

2020

University of North Carolina Wilmington
Master of Science in
Computer Science and Information Systems
Proceedings

<https://csbapp.uncw.edu/mscsis>

PAYMENT INTEGRATION IN NEPAL

Ganga Poudel Chapagain

A Capstone Project Proposal Report

Submitted to the University of North Carolina Wilmington

in Partial Fulfillment of the Requirements for

the Degree of Master of Science

Department of Computer Science

Department of Information Systems and Operations Management

University of North Carolina Wilmington

2019-2020

Advisory Committee

Dr. Gulustan Dogan

Committee Member

Dr. Jeffrey Cummings

Committee Member

Dr. HyunBum Kim, Chair

Accepted By

Dean, Graduate School

TABLE OF CONTENTS

	Page
List of figures.....	3
Abstract.....	4
1. Introduction.....	5-6
2. Background.....	7-8
3. Related Work.....	9
4. Review and analysis.....	9-16
4.1 Business scenario of payment integration method.....	10
4.2 Diagrams	10-12
4.2.1 Architectural Diagram of software	11
4.2.2 UML diagram of software	12
4.2.3 Activity diagram	13
4.2.4 Use case diagram for the Main page and Login Page.....	14
4.2.5 Use case diagram of Payment processing	15
4.3 Analysis of Technologies Used	15-16
4.3.1 Eclipse Software.....	15
4.4 Analysis of Programming languages.....	16-20
4.4.1 Java	16
4.3.2 PostgreSQL management system.....	17
4.4.2 Hypertext Markup language.....	18
4.4.3 Cascading Style Sheets (CSS).....	19
4.4.4 Bootstrap.....	20
4.4.5 Java Server Pages.....	20
4.5 Analysis of Payment Gateway Service Provider.....	21-22
4.5.1 PayPal.....	21
5. Methodology	22
7. Security	23
7. Implementation of Payment Integration software.....	23-27
8. Validation of Code.....	27-28

9. Lesson Learned.....	29
10. Conclusion.....	30
11. Future work.....	31
12. References.....	32-33
13. Appendix A.....	34-37

LIST OF FIGURES

Figure 1: Software development life cycle [3]	6
Figure 2: Website of Bhatbhateni Store [4]	8
Figure 3: Traditional travel website [5]	8
Figure 4: Payment integration available in Nepal [6]	9
Figure 4: Business Scenario of Payment Processing	10
Figure 6: Architectural Diagram of Software	11
Figure 7: UML Diagram	12
Figure 8: Activity Diagram	13
Figure 9: Use case diagram for Main page	14
Figure 10: Use case diagram for Login Page	14
Figure 11: Use case diagram for payment processing	15
Figure 12: Sample of Eclipse software page	16
Figure 13: Sample of Java code	17
Figure 14: Sample of PostgreSQL page	18
Figure 15: Sample of HTML page	19
Figure 16: Login form using Bootstrap	20
Figure 17: Sample Page of JSP	21
Figure 18: PayPal website sample [21]	22
Figure 19: Users Information saved in database	23

ABSTRACT

Payment Integration in Nepal. Poudel Chapagain, Ganga, 2019-2020. Capstone Paper, University of North Carolina Wilmington.

Payment integration refers to the service provided by the business provider to authorize the payment process and is being used widely in the world. Processing can be done through credit cards, cash, or direct payments. People are using payment integration for their businesses, banks, stores, and online applications. It is a very easy and reliable process for the current era. In the current context, it has become an essential part of every business. It makes processing easy and fast. This project reflects the reliable and secure payment processing website using the help of third-party vendors. For this project, we have utilized a variety of technologies. It consists, mainly of a database (PostgreSQL server management) which used to record the data of the users. JSP is popular for creating form and standard language for documents designed to be displayed in a web browser. So, a form has created using JSP which includes the credit card number, expiration date, security code, payer name, payer address, zip code fields. There are different forms for real customers and the admin. In this project, Eclipse is used as the main front-end platform. The reason for using Eclipse is that this is the compatible platform specially to create the website. Java programming language is used to develop the website along with that CSS, HTML, bootstraps, JSP

tag is used to create the form with the help of Eclipse. The information related to a credit card is sent to a third-party website using one of the many data transmission methods such as XML, POST, AJAX, etc. Third-party payment website examples are PayPal, etc. This paper includes detailed information about the project and the website is applicable for real-life use.

1. INTRODUCTION

Payment integration is defined as the commercial service given by an e-commerce application service provider that authorizes credit card or direct payments processing for e-businesses and all sellers who deal with the sales business. In the context of a different country, payment processing is provided by a bank to its customers and most of the people but in another case, it can be provided by a specialized financial service provider as a separate service, such as a provider [1].

The use of payment processing services gains popularity especially as we continue to move towards a cashless society. The move from traditional brick and retailers to online reinforces the need for payment processing. Peoples are also using more online payment processing because it being more convenient for them. Buying something online rather than roaming to every shop, it saves peoples time and its reliable to them. The payment processing service provider has made the easy process of the payment because customers do not have to worry about the transfer of the money. When the customer provides their information on the website with a credit card number, expiration date, and security code. Their money will deduct automatically. Furthermore, all the information related to the products are also provided in every seller's pages, so people can choose their required product by sitting at home.

The current software is available for online shopping limit the presence of payment integration. It contains all the information of the items in the pages but lacking the online shopping using the

credit/debit card option for the customers. Analyzing the weakness of the software for a well-known grocery shop, this project is developing and integrating payment system especially target to those kinds of businesses.

This project mainly focused on the design of the previous website and propose a new architectural design based on the new web application that provides the facilities of the payment integration system using new technologies along with the privacy and security of the users.

This project supports the life cycle of software development (Figure 1) during software design. During software development, there are multiple phases where we need to work on. It is categorized into multiple phases: requirement analysis, design, development, testing, and maintenance [2]

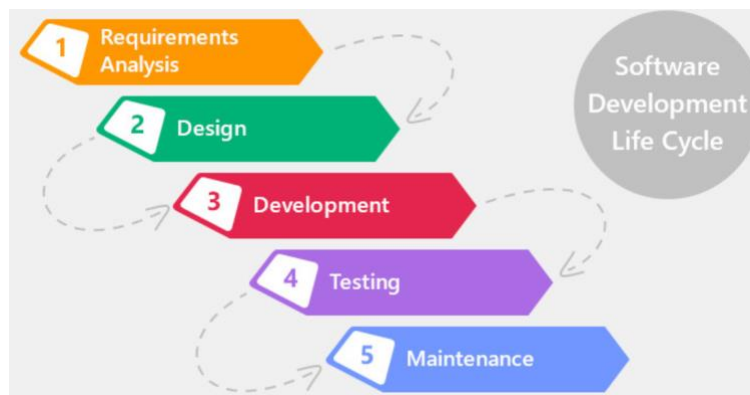


Figure:1 Software development Life Cycle [3]

Requirement Analysis is the initial phase where all the requirements regarding software design are included. Examples include discussion among different shareholders, required resources, required software, time, and money. Once all the information is collected, then documentation is done and process to the next steps. In design phase software is developed according to the requirement

specification document. It includes the design of the hardware, software, and entire system architecture. The development phase includes the coding part which is required for the software. This phase typically takes more time compared to other phases. The developers must work hard on this phase to create the required output. After the coding part is done, testing will be done to check if all requirements have met by the software. There are multiple testing processes like unit testing, acceptance testing, and integration testing. The final phase is maintenance where the finished product is delivered to the customer. Problem-related is solved if the customer has an issue with the software.

2. BACKGROUND

This project is based on the grocery store and travel agent payment integration available in the country Nepal. Bhatbhateni [4] (grocery store) is established since 1984 A.D. The owner started his business from 120 sq. ft store which becomes Nepal's biggest retail business and it contains more than 10,000 customers daily. Bhatbhateni (like Walmart, Target, Sam's club) has its branches all over the country. Figure 2 is the screenshot of the Bhatbhateni website. We can get every item in this store, For example, food, clothes, kitchen items and so on. The main concern is, if people want to buy anything from the store then they need to go to the store to purchase it. It is lacking the online system, especially for the payment. Recently they have offered home delivery of the items with the use of calls and messages, but the customer has to pay money who delivers the items to them. It doesn't assure that money is going to the owner or not. With the help of payment gateway into their website really can benefit their business.

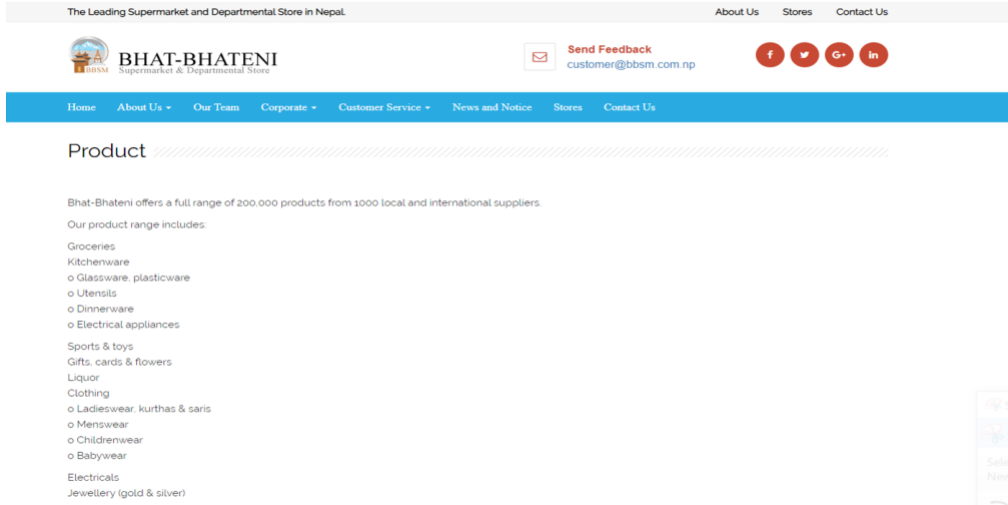


Figure:2 Website of Bhatbhateni Store [4]

Nepal travel Agents [5] website well known as traveling website for the visitors to book different places, (Figure 3) website offers the choice of different locations to travel around Nepal. When someone wants to travel and book the ticket, they have to contact the agents. This website does not provide the facility of online booking and payments This project focused on those kinds of business which is lacking the payment integration methods.

