**SMART COMMUNICATION**

## A PROJECT REPORT

***Submitted by,***

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### *Under the guidance of,*

**Dr./Mr. SukruthGowda M A**

***in partial fulfillment for the award of the degree of***

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE AND ENGINEERING.**

**At**



**PRESIDENCY UNIVERSITY**

**BENGALURU**

**DECEMBER 2024**

**PRESIDENCY UNIVERSITY**

**SCHOOL OF COMPUTER SCIENCE ENGINEERING**

**CERTIFICATE**

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**DECLARATION**

We hereby declare that the work, which is being presented in the project report entitled **SMART COMMUNICATION** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of our own investigations carried under the guidance of **Mr. SukruthGowda M A**

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We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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**ABSTRACT**

India’s handicrafts sector is indeed rich and forms an integral part of the economy and culture of the country. Millions of people are engaged in it, providing opportunities especially in the peripheral regions where the art and skills are a family heirloom. Even with such important percentage, legal handicrafts are still absent in a considerable percentage of the global economy. This is mainly due to adverse effects such as low levels of digital literacy, use of intermediaries, and unavailability of effective markets.

The E-COMMERCE FOR ARTISANS’ platform is an information and communication technology-based solution that is intended to change the way artisans interact with the market both at the local and international levels. The platform allows artisans to present their work without any agents and to make the maximum profit possible. The platform provides specific and customizable features for rural artisans which include easy product uploads, secure payments, event organizing and promoter, and advanced payment systems such as COD to build trust.

This project provides a certain digital intervention in order to assist the craft and artisans’ community in enhancing its productivity, pursuing new markets and promoting its self-management. The project is also significant culturally as it seeks to protect the traditional arts and crafts of India from dying out in the present economy. The platform is simple to navigate and is available in several languages which means even an artisan with very basic computer skills will be able to use the platform. This helps in reducing the technological disparity thereby addressing economic growth for all.

**ACKNOWLEDGEMENT**

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Pro-VC, School of Engineering and Dean, School of Computer Science Engineering & Information Science, Presidency University for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Deans **Dr. Shakkeera L and Dr. Mydhili Nair,** School of Computer Science Engineering & Information Science, Presidency University, and Dr. Asif Mohammed Head of the Department, School of Computer Science Engineering & Information Science, Presidency University, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Dr./Mr.** **SukruthGowda M A** and Reviewer **Dr./Mr. Taranath N L, Associate Professor**, School of Computer Science Engineering & Information Science, Presidency University for his/her inspirational guidance, and valuable suggestions and for providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We would like to convey our gratitude and heartfelt thanks to the PIP2001 Capstone Project Coordinators **Dr. Sampath A K, Dr. Abdul Khadar A and Mr. Md Zia Ur Rahman,** department Project Coordinators **Mr.Amarnath J L, Dr. Jayanthi Kamalasekaran** and Git hub coordinator **Mr. Muthuraj.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

ANANDHU PRADEEP

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**CHAPTER-1**

**INTRODUCTION**

**1.1 The Role of Handicrafts in India’s Economy and Culture**

Handicrafts represent the heart of India’s cultural heritage, blending artistry, tradition, and economic significance. They are the embodiment of generations of craftsmanship, with skills passed down as a family legacy. From the intricately woven *Pashmina shawls* of Kashmir to the vibrant *Madhubani paintings* of Bihar and the exquisite *Kanjeevaram sarees* of Tamil Nadu, each craft reflects the unique cultural identity of its region.

India’s handicrafts sector plays a crucial role in rural employment and economic development. It stands second only to agriculture in providing livelihoods to over **43 million people**, particularly in rural and remote areas. This sector contributes significantly to the Indian economy:

* Handicrafts account for approximately **3% of India’s GDP**, showcasing their economic importance.
* The global demand for Indian handicrafts is reflected in exports that reached **$3.5 billion** in 2022, despite challenges like competition from machine-made goods.

Beyond their economic impact, handicrafts are cultural artifacts that preserve India’s artistic traditions. For example:

* **Madhubani Paintings**: Originating in Bihar, these paintings depict mythological themes and daily life. They are recognized globally for their fine detailing and use of natural colors.
* **Kutch Embroidery**: Practiced in Gujarat, this embroidery is admired for its vibrant colors, intricate mirror work, and needlework techniques.

However, modern industrialization has commodified handicrafts, often prioritizing cost efficiency over craftsmanship. This has led to a decline in the originality and authenticity of many traditional crafts. Rural artisans, the custodians of these arts, face significant challenges in sustaining their livelihoods in a competitive market dominated by machine-made replicas.

**1.2 Challenges in the Handicrafts Sector**

Despite its rich cultural and economic contributions, the handicrafts sector faces numerous challenges that hinder its growth and sustainability.

**1.2.1 Limited Market Access**  
Rural artisans primarily depend on local fairs and government-organized events, such as the *Surajkund Mela* and *Dilli Haat*, to showcase and sell their products. While these events provide valuable opportunities, they occur sporadically and are geographically restricted. As a result, many artisans remain excluded from potential markets, both domestic and international.

**1.2.2 Dependence on Middlemen**  
The supply chain for handicrafts is often dominated by middlemen who dictate prices and reduce artisans’ earnings. Artisans typically receive only **20-25% of the final selling price**, as intermediaries take a significant share. For instance:

* A handmade *Channapatna toy* sold for ₹1,000 in urban markets might earn the artisan no more than ₹200-₹250.

This system undermines the financial sustainability of artisans and forces many to abandon their craft.

**1.2.3 Competition from Machine-Made Goods**  
The growing popularity of machine-made replicas has severely impacted the demand for authentic handmade products. Machine-made goods are mass-produced, cheaper, and readily available, posing a significant threat to artisans’ livelihoods. For example:

* Replicas of *Channapatna wooden toys* and *Jaipur block prints* often flood markets, priced much lower than their authentic counterparts.

Consumers unaware of the value of handmade products often opt for cheaper, machine-made alternatives.

**1.2.4 Digital Divide**  
The digital divide remains a significant barrier for artisans, particularly in rural areas. While initiatives like *Digital India* aim to improve digital literacy, only **30% of rural artisans** have access to digital tools and platforms. Factors contributing to this divide include:

* Limited access to affordable smartphones and internet connectivity.
* Language barriers, as most platforms operate primarily in English.
* Lack of awareness and training on how to use digital platforms effectively.

**1.2.5 Sustainability Concerns**  
Many artisans practice sustainable production methods using natural materials and eco-friendly techniques. However, their products often lack branding and certifications that appeal to eco-conscious consumers. As a result, artisans miss out on opportunities to attract buyers who prioritize sustainability.

**1.3 Objectives of the Proposed Platform**

To address the challenges faced by artisans, this project proposes an **E-Commerce Platform for Artisans**. The key objectives of the platform are as follows:

1. **Bridging the Digital Divide**
   * Develop an intuitive platform with simple onboarding processes tailored for artisans with low digital literacy.
   * Provide training and support in regional languages to ensure inclusivity and accessibility.
2. **Global Reach and Market Expansion**
   * Allow artisans to showcase their products to buyers across the globe, moving beyond local fairs and exhibitions.
   * Integrate tools that enable artisans to share videos and cultural narratives, helping buyers appreciate the craftsmanship and traditions behind each product.
3. **Promoting Artisan Stories**
   * Highlight the cultural significance and uniqueness of handmade products through storytelling.
   * Offer features that allow artisans to include multimedia elements, such as product-making videos, descriptions, and customer reviews, to build trust and engagement.
4. **Economic Empowerment**
   * Facilitate direct buyer-seller interactions, eliminating middlemen and enabling artisans to retain a larger share of profits.
   * Provide tools such as sales analytics and inventory management to help artisans make informed business decisions.

**1.4 Scope of the Project**

The scope of the project includes the development of a user-friendly e-commerce platform tailored to meet the needs of rural artisans. The platform will provide a range of features aimed at enhancing productivity, improving market access, and promoting cultural preservation.

**Key Features of the Platform**:

* **Inventory Management**: Artisans can track their products, update stock levels, and manage orders efficiently.
* **Event Management**: Tools to organize workshops, live sales events, and exhibitions, enabling artisans to engage with buyers in real time.
* **Multi-Language Interface**: Support for multiple languages ensures that artisans from diverse regions can use the platform easily.
* **Secure Payment Systems**: Integration of phased payment methods, including Cash on Delivery (COD), to build trust among buyers.
* **Sales Analytics**: Dashboards that provide insights into sales trends, buyer behavior, and inventory performance.
* **Eco-Branding**: Highlight products made using sustainable materials and processes, appealing to eco-conscious buyers.

**1.5 Impact Goals**

The proposed platform aims to achieve the following short-term and long-term goals:

**Short-Term Goals**:

* Boost artisan incomes by **20%** within the first year of implementation.
* Provide training to at least **500 artisans** on how to use the platform effectively.

**Long-Term Goals**:

* Reduce reliance on intermediaries by **50%**, enabling artisans to sell their products directly to buyers.
* Connect artisans to **50+ global markets**, providing sustained opportunities for growth.
* Promote India’s cultural heritage by increasing the visibility of traditional crafts worldwide.

By addressing key challenges such as limited market access, dependence on middlemen, and the digital divide, this platform will empower rural artisans to thrive in the global marketplace.

**CHAPTER-2**

**LITERATURE SURVEY**

**2.1 General Overview of Existing Solutions**

The current landscape of e-commerce platforms designed for artisans highlights a mix of opportunities and limitations. Artisans, particularly those in rural regions, rely on traditional methods such as local fairs, exhibitions, and face-to-face sales. While the digital revolution has introduced platforms like *Amazon, Etsy, Meesho*, and government-backed solutions, significant gaps remain in catering to the specific needs of this community.

