance in managing Mama Reni Enterprise business, some tests have been conducted on the admin panel side. For example, the manage order function is tested in each phase for the admin able to respond and update the customer status. In addition, this function also gives the best result after the test is performed which has fulfilled its requirements by showing details

of order place in terms of an ID order number, order items, total price and remarks. Manage category and manage food also has been tested to assure the function is doing well where it can update the latest category and food on the system. Report Function is well tested in order to avoid the report become redundant and able to analyze order activities within the month or years.

#### 4. Result and Discussion

In this section, the result from the functional testing was discussed and the satisfaction rate of system development is determined through customer and admin responses from the questionnaire.

##### 4.1 Result

The developed system was successfully implemented as it received a 100% success rate in all tests. There were 34 tests are designed to evaluate the functionality for testing cased in e-Bakery system. The success rate of development e-Bakery can be calculated using the formula below,

$$\frac{\text{No. of success case}}{\text{Total no. of test case}} \times 100\% = \text{overall percentage success}$$

$$\frac{34}{34} \times 100\% = 100\% \text{ success on the system testing}$$

##### 4.2 Percentage of Pass and Fail On System Testing

Figure 6 shows the overall percentage of the test achieved successful result regarding the formulation above.

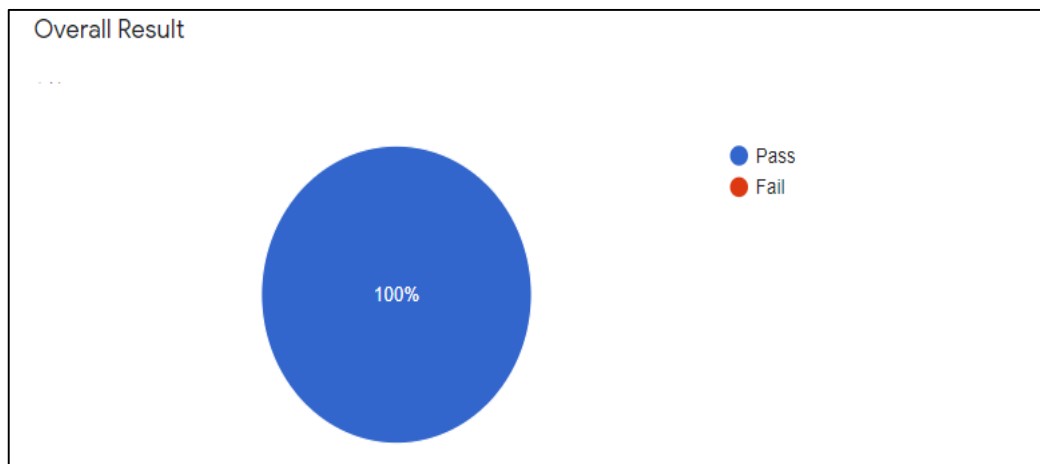


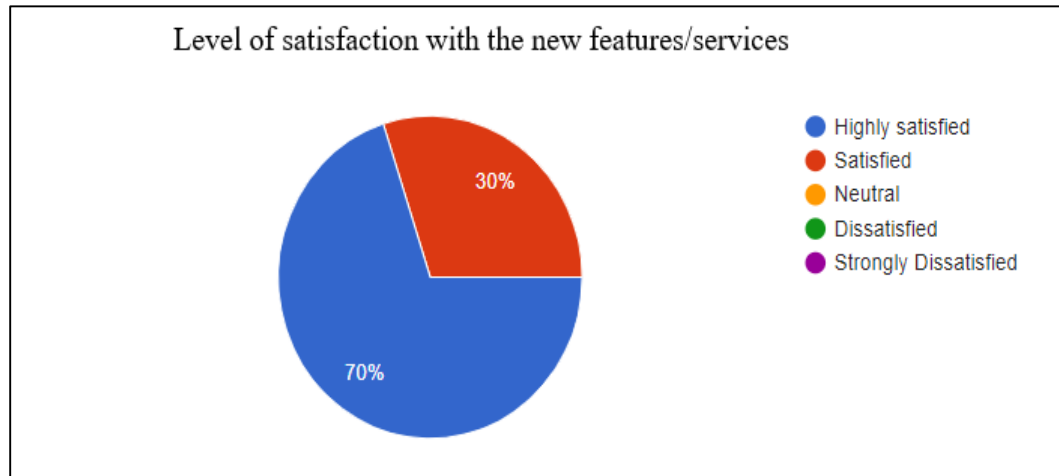
Figure 6 shows the pie chart indicates the overall percentage of the pass and fail on system testing according to the success rate from 34 tests. The success rate for overall result is 100% while failure rate is 0% based on the total number of tests and number of the successes.

The database must be tested since it is necessary for storing and retrieving user and order information data. This can be done by running the system using localhost. There is no error message represent while running the system. The design of the webpage is a user-friendly concept where the customers easy to understand the system function well. This is important in order to maintain the harmony between the customer and seller.

### 4.3 Discussions

This study is to present user satisfaction using e-Bakery system web-based approach, which highlights the multifaceted and interdependent of the system success. Apart from the association between system satisfaction and success, the expected relationships between the success variables were considerably supported by the relationship between admin and customer productivity.