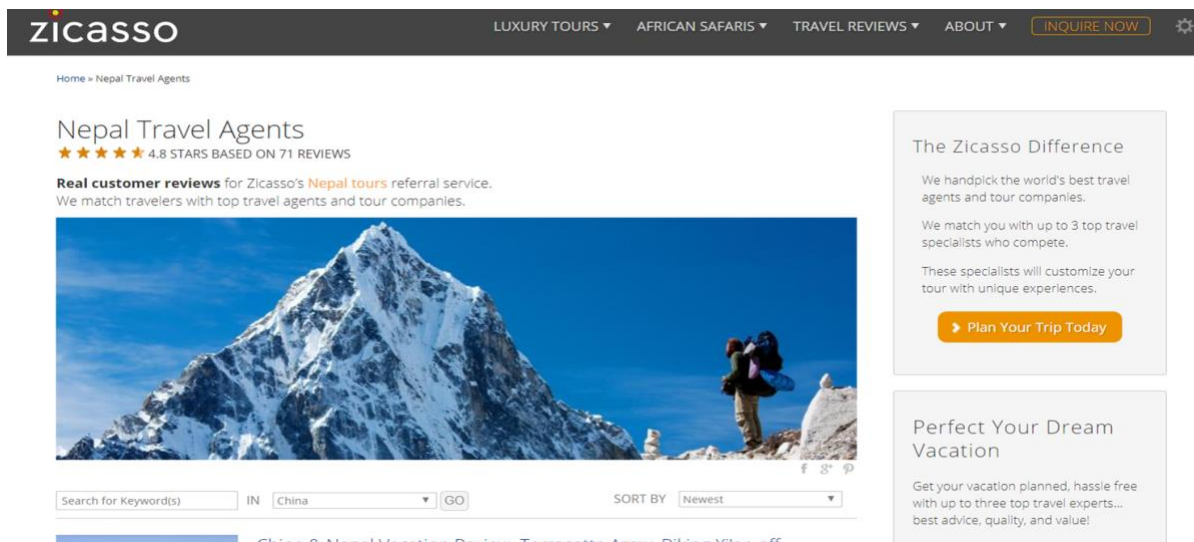


Figure:3 Traditional travel website [5]

2.2 RELATED WORK

In Nepal, there is multiple payment integration already available. Figure 4 [6] is an example of payment integration methods now available in Nepal. Among them (from Figure 4), e-Sewa is the most popular payment Gateway. It is providing multiple services likes credit card payment, electricity bill payment through their website. But it comes with some weakness which is web-based. If the user wants to access it through mobile, then they need to have the app installed on their mobile otherwise it does not support the mobile devices. Also, it is lacking payment services, especially for the grocery stores. To overcome the weakness of the existing payment gateway available in Nepal, this software is designed which is both web and mobile-based.



Figure 4: Payment Integration methods available in Nepal [6]

3. REVIEW AND ANALYSIS

3.1 BUSINESS SCENARIO OF PAYMENT INTEGRATION METHOD

Figure 5 describes how payment processing can be done. In the initial phase, the customer places an order which goes to the cart and then they pay for the products. The gateway for the payment processor receives the notification and it verifies all information of the customers. After the information has been approved the money is reduced from the customer bank and transfer to the owner account who sells the product.

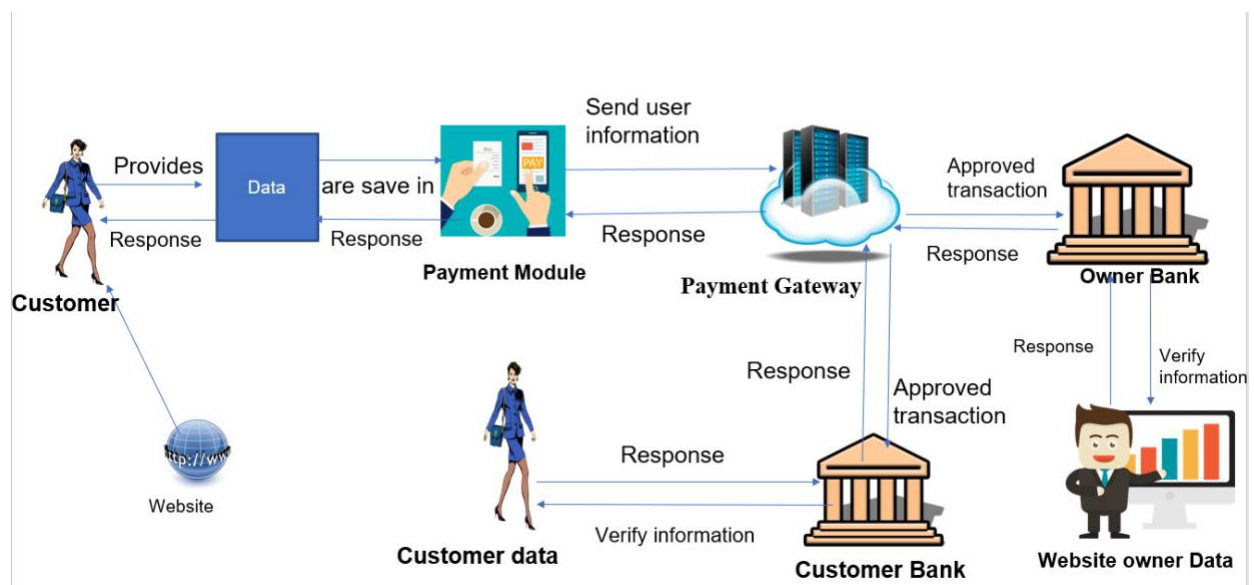


Figure:5 Business Scenario of Payment processing

3.2 DIAGRAMS

3.2.1 ARCHITECTURAL DIAGRAM OF SOFTWARE

Figure 6 is the architectural diagram of software using Struts 2(open-source framework for web development) MVC framework. First users go through the browser, it sends a request to the controller. The controller is known as struts 2 dispatcher and it handles all the requests from the

browser and acts as a filter. Then, the controller sends a request to the model (all the modeling is done using java programming languages) and JSP then model verifies the information from the database and fetches the information. The model will send the response back to view (JSP- where all form is created for the front end) and after verifying all the information from the model, view response back to the browser.

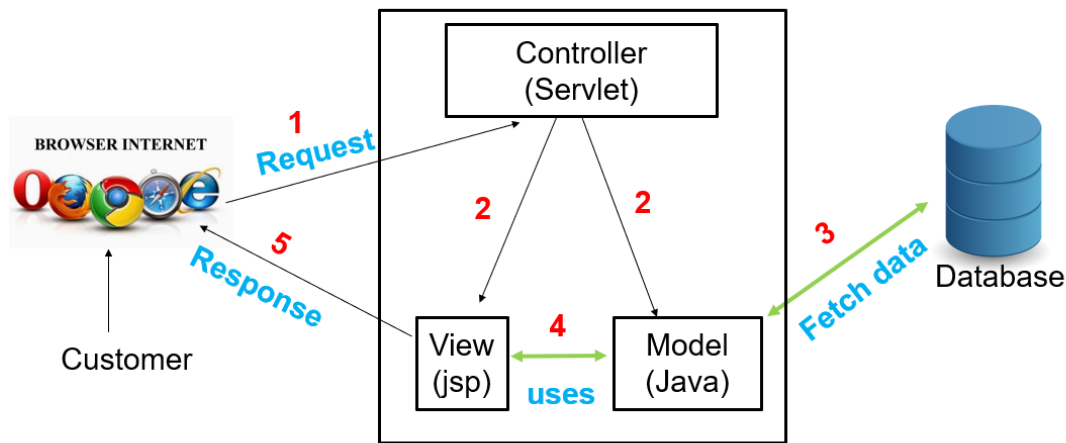


Figure 6: Architectural Diagram of Software

3.2.2 UML DIAGRAM

The software contains a total seven tables which are created in the database using the PostgreSQL query. From Figure 7, Person is the main table that belongs to a customer, admin, and Contact us table. Likewise, customer table belongs to address, product, payment and credit card table and admin table belongs to address table, In the figure, pk refers to primary key which must be unique and fk represents foreign key which creates the relationship between tables and 1 represents exactly one, * represents zero or more and 1...* represents 1 or more.

