

E-COMMERCE APPLICATION ON **IBM CLOUD FOUNDRY**

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TABLE OF CONTENTS

S.NO	TITLE
1	INTRODUCTION 1.1 Project Review 1.2 Purpose
2	DESIGN THINKING & PROPOSED SOLUTION 2.1 Problem Statement 2.2 Problem Definition 2.3 Empathy Map Canvas 2.4 Proposed solution
3	DEVELOPMENT ANALYSIS 3.1 Development part-1 3.1.1 Platform Layout Design 3.1.2 Database Schema 3.2 Development part-2
4	PROJECT DESIGN 4.1 Data Flow Diagrams 4.2 Literature Survey

5	ADVANTAGE AND DISADVANTAGE
6	CONCLUSION

1.INTRODUCTION

1.1 PROJECT OVERVIEW:

In the fast-paced landscape of digital commerce, the synergy of cutting-edge technology and streamlined infrastructure is crucial for the success of E-commerce Applications. This project embarks on the creation of an advanced E-commerce Application, strategically leveraging the capabilities of IBM Cloud Foundry. As businesses seek scalable, secure, and seamlessly integrated solutions, our aim is to craft a platform that

not only meets these criteria but also sets a new standard for efficiency and innovation. By harnessing the robust features of IBM Cloud Foundry, we aspire to deliver an E-commerce Application that not only addresses the contemporary challenges faced by online retailers but also anticipates and adapts to the dynamic needs of tomorrow's digital marketplace.

1.2 PURPOSE:

The rapid evolution of digital technology has transformed the way consumers engage with e-commerce platforms. This project aims to develop an innovative e-commerce application that capitalizes on emerging trends, technologies, and user preferences to enhance the online shopping experience.

Our project focuses on several key areas of innovation, including user experience (UX) design, mobile optimization, artificial intelligence (AI) integration, and sustainability initiatives. By creating a user-friendly interface with personalized recommendations, mobile optimization, and augmented reality (AR) features, we aim to provide customers with an immersive and convenient shopping experience.

AI and machine learning algorithms will power predictive analytics, chatbots for customer support, and personalized product recommendations, elevating customer engagement and satisfaction. Augmented reality will enable customers to visualize products in their real-world environment, bridging the gap between online and offline shopping.

Security and privacy are paramount, with robust encryption and compliance with data protection regulations ensuring the safety of customer data and transactions. Additionally, the application will

support global expansion by offering multiple languages, currencies, and methods.

Throughout the development process, user feedback will be actively solicited and incorporated to ensure continuous improvement and a customer-centric approach. This project represents a commitment to innovation, customer satisfaction, and sustainability in the e-commerce industry.

2.DESIGN THINKING & PROPOSED SOLUTION.