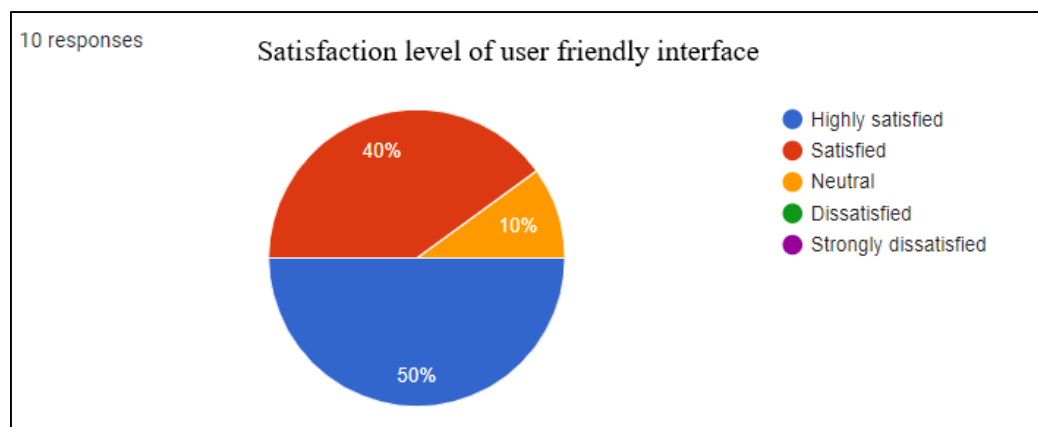
The level of satisfaction on using the features and services is carried out by providing a questionnaire to ten respondents who will use the system, including the owner of Mama Reni Enterprise and its customers. Figure 7 shows the respondents' satisfaction regarding the new features and services provide through the e-Bakery system.



**Figure 7: Respondents Satisfaction with New Features and Services**

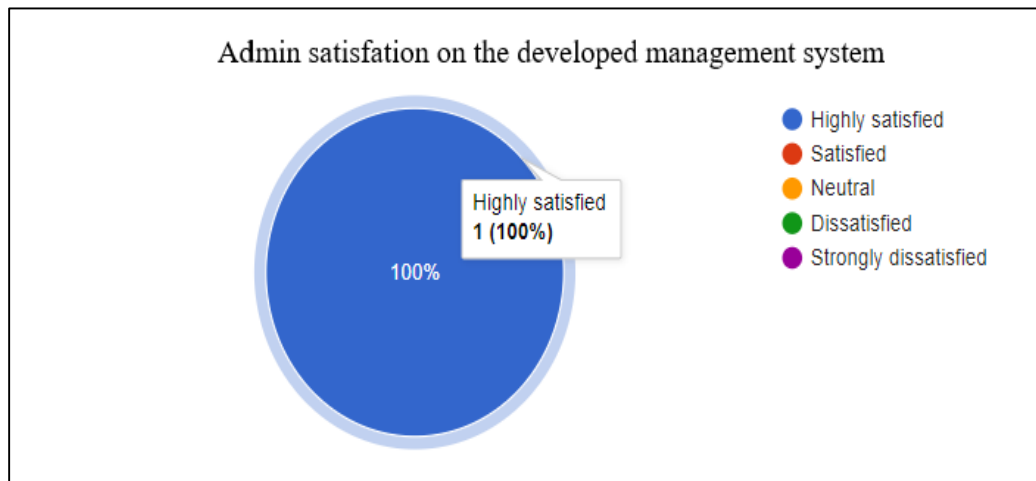
Figure 7 illustrates the pie chart of the admin and the customer satisfaction by the new features and also the services provided. Based on the pie chart, the level of the highly satisfied is about 70 percent meanwhile the percentage of satisfied is 30. Overall, the e-bakery system has a high level of satisfaction with the services it provides. Generally, users are pleased with the services offered by the new system because there is no customer that disagrees with the system services.

Figure 8 shows the percentage of satisfaction regarding the user-friendly interface, which included both the customer and the admin.



The pie chart indicates the level of respondent's satisfaction with the user-friendly interface in the system. 50 percent of the respondents were highly satisfied while 40 percent of them are satisfied. About 10 percent of them are neutral about the satisfaction of the interface as shown in Figure 8. This can be proven testing on the user interface has present good feedback from customers.

Figure 9 shows the percentage of administrators' satisfaction with the developed management system. Effective management techniques and user representation are critical components of ensuring that an appropriate level of user satisfaction is maintained throughout the system development process.



**Figure 9: Respondents Satisfaction on the Developed Management System**

Figure 9 shows the pie chart of admin responses regarding the satisfaction in using the system management developed in the system. As a result, respondent 100 percent highly satisfied with the system management where the admin very agrees with the process of manage order received from the customer and very confident on handling the activities happened.

On the whole, the e-bakery system meets the needs of all users which are the admin and the customer. Satisfaction variables have a significant influence on performance [8]. Most of the customers give some good feedback and satisfactory regarding the system functions and confidence to use it.

## 5. Conclusion

In conclusion, e-Bakery system indeed is beneficial for the customer where it can encourage larger orders by providing customers with additional time to peruse the menu and discover new items to try. Other than that, the admin is able to handle important procedures in the Mama Reni Enterprise management process and monitor the order received made by the customer. Despite that, in order to further strengthen this system in the future, several enhancements will be proposed including adding on the quantity options of the cake and pastry, implement sales promotion in order to attract customer interest. Among that, the most important enhancement is to provide a deposit for purchase assurance from the customer to enable smooth consumption and for admin's safekeeping.

## Acknowledgement

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