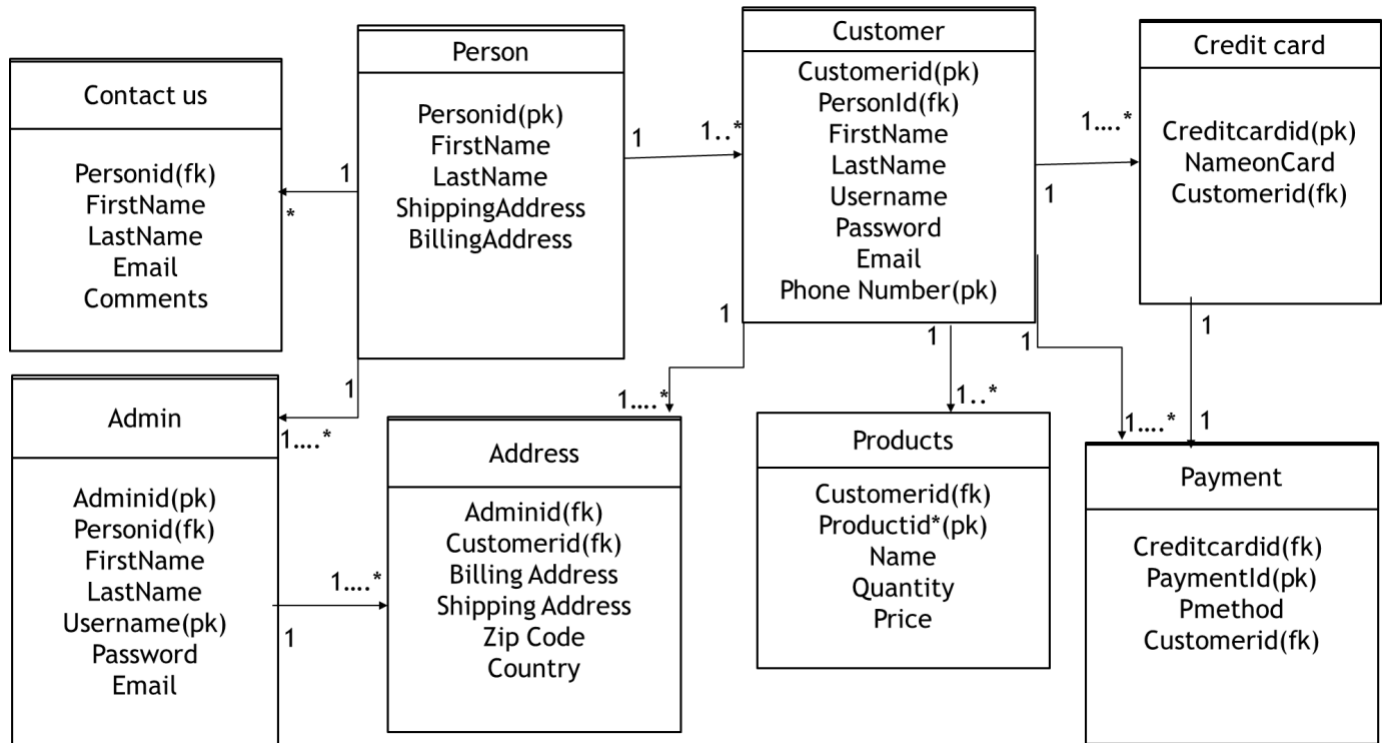


Figure 7: UML diagram of the software

3.2.3 ACTIVITY DIAGRAM

Figure 8 describes the flow of the website. First users can enter through the website where they have three choices register, login, or surf through the website. If users are new, they can simply register through the website and if they are existing users, they can log in using their credentials. After login credentials are provided and if they are valid then users redirect to the next page where they can see different options like payment, edit profile, payment history, and receipt. Finally, they can logout from the system.

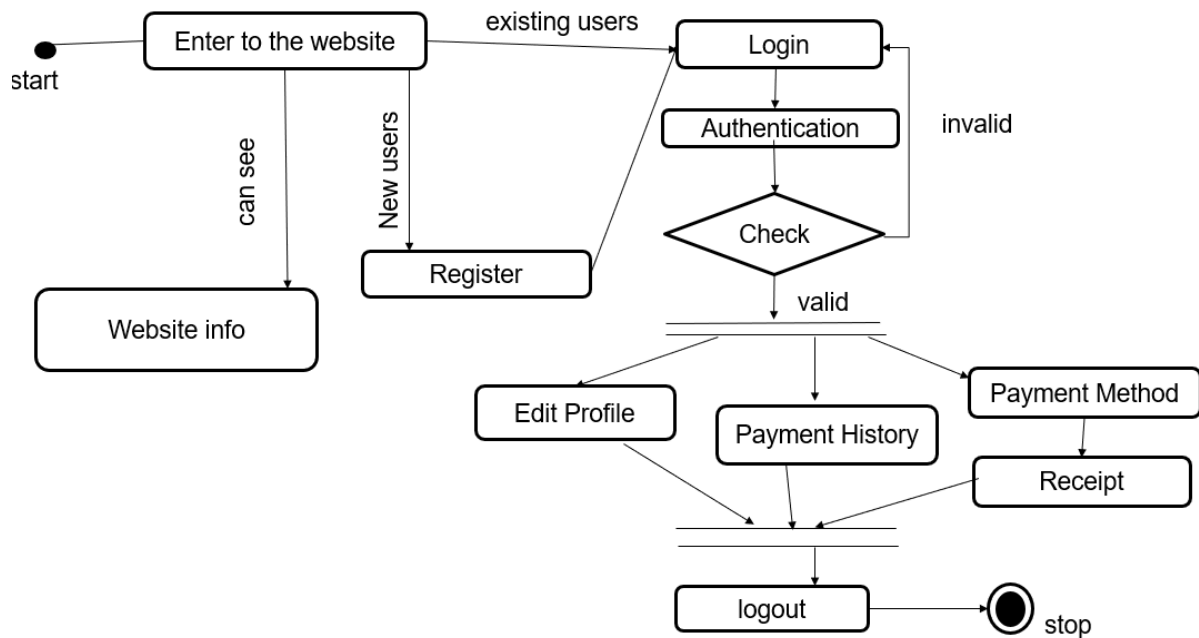


Figure 8: Activity diagram of a website

3.2.4 USE CASE DIAGRAM FOR MAIN PAGE AND LOGIN PAGE

Figure 9 describes the use case scenario of the website. Users enter the website where they can see the main page which includes information regarding the website. They can sign up for a new account or if they already have registered their account, they can go through the login process. All the data from the users are being verified and managed by the admin through database records. Likewise, Figure 10 use case diagram is the scenario after a user's login to the page. It will redirect to the next page where a user can use their desired payment methods, using PayPal and can get the receipt, edit their profile, and finally can logout from the system.

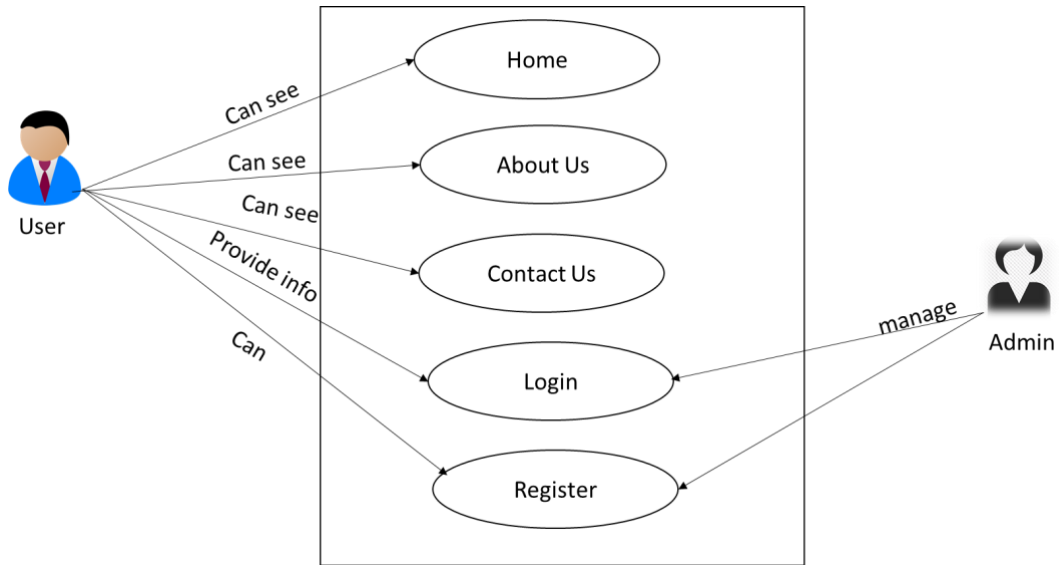


Figure:9 Use case diagram for the main page of the website

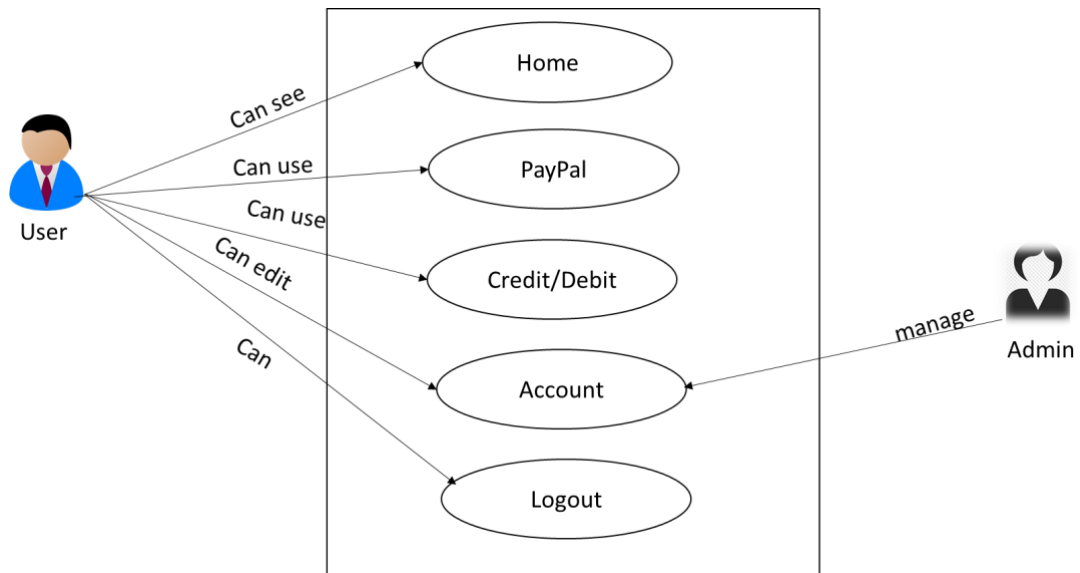


Figure 10: Use case diagram after login to the website

3.2.5 USE CASE DIAGRAM FOR PAYMENT PROCESSING

Figure 11 describes the processing of credit cards from customer banks to the merchant's bank.