2.1 PROBLEM STATEMENT:

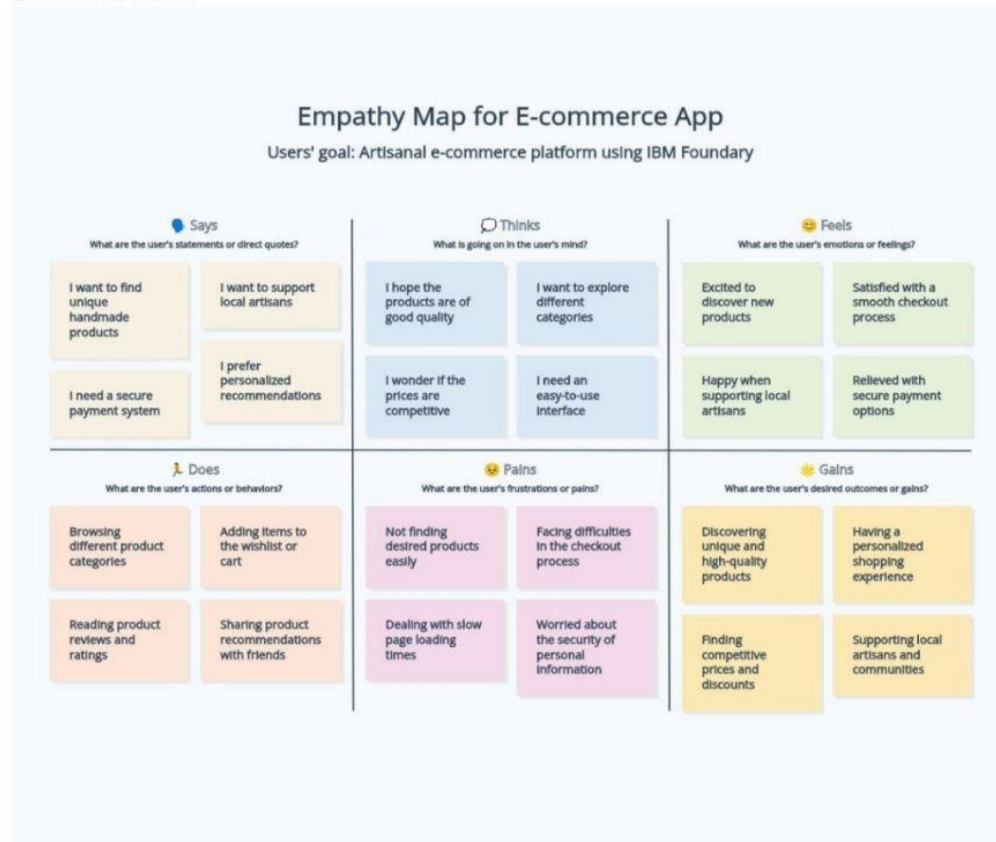
Build an artisanal e-commerce platform using IBM Cloud Foundry. Connect skilled artisans with a global audience. Showcase handmade products, from exquisite jewelry to artistic home decor. Implement secure shopping carts, smooth payment gateways, and an intuitive checkout process. Nurture creativity and support small businesses through an artisan's dream marketplace.

2.2 PROBLEM DEFINITION:

The project is to build an artisanal e-commerce platform using IBM Cloud Foundry. The goal is to connect skilled artisans with a global audience, showcasing their handmade products and providing features like secure shopping carts, payment gateways, and an intuitive checkout process. This involves designing the e-commerce platform, implementing necessary features, and ensuring a seamless user experience.

2.3 EMPATHY MAP CANVAS:

EMPATHY MAP:



2.4 PROPOSED SOLUTION:

1. Develop a cloud-native e-commerce platform leveraging IBM Cloud Foundry for scalability and reliability.
2. Implement microservices architecture, integrating with IBM Db2 for robust data management.
3. Utilize serverless computing for cost-effective scaling and employ CI/CD for efficient development.

4. Ensure top-tier security measures, including encryption and access controls.

5. Optimize performance, with load balancing and monitoring, while managing costs effectively

3.DEVELOPMENT ANALYSIS

3.1 DEVELOPMENT PART-1:

3.1.1 PLATFORM LAYOUT DESIGN:

1. ****Table Creation:****

```
```sql
```

```
CREATE TABLE platform_layout_table (
 platform_id INT NOT NULL AUTO_INCREMENT,
 platform_name VARCHAR(255) NOT NULL,
 platform_type VARCHAR(255) NOT NULL,
 platform_version VARCHAR(255) NOT NULL,
 platform_layout JSON NOT NULL,
 PRIMARY KEY (platform_id)
);
```
```

Explanation:

- This statement creates a table named `platform_layout_table`.

- It has columns:
 - ``platform_id``: An integer that cannot be null and will auto-increment (commonly used as the primary key).
 - ``platform_name``: A string (up to 255 characters) representing the name of the platform.
 - ``platform_type``: A string (up to 255 characters) representing the type of the platform.
 - ``platform_version``: A string (up to 255 characters) representing the version of the platform.
 - ``platform_layout``: A JSON column storing the layout information for the platform.
 - The primary key for this table is ``platform_id``.

