

Butwal Multiple Campus

Tribhuvan University

Golpark-03, Butwal



Final Year Project Report

On

FarmPal

(Course Code: CSC-412)

In partial fulfillment of the requirement for the Bachelor's Degree in Computer Science
And Information Technology (BSc. CSIT)

Department of Computer Science and Information Technology

Butwal Multiple Campus

Submitted By:

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Supervisor Recommendation

I hereby recommend that this project is prepared under my supervision by **Sudip Pandey and Kapil Pokhrel** entitled “**FarmPal**” in the partial fulfillment of the requirements for degree of B.Sc. in Computer Science and Information Technology be processed for the evaluation.

.....

Mr. ~~Chandra Prasad Regmi~~

Project Supervisor

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Approval Letter

This is to certify that this project prepared **Sudip Pandey and Kapil Pokhrel** entitled “**FarmPal**” in the partial fulfillment of the requirements for degree of B.Sc. in Computer Science and Information Technology of Tribhuvan University has been well studied. In our opinion, it is satisfactory on the scope and quality as a project for a required degree.

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Student's Declaration

We hereby declare that project report entitled “FarmPal” submitted in the partial fulfillment of the requirement for Bachelor's Degree in Computer Science and Information Technology of Tribhuvan University, is our original work and not submitted for the award of any other degree, diploma, fellowship, or any other similar title or prize.

.....

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Acknowledgment

We would like to express our sincere appreciation for the guidance and support provided to our group during the completion of our college project. Your valuable insights, constructive feedback, and unwavering support have been instrumental in enabling us to produce a report that meets the high standards set by the college. We would like to extend our gratitude to the faculty members of the BSc. CSIT for providing us with access to the resources and facilities necessary for the successful completion of our project. Their dedication to teaching and their willingness to assist us in our academic pursuits have been invaluable.

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Finally, we would like to acknowledge the support of our family and friends, whose encouragement and motivation have been the driving force behind our success. Thank you once again for your invaluable contribution to our academic growth, and we look forward to your continued guidance and support in our future endeavors.

Abstract

The project “**FarmPal**” presents the development of an innovative e-commerce platform designed to bridge the gap between farmers and manufacturers by eliminating middlemen in the agricultural supply chain. The platform enables direct transactions for purchasing essential agricultural products such as seeds, fertilizers, and farming equipment. It provides a streamlined interface for farmers to access high-quality products at lower costs while ensuring transparency in pricing and product availability. Additionally, the platform offers a section for manufacturers to promote special events, discounts, and offers directly to farmers, fostering a more efficient and direct connection between producers and end users. By leveraging technology to facilitate communication and commerce, this platform aims to empower farmers, improve market access, and enhance agricultural productivity. The project is a solution to traditional supply chain inefficiencies, promoting sustainability and economic growth in the agricultural sector.

Keywords: Farmers, Sellers, Admin, Events, Product

Table of Contents

Supervisor Recommendation	i
Approval Letter	ii
Student's Declaration	iii
Acknowledgment	iv
Abstract	v
List of Abbreviations	viii
List of Figures	ix
List of Tables	x
Chapter 1	1
1.1 Introduction.....	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Scope and Limitation	3
1.4.1 Scope:	3
1.4.2 Limitation	4
1.5 Development Methodology	4
1.6 Report Organization.....	6
Chapter 2: Background Study and Literature Review	7
2.1 Background Study.....	7
2.2 Literature Review:	8
Chapter 3: System Analysis	9
3.1 System Analysis.....	9
3.1.1 Requirement Analysis.....	9

3.1.2 Feasibility Analysis.....	11
3.1.3 Analysis.....	12
Chapter 4: System Design.....	16
4.1 Design	16
User Interface Design	17
Database Design:	20
4.2 Algorithm Details.....	21
Content-Based Filtering	21
Category-based Filtering.....	22
Chapter 5: Implementation and Testing.....	23
5.1 Implementation	23
5.1.1 Tools Used.....	23
5.1.2 Implementation Details of Modules	24
5.2 Testing.....	26
5.2.1 Test Cases for Unit Testing	26
5.2.2 Test Cases for System Testing.....	28
5.3 Result Analysis	28
Chapter 6: Conclusion and Future Recommendations.....	30
6.1 Conclusion	30
6.2 Future Recommendations	30
Bibliography	32
Appendices.....	33

List of Abbreviations

GUI	Graphical User Interface
No SQL	Non SQL / Not only SQL
API	Application Programming Interface
ER	Entity Relationship
DFD	Data Flow Diagram
UX	User Experience
UI	User Interface