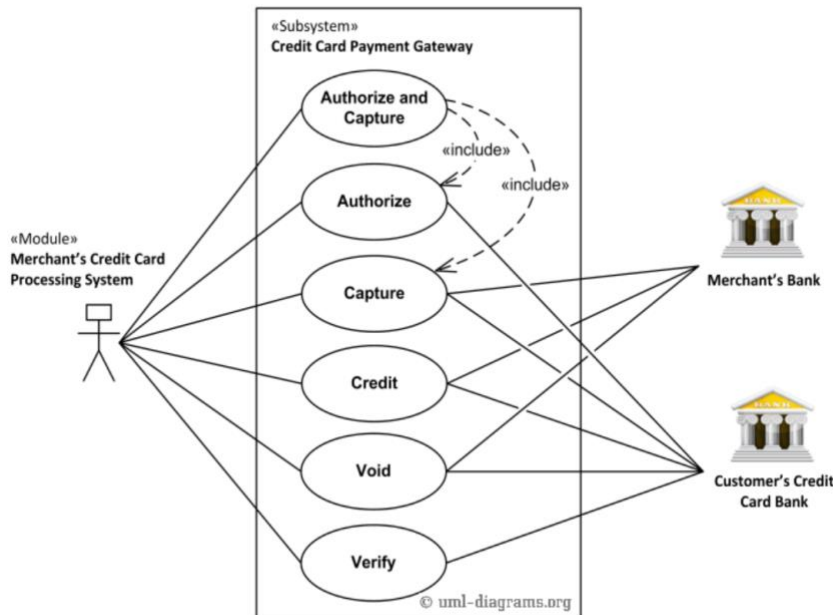


Figure:11 Use case diagram for payment processing

3.3 ANALYSIS OF TECHNOLOGIES USED

3.3.1 ECLIPSE SOFTWARE

Eclipse[7] is defined as the platform for an integrated development environment (IDE). We can use it to develop computer programs, websites, web apps, web services, and mobile apps. Java languages are specially used for the eclipse to develop java applications but can also use to develop applications in other programming languages using plug-in including Ada, ABAP, C, C++, and C# [8]. Eclipse software development kit includes java development tools with a built-in compiler and full model of java source files. It is an easy analysis code and refactors the code with eclipse It also supports Tomcat, Glassfish, and allows the server to install directly from the IDE. It also

supports remote debugging and allows users to understand the error that is running in the server [9]. Figure 12 is the sample page of Eclipse where we can write our java code for designing software.

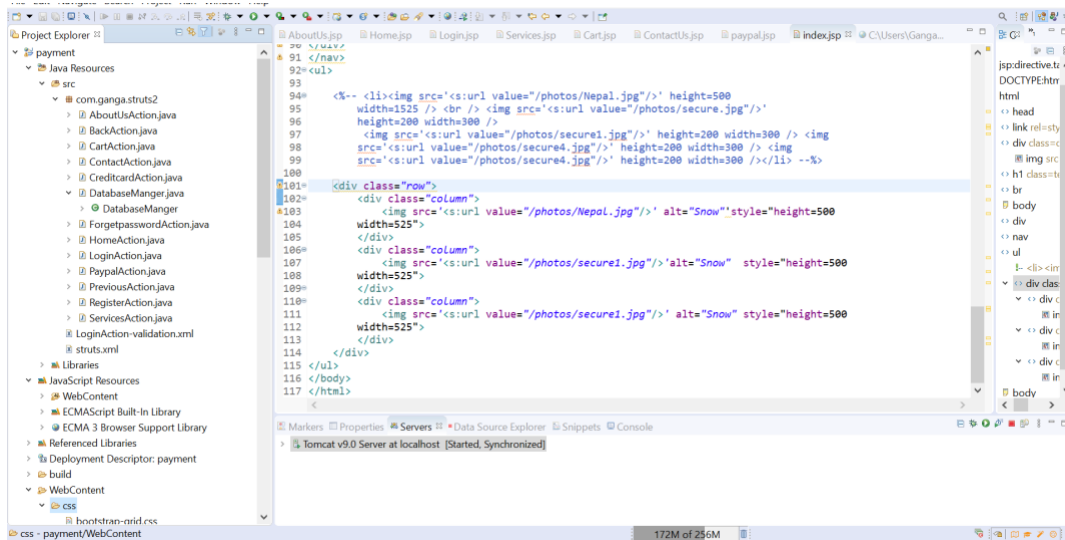


Figure 12: Sample of Eclipse page

3.4 ANALYSIS OF PROGRAMMING LANGUAGES

3.4.1 JAVA

Java is an object-oriented programming language which is based on the class and object and platform independent. Once code is written you can run compiled java code anywhere on all platforms where it supports java without the need for recompilation [10]. Java code is written similarly like C++ with multiple classes and by creating the object of the classes. Java allows users to download untrusted code over a network and run it in a secure environment, which means it does not affect the host system with any malware, cannot read or write files from the hard drive. It is used for mobile applications, desktop applications, web applications, web servers and

application servers, games, and database connection. It is open-source, free, easy to download, secure, and faster programming language. The code in the java is first compiled into byte code and then byte code is run on the Java Virtual machine (JVM). They are easily manageable. Figure 14 represents the sample code written in java programming language.

```
package com.ganga.struts2;

import com.opensymphony.xwork2.ActionSupport;

public class LoginAction extends ActionSupport {

    private static final long serialVersionUID = 1L;

    private String username;
    private String password;

    public String getAddress() {
        return username;
    }

    public String getUsername() {
        return username;
    }

    public void setUsername(String username) {
        this.username = username;
    }

    public String getPassword() {
        return password;
    }

    public void setPassword(String password) {
        this.password = password;
    }
}
```

Figure:13 Sample of Java code

3.3.2 POSTGRESQL MANAGEMENT SYSTEM

PostgreSQL is a free and open relational database management system. It has multiple features transactions like atomicity, consistency, isolation, durability, properties, and automatically updates view, triggers, foreign keys, and stored procedure [11]. It is used as a default database for the macOS server and version is available for Windows, Linux, OpenBSD, and FreeBSD [12]. Figure 15 is the sample query for creating a table using a PostgreSQL database.

Query Editor

```
1  -- Table: public.person
2
3  |
4
5  CREATE TABLE public.person
6  (
7      username character varying(50) COLLATE pg_catalog."default" NOT NULL,
8      firstname character varying(50) COLLATE pg_catalog."default",
9      lastname character varying(50) COLLATE pg_catalog."default",
10     password character varying(500) COLLATE pg_catalog."default",
11     shippingaddress character varying(50) COLLATE pg_catalog."default",
12     billingaddress character varying(50) COLLATE pg_catalog."default",
13     country character varying(50) COLLATE pg_catalog."default",
14     id bigint NOT NULL DEFAULT nextval('person_id_seq'::regclass),
```

Figure:14 Sample of PostgreSQL query

3.4.2 HYPERTEXT MARKUP LANGUAGE (HTML)

Figure 16 represents the Html tags and it is defined as the standard language to design webpages to be displayed in a web browser. It is the simplest language compared to others like java, C, C++, HTML works with a web browser, where web browsers receive HTML documents from a web server or local storage and render them in the browser. It is supported by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript. HTML describes the structure of a web page semantically and includes cues for the appearance of the document. [13]

```

<!DOCTYPE html>
<html>
  <head>
    <title>Example</title>
    <link rel="stylesheet" href="sty1
  </head>
  <body>
    <h1>
      <a href="/">Header</a>
    </h1>
    <nav>
      <a href="one/">One</a>
      <a href="two/">Two</a>
      <a href="three/">Three</a>
    </nav>

```

Figure:15 Sample of an HTML page

3.4.3 CASCADING STYLE SHEETS (CSS)

CSS is a style sheet language specially used for the designing of a document that is written in a language like HTML [14]. It is a very popular technology like JSP, JavaScript, Html. It is mainly used for the presentation of the page which includes colors, layout, and fonts [15]. Used of CSS have multiple benefits, code can be reused which means it saves time. It is easily maintainable because if we want to change it globally, we can simply change the style and all elements are updated automatically on the page. It is compatible with future browser and it is platform independence [16].

3.4.4 BOOTSTRAP

Bootstrap is a front-end structure which is used to create dynamic websites and web applications. The popularity of bootstrap is increasing day by day because it is easy, supports all browsers and fast to develop a website. It has pre-style components of alert, dropdown, navbar, and so on. It supports HTML with basic style definitions. We can use CSS with the help of CSS to enhance the

design of the website. It also supports the approachable design and dynamically adapts the layout of web pages by considering each characteristic of the device used [17]. Figure 17 is the sample layout of the login page using Bootstrap.