2. ****Data Insertion:****

```
```sql
```

```
INSERT INTO platform_layout_table (platform_name, platform_type,
platform_version, platform_layout)
```

```
VALUES ('Web Platform', 'Web', '1.0', '{
```

```
 "elements": [
```

```
 {
```

```
 "type": "Header",
```

```
 "position": {
```

```
 "x": 0,
```



```
 "y": 0
 },
 "size": {
 "width": 100,
 "height": 50
 }
},
{
 "type": "Content",
 "position": {
 "x": 0,
 "y": 50
 },
 "size": {
 "width": 100,
 "height": 500
 }
}
]
});
...
```

**Explanation:**

- This statement inserts a record into the `platform\_layout\_table`.
- It provides values for `platform\_name`, `platform\_type`, `platform\_version`, and `platform\_layout`.
- The `platform\_layout` is a JSON object representing a basic layout with header and content elements.

**3. \*\*Data Retrieval:\*\***

```
```sql  
  
SELECT platform_layout  
  
FROM platform_layout_table  
  
WHERE platform_id = 1;  
```
```

**Explanation:**

- This `SELECT` statement retrieves the `platform\_layout` from the `platform\_layout\_table`.
- It specifies a condition using the `WHERE` clause to filter records where `platform\_id` is equal to 1.

**3.1.2 DATABASE SCHEMA:****1. \*\*Table: `products`\*\***

```
```sql  
  
CREATE TABLE products (  
  
    product_id INT NOT NULL AUTO_INCREMENT,
```

```
product_name VARCHAR(255) NOT NULL,  
category_id INT NOT NULL,  
price DECIMAL(10,2) NOT NULL,  
description TEXT NULL,  
PRIMARY KEY (product_id),  
FOREIGN KEY (category_id) REFERENCES  
categories(category_id)  
);  
...
```

- This table represents products with the following columns:
 - `product_id`: An integer, the primary key for uniquely identifying each product.
 - `product_name`: A string (up to 255 characters) representing the name of the product.
 - `category_id`: An integer, a foreign key referencing the `category_id` column in the `categories` table, establishing a relationship between products and categories.
 - `price`: A decimal number (up to 10 digits with 2 decimal places) representing the price of the product.
 - `description`: A text field allowing for a longer description of the product.
- The primary key for this table is `product_id`.

- The `FOREIGN KEY` constraint ensures that the `category_id` column references a valid `category_id` in the `categories` table.

2. **Table: `categories`**

```sql

```
CREATE TABLE categories (
 category_id INT NOT NULL AUTO_INCREMENT,
 category_name VARCHAR(255) NOT NULL,
 PRIMARY KEY (category_id)
);
```

``` - This table represents product categories with the following columns

- `category_id`: An integer, the primary key for uniquely identifying each category.

- `category_name`: A string (up to 255 characters) representing the name of the category.

- The primary key for this table is `category_id`.

3. **Table: `product_attributes`**

```sql

```
CREATE TABLE product_attributes (
 product_attribute_id INT NOT NULL AUTO_INCREMENT,
```