A detailed study of the various types of platforms—general e-commerce, artisan-specific marketplaces, government-backed platforms, and NGO initiatives—reveals critical insights into their strengths and weaknesses. This survey explores how each platform addresses (or fails to address) the challenges faced by artisans.

**2.2 Traditional Handicraft Marketplaces**

**Physical Stores and Exhibitions**:  
For decades, rural artisans have relied on physical stores, government exhibitions, and fairs to showcase their products. Events like the *Surajkund Mela* and *Dilli Haat* are prominent examples, providing artisans with direct interactions with customers. The key advantages include:

* Buyers can physically inspect the products.
* Artisans can engage personally, sharing the stories behind their crafts.

**Limitations**:

* **Geographical Reach**: Such events occur sporadically and are limited to specific regions. Artisans from remote areas are often excluded.
* **High Operational Costs**: Setting up stalls, transportation, and storage expenses eat into profits.
* **Limited Footfall**: The audience is restricted to local or regional buyers, significantly reducing sales potential.

*For example*: An artisan from Odisha specializing in *Pattachitra paintings* may travel thousands of kilometers to showcase their work at fairs in Delhi, incurring substantial expenses that reduce their overall earnings.

**2.3 General E-Commerce Platforms (Amazon, Flipkart, eBay)**

Large-scale e-commerce platforms such as Amazon, Flipkart, and eBay provide artisans with access to global markets. They offer logistics support, secure payments, and a vast customer base, making them attractive for selling products.

**Strengths**:

1. **Global Reach**: Platforms like Amazon enable artisans to sell products to international buyers, broadening their market.
2. **Logistics Support**: Built-in partnerships with delivery services ensure seamless shipping processes.
3. **Trust Factor**: Customers trust established platforms for secure transactions and reliable product quality.

**Limitations**:

1. **Visibility Issues**: Artisans struggle to gain visibility due to competition with machine-made goods.
2. **High Fees**: Listing fees, transaction charges, and commission reduce artisans' profits.
3. **Loss of Authenticity**: Handmade products often get lost among mass-produced items.

**Example**: While an artisan selling *Banarasi sarees* may benefit from Amazon’s global reach, their products compete with machine-made replicas priced at a fraction of the cost.

**Relevant Link**: Amazon Handmade

**2.4 Artisan-Specific Platforms (Etsy, Craftsvilla)**

Platforms like *Etsy* and *Craftsvilla* focus on handmade, vintage, and artisanal products, providing niche audiences for rural artisans.

**Strengths**:

1. **Niche Audience**: Attracts buyers who value authenticity and handmade craftsmanship.
2. **Storytelling Features**: Artisans can share detailed descriptions and narratives about their products.
3. **Customization Options**: Allows artisans to offer personalized products.

**Limitations**:

1. **High Competition**: Even within niche platforms, artisans face significant competition from global sellers.
2. **Transaction Fees**: Fees for listing, selling, and processing payments can erode profits.
3. **Technical Barriers**: Navigating platforms like Etsy can be challenging for artisans with limited digital literacy.

**Example**: On Etsy, a *Chikankari kurta* artisan from Lucknow may find buyers globally, but they compete with thousands of sellers offering similar products.

**Relevant Link**: [Etsy Artisan Marketplace](https://www.etsy.com)

**2.5 Government-Supported Platforms**

Government initiatives like *India Handloom Brand* and *Handloom Mark Scheme* aim to provide artisans with credibility and market access. These platforms emphasize quality assurance and promote traditional crafts.

**Strengths**:

1. **Credibility**: Government-backed certifications build buyer trust.
2. **Low Commissions**: Lower fees compared to private platforms benefit artisans financially.
3. **Promotion of Traditional Crafts**: Platforms focus on preserving cultural heritage.

**Limitations**:

1. **Limited Outreach**: Bureaucratic processes and slow adoption of new technologies hinder effectiveness.
2. **Technical Challenges**: Platforms are often not user-friendly for artisans with low digital skills.
3. **Lack of Marketing**: Limited promotional efforts reduce visibility for artisans.

**Example**: An artisan producing *Handloom sarees* in Tamil Nadu may benefit from the India Handloom Brand but struggle with online visibility.

**Relevant Link**: [India Handloom Brand](http://handlooms.nic.in)

**2.6 Mobile-Only Marketplaces (Meesho)**

Mobile-first platforms like *Meesho* target rural artisans who rely on smartphones for business. Meesho empowers artisans to sell their products through social commerce models.

**Strengths**:

1. **Accessibility**: Mobile apps are easier for rural artisans to use.
2. **Low Investment**: Artisans can list products with minimal upfront costs.
3. **Reseller Network**: Meesho’s model allows resellers to promote products on social media.

**Limitations**:

1. **Limited Features**: Compared to full e-commerce platforms, Meesho lacks advanced tools like analytics dashboards.
2. **Profit Margins**: Reseller commissions may reduce artisans’ earnings.
3. **Scalability Issues**: Meesho primarily caters to small-scale sellers, limiting business growth.

**Relevant Link**: [Meesho](https://www.meesho.com)

**2.7 Social Media Commerce (Facebook, Instagram Shops)**

Social media platforms like *Instagram* and *Facebook* allow artisans to showcase their work to a global audience at little to no upfront cost. Viral marketing and direct buyer interactions are key strengths.

**Strengths**:

1. **Minimal Investment**: Artisans can promote products without significant costs.
2. **Global Reach**: Social media provides access to international buyers.
3. **Direct Engagement**: Artisans can communicate directly with customers, building trust.

**Limitations**:

1. **Lack of Payment Support**: Platforms do not provide built-in payment systems, forcing artisans to manage payments manually.
2. **Algorithm Challenges**: Artisans often need to invest in paid advertisements to maintain visibility.
3. **Logistics Gaps**: Social platforms lack integrated logistics support.

**Example**: A *Warli art* artisan may attract buyers through Instagram but struggle to manage payments and deliveries.

**Relevant Link**: [Instagram for Business](https://business.instagram.com)

**2.8 NGO and Non-Profit Platforms (Sasha, Dastkar)**

NGOs like *Sasha* and *Dastkar* focus on ethical trade, capacity building, and fair wages for artisans.

**Strengths**:

1. **Fair Trade Practices**: Ensures artisans receive fair compensation.
2. **Training Programs**: NGOs provide skill development and business training.
3. **Community Support**: Artisans benefit from collective efforts and resources.

**Limitations**:

1. **Limited Technology**: These platforms often lack advanced e-commerce features.
2. **Funding Challenges**: Reliance on donations can affect long-term sustainability.
3. **Restricted Reach**: Limited market outreach compared to private platforms.

**Example**: An NGO may help artisans producing *Kantha embroidery*, but their products may not reach global buyers due to a lack of digital tools.

**Relevant Link**: [Dastkar](https://www.dastkar.org)

**2.9 Research Gaps Identified**

From the literature survey, the following key gaps have been identified:

1. **Accessibility**: Platforms like Amazon are not tailored for low-digital-literacy users.
2. **Buyer Trust**: Limited tools to verify artisans’ credibility hinder sales.
3. **Sustainability Branding**: Few platforms emphasize eco-friendly handicrafts.
4. **Collaborative Tools**: Lack of group resources and networking options.
5. **Cultural Storytelling**: Missing features to highlight the history and significance of crafts.

**2.10 Summary and Need for Innovation**

While existing platforms offer partial solutions, they fail to provide a **holistic approach** that addresses the unique challenges of rural artisans. The proposed **E-Commerce Platform for Artisans** aims to bridge these gaps by:

* Simplifying digital adoption with a user-friendly interface.
* Promoting storytelling and cultural branding to differentiate handmade products.
* Enabling secure transactions and scalable logistics solutions.
* Empowering artisans through analytics tools and community-building features.

By addressing these critical gaps, the platform will transform the handicraft sector, ensuring artisans gain visibility, profitability, and long-term sustainability.

**CHAPTER-3**

**SYSTEM ANALYSIS AND DESIGN**

**3.1 Introduction to System Analysis and Design**

The proposed **E-Commerce Platform for Artisans** is designed to address the challenges faced by rural artisans in accessing markets, enhancing their income, and preserving India’s cultural heritage. **System Analysis and Design** is a critical phase in this project’s lifecycle, ensuring the platform is functionally robust, user-friendly, scalable, and aligned with the needs of artisans and buyers.

System analysis focuses on understanding the current challenges, identifying requirements, and analyzing existing solutions. System design, on the other hand, translates these requirements into a structured architecture that guides the platform’s development.

The platform incorporates a **user-centric approach** with a focus on accessibility, performance, security, and simplicity. By adopting modern technologies like **Node.js, React.js, and MongoDB**, it ensures a seamless user experience while maintaining technical flexibility and scalability.

**3.2 System Analysis**

**3.2.1 Problem Analysis**

The analysis phase begins with identifying the primary issues faced by artisans:

1. **Limited Market Reach**: Artisans rely heavily on local fairs or intermediaries, restricting their reach to local buyers.
2. **Middlemen Dependence**: Middlemen dominate pricing, leaving artisans with minimal profit.
3. **Technological Barriers**: Many artisans lack digital skills, preventing them from using existing e-commerce platforms.
4. **Trust Deficiency**: Buyers are hesitant to trust unknown sellers on digital platforms without verified reviews or assurances.
5. **Logistical Challenges**: Existing platforms face difficulties in delivering products to and from rural regions efficiently.
6. **Lack of Collaborative Features**: Artisans cannot organize events or share resources on current platforms.

These problems form the foundation for developing a platform tailored to rural artisans, integrating features that simplify usage, promote trust, and expand market access.

**3.2.2 Feasibility Analysis**

Feasibility analysis evaluates the practicality of implementing the proposed system in terms of **technical, operational, economic, and social aspects**.