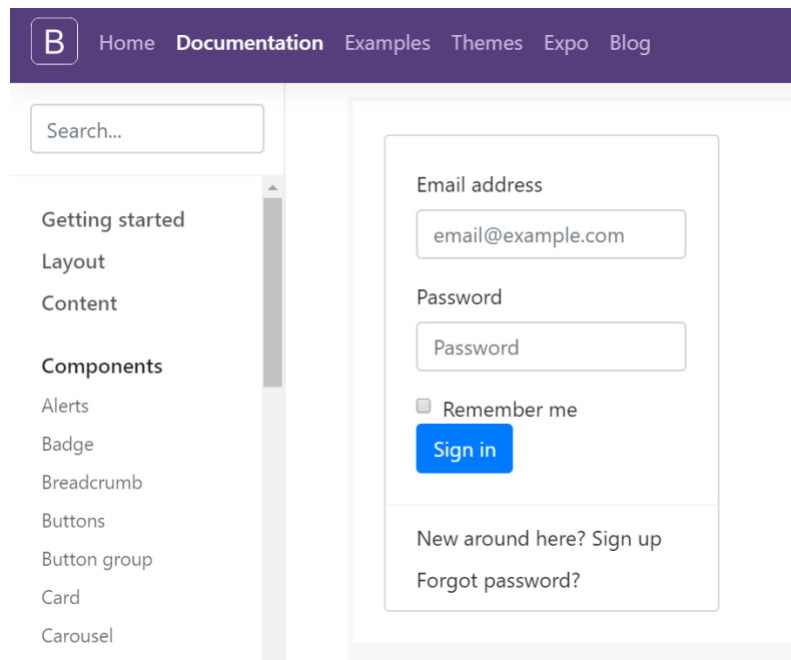


Figure:16 Login form using Bootstrap [18]

3.4.5 JAVA SERVER PAGES (JSP)

JSP is the platform used to develop webpages which mainly supports dynamic content. It is mainly used in the java code with the help of Html pages using JSP tags. It tags start with <% and end with %>. It is a type of java servlet, which is designed to use for a java web application. Programmers use it as a text which combines Html and XHTML code and embedded JSP actions and commands. JSP is popular for a variety of things such as retrieving information from a database or registering the user preferences, passing control between pages, and sharing

information between requests, pages, and so on [19]. Figure 18 represents the sample of JSP tags used to create different forms used to design the software.

```

104</div>
105</ul>
106</br>
107
108<div class="container">
109<h2>Welcome to Login/Signup page</h2>
110<s:form actions="LoginAction.action" method="post" validate="true">
111<div class="form-row">
112<div class="form-group col-md-10">
113<!-- <label for="username">Username</label> <input
114type="text" class="form-control is-valid" id="username"
115placeholder="" value="admin" required -->
116<label for="username">Username</label></br>
117<input type="text" id="username" name="username" required>
118<!-- <s:textfield name="username" key="Username" cssClass="form-control"
119theme="simple" /> --%>
120</div>
121</div>
122<div class="form-row">
123<div class="form-group col-md-10" id="show_hide_password">
124<label for="password">Password</label> </br>
125<input type="password"
126id="psw" name="psw" pattern="(?!.*)(?=[a-z])(?=[A-Z]).{8,}"
127title="Must contain at least one number and one uppercase and lowercase letter, and
128required"
129<!-- <s:textfield name="password" key="Password" cssClass="form-control"
130theme="simple" /> --%>
131</div>
132</div>
133<div class="form-check">
134<input type="checkbox" class="form-check-input" id="exampleCheck1">
135<label class="form-check-label" for="exampleCheck1">Remember
136Me</label>

```

Figure:17 Sample Page of JSP

3.5 ANALYSIS OF PAYMENT GATEWAY SERVICE PROVIDER

3.5.1 PAYPAL

It is an American based company that supports online payments and money transfer electronically. It provides the service worldwide and it is more famous among the people also. It is the company that operates as a payment processor for online retailers, sale sites, and many other business users. All the private and personal data are saved on the website. It also allows users to create their account and then transfer the money. It is a very convenient way; it charges some fee for providing the service such as one-click transactions and password memory.[20]. Figure 19 is the PayPal page used for the payments.

Figure 18: PayPal website sample [21]

4. METHODOLOGY

In this project, the main platform used is eclipse with a java programming language. We used different methods to implement the software. We create different forms using JSP (java server pages). This contains many forms with multiple fields such as Login: username and password, Register: first name, last name, username, password, email, zip code, billing address, and shipping address. Likewise, for payment, we integrate PayPal to our website. All credit card information is passed to the third-party website which is PayPal, using XML and POST methods. Customers provide their details, PayPal [22] website will send a response back to us, either approved or declined. We processed the response and save payment information in the database with the exact payment method, and confirmation number. We do not save credit card number, expiration date, payer name, and payer address in our database because of the security purpose. In case if we want to retrieve any information in the future, we use the confirmation number which helps to retrieve the required information. To secure user privacy we have to use the Bcrypt method to encrypt the

password which cannot be retrieved by anyone. In the front-end development HTML, CSS, Bootstrap is being used to provide a better design for the software.

6. SECURITY

This project also focused on the privacy of the customers. First is password encryption while saving their information in the database. For password encryption, we have used the **Bcrypt** method which is the slow algorithm to convert the plain text into an encrypted password. The main reason for using Bcrypt methods is to secure the user’s privacy and prevent their privacy from hackers. Figure 20 describes the data saved in the database where we can see the password is encrypted. Additionally, as we can see from figure 20, we have used the same password while registering for both users. The good part of Bcrypt is it converts them into different patterns so nobody can guess that the same password is being used for different users. Secondly, users/customer's credit card information is not saved in the database for security concerns. We only save their name, billing address, shipping address in the database.

Query History Messages Data Output

	username character varying (50)	firstname character varying (50)	lastname character varying (50)	password character varying (500)
1	Ganga	Ganga	Poudel	\$2a\$10\$IWBcIlUleHPocFPg6WXfoeQDpsEF1JzFfeYLrkqG5jqf6W6OQ.LW
2	Gangap	Ganga	Poudel	\$2a\$10\$rxIYjOhjYDAQ.TdvknL8gupvBwxkQsiNeXOx9LiWETaFOokuITEjy

Figure 19: Users information saved in the database

7. IMPLEMENTATION OF PAYMENT INTEGRATION WEBSITE

4.1 IMPLEMENTATION OF FORMS

In this, we have implemented many forms which are used in the software. It is developed using multiple technologies like java, Bootstrap, CSS, Html, and PostgreSQL. It contains login, register, contact us, and payment form. In Image 1, a registration form is being validated. Image 3 is the

implementation of the login form where users need to provide the right credentials otherwise, they will not be able to log in through the website. For the recovering password, the link will come to the user's email. Image 5 contact us form is being validated. Further, Image 7 is the validation of the payment form where users provide their payment methods, for security reasons we cannot provide a screenshot of information of credit card in the form after real data are provided to the payment form transaction will complete.

The image displays two side-by-side screenshots of a registration form titled "Welcome to Registration Form".

The left screenshot shows the form with all input fields empty. Red error messages are displayed below each field:

- FirstName*: Please provide FirstName.
- LastName*: Please provide LastName.
- UserName*: Please provide Username.
- Password*: Please provide Password.
- Retype-Password*: Please provide RetypePassword.
- Email*: Please provide email.
- ZipCode*: Please provide Zipcode.
- BillingAddress*: Please provide billingAddress.
- ShippingAddress*: Please provide shippingAddress.

The right screenshot shows the form with the following data entered:

- FirstName*: John
- LastName*: wyatte
- UserName*: John23
- Password*: [masked]
- Retype-Password*: [masked]
- Email*: john@gmail.com
- ZipCode*: 28403
- Country*: United States
- BillingAddress*: 423 South college road
- ShippingAddress*: 423 south college road

Red error messages are present for the Password and Retype-Password fields: "Password must match".