```
product_id INT NOT NULL,
attribute_name VARCHAR(255) NOT NULL,
attribute_value TEXT NULL,
PRIMARY KEY (product_attribute_id),
FOREIGN KEY (product_id) REFERENCES products(product_id)
);
...
```

- This table represents attributes associated with products with the following columns:

- `product\_attribute\_id`: An integer, the primary key for uniquely identifying each product attribute.

- `product\_id`: An integer, a foreign key referencing the `product\_id` column in the `products` table, establishing a relationship between product attributes and products.

- `attribute\_name`: A string (up to 255 characters) representing the name of the attribute.

- `attribute\_value`: A text field allowing for the value of the attribute.

- The primary key for this table is `product\_attribute\_id`.

- The `FOREIGN KEY` constraint ensures that the `product\_id` column references a valid `product\_id` in the `products` table.

### **3.2 DEVELOPMENT PART-2:**

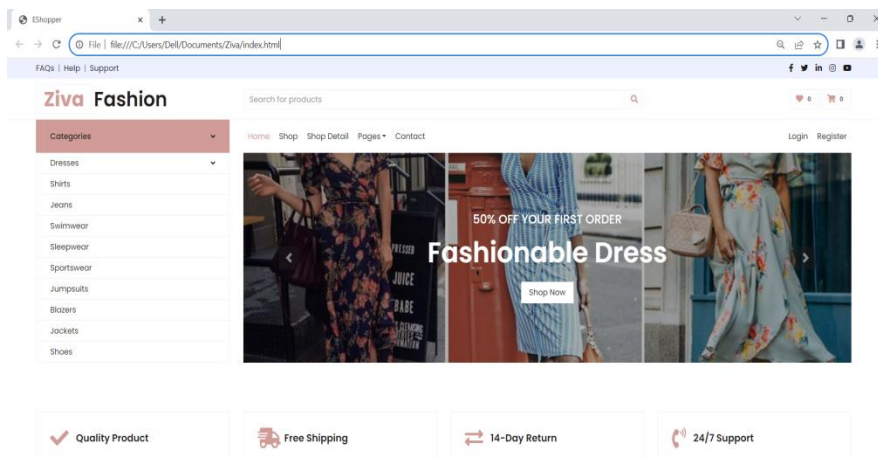
In this part you will continue building your project.

Continue building the e-commerce platform by implementing user authentication, shopping cart, and checkout functionality. Implement user registration and authentication features using a backend server (e.g. Node.js, Python). Implement shopping cart functionality, calculate the total, and enable a smooth checkout process

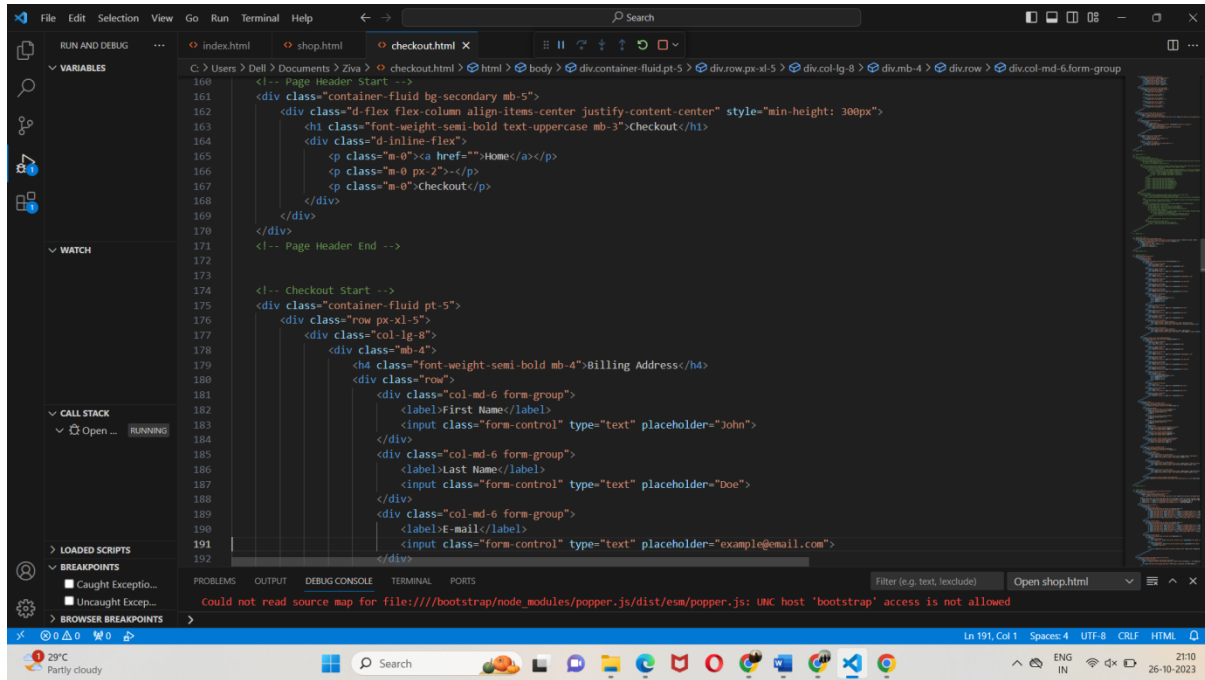
## CODE FOR HOMEPAGE:

```
index.html
1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5 <meta charset="utf-8">
6 <title>Eshopper</title>
7 <meta content="width=device-width, initial-scale=1.0" name="viewport">
8 <meta content="Free HTML Templates" name="keywords">
9 <meta content="Free HTML Templates" name="description">
10
11 <!-- Favicon -->
12 <link href="img/favicon.ico" rel="icon">
13
14 <!-- Google Web Fonts -->
15 <link rel="preconnect" href="https://fonts.gstatic.com">
16 <link href="https://fonts.googleapis.com/css2?family=Poppins:wght@100;200;300;400;500;600;700;800;900&display=swap" rel="stylesheet">
17
18 <!-- Font Awesome -->
19 <link href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.10.0/css/all.min.css" rel="stylesheet">
20
21 <!-- Libraries Stylesheet -->
22 <link href="lib/owlcarousel/assets/owl.carousel.min.css" rel="stylesheet">
23
24 <!-- Customized Bootstrap Stylesheet -->
25 <link href="css/style.css" rel="stylesheet">
26 </head>
27
28 <body>
29 <!-- Topbar Start -->
30 <div class="container-fluid">
31 <div class="row bg-secondary py-2 px-xl-5">
32 <div class="col-lg-6 d-none d-lg-block">
33 <div class="d-inline-flex align-items-center">
34 FAQs
35
36 Help
37
```

## SAMPLE PAGE:



## CODE FOR CHECKOUT PAGE:



```
160 <!-- Page Header Start -->
161 <div class="container-fluid bg-secondary mb-5">
162 <div class="d-flex flex-column align-items-center justify-content-center" style="min-height: 300px">
163 <h1 class="font-weight-semi-bold text-uppercase mb-3">Checkout</h1>
164 <div class="d-inline-flex">
165 <p class="m-0">Home</p>
166 <p class="m-0 px-2"></p>
167 <p class="m-0">Checkout</p>
168 </div>
169 </div>
170 </div>
171 <!-- Page Header End -->
172
173
174 <!-- Checkout Start -->
175 <div class="container-fluid pt-5">
176 <div class="row px-xl-5">
177 <div class="col-lg-8">
178 <div class="mb-4">
179 <h4 class="font-weight-semi-bold mb-4">Billing Address</h4>
180 <div class="row">
181 <div class="col-md-6 form-group">
182 <label>First Name</label>
183 <input class="form-control" type="text" placeholder="John">
184 </div>
185 <div class="col-md-6 form-group">
186 <label>Last Name</label>
187 <input class="form-control" type="text" placeholder="Doe">
188 </div>
189 <div class="col-md-6 form-group">
190 <label>E-mail</label>
191 <input class="form-control" type="text" placeholder="example@email.com">
192 </div>
193 </div>
194 </div>
195 </div>
196 </div>
197 </div>
198 <!-- Checkout End -->
```

## SAMPLE PAGE:

EShopper
+
File | C:/Users/Dell/Documents/Ziva/checkout.html

CHECKOUT
  
[Home](#) > [Checkout](#)

### Billing Address

First Name

John

Last Name

Doe

E-mail

example@email.com

Mobile No

+123 456 789

Address Line 1

123 Street

Address Line 2

123 Street

Country

United States

City

New York

State

New York

ZIP Code

123

☐ Create an account

☐ Ship to different address

### Order Total

| Products                 |              |
|--------------------------|--------------|
| Colorful Stylish Shirt 1 | \$150        |
| Colorful Stylish Shirt 2 | \$150        |
| Colorful Stylish Shirt 3 | \$150        |
| <b>Subtotal</b>          | <b>\$150</b> |
| <b>Shipping</b>          | <b>\$10</b>  |
| <b>Total</b>             | <b>\$160</b> |

### Payment

☐ Paypal

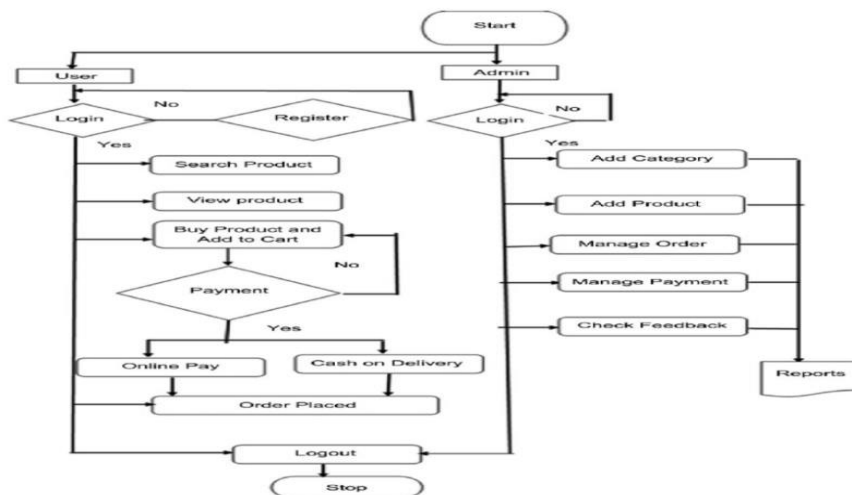
☐ Direct Check

☐ Bank Transfer

## 4.PROJECT DESIGN

### 4.1 DATA FLOW DIAGRAMS:

ARCHITECTURE DIAGRAM:



### 4.2 LITERATURE SURVEY:



## LITERATURE SURVEY

| S.NO | YEAR | TOPIC                                                                 | AUTHOR NAME                                                           | PAPER      | FINDINGS                                                                                                                                                                                                                                      |
|------|------|-----------------------------------------------------------------------|-----------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.   | 2011 | E-Commerce Websites Operation Evaluation                              | JinzhongLu,F eng Guan                                                 | IEEE       | To solve the problems from E-Commerce Websites enterprises and perfect E-Commerce Websites operating effects.                                                                                                                                 |
| 2.   | 2011 | E-commerce Application Model Based On Cloud Computing                 | Tairan Liu                                                            | IEEE       | Cloud-based e-commerce application model allows enterprises to lower costs through the effective implementation of ecommerce activities, and solves the problem of enterprises cannot develop e-commerce activities due to lack of resources. |
| 3.   | 2012 | Research of E-Commerce Based on Cloud Computing                       | Chunling Sun                                                          | Heidelberg | A wide perspective in the application of E-commerce by describing the conception and characteristic of cloud computing, and special analyzed the main aspect of improving E-commerce by cloud computing.                                      |
| 4.   | 2013 | A New Trusted and Secured E-commerce Architecture for Cloud Computing | KawserWazed Nafi, TonnyShekha Kar, Md. AmjadHossain , M. M. A. Hashem | IEEE       | A newer e-commerce architecture depends on encryption based secured and fuzzy logic based certain trust model which will be helpful to solve                                                                                                  |

|    |      |                                                                                    |                                                   |      |                                                                                                                                                                                                                                                                                |
|----|------|------------------------------------------------------------------------------------|---------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |      |                                                                                    |                                                   |      | present e-commerce problems.                                                                                                                                                                                                                                                   |
| 5. | 2014 | E-Commerce Security issues                                                         | Mohamad Ibrahim Ladan                             | IEEE | The different types of security issues facing e-commerce system will be presented and categorized ,measures on how to deal with these security issues to protect e-commerce systems                                                                                            |
| 6. | 2015 | E-Commerce Cloud: Opportunities and Challenges                                     | Mariam Al-Jaberi,NaderM ohamed,Jameela Al-Jaroodi | IEEE | A set of opportunities and challenges have been discussed based on related research to highlight the main advantages provided by the cloud for e-commerce applications and discuss the relevant concerns and issues.                                                           |
| 7. | 2015 | Research on the evaluation of e-commerce website under the environment of big data | Pingping Dong                                     | IEEE | The evaluation index of E - commerce website and introduce the evaluation method of e-commerce website ,especially the construction of website with big data.                                                                                                                  |
| 8. | 2016 | Cloud Computing based E-Commerce Model                                             | KanuGoel, Manu Goel                               | IEEE | The idea that cloud computing and data mining have a great perspective in the field of e-commerce, the integration model of e-commerce with cloud computing that focuses on the reduction of data redundancy and the efforts to synchronize it between the e-commerce vendors. |