1. **Technical Feasibility**:
   * The platform will utilize a **microservices architecture** for scalability and flexibility.
   * Technologies like **Node.js, React.js, and MongoDB** are widely adopted, ensuring robust development and easy maintenance.
   * Cloud infrastructure (AWS/Vercel) will provide reliable hosting and high uptime.
2. **Economic Feasibility**:
   * By eliminating intermediaries and increasing global visibility, the platform will significantly improve artisans’ income.
   * Minimal operational costs and affordable cloud-based solutions make the project cost-effective.
3. **Operational Feasibility**:
   * The system will include an intuitive **multi-language interface** to cater to artisans with varying levels of digital literacy.
   * Features like **cash-on-delivery (COD)** and simplified product management ensure ease of use.
4. **Social Feasibility**:
   * Promoting India’s cultural heritage ensures social acceptance and support.
   * Empowering rural artisans aligns with sustainable development goals, improving livelihoods and preserving traditions.

**3.3 Functional Requirements**

The functional requirements of the system define what the platform must achieve to meet user expectations and project objectives:

1. **Artisan Registration and Profile Management**:
   * Simple onboarding process with minimal data requirements (name, craft type, region).
   * Support for multiple languages during registration.
   * Profile management to upload products, set prices, and update inventory.
2. **Product Listing and Inventory Management**:
   * Upload high-quality product images with descriptions (size, material, price).
   * Inventory tracking system with automated notifications for low stock levels.
3. **Event Management and Collaboration**:
   * Tools to organize virtual exhibitions, workshops, and promotional events.
   * Artisan networking modules for sharing ideas, resources, and experiences.
4. **Secure Payment System**:
   * Integration of **COD (Cash on Delivery)** and digital payment gateways (Razorpay, UPI).
   * Phased payment systems to build buyer trust.
5. **Analytics Dashboard**:
   * Sales tracking and performance analytics for artisans.
   * Insights into popular products, buyer demographics, and sales trends.
6. **Admin Dashboard**:
   * Administrative controls to manage user accounts, monitor activities, and generate performance reports.
   * Fraud detection tools to ensure platform security.
7. **Buyer Interaction Features**:
   * Direct messaging between buyers and artisans for personalized communication.
   * Verified reviews and product ratings to build trust and credibility.

**3.4 System Design**

The system design phase focuses on defining the platform’s architecture, components, and workflow. It ensures the system is scalable, efficient, and capable of handling user demands.

**3.4.1 System Architecture**

The platform adopts a **microservices architecture**, where different modules—user management, product management, payments, and event management—are decoupled for flexibility and scalability.

1. **Frontend (User Interface)**:
   * Developed using **React.js**, ensuring a responsive, dynamic, and mobile-friendly user experience.
   * Styled with **Tailwind CSS** and **Bootstrap** for modern aesthetics.
2. **Backend (Server-Side Logic)**:
   * Built with **Node.js** and **Express.js** for handling user requests, data processing, and business logic.
   * API endpoints will manage user authentication, product listings, events, and payments.
3. **Database**:
   * **MongoDB** is used as the database due to its flexibility in storing diverse data types, such as product details and user profiles.
   * The database will support features like product searching, sorting, and filtering.
4. **Cloud Infrastructure**:
   * The platform will be hosted on **AWS** or **Vercel**, ensuring high availability and scalability.
   * CI/CD pipelines will enable continuous integration and deployment for seamless updates.

**3.4.2 User Workflow**

**Artisan Workflow**:

1. Registration → Profile Setup → Product Upload → Inventory Management → Event Organization → Sales Tracking.

**Buyer Workflow**:

1. Account Setup → Product Search → Communication with Artisans → Order Placement → Secure Payment → Product Delivery → Feedback Submission.

**Admin Workflow**:

1. User Management → Product and Event Monitoring → Fraud Detection → Generating Reports.

**3.5 Non-Functional Requirements**

Non-functional requirements ensure the platform delivers a high-quality experience.

1. **Performance**:
   * The system will support 200+ simultaneous users without delays.
   * Load balancing and cloud scaling will manage traffic spikes during promotional events.
2. **Security**:
   * **SSL encryption** for all transactions.
   * OAuth 2.0 for secure user authentication.
   * Fraud detection tools to prevent unauthorized activities.
3. **Usability**:
   * The interface will prioritize simplicity, ensuring artisans with minimal digital skills can navigate easily.
   * Tutorials and guides will be available in regional languages.
4. **Availability**:
   * The system will ensure **99.9% uptime**, even in areas with inconsistent internet connectivity.
5. **Scalability**:
   * Microservices architecture allows independent scaling of system components as user demand grows.
6. **Maintainability**:
   * The modular design ensures easy maintenance and updates without disrupting system operations.

**3.6 Data Flow Diagrams (DFDs)**

The system’s data flow diagrams outline how data moves between users, processes, and the database.

1. **Level 0 DFD (Context Diagram)**:
   * Represents the overall system and its interactions with artisans, buyers, and administrators.
2. **Level 1 DFD**:
   * Breaks the system into modules: User Management, Product Management, Payments, and Analytics.
   * Shows data inputs (registration details, product data) and outputs (order status, analytics reports).

**3.7 Conclusion**

The **System Analysis and Design** phase plays a critical role in ensuring the platform meets its objectives of empowering artisans, enhancing market access, and preserving cultural heritage. By combining a user-friendly interface with robust backend architecture and scalable infrastructure, the platform addresses key challenges faced by artisans and creates opportunities for sustainable growth.

This structured approach ensures the system delivers performance, security, and usability while remaining adaptable to future enhancements.

**CHAPTER-4**

**IMPLEMENTATION**

**4.1 Introduction to Implementation**

The **Implementation phase** of the **E-Commerce Platform for Artisans** is a vital step in converting the ideas, designs, and plans outlined in previous chapters into a working, functional system. This phase marks the transition from conceptualization to the actual product, where the platform begins to take shape through code, structure, and integration of various technologies.

At the core of this process is the goal of building a platform that is not only functional but also accessible to rural artisans, many of whom are new to digital technologies. The platform is designed to help them showcase their crafts, expand their market reach, and bypass traditional middlemen. The implementation was carried out using several **modern web technologies** and a **modular development approach**. The platform’s architecture, developed with **React.js** for the frontend and **Node.js** along with **Express.js** for the backend, ensures flexibility, scalability, and ease of maintenance. This chapter details the **key technological choices**, the **development process**, and the **features implemented**. It also provides insight into the **testing and debugging** processes that helped ensure the platform was both functional and reliable.

**4.2 System Architecture and Technology Stack**

The architecture of the **E-Commerce Platform for Artisans** was developed to provide a robust, scalable, and efficient solution that could support the growing number of users and products as the platform expands. It was structured using a **client-server model**, where the **client** interacts with the **server** via HTTP requests.

1. **Frontend Development: React.js, HTML, and CSS**
   * **React.js** was selected for the frontend to create a highly dynamic and interactive user interface. React’s component-based architecture is ideal for building large-scale applications because it allows developers to break the interface into reusable components. This not only helps in maintaining the code but also ensures that each component can update independently when data changes, providing a seamless user experience without page reloads.
   * The **HTML** provides the structural layout of the platform, defining the different sections like product listings, registration forms, and artisan profiles.
   * **CSS** is used for styling the platform, making it visually appealing and ensuring that the platform is responsive, meaning it adapts to various screen sizes and devices. Given that many artisans may be accessing the platform from mobile devices, the layout is optimized for mobile-first design.
2. **Backend Development: Node.js and Express.js**
   * **Node.js** was chosen for the backend because it allows developers to use JavaScript for both the frontend and backend, which makes the development process more streamlined and efficient. Node.js is highly performant and scalable, making it an ideal choice for handling multiple simultaneous requests from users.
   * The backend is structured using **Express.js**, a minimalist web framework for Node.js that simplifies routing, middleware integration, and HTTP request handling. Express is lightweight yet powerful, enabling the development of robust backend systems capable of processing artisan registration, product listing, order management, and other essential operations.
3. **Database: MongoDB**
   * For data storage, **MongoDB** was selected due to its flexibility and scalability. It is a NoSQL database that stores data in a format called **BSON (Binary JSON)**, allowing for the storage of complex data structures. MongoDB’s schema-less nature allows for easy adjustments to the structure of data, which is ideal for an evolving platform where data types and relationships may change over time.
   * **MongoDB** is highly suited for the platform because it can efficiently handle large amounts of unstructured data like product images, user profiles, and transaction records. This choice ensures that the platform can scale smoothly as more artisans and buyers join.
4. **Local Development Environment: VS Code**
   * **VS Code** was the primary development environment used to build and test the platform. It is a lightweight, open-source IDE with support for JavaScript, Node.js, and React.js, making it an ideal tool for full-stack development. VS Code also supports extensions like **Live Server**, **ESLint**, and **Prettier**, which enhanced the development process by offering features like live preview, error-checking, and automatic code formatting.

**4.3 Features Implemented**

**4.3.1 Artisan Registration and Profile Management**

The artisan registration process is designed to be simple and accessible, even for artisans with minimal digital literacy. The registration form asks for basic information, including the artisan’s name, region, craft type, and contact details. After registration, artisans are given a unique **Artisan ID** that they can use to manage their profiles.

Once logged in, artisans can complete their profiles by adding high-quality images of their products, descriptions, and pricing. The platform allows artisans to update their profiles as their business evolves, including adding new products, adjusting prices, and keeping track of stock levels. The profile management interface is intuitive, with easy-to-follow prompts in regional languages. This minimizes the technological gap that often hinders artisans from using digital platforms. The backend database, **MongoDB**, ensures that artisan profiles and product data are securely stored and quickly retrievable when needed.

