E-commerce solution for Cake Shop

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Abstract- **Due to the advancement of technology in the field of electronic commerce (e-commerce) more and more people tend to buy their needs using internet. As an addition to this new trend, majority of the cake shops in Sri Lanka have started to sell their cakes online. Relish Cake Products is one such shop. The aim of this research is to gather, analyze and give an in-depth insight of the complete Relish Cake Products e-commerce system by defining the goals, major aspects, results and conclusions in detail. This e-commerce system was implemented by Relish Cake Products as a solution to reach out more customers, and by doing that, expand their sales. The detailed requirements, system models, implementation details and an analysis on testing of the e-commerce web application is provided in this document. The purpose of this paper is to provide a detailed overview of the e-commerce web application for Relish Cake Products. It will explain the features of the system, the interfaces of the system, what the system will do, the constraints under which it must operate, supporting information, adaptability of the project and how the system will react to external stimuli.**

Keywords—advancement; cake; insight; goals; aspects; conclusions; results; solution; features; constraints

I. INTRODUCTION

Relish Cake Products is a newly initiated small scale business. It was started few months back. It produces cakes for various occasions such as weddings and birthdays and also it produces cupcakes and custom designs according to customer requests. Right now they do not have any marketing strategy and they are not able to publish their products to the public. The selling and buying processes happen manually. People who bought cakes from this company recommend it to others, but no other measures have been taken to give exposure to their products.

The main purpose of the developed system is to automate the current cake selling and buying system. By automating the current system the company expect to uplift their financial status while taking measures to prevent frauds. Currently the company does not have any means of publishing their various cake designs to the public. But this system provides the opportunity for the company to advertise various cake designs which would help the company to reach more people regarding cakes from Relish Cake Products. On the other hand it will help the company to expand their customer base.

The system provide capabilities for the company to sell their various types of cakes. It also provide capabilities for the company to display their various types of unique cake designs. There will be two kinds of user roles involved in this system admin and the customer. Admin has the privileges of adding various kinds of cake designs to the system and control the overall system. Customer has the privileges of viewing various kinds of cake designs and order cakes according to their need. The outcome of this project will be a web based e-commerce solution so that wider population will be covered at once and company will have the opportunity to expand their customer base.

The paper is structured as follows. The section II discusses about the literature relevant to the implemented system. Section III discusses about the architecture of the system. Section III describes the work flow sequence and it contains system models. Section IV discusses about the implementation procedure of the system. Section V describes about the procedure followed in system testing and finally section VI describes about the final conclusion and future modifications to the system.

II. LITERATURE REVIEW

In the present context there are lot of cake shops all around Sri Lanka. Most of those famous cake shops have e-commerce web applications to sell cakes online. But most of those cake selling shops do not provide the features provided by Relish Cake Products e-commerce system.

The Cake Factory [1] is a famous cake shop in Sri Lanka which has an e-commerce web site to sell cakes online. But it doesn't provide features for users to order a customized cake. For example customers can't order cake for their special occasions like birthdays and anniversaries. Customers can just select cakes from their online menu which contains standard cakes like chocolate cakes, ribbon cakes etc. Cakes are displayed in a list therefore it is difficult for users to select cakes.

Divine cake shop [2] also provides an e-commerce website for customers to buy cakes online. Divine also doesn't provide features to order a customized cake for special occasions like birthdays and anniversaries etc.

BreadTalk Sri Lanka [3] is also a well-known shop among Sri Lankans. They also maintain a website which

shows their products. The shop accepts online orders and deliver the cakes to customers. Website also provides features to order birthday cakes and cakes for special occasions. But it doesn't have the ability to add customized wording into cakes.

Features provided by Relish Cake's e-commerce system has been able to cater for customer needs. Relish Cake's e-commerce system has a price range selector in which the customers can select the price range for their cakes so that it would they can select cakes which suits their budget without having to go through the entire catalogue. Most of the cake shops in Sri Lanka do not have that feature. Attractive images and dynamic content provided by the Relish cakes' e-commerce system is unique due to its picturesqueness. Customized wording feature in which the customers have the ability to add a special wish for their cakes on their special occasions is also a customer satisfaction factor provided by Relish cake's e-commerce system. Cakes made on customers request is also special part of the Relish Cake's e-commerce system. Customers have the ability to upload an image of a cake and get a quote for the cake.