Image1: Form validation and Password validation during registration

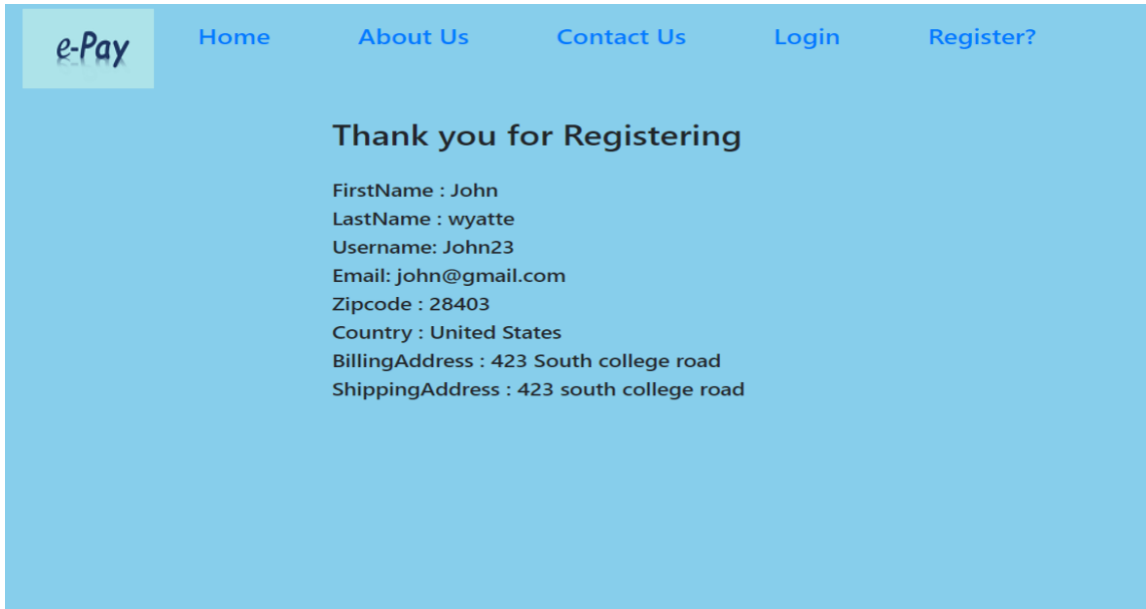


Image2: After registration users will redirect to this page

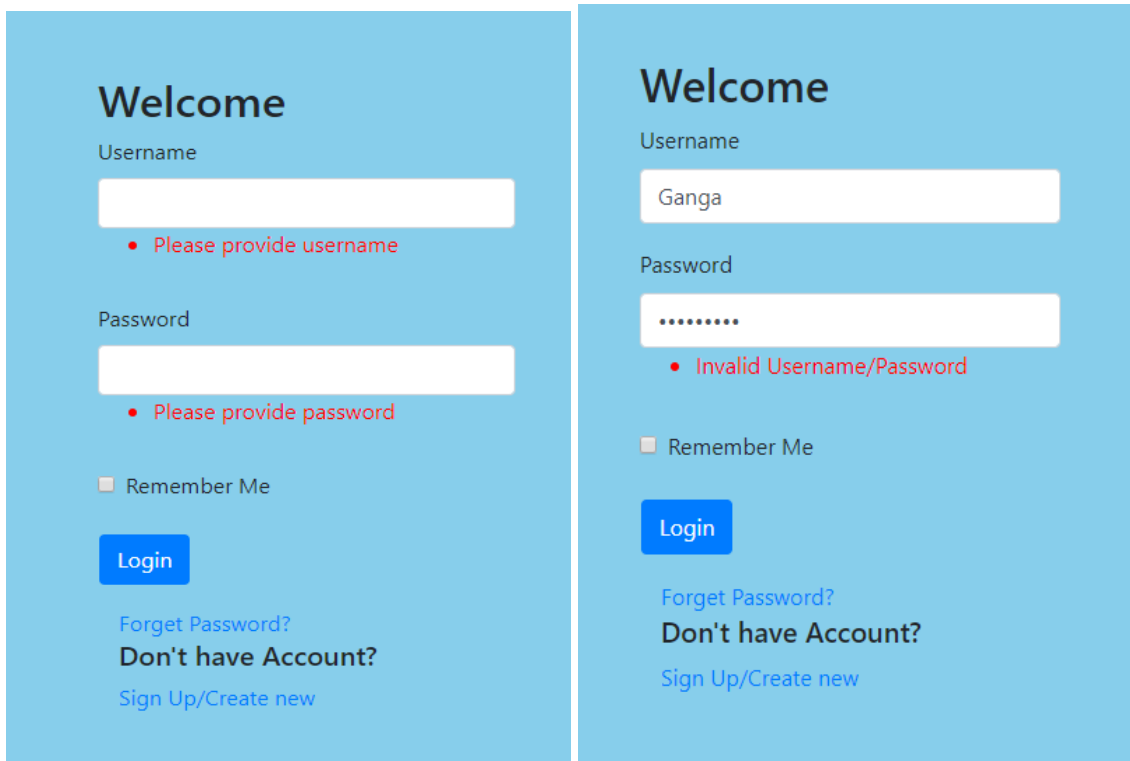


Image3: Login form validation

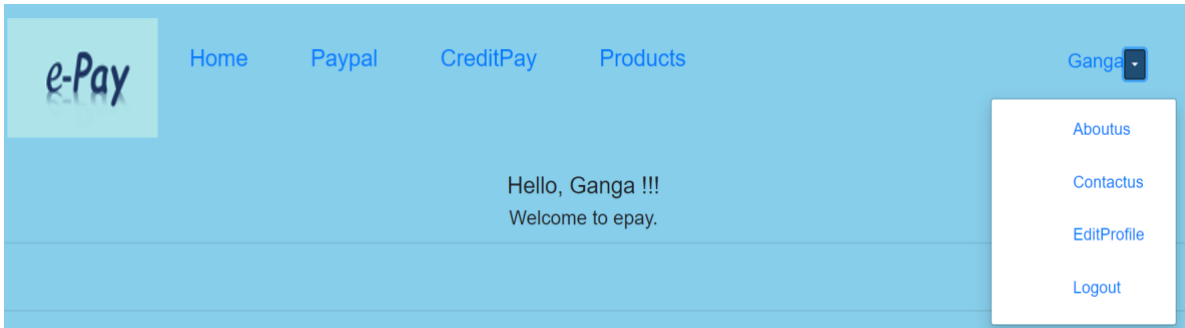


Image 4: After Login user will see this page

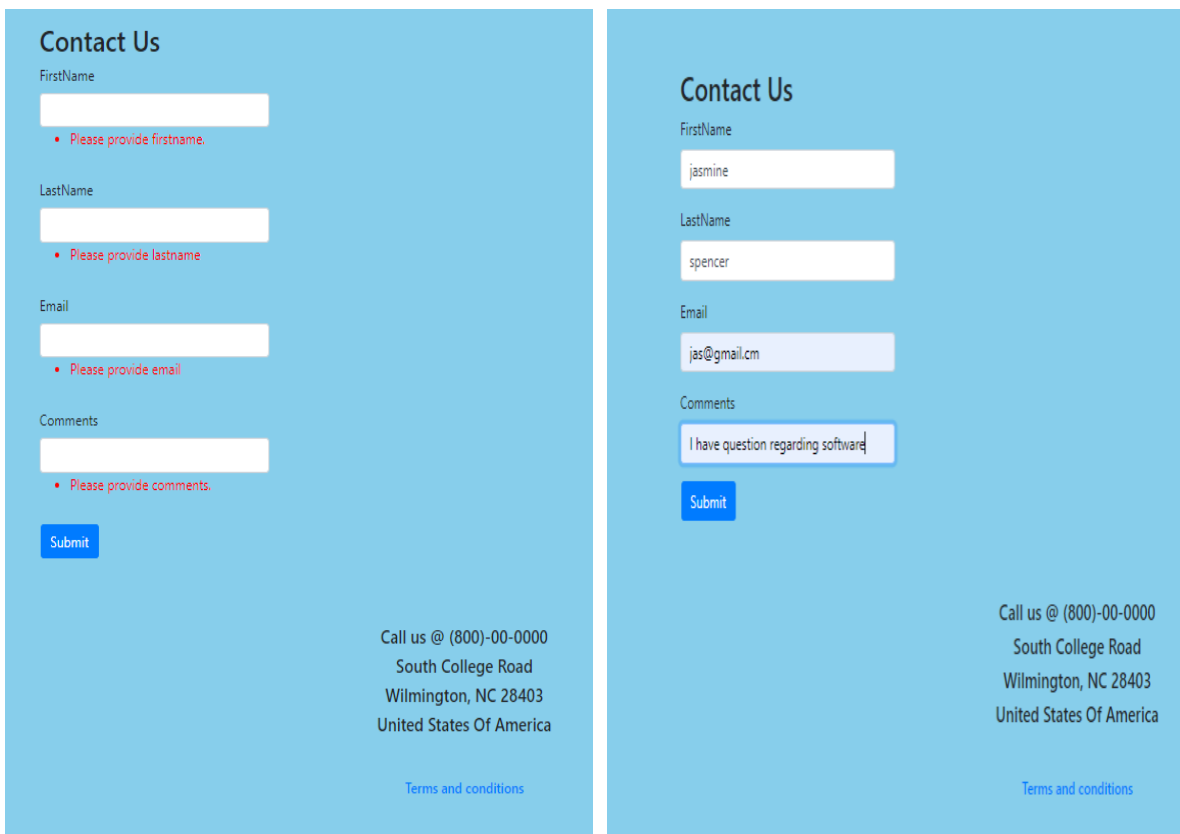


Image 5: Contact us page validation

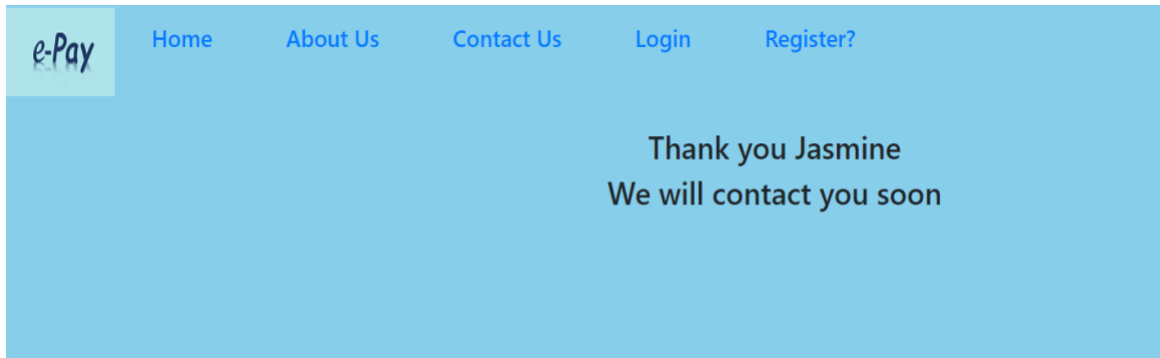


Image 6: After contacting merchant user will see this page

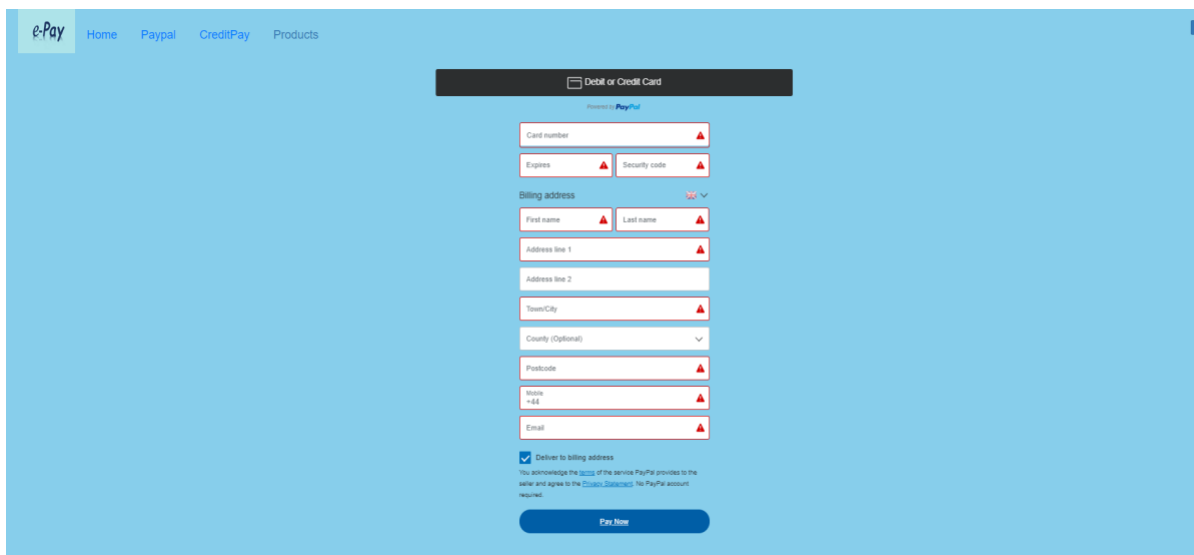


Image7: Payment form validation

5. VALIDATION OF CODE

Code validation is done using an eclipse validator which will help to find out the errors, warnings, and messages in the code. Image 8 and image 9 describes how we can validate our code in eclipse.