**4.3.2 Product Listings and Inventory Management**

Artisans can list products by uploading images, entering product descriptions, specifying sizes, and setting prices. The system provides an easy-to-use interface for adding new products and managing existing ones. For each product, artisans can add multiple images to showcase different angles and variations.

Inventory management is an important feature of the platform, as it helps artisans keep track of stock levels. If stock for a product is running low, the system sends notifications to the artisan, prompting them to update or replenish their inventory. This reduces the risk of stockouts or overselling, ensuring a smoother customer experience.

The data for each product—images, descriptions, prices, and inventory—is stored in **MongoDB**, allowing artisans to update their listings as often as needed.

**4.3.3 Event Management and Collaboration Tools**

One of the key features of the platform is its event management system, which allows artisans to organize virtual exhibitions, workshops, and live sales events. These events are an excellent opportunity for artisans to showcase their work to a larger audience, interact with buyers, and build trust with potential customers.

Artisans can create event pages where they can list the products they will showcase, set event dates, and provide additional information about their craft. These events are promoted on the platform’s main page, attracting attendees who may not otherwise be aware of the artisan’s work.

Additionally, **collaboration tools** allow artisans to connect with each other. They can exchange ideas, share resources, and learn from one another. This feature is particularly valuable for artisans in rural areas who may not have access to larger artisan networks. The collaboration tools also help foster a sense of community among users.

**4.3.4 Payment System (Cash on Delivery)**

The payment system on the platform is designed to be simple and secure. Since integrating complex third-party payment gateways like **Razorpay** or **Paytm** would require additional legal and regulatory formalities, the platform primarily uses **Cash on Delivery (COD)** as the payment method. This method is widely accepted in rural areas and provides an added layer of trust between the buyer and artisan.

In addition to COD, the platform also includes a **basic payment simulation system**. When buyers enter their payment details, they receive a message confirming **"Payment Successful"**. While this system does not handle real monetary transactions, it simulates the payment process to create a smooth checkout experience for the users.

**4.3.5 Buyer Interaction and Trust-Building Features**

Trust is a vital element in any e-commerce platform, especially when buyers are purchasing handmade goods from unknown artisans. The platform builds trust by allowing buyers to leave **ratings and reviews** for artisans and their products. These reviews help other buyers make informed purchasing decisions and provide feedback that artisans can use to improve their offerings.

In addition to reviews, the **messaging system** allows buyers to directly communicate with artisans. Buyers can ask questions about products, inquire about customizations, or simply express interest in the artisan's work. This direct interaction builds relationships between artisans and their customers, encouraging repeat purchases and fostering a sense of loyalty.

**4.4 Testing and Debugging**

Testing is an essential part of the development process, ensuring that the platform works as expected and is free of bugs or errors. The testing phase includes several types of testing, including:

1. **Functionality Testing**:  
   This ensures that every feature of the platform works as intended. Testing was carried out for functionalities such as user registration, product listing, inventory management, event creation, and payment simulations. Each feature was tested individually and then as part of the integrated system to ensure smooth interaction between components.
2. **Performance Testing**:  
   As the platform may have multiple users accessing it simultaneously, performance testing ensured that the system could handle a large number of concurrent users without slowing down or crashing. This was particularly important for virtual events where many users may log in at the same time.
3. **Security Testing**:  
   Ensuring that user data is secure is crucial. The platform uses **SSL encryption** for all transactions to protect sensitive data. Security testing also included checking for potential vulnerabilities, ensuring that unauthorized users cannot access private information or perform malicious actions.
4. **User Acceptance Testing (UAT)**:  
   A group of artisans was invited to test the platform, providing valuable feedback on the user experience. UAT focused on ensuring that artisans could easily navigate the platform, create product listings, and manage their profiles without difficulty.

**4.5 Challenges Encountered**

Several challenges were encountered during the implementation phase, and overcoming them required creative solutions and a commitment to improving the platform’s usability and functionality.

1. **Simplifying User Authentication**:  
   One of the biggest challenges was designing a user authentication system that would be easy for artisans to understand. Many artisans in rural areas have limited digital literacy, so the registration process was simplified, and tutorials were added to guide them through each step.
2. **Product Image Quality**:  
   Many artisans did not have access to high-quality cameras, making it difficult for them to upload clear and detailed product images. To help artisans, a tutorial was provided on how to take better photos using basic smartphones. This resource allowed artisans to improve the quality of their listings, making their products more attractive to buyers.
3. **Database Optimization**:  
   As more artisans and products were added to the platform, database queries began to slow down. Optimizing MongoDB queries and indexing the database helped speed up data retrieval times, ensuring that the platform remains responsive even as it scales.

**4.6 Conclusion**

The **implementation phase** of the **E-Commerce Platform for Artisans** has successfully brought together a user-friendly interface, a scalable backend, and a flexible database system to create a platform that meets the needs of rural artisans. By focusing on **simplicity**, **security**, and **community**, the platform offers artisans a way to reach a wider audience, sell their products directly to buyers, and grow their businesses.

The **React.js** frontend, **Node.js** backend, and **MongoDB** database work together to provide a responsive, scalable, and efficient system. The **Cash on Delivery (COD)** payment system, along with the basic payment simulation, ensures that the platform remains accessible and easy to use without the complexities of third-party payment systems.

Overall, the implementation of the platform marks a significant step forward in empowering artisans, promoting cultural heritage, and fostering economic growth in rural communities. As the platform continues to develop, additional features will be integrated, including real-time payment systems, advanced event management tools, and improved collaboration features.

**CHAPTER-5**

**TESTING**

**5.1 Introduction to Testing**

Testing is a vital step in the development lifecycle of the **E-Commerce Platform for Artisans**, ensuring that the platform functions as expected, meets user requirements, and provides a secure and seamless experience. It helps identify and address bugs, performance issues, and usability concerns before the platform is launched to a broader audience. This chapter discusses the testing methods employed during the implementation phase, focusing on **functionality**, **security**, **performance**, **usability**, and **user acceptance** testing.

**5.2 Types of Testing**

**5.2.1 Functionality Testing**

**Functionality Testing** verifies that each feature of the platform works according to its specifications. This is crucial to ensure that users can perform tasks like registering, adding products, and managing events without encountering errors.

**Objective**: To ensure that all core features, such as artisan registration, product listings, payment simulation, and event management, function correctly.

**Testing Process**:

* **Registration**: Tested to confirm that artisans can sign up without errors.
* **Product Listings**: Validated the ability to upload products and make updates.
* **Payment Simulation**: Ensured that after entering payment details, the user sees the "Payment Successful" message.
* **Event Management**: Tested the creation, update, and deletion of events to ensure they display correctly for users.

**Outcome**:  
The platform passed all key functionality tests, with minor issues resolved, including form validation and error handling improvements.

**5.2.2 Performance Testing**

**Performance Testing** checks how well the platform performs under normal and peak usage, ensuring it can handle high traffic without performance degradation.

**Objective**: To evaluate the system’s responsiveness and stability under various user loads.

**Testing Process**:

* **Stress Testing**: Simulated multiple users accessing the platform at the same time.
* **Load Testing**: Tested the system’s response when a large number of products were listed, ensuring no slowdown occurred.
* **Database Performance**: Ensured the system could retrieve and store data efficiently, even as the database grew.

**Outcome**:  
The platform handled up to **200+ concurrent users** without significant slowdowns. Minor optimizations were made to improve database query speeds and overall response times.

**5.2.3 Security Testing**

**Security Testing** ensures that user data is safe from unauthorized access and malicious threats. This is critical for protecting sensitive information such as personal data and payment details.

**Objective**: To verify that user data, including registration and payment information, is transmitted and stored securely.

**Testing Process**:

* **Authentication**: Ensured that only authorized users could log in and access their profiles.
* **Encryption**: Validated **SSL encryption** for all sensitive data.
* **Authorization**: Verified that users could only access their own data and not that of other artisans.

**Outcome**:  
All security measures were in place, with **SSL encryption** protecting data. No vulnerabilities were found, and the platform passed all security checks.

**5.2.4 Usability Testing**

**Usability Testing** ensures that the platform is user-friendly, especially for artisans who may have limited experience with digital tools.

**Objective**: To confirm that the platform is intuitive and that users can easily perform essential tasks, such as registering, uploading products, and completing purchases.

**Testing Process**:

* **UI Testing**: Checked the layout and design for clarity, ensuring that key features were easily accessible.
* **UX Testing**: Artisans tested key functions like registering and product listing to gauge the ease of use.

**Outcome**:  
The interface was deemed intuitive by testers, although minor adjustments were made to improve the **image upload process**, with tutorials provided to artisans on how to improve photo quality.

**5.2.5 User Acceptance Testing (UAT)**

**User Acceptance Testing (UAT)** is performed to ensure the platform meets the expectations of end-users, particularly artisans. It validates that the platform is functional and serves its purpose.

**Objective**: To ensure the platform meets the real-world needs of artisans and that they can use it effectively to manage their business.

**Testing Process**:

* **Artisan Feedback**: A group of artisans tested the platform, providing feedback on the usability and effectiveness of key features.
* **Real-world Tasks**: Artisans performed tasks like creating profiles, uploading products, and managing orders.

**Outcome**:  
UAT confirmed that the platform was aligned with the needs of artisans. Feedback led to improvements in the registration process and interface simplifications.

**5.3 Conclusion**

The testing phase of the **E-Commerce Platform for Artisans** ensured that the platform functions efficiently, securely, and meets the needs of its users. Through **functionality**, **performance**, **security**, **usability**, and **user acceptance testing**, the platform was thoroughly validated to handle real-world scenarios.