III.   SYSTEM MODELS

A. System Requirement

There are two user roles involved in the system, admin and customer. Functional requirements are defined according to these two user roles. Customers have the ability to register in the system and to search cakes through online menu. Online menu contains basic cakes such as Chocolate cakes, Coffee cakes and Fruit cakes. Once a cake and the required quantity has been selected, customer has the ability to add it to cart and look for another cake. When customer needs to buy cakes he/she can go to cart and buy cakes. The special function provided by this system is that the customers can request for cake. For example if they want a personalized cake for someone's birthday, they can request that cake by uploading an image of the requested cake or by selecting an available cake design from the existing cake designs in the shop. Figure 8 shows the use cases of customer. Admin has the ability of uploading cake designs to the system, view monthly sales and accept or reject cake request orders by analyzing the images the customers have send.

The system contains easily understandable and manageable interfaces. The interfaces are attractive so that lots of customers are attracted to the shop. The system is expected to have 99% availability. Special attention is being given to security of the system since online money transactions happen through the system. All the accounts will be logged off after a certain amount of inactive time. Financial transaction safety would be handled by the Paypal API [4]. Secured and guaranteed service will be provided to the customers 24/7.
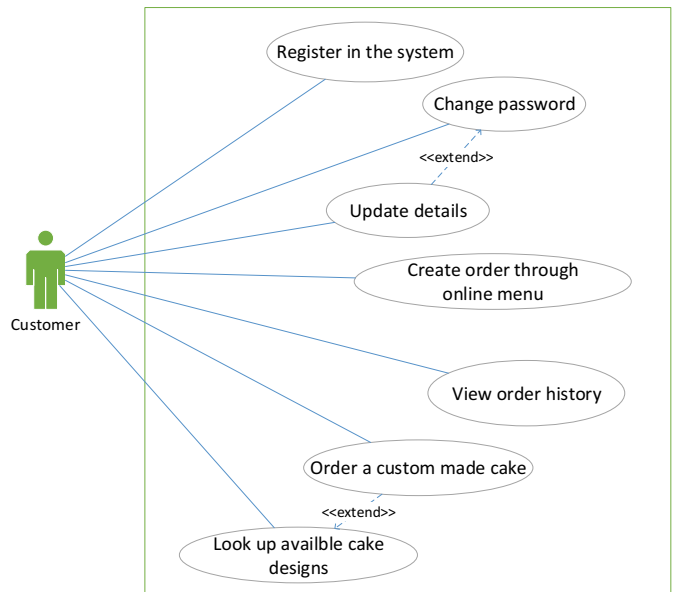

Fig.1: Main Use Case Diagram for Customer

B. System Design

4+1 model of architecture has been used in implementing the system. Laravel PHP framework [5] was used to develop the system. It mainly follow the MVC architecture and additionally it has a routing view also. All the database classes are stored in the model package. In view package all the web interfaces are stored and in controller package all the business logic, which connects the model layer with the view layer, are stored. In routing layer routes which maps the URLs with the views are stored.