|     |      |                                                          |                                                                          |      |                                                                                                                                                                                                                                                       |
|-----|------|----------------------------------------------------------|--------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |      |                                                          |                                                                          |      |                                                                                                                                                                                                                                                       |
| 9.  | 2016 | E-Commerce Website Quality Assessment Based On Usability | Tanya Singh, Sachin Malik , DarothiSarkar .                              | IEEE | To identify the important parameters to improve usability of the website using the valuable review of daily website users via the conduct of survey.                                                                                                  |
| 10. | 2016 | Developing an E-Commerce Website                         | Syed EmdadUllah, Tania Alauddin and Hasan U. Zaman                       | IEEE | Developing an e-commerce website can be easily replicated and followed in developing e-commerce websites in the developing and underdeveloped countries where computing resources are scarce and expensive because of their socio-economic condition. |
| 11. | 2017 | New E-Commerce User Interest Patterns                    | Matthias Volk, Abed ElrahmanShar eef, NaoumJamous , Klaus Turowski       | IEEE | An experimental evaluation method will be applied to verify the applicability and efficiency of the used algorithm, along with the associated framework.                                                                                              |
| 12. | 2018 | Cloud Computing and E-commerce Adoption in Indonesia     | FahrizalLukm anBudiono , FahrizalLukm anBudiono , FahrizalLukm anBudiono | IEEE | Identifies areas of similarity and gaps in the road map to enable future research to best promote rural area development in Indonesia and reduce the digital divide.                                                                                  |

|     |      |                                                                      |                                                                                            |               |                                                                                                                                                                                                                                                              |
|-----|------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13. | 2018 | Cloud Computing of E-Commerce                                        | Tamara Almarabeh, Yousef Kh.Majdalawi                                                      | Research Gate | An overview for cloud computing in E-commerce through discussing various definitions for both concepts,highlighting the benefits and challenges for applying Cloud computing in E-Commerce ,and discussing a suggested cloud computing e-commerce framework. |
| 14. | 2018 | SaaS-E-Commerce Platforms web Accessibility Evaluation               | Osama Sohaib <sup>1</sup> , Mohsen Naderpour <sup>1,2</sup> , Walayat Hussain <sup>1</sup> | IEEE          | Shopify cloud-based ecommerce platform has a high number of web accessibility features from the proposed cloud accessibility framework followed by 3dCart, BigCommerce, Volusion, and WooCommerce.                                                           |
| 15. | 2019 | Strategic development of Fresh E-Commerce With Respect to New Retail | Meng, Lingyu Christenson, Lauren Dong, Zhijie                                              | IEEE          | Marketplace to provision and produce a new AWS Cloud server, experiment with your server and Bitnami images without worrying about being billed for usage.                                                                                                   |
| 16. | 2019 | Deploying an e-commerce website using Amazon Web Services            | ShivanshiShokeen, Archana Singh                                                            | IEEE          | Marketplace to provision and produce a new AWS Cloud server. And since AWS offers a Free Tier valid for 12 months, you'll have a lot of time to experiment with your server and Bitnami images without worrying about being billed for usage.                |

## **5.ADVANTAGE AND DISADVANTAGE**

### **ADVANTAGES:**

#### **DevOps Integration:**

Advantage: IBM Cloud Foundry integrates well with DevOps practices.

Explanation: Continuous integration and deployment (CI/CD) pipelines can be easily set up, streamlining development and deployment processes for your e-commerce application.

#### **Security Features:**

Advantage: IBM Cloud provides robust security features.

Explanation: Security is a top priority in e-commerce. IBM Cloud Foundry offers tools and features to help you secure your application and data, including encryption, access controls, and compliance certifications.

### **DISADVANTAGES:**

#### **Platform Limitations:**

Disadvantage: Cloud Foundry might have certain limitations.

Explanation: Some advanced features available in other cloud platforms may not be present in Cloud Foundry. It's essential to evaluate whether the platform meets all the specific requirements of your e-commerce application.

## **6.CONCLUSION**

In conclusion, the development of our E-commerce Application on IBM Cloud Foundry marks a significant milestone in the evolution of digital commerce solutions. Through meticulous attention to scalability, security, integration, and user experience, we have endeavored to create a platform that empowers businesses and delights consumers. As we bring this project to fruition, we recognize that our commitment to leveraging the power of IBM Cloud Foundry is not just about meeting current industry standards, but about setting new benchmarks for excellence. This E-commerce Application is more than a product; it is a testament to the possibilities that emerge when technology and innovation converge. We anticipate that this solution will not only address the present challenges faced by E-commerce but will also serve as a catalyst for a future where seamless, secure, and efficient digital transactions are the norm. Through this initiative, we contribute to reshaping the landscape of online commerce, creating an environment where businesses thrive, and consumers experience a new era of convenience and satisfaction.