By addressing identified issues, optimizing performance, and enhancing security, the platform was prepared for launch, offering artisans a reliable and user-friendly environment to expand their businesses. Testing continues to be an ongoing process, with future enhancements being tested based on user feedback and platform growth.

**CHAPTER-6**

**CONCLUSION**

The **E-Commerce Platform for Artisans** was developed to empower rural artisans by providing them with a simple, accessible online marketplace where they can sell their handmade products directly to global buyers. By using **React.js**, **Node.js**, and **MongoDB**, the platform was designed to be scalable, secure, and easy to use, even for artisans with limited digital experience.

**Key Achievements**

1. **User-Centric Design**: The platform’s **simple registration process** and **multilingual support** helped artisans with limited digital literacy to easily create accounts and manage product listings.
2. **Empowerment Through Direct Market Access**: By eliminating intermediaries, the platform allows artisans to retain a larger portion of their earnings while gaining access to a global customer base.
3. **Cash on Delivery (COD) Payment System**: The **COD system** simplified transactions, particularly for artisans in rural areas who are not familiar with online payments, ensuring a secure and trusted buying process.

**Challenges and Solutions**

Several challenges were faced during development, including low **digital literacy** among artisans and the **quality of product images**. These issues were addressed through **tutorials** and guidance on image uploads. Additionally, the decision to use **Cash on Delivery (COD)** instead of third-party payment gateways simplified payment processing and legal complexities.

**Future Potential**

The platform has great potential for growth. Future enhancements could include integrating **advanced payment systems**, improving **logistics solutions** for faster delivery, and providing **advanced analytics tools** for artisans. These improvements will help expand the platform’s reach and provide artisans with valuable business insights.

The platform is well-positioned to grow as a sustainable solution for artisans, empowering them economically and preserving traditional crafts globally. As it scales, the platform can become a valuable resource for artisans worldwide, promoting cultural heritage and fostering economic growth in rural communities.

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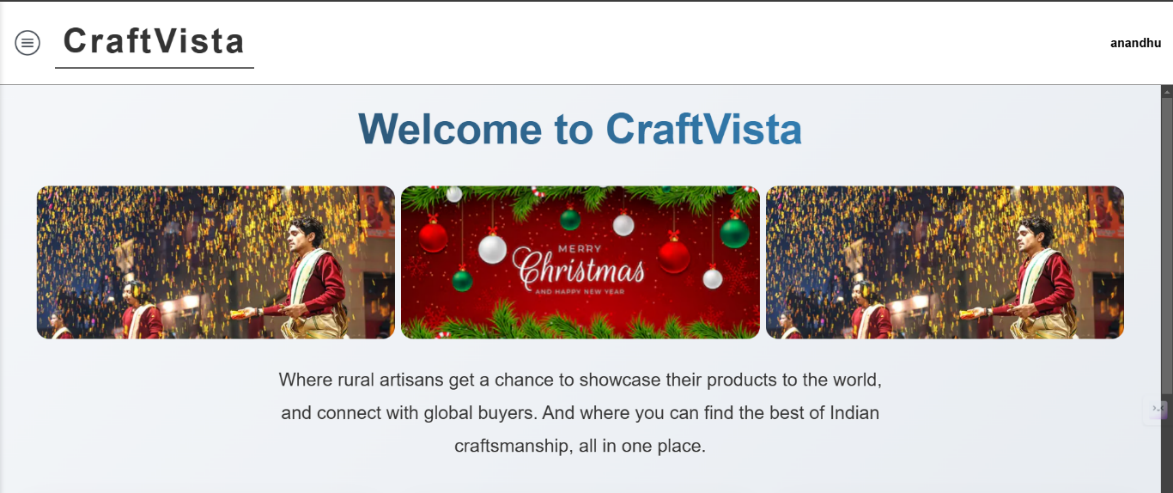
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   * Digital Marketing for Rural Artisans – Case Studies: [*https://digitalindia.gov.in*](https://digitalindia.gov.in)

**Notes:**

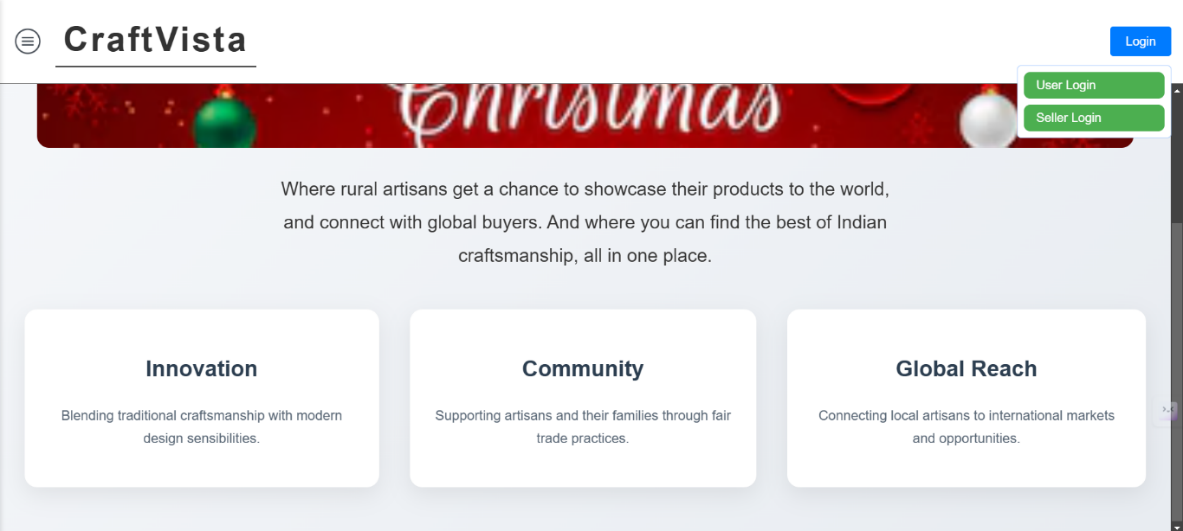
* This combined reference list integrates the information from **e-commerce platforms**, **technologies used**, **testing methods**, and **artisan empowerment** efforts.
* Links to official documentation for **React.js**, **Node.js**, and **MongoDB** support the technical aspects of the project.
* References to government and NGO initiatives like **India Handloom Brand** and **Dastkar** help validate the project's cultural and economic goals.

**APPENDIX-A (Screenshots)**

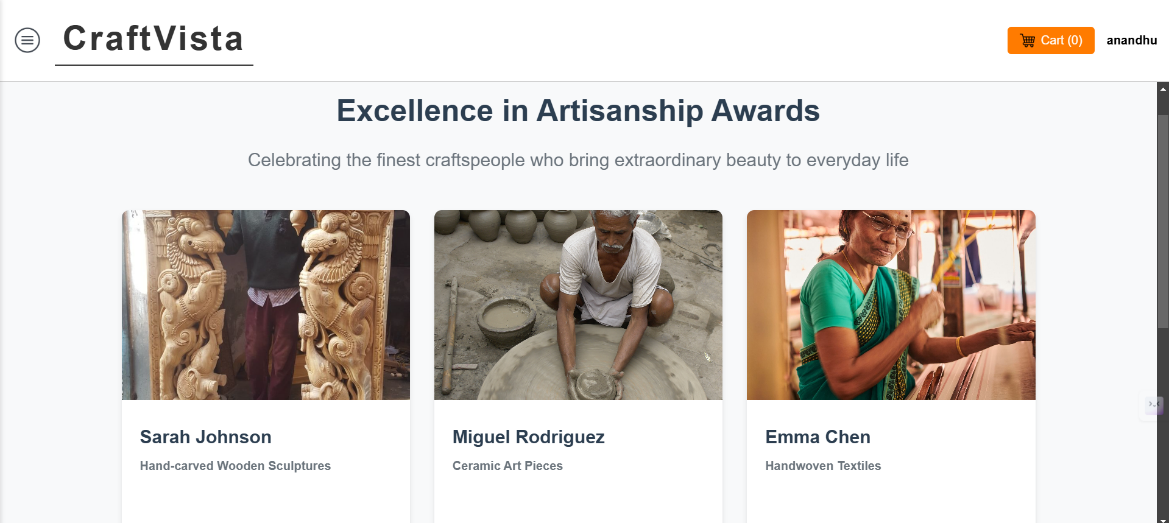
**Home Page** (Figure 1.1.1)

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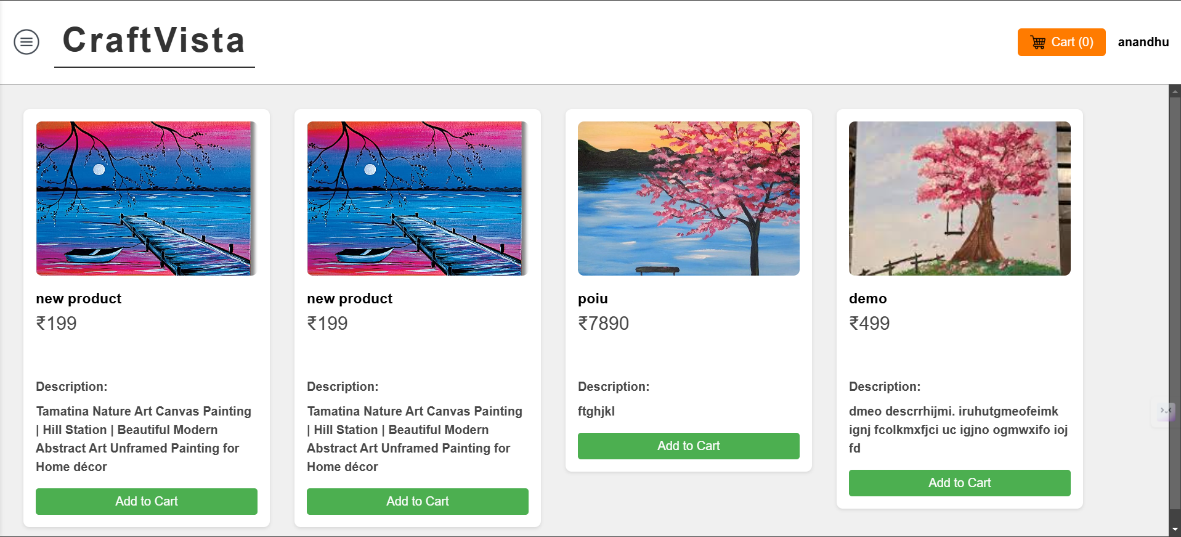
(Figure 1.1.2)