1)   Class diagram

Figure 2 shows the class diagram of the system. The system consist of an abstract Cake class which includes all the details about the cakes including name, quantity, served amount etc. There are two other types of classes which inherit the cake class; RequestCake class and BasicCake class. RequestCake class contain information about the requests made by the customers for cakes of various functional moments like birthdays. It consist an imgURL attribute which stores the URL of the images of cake designs uploaded by customers. BasicCake sub class contain information about basic cakes such as chocolate cake and butter cake. Customer class contains information about the customer. A customer has the ability to order 0 or more orders. So 0* relationship is used between the Customer and Order classes. An order may contain 1 or more types of cake orders. For example a person can buy chocolate cake and butter cake. So an order contains 1 or more order items. Custom Order Item is inherited by the Order Item. Additionally CustomOrderItem class contain details about the cake requests orders.
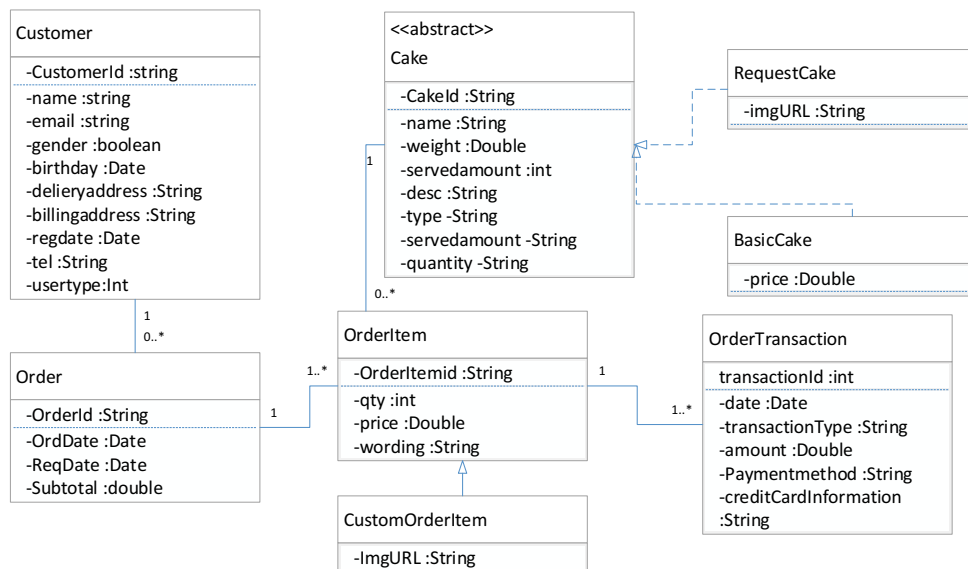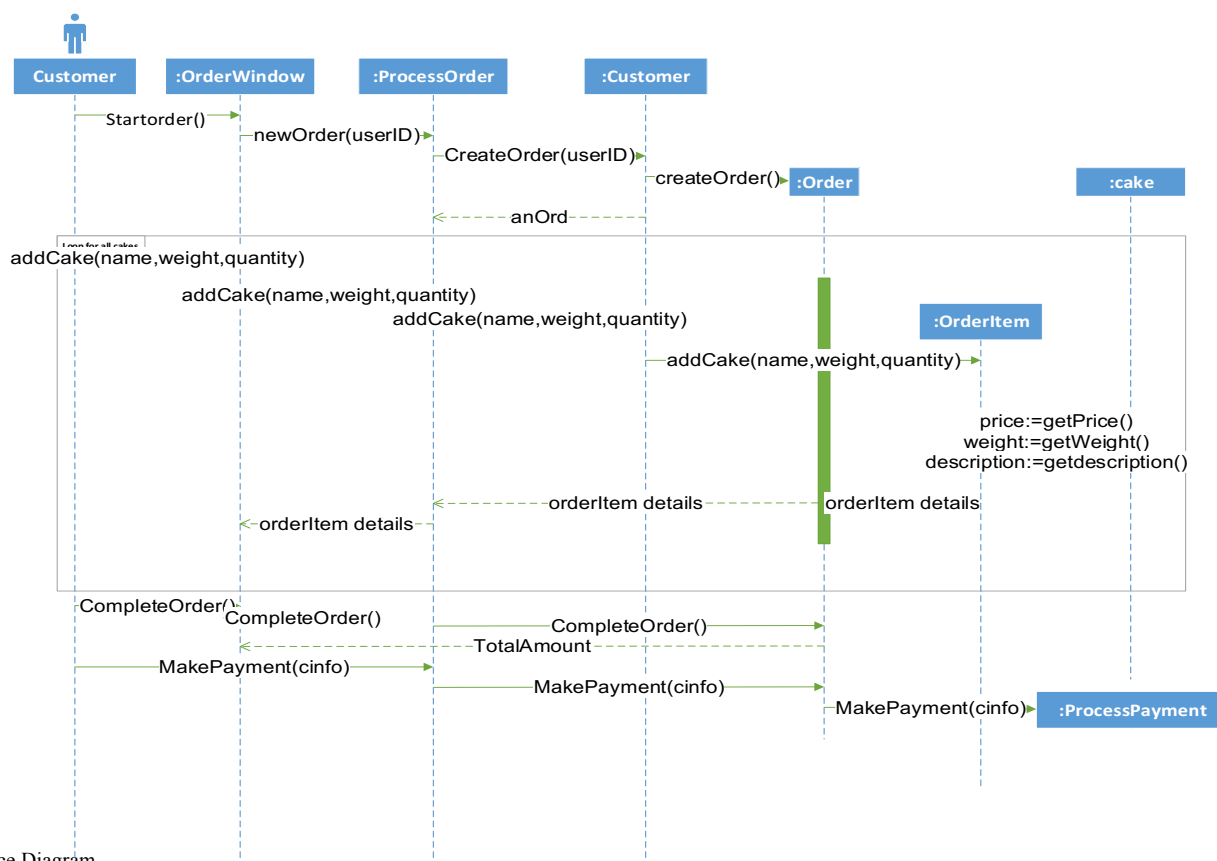
Fig. 2: Class Diagram