List of Figures

Figure 1: Iterative Waterfall Method	5
Figure 2: Use Case Diagram	10
Figure 3: ER Diagram	13
Figure 4:Context Level DFD	14
Figure 5: Level 1 DFD	14
Figure 6: Level 2 DFD	15
Figure 7: Flow chart of system	16
Figure 8: WireFrame Design of the system	19
Figure 9: Schema Design For Database	20

List of Tables

Table 1: Gnatt Chart.....	12
Table 2: Test Case for Unit Testing.....	26

Chapter 1

1.1 Introduction

Agriculture is a cornerstone of many economies, particularly in developing regions, where the majority of the population relies on farming for their livelihoods. Despite its importance, farmers often face challenges when it comes to accessing essential agricultural inputs such as seeds, fertilizers, and farming equipment. One of the main obstacles is the involvement of intermediaries, or middlemen, who inflate prices, restrict product choices, and create delays in the procurement process. This results in farmers paying higher prices for lower-quality products, ultimately reducing their productivity and profitability.

To address these challenges, this project introduces an e-commerce platform that connects farmers directly with manufacturers, effectively removing the need for middlemen. The platform serves as a digital marketplace, enabling farmers to purchase high-quality agricultural inputs such as seeds, fertilizers, and farming equipment directly from manufacturers. By eliminating intermediaries, the platform ensures fair pricing, better product availability, and more transparent transactions, allowing farmers to access the resources they need efficiently and affordably.

In addition to facilitating direct purchases, the platform allows manufacturers to promote special offers, discounts, and agricultural events directly to farmers. This feature enables manufacturers to connect with their target audience more effectively while providing farmers with access to exclusive deals and promotions. Farmers can benefit from timely information about upcoming events, product launches, and discounts that are tailored to their specific agricultural needs.

The design of the platform focuses on simplicity and user-friendliness, ensuring that even farmers with limited technical expertise can navigate it with ease. With a streamlined interface and accessible features, farmers can quickly find and purchase the products they need, reducing both time and effort in procuring essential supplies.

By creating a direct link between farmers and manufacturers, this e-commerce platform addresses critical inefficiencies in the agricultural supply chain. It not only reduces costs and improves access

to quality inputs but also fosters a more transparent, equitable marketplace for farmers. The project aims to revolutionize the way farmers access essential resources, ultimately improving productivity, increasing profits, and promoting sustainable agricultural practices.

1.2 Problem Statement

Farmers and agricultural businesses often face numerous challenges when it comes to sourcing and purchasing farming equipment. Traditional purchasing methods, such as visiting physical stores or relying on local suppliers, can be time-consuming, limit options, and result in higher costs. Moreover, farmers frequently lack access to reliable information, reviews, and expert guidance, making it difficult to make well-informed decisions about essential equipment. These challenges can hinder efficiency, productivity, and overall farm performance.

In response to these issues, FarmPal is developed as a comprehensive e-commerce platform designed to simplify the process of purchasing farming equipment. FarmPal aims to provide a user-friendly and accessible solution that allows farmers to browse, compare, and purchase farming tools and machinery directly from manufacturers. By eliminating middlemen, the platform ensures that farmers have access to a wider range of equipment at competitive prices, without the additional cost markup typically imposed by intermediaries.

The platform is designed to enhance the purchasing experience by offering valuable information, such as detailed product descriptions, customer reviews, and expert recommendations. This wealth of information enables farmers to make informed decisions, ensuring they invest in the right equipment that suits their specific needs. FarmPal also provides personalized suggestions based on farmers browsing and purchase history, streamlining the decision-making process even further.

With a focus on accessibility, convenience, and cost-effectiveness, FarmPal is poised to revolutionize the way farmers source their farming equipment. The platform offers a seamless shopping experience that saves time and effort, while also providing essential resources to help farmers make smarter purchasing decisions. By supporting farmers in this way, FarmPal contributes to increased agricultural productivity, reduced costs, and improved overall efficiency in farm operations.

1.3 Objectives

The core objectives of FarmPal, a marketplace for farmers and manufacturers, are outlined as follows:

- To cut the middleman between farmers and agriculture equipment manufacturers.
- To allow farmers to directly purchase seeds, fertilizers, insecticides through internet.
- To allow farmers to get insights and information about different events and discounts available directly from sellers.