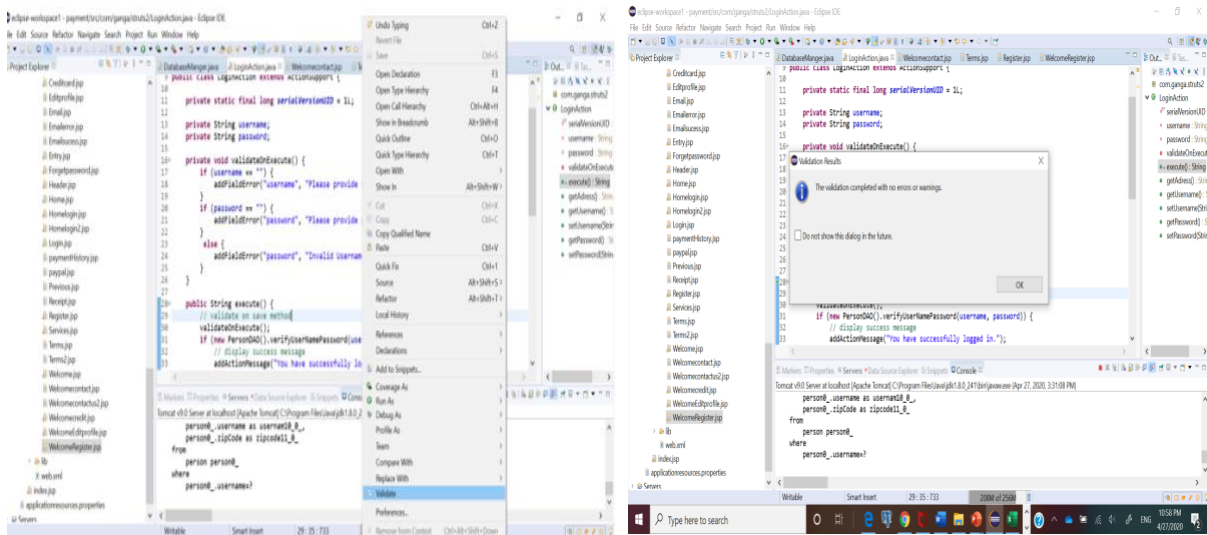


Image8: Validation of code using eclipse validator

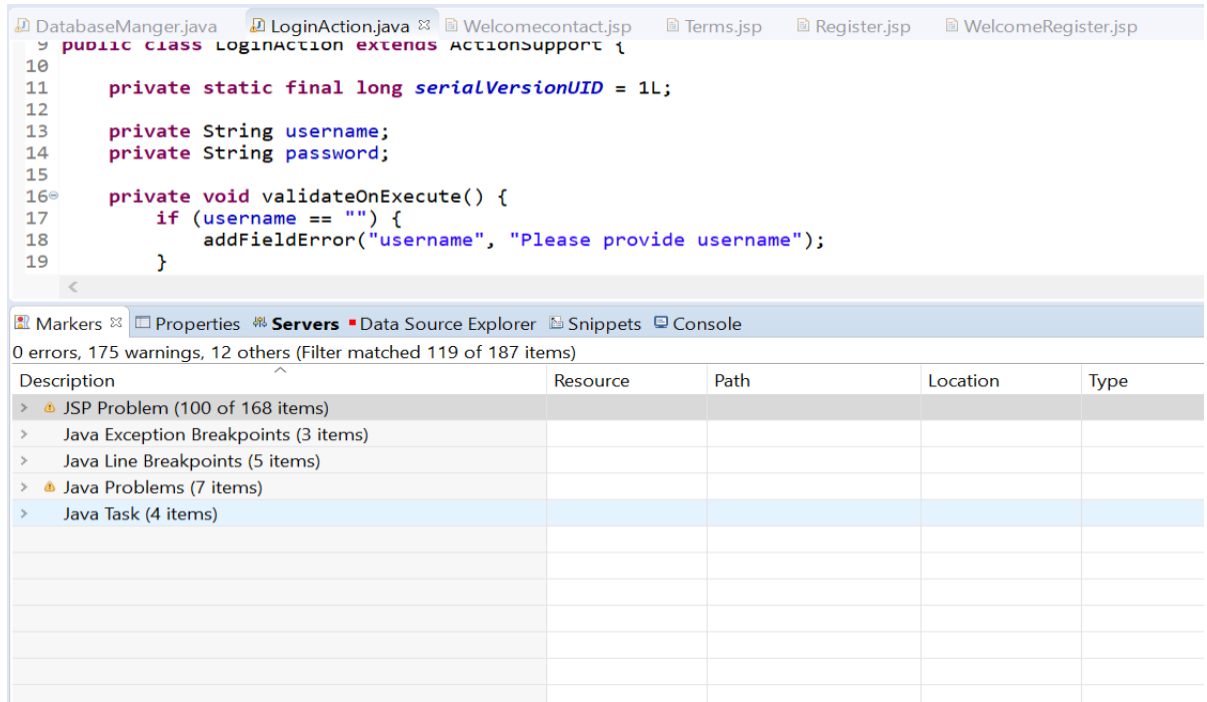


Image9: Display Errors, Warning and messages after validating code

6. LESSON LEARNED

The First Step was to analyze the traditional website used for the business. As I noticed they have not used the concept of payment integration on their website. I realized if I could create a payment integration gateway for those kinds of business it can benefit them. This project is associated with software development, so the first task was to understand the concept of its life cycle. I researched it with the help of goggle and my course called "Analysis Modeling and Design". The software development life cycle helps me to understand the concept more efficiently. During my project, I learned multiple technologies and their uses. For Example, Java, HTML, CSS, Bootstrap, JSP, database management system, With the help of Html, CSS, Bootstrap, I was able to create the form required for the login, register and credit card payment. Java is the main programming language used for this project, which is platform-independent and free of cost. Java uses the tomcat server to connect to the server to display the web pages. I implement java with the help of Struts2 with the MVC framework. MVC framework helps me to understand the development part and its features which help create websites. I referred tutorial of struts 2 [23] for web application development. which helps me to put me on the right track. For payment processing, I learned about PayPal which is secure and popular, and I referred it from to the PayPal website [24].

Used of PostgreSQL server, help to understand the concept of creating tables, deleting, updating. I had my course called "Database management System" that helps me write a query for table creation, selection, and deleting the table. I also used the concept of data types like integer, character, variable, and so on. It also used the concept of the primary key and foreign key and association among the tables. I used a java connector to connect my data with the database. During my project, I learned about time management for each task.

7. CONCLUSION

The main aim of this project was to deliver a payment integration gateway using different technologies and methods. The paper describes the process and the required resources for the project, in this project we used development software as an eclipse. The main reason for using the eclipse platform is, it is popular for creating a website and it comes with multiple features. We used the Java programming language which comes with different features like struts2, MVC (model view controller) framework. In this project, multiple tags are used like HTML, CSS which is used to create the form using the JSP pages. PostgreSQL is used to create, store, or save information about users. Furthermore, the project is also focused on the secure transaction process, which includes the PayPal service provider website. The paper also illustrates the proposed methodology requires to complete the project and includes the timeline used for this process. The final goal of the project was to deliver the complete website for payment Integration, with the help of a third-party vendor (transaction service provider like PayPal) which we have described before. The period to complete the project was around 180 days.

8. FUTURE WORK

We used a different technology for this project, but still, there are more tools available. Java comes with multiple features that include spring framework and have its built-in library. Also, hibernate can be used to deals with the database through eclipse which helps to design the web applications. In future implementation and analysis of that kind of features can be done.