Fig. 3: Sequence Diagram

2) Sequence design

The main sequence diagram of the system is shown Figure 3. It depicts the sequence of customer ordering a cake and making the payments. At first customer initiate a new order through the online menu section (OrderWindow). An order object will be returned as the response to the initiation of a new order. Then customer has the ability to add cakes to the order object.

An order object contains 1 or more than one order items (cakes). Customer can view the details of cakes such as price, quantity and served amount. If the cake suits the customer need, he/she can add it to the order object (cart).

Once adding the items to order is completed, customer has the ability to purchase the items in the order. When order is completed details about the order is returned to the customer it includes total amount and quantities of the items in the order. Then customer can make the payment and the system connects with the PayPal API to receive the payment. Once the payment is received customer will be notified using an automated SMS.

IV. SYSTEM IMPLEMENTATION

A. Implementation procedure

Laravel framework [5] was used to develop the system. It is a web application framework in PHP with its unique and elegant syntax. Laravel consists of authentication, routing, sessions and caching of data which makes life easier for developers.

For all the implementation tasks intellij idea IDE [6] was used. The Laravel plugin for the IDE makes web interface development, routing, and function development easy. A SMS gateway was also used in the system. SMS gateway provided by Textit.biz [7] was used in the system. It provides services in sending and receiving messages. An automated message will be send to the customers of Relish cake Products when they purchase cakes. It includes the details of the order. After the completion of the order another text message will be sent to the customer to confirm the order completion and ask them to collect their order at the shop since the company has not started delivery services.

Bootstrap [8] was used in creating web pages. Bootstrap make the front end web development faster and easier. It provides many features to create attractive web interfaces. jQuery was used as the front end scripting language. It makes activities such as HTML document traversal and manipulation, event handling, animation, and Ajax much simpler with an easy-to-use API that works across a multitude of browsers. JQuery validator was used to validate the form submissions and other field submissions. It provides an easy mechanism to validate fields according to our requirement. Price range selector, customized wording section and all other web interfaces were implemented using Bootstrap, JQuery and Ajax.

Chart.js [9] library was used to generate charts. Admin of the system has the ability to view monthly sales report and other reports. Those reports are generated using the attractive charts provided by Chart.js.

B. Content

The information related to cakes are provided by Relish Cake Products. Cakes and their details such as size, served amount and price are provided by the company. Categories are also provided by the company but these can be changed or new categories be added with time.

C. Algorithm

Since the project is an e-commerce web solution, not many complex algorithms were used. Much of the hard work

was handled by the Laravel framework. Since this web application contains many colourful images, they should be loaded efficiently so that no hindrance will be caused to the customer experience. Hence, measures such as efficient caching mechanisms, have been taken to improve the response time of the system.