1.4 Scope and Limitation

1.4.1 Scope:

The scope of this project focuses on developing an e-commerce platform, FarmPal, specifically designed for farmers and agricultural businesses to simplify the process of sourcing and purchasing farming equipment. Key features of the platform include:

Direct Connection with Manufacturers: FarmPal allows farmers to purchase farming equipment directly from manufacturers, bypassing traditional middlemen and reducing costs.

Comprehensive Marketplace: The platform will offer a wide range of farming equipment, from basic tools to advanced machinery, catering to farmers of all sizes and needs.

Product Information and Reviews: FarmPal provides detailed product descriptions, customer reviews, and expert recommendations, ensuring farmers have access to reliable information for making well-informed purchasing decisions.

Offers and Promotions: Manufacturers can use the platform to promote special offers, discounts, and events, giving farmers access to exclusive deals.

User-Friendly Interface: The platform is designed with ease of use in mind, ensuring that farmers with varying levels of technological proficiency can navigate it comfortably.

Order and Delivery Tracking: FarmPal includes features for tracking orders and deliveries, ensuring that farmers can monitor their purchases from start to finish.

Cost-Effective Solution: By reducing the reliance on middlemen and streamlining the procurement process, the platform offers a cost-effective solution to acquiring farming equipment.

Mobile Access: FarmPal will be accessible via mobile devices, allowing farmers to browse and make purchases from anywhere, even in rural or remote locations.

1.4.2 Limitation

Initial Trust Barriers: Farmers who are accustomed to traditional purchasing methods may be hesitant to trust an online platform for making significant equipment purchases. Building trust may take time, especially in regions where digital solutions are still gaining traction.

Logistics and Delivery: Delivering heavy or large farming equipment to rural areas may pose logistical challenges. Delays in delivery or high shipping costs could become potential concerns for users.

Technical Proficiency: While the platform is designed to be user-friendly, farmers who are less familiar with technology may face a learning curve when using the platform, particularly those with little experience in e-commerce.

Limited Product Availability: Depending on partnerships with manufacturers, the availability of certain products may be limited to specific regions. Farmers in certain areas may have fewer equipment options compared to those in more connected regions.

Payment Systems: Farmers in remote areas may not have access to modern digital payment methods, such as credit cards or mobile payments, which could limit their ability to purchase equipment through the platform. Alternative payment methods may need to be considered.

Competition: FarmPal may face competition from established agricultural supply chains, local suppliers, or other e-commerce platforms, which could slow down the platform's adoption in certain regions.

1.5 Development Methodology

The chosen development methodology for the project is the Iterative Waterfall Model. The Iterative Waterfall Model is a linear and sequential approach to software development, where the

Entire project is divided into distinct phases. Each phase must be completed before moving on to the next, emphasizing a structured and systematic progression. The Iterative Waterfall Model is characterized by its rigidity, with well-defined stages such as requirements gathering, design, implementation, testing, deployment, and maintenance. This method is particularly suitable when project requirements are well-understood and unlikely to change significantly during development.

The Iterative Waterfall Model offers a clear framework, making it easier to manage and control each phase. This approach aligns with the project's characteristics, providing a systematic and controlled development process to meet the specified deadline.