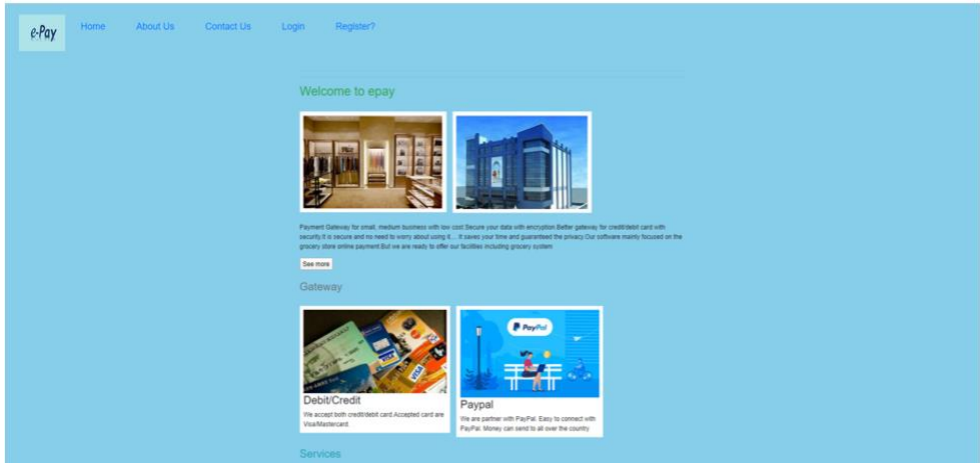
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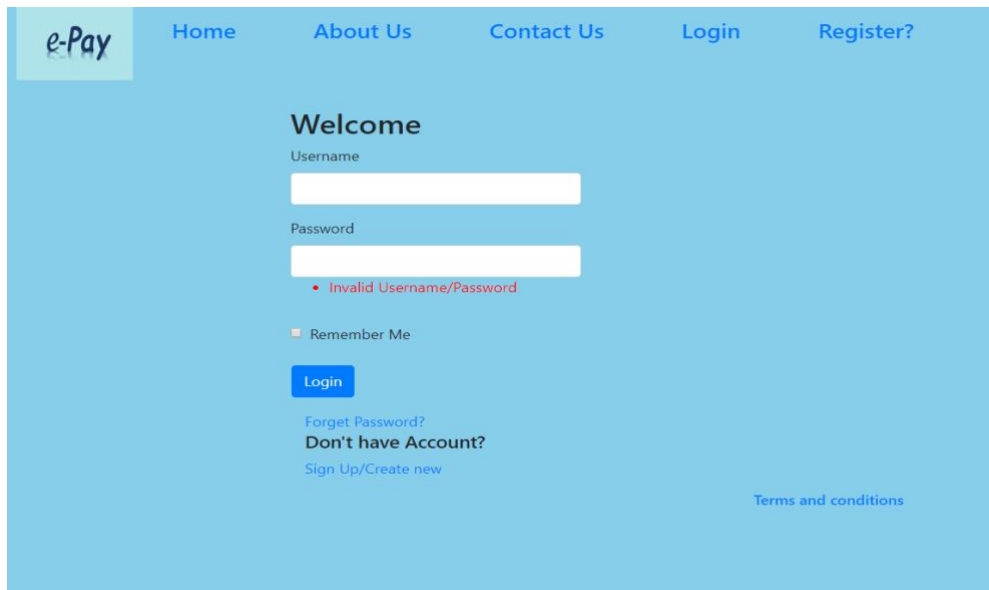
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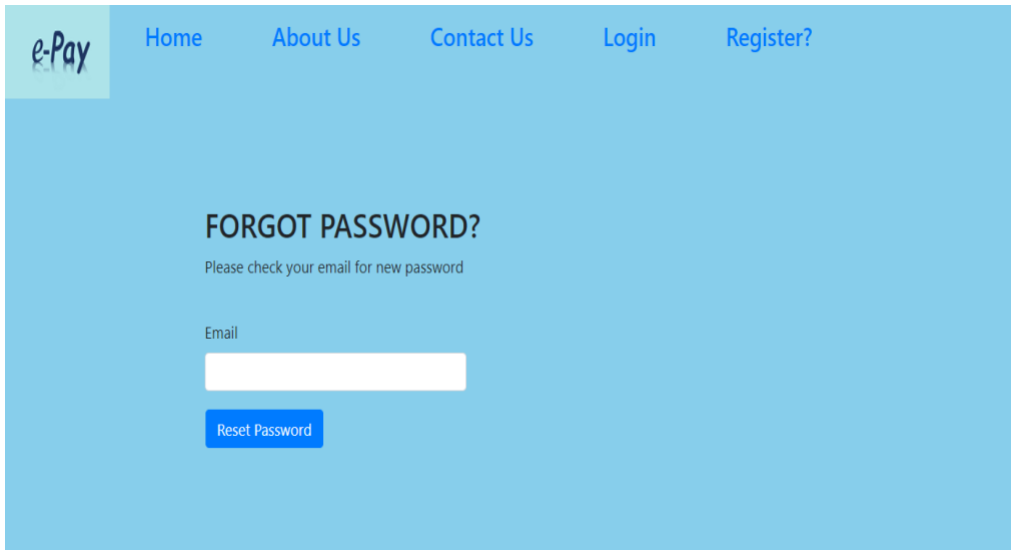
10.APPENDIX A

1. Home Page

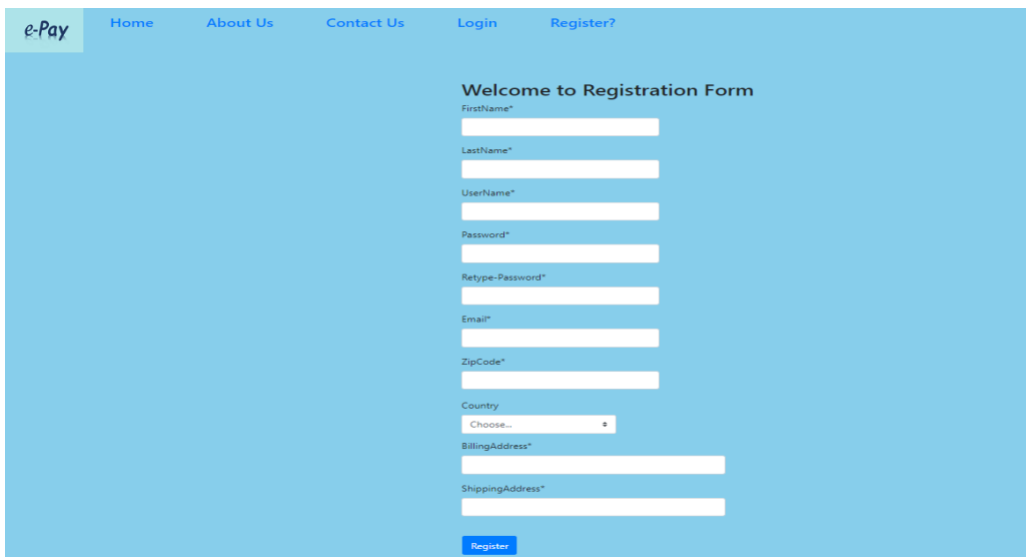


2. User Login Page

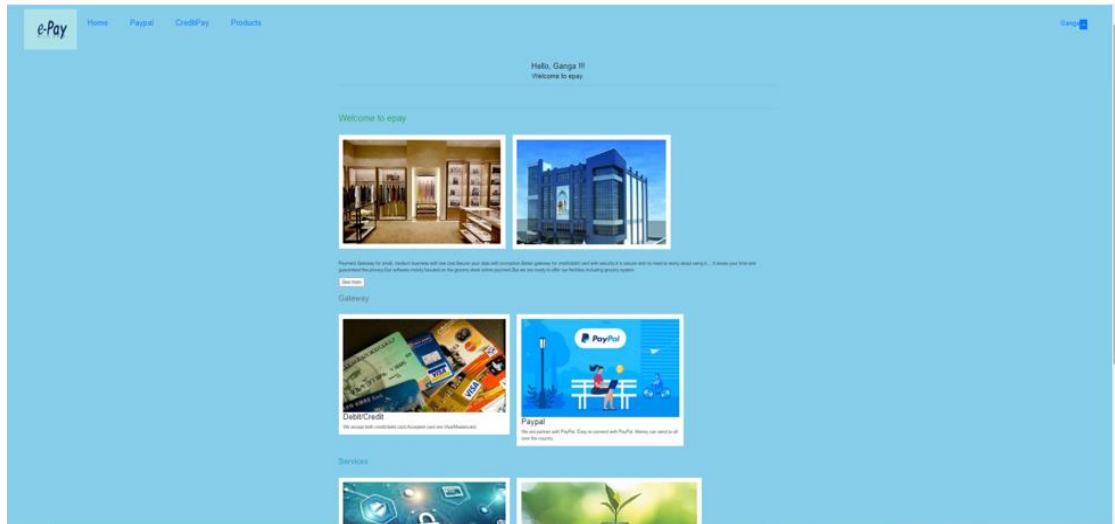




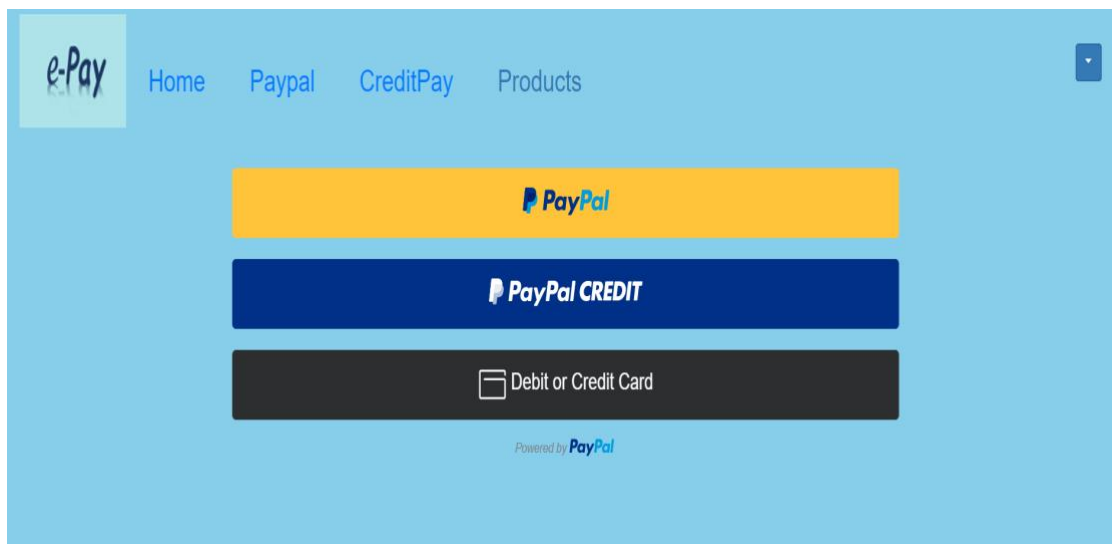
3. Signup Page



4. Welcome Login Page




5. Payment Page




e-Pay Home Paypal CreditPay Products

Debit or Credit Card

Powered by 

Card number

Expires Security code

Billing address 

First name Last name

Address line 1

Address line 2

Town/City

County (Optional)

Postcode

Phone +44

Email

Deliver to billing address

You acknowledge the [security](#) of the service PayPal provides to the seller and agree to the [Credit Agreement](#) for PayPal account holders.

Pay Now


6. About Us page

e-Pay Home Paypal CreditPay Products

About Us

We believe any businesses is capable of attracting customers when they put their heart and soul in what they stand for. With that thought in mind we have created payment integration software to where our customers succeed while we grow! help businesses grow better every day.

Our Team



Ganga Poudel Chapagain

Designer

Very passionate towards web designing

[Terms and conditions](#)

7. Contact Us page



Contact Us

FirstName

LastName

Email

Comments

Submit

Call us @ (800)-000-0000
South College Road
Wilmington, NC 28403
United States Of America