Other than that efficient database queries were used to make the retrieval of data to be minimal. Welcome page of the web application shows the cakes with the most number of sales up to the relevant date. It is used as a marketing strategy to attract more people to the system. To retrieve the cakes with the most number of sales two or three tables have to be joined and maximum count have to be calculated. This is one instance where a complex query had to be used to retrieve data. The query is executed using the query builder of the Laravel framework.

D. Main interfaces

The home screen of the e-commerce application contains colorful images to attract the attention of the customers. Figure 4 shows the cake selection window of the e-commerce application. It shows the cakes in different categories so that the customers are able to select their preference
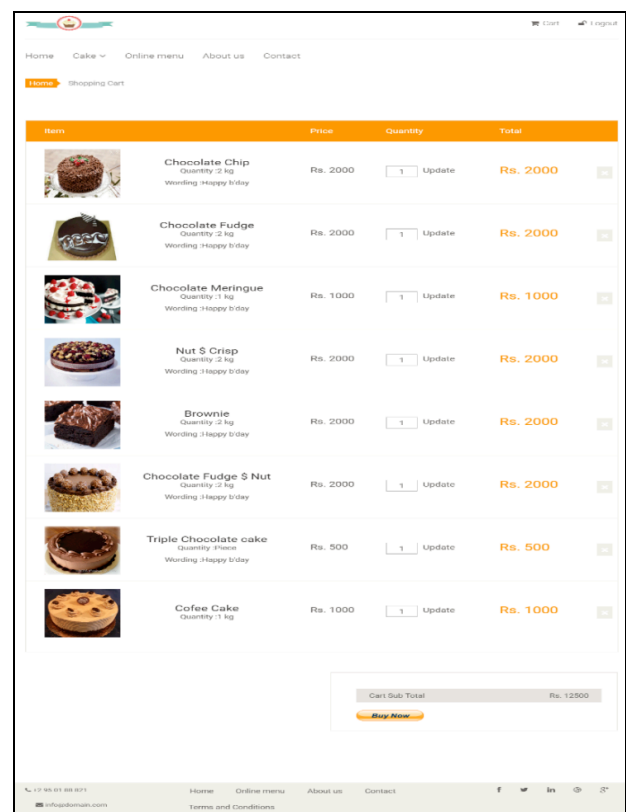

Fig. 4: Cake Selection Window

Figure 5 shows the window provided for the admin of the system to view the orders. Once the order is complete they can press the order completed button and an automated message will be send to the customers.
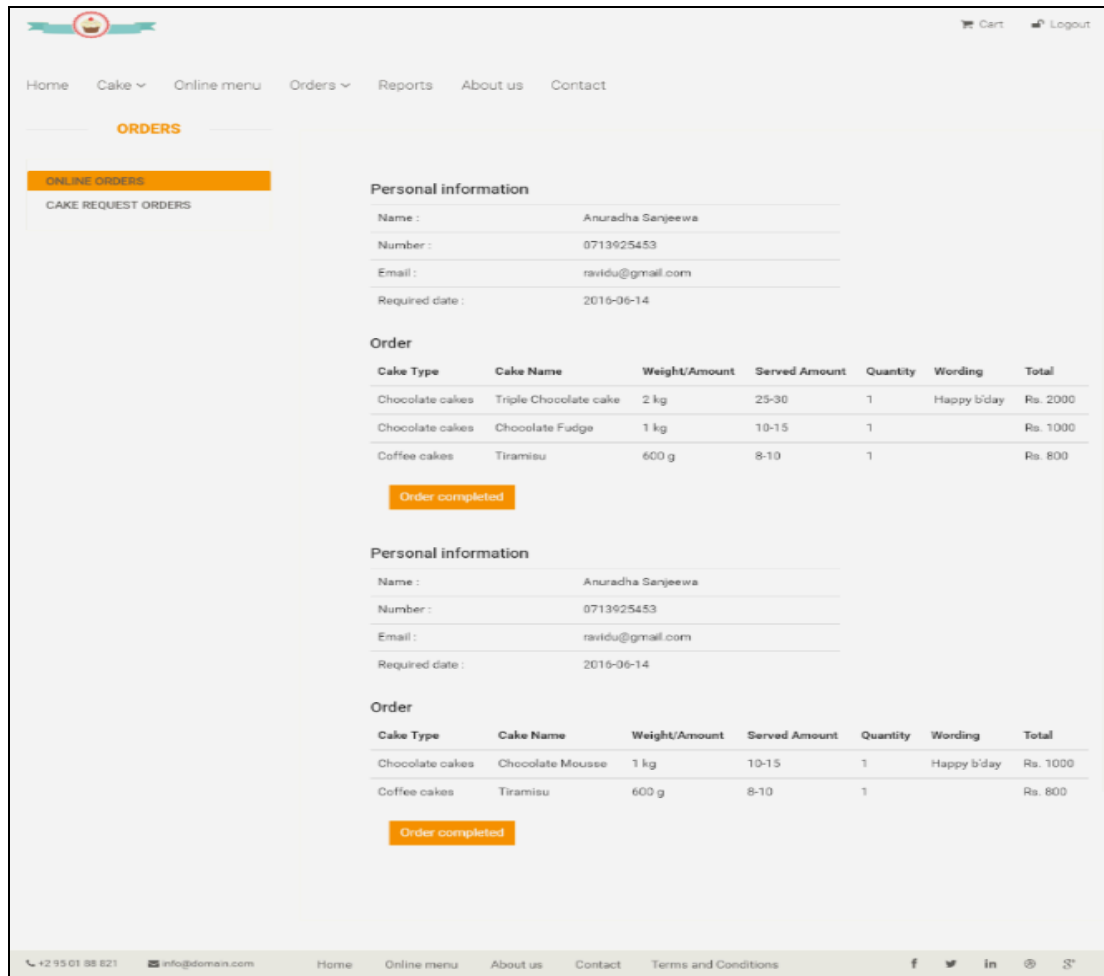
Fig 5: Order Selection Window