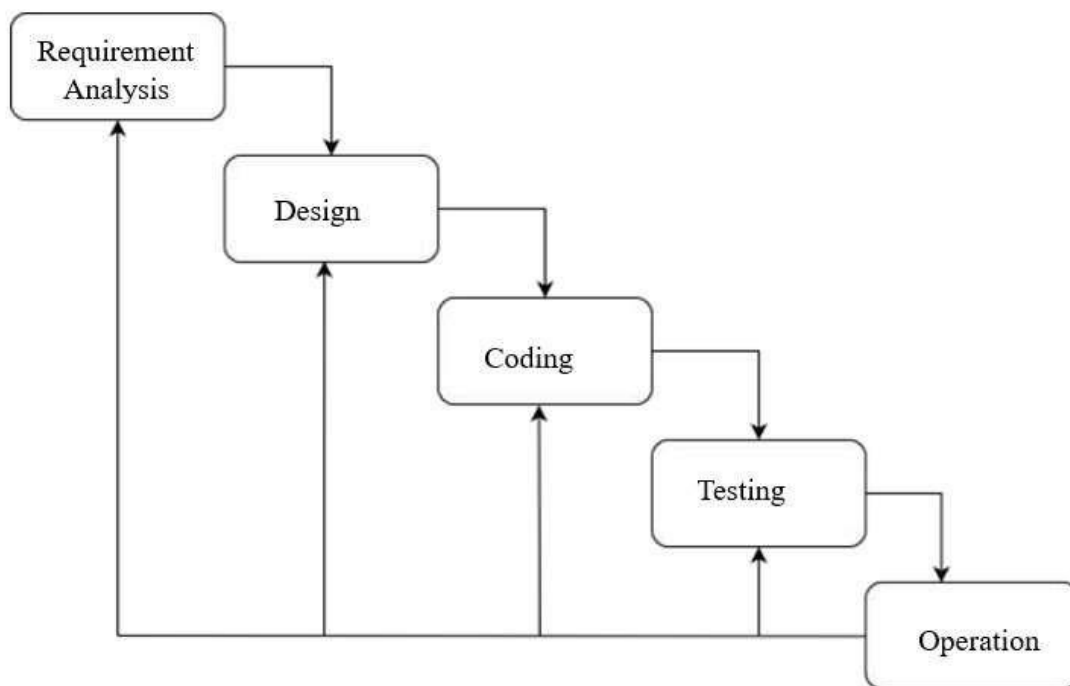


Figure 1: Iterative Waterfall Method

Here, we give some details about how the above steps works: -

- **Requirements** – Here we analyzed all the needs that are needed to get to started on the web application like technology stacks and resources by which we determine what the goals associate with building our system which include functional requirements, features and division of work to create the system.
- **Design** - Here we designed system with login and registration page, product page, marketplace, blogs, weather and checkout page based on the information we gathered during requirement phase.

- **Coding** - Here we figure out how to solve problems and write code.
- **Testing** - Here we conducted unit testing, integration testing and User Acceptance Testing to make sure the code does what it supposed to do without breaking anything.

1.6 Report Organization

This report is divided into six chapters. Each chapter is further divided into different headings. The preliminary section contains the overall information about the project. This section includes abstract, table of contents, list of figures and abbreviations.

Chapter 1: Gives introduction about FarmPal. The problem definition, objectives, scope, limitations and development methodology of this system are discussed.

Chapter 2: Introduces background study and literature review where the research works done in the field related to the system is discussed in brief.

Chapter 3: Focuses on analyzing the application.

Chapter 4: Gives information about overall system architecture, use case diagram, state diagram, data, design and algorithm details.

Chapter 5: Includes the system development models and tools used along with the different tests and result analysis.

Chapter 6: Draws the conclusion of the project and discuss the necessary recommendations along with future scopes.

Chapter 2: Background Study and Literature Review

2.1 Background Study

The agricultural sector plays a crucial role in the global economy, especially in developing countries, where a significant portion of the population depends on farming for their livelihood. Despite the importance of agriculture, farmers often face significant barriers when trying to access essential resources such as farming equipment, seeds, and fertilizers. One of the primary issues lies in the inefficiencies within traditional supply chains, where middlemen inflate prices, limit product availability, and delay deliveries. This has led to increased operational costs for farmers, reduced productivity, and a dependency on intermediaries for vital inputs.

The rise of e-commerce has transformed industries worldwide by offering direct access to products and services. In agriculture, e-commerce platforms in developed regions have enabled farmers to bypass intermediaries, access better prices, and improve decision-making through direct purchasing from manufacturers. The costs of agricultural inputs have consistently risen since the onset of the pandemic, posing significant challenges for businesses in their pursuit of profitability. With 53% of respondents considering this issue more severe than the previous year, it underscores the urgency for solutions [1]. Despite some improvement in the inflation issue, overall input prices continue to escalate, impacting both growers and consumers as costs travel through the supply chain, leading to elevated prices.

Despite these challenges, the demand for online platforms that provide direct access to farming equipment is growing. By eliminating middlemen and offering transparent pricing and reliable product information, e-commerce platforms can empower farmers to make better-informed decisions and reduce costs.

FarmPal aims to address these issues by creating a digital marketplace that connects farmers directly with manufacturers of farming equipment. This platform will simplify the procurement process, offer a wider range of products, and provide farmers with valuable insights through product reviews and expert recommendations. Through this approach, FarmPal seeks to enhance agricultural productivity, reduce costs, and improve access to quality equipment for farmers.

2.2 Literature Review:

These are the systems alike FarmPal:

System 1: AgriBazaar

AgriBazaar is an online agricultural marketplace in India that connects farmers directly with buyers.

Drawbacks: The User Interface of the system is little complex to use.

FarmPal user interface are designed in a way that it becomes easier to use for the farmers.

System 2: AgMarket

AgMarket is an online marketplace in Australia that allows farmers to sell