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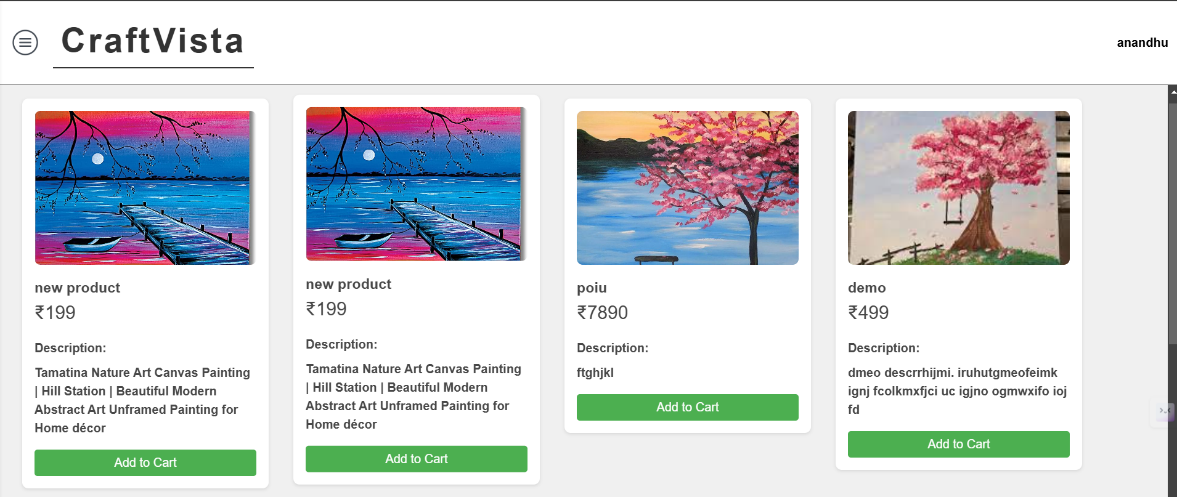
**Awards**(Figure 1.2)

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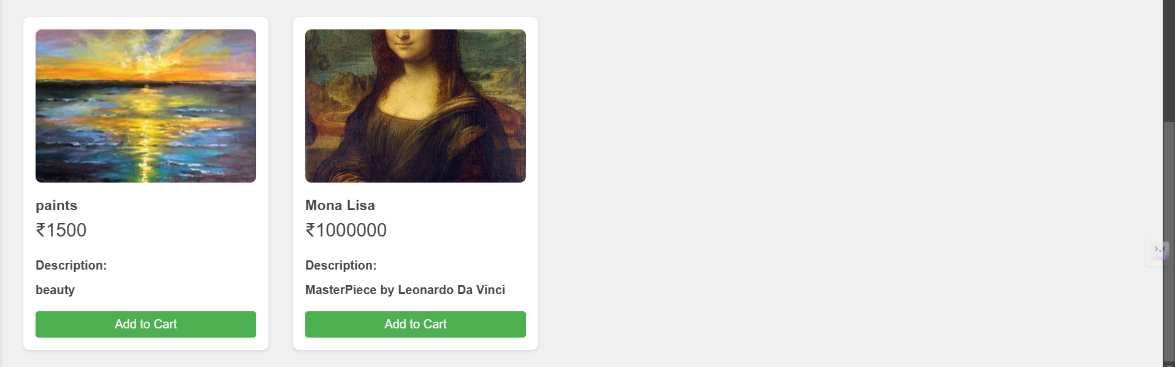
**Best Selling** (Figure 1.3)

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**Products** (Figure 1.4.1)

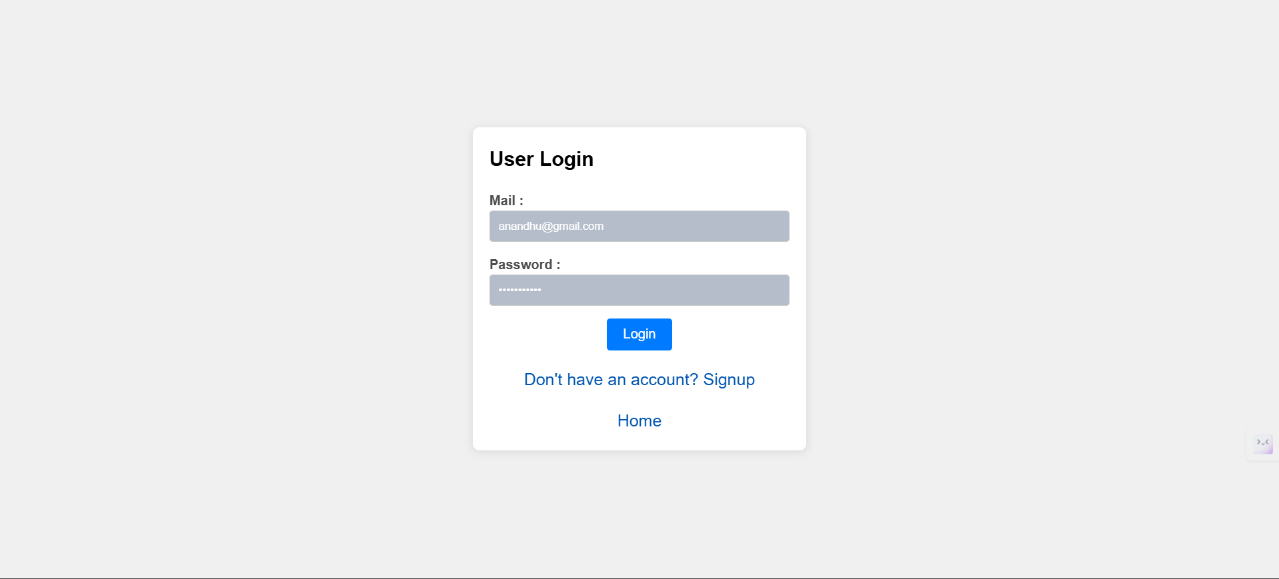
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(Figure 1.4.2)

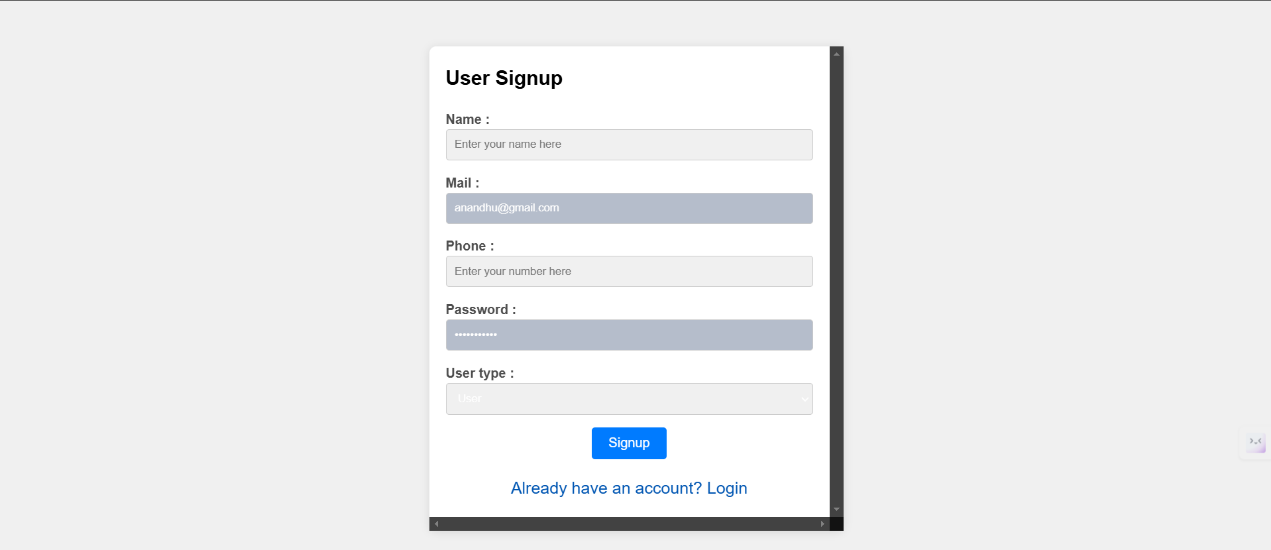
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**USER SIDE**