V. SYSTEM TESTING AND ANALYSIS

A. Testing Approach

Testing process is consist of four main parts, namely:

1. Data and database integrity testing

2. Function testing

3. User interface testing

4. Performance testing

In data and database integrity testing integrity of the imported schema is tested independent of the UI. For this purpose database seeders was used. Database seeders are provided by the Laravel framework to seed and validate the database. Valid and invalid data was used as inputs and checked with the output.

Function testing was used to check whether all the business models, stated in the use case model, are implemented. This was done by comparing the functions in the system with the system requirements document.

User interface testing verifies user's interaction with the system irrespective of the machine they used. For this network monitor of the web browser, Selenium IDE and Laravel frameworks in build functions was used.

In performance testing responsiveness of the system is tested. MySQL workbench and network monitor of the browser was used for this purpose.

B. Aspects related to performance, security, failures

Aspects related to performance were tested to measure the load time of the system. As the system deals with money much more care should be given to the security aspect. But Laravel framework supports many security features. Session management is done by Laravel framework. Hashing user's username and validating a user in login are some other key features which are handled by Laravel framework. Money transactions are handled by the PayPal API. Failure recovery of the system is guaranteed to be 10 minutes after the failures.

VI. Conclusion and future work

The implemented system supplies all the functional requirements. At the moment, most of the web sites of cake shops in Sri Lanka do not provide features to add customized wording, price range selectors and request cakes by images. These features will be catered in this solution. Thus the system is expected to serve Relish Cake Products and will be able to maximize their profit. The implemented system is ready to deploy in a server so that the Relish cake Products would be able to use the system very soon.

The biggest challenge the company had was on how to publish their cake designs and expand their customer base. By using this system, Relish Cake would be able to gain their ultimate goal of maximizing their profit. They would be able to widen their customer base by going online. Company would also get the chance of show their unique cake designs to the public.

There are few future improvements that will improve the reliability and usability of the system. The company is going to start the delivery system soon so mechanisms should be added to the system to support delivery facilities.

Another improvement that will increase the usability of the system is an order status meter. If there is an indicator to show the status of customer's order it will be much more beneficial for the customers. Customers will be able to know in which state their cake order is in for example whether it's baked or whether it's in the making state.

E-mail confirmation in register process will also add up as a future enhancement. So those customers can be validated when they log into the system.

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