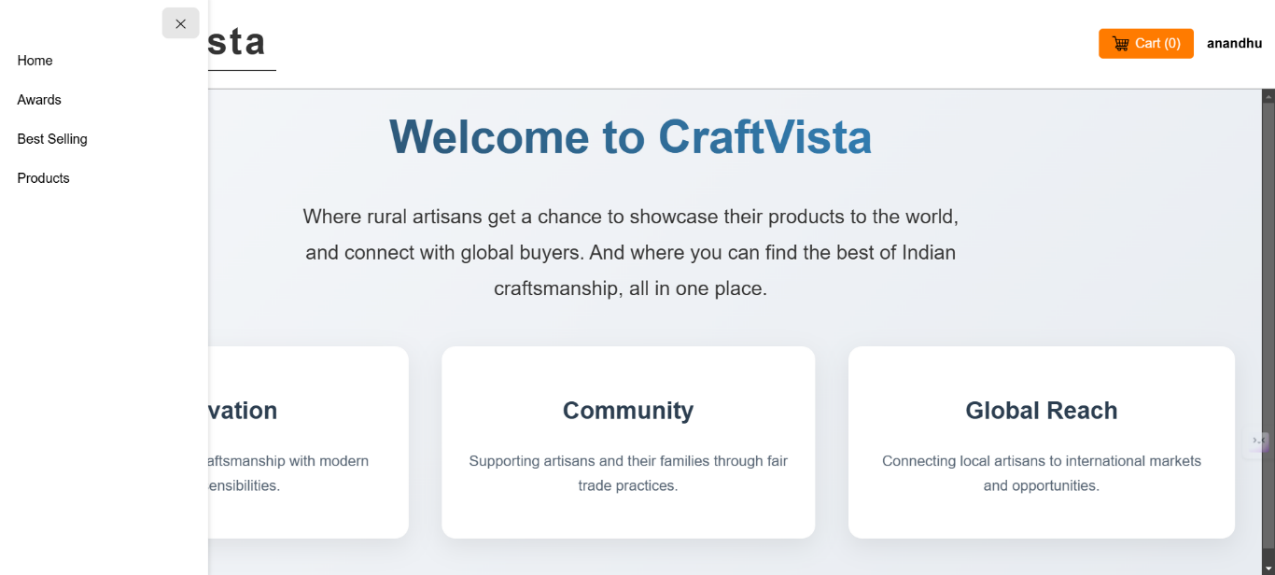
**Login** (Figure 2.1)

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**Sign Up** (Figure 2.2)

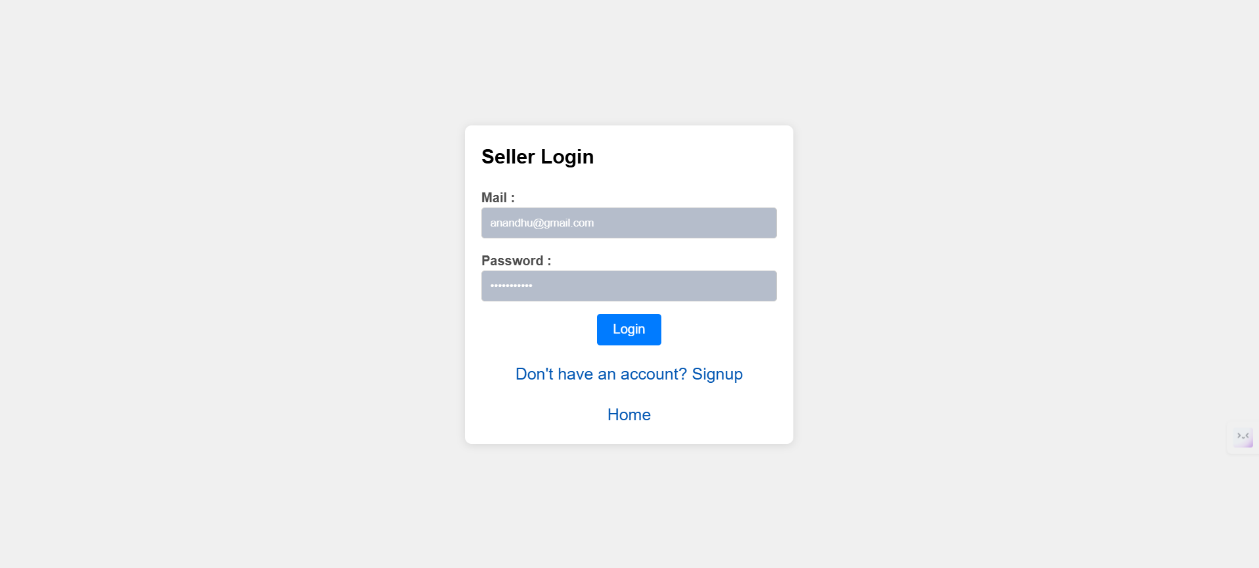
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**Navigation Bar** (Figure 2.3)

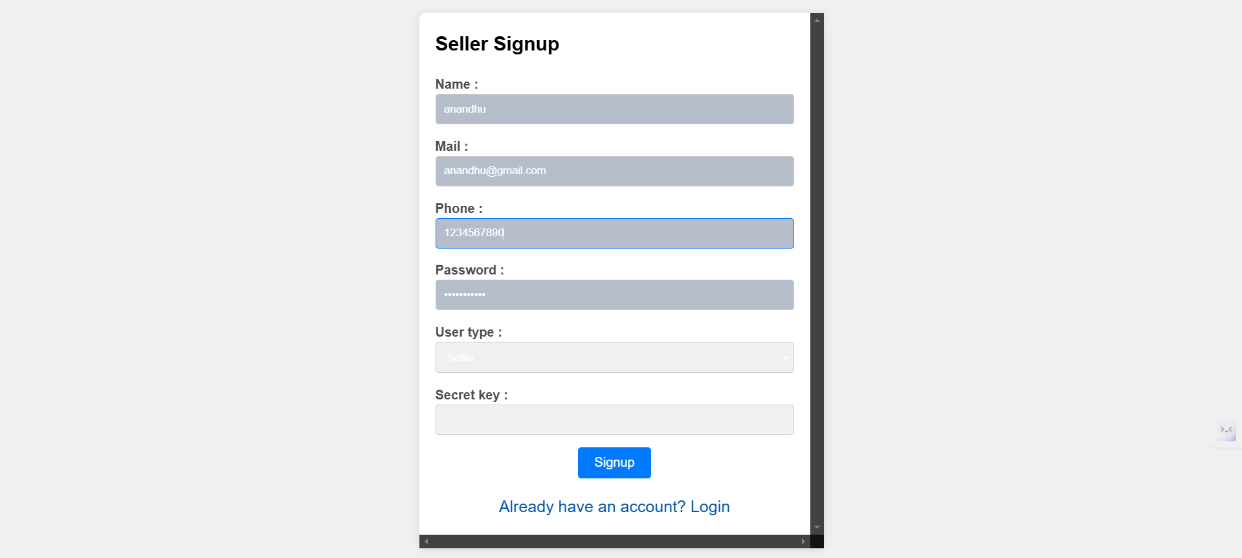
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**SELLER SIDE**

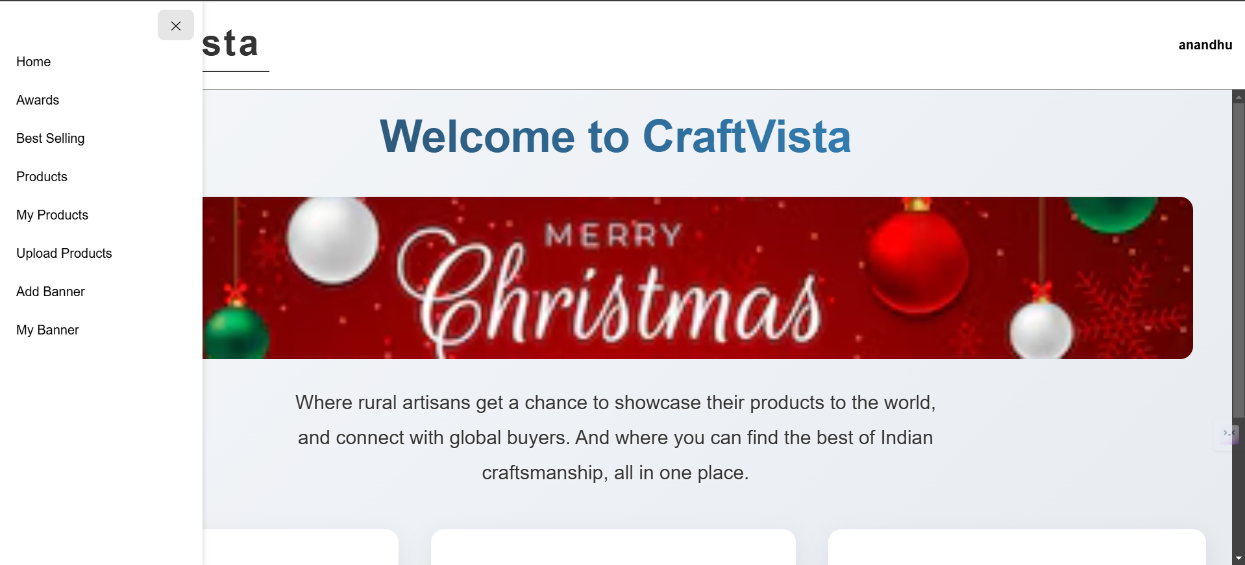
**Login** (Figure 3.1)

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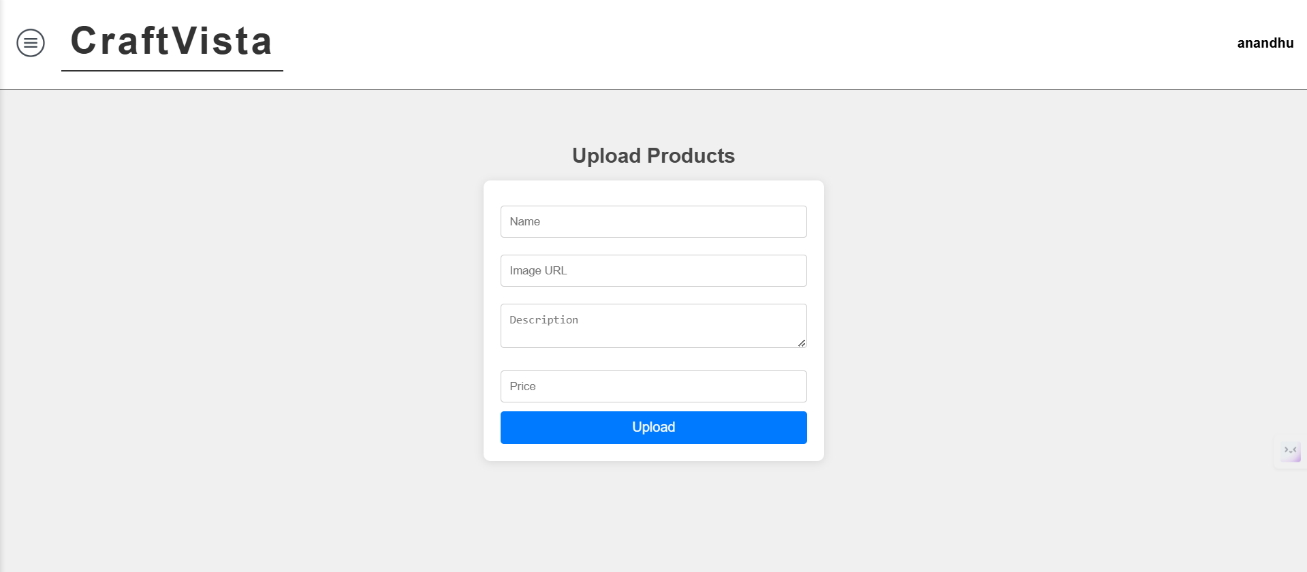
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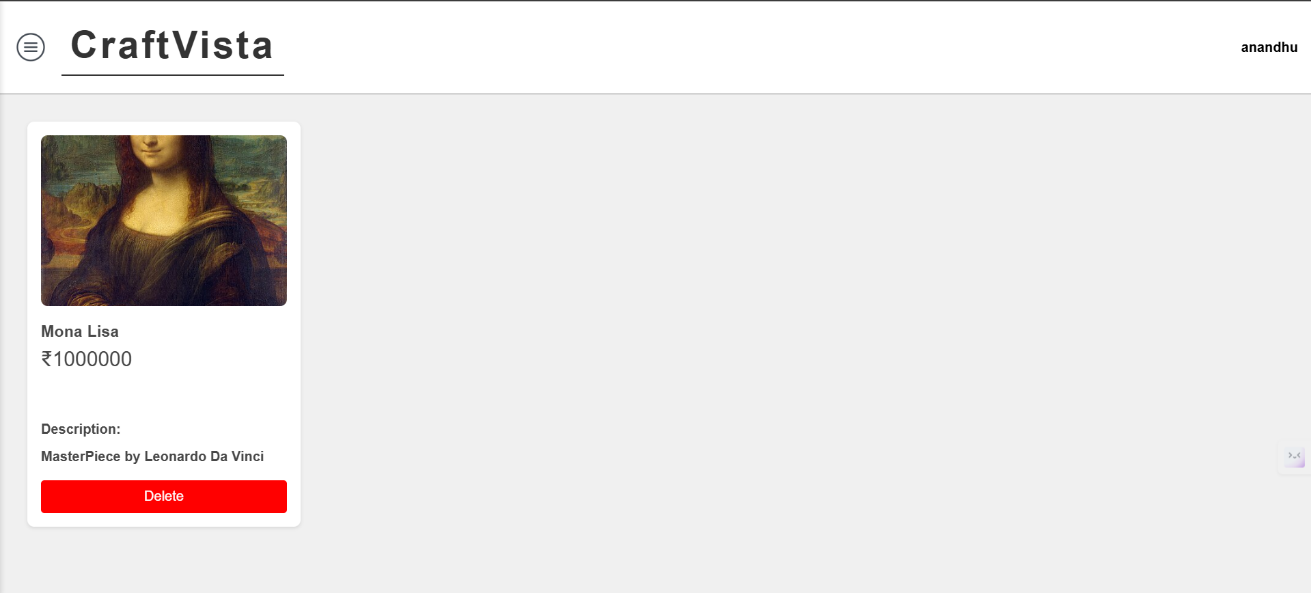
**Navigation Bar** (Figure 3.3)

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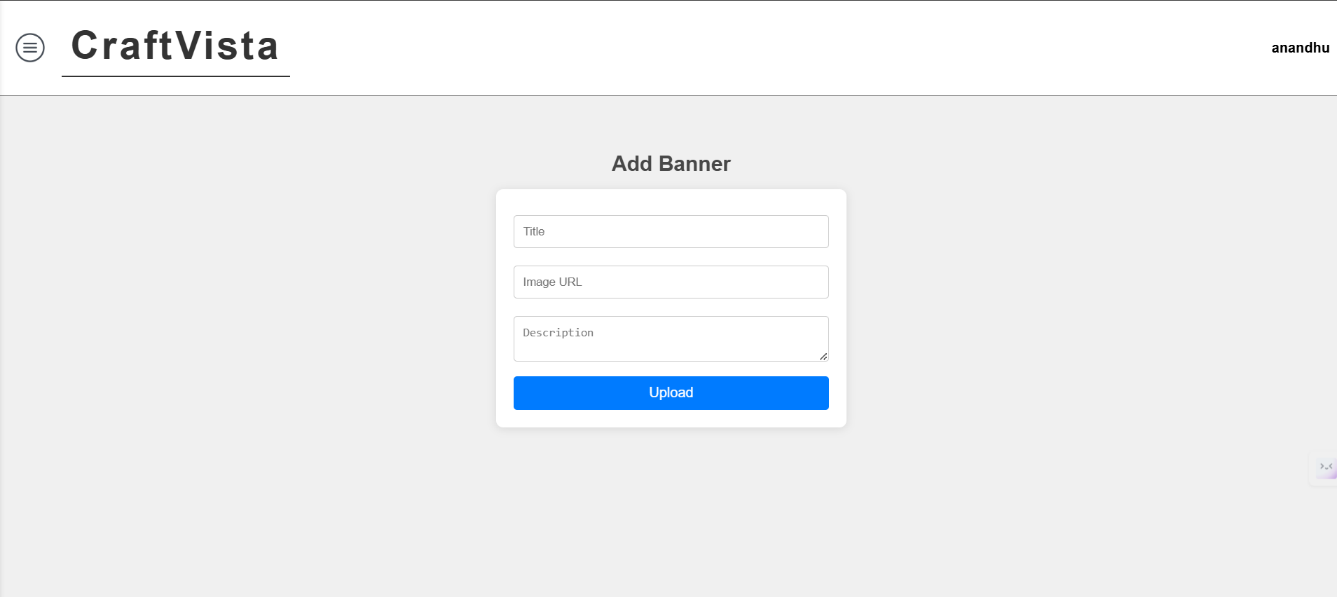
**Product Upload** (Figure 3.4)

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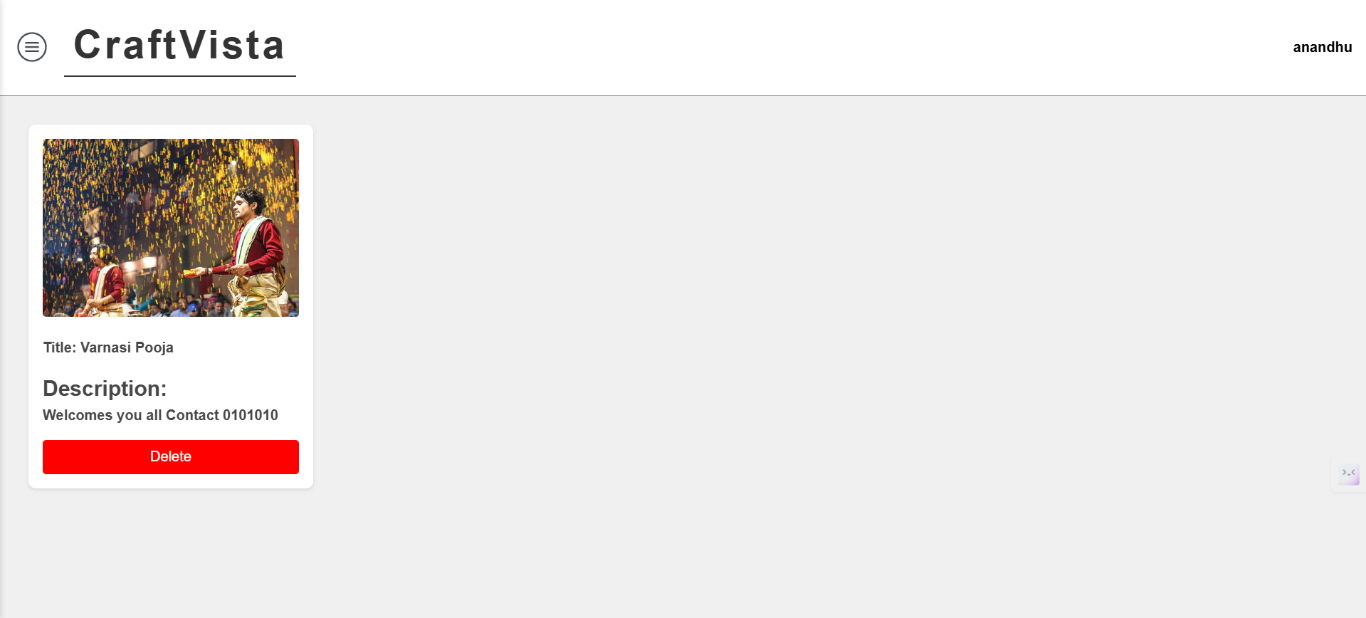
**My Products** (Figure 3.5)

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**Upload Banner – Create Event** (Figure 3.6)

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**My Banner – Event** (Figure 3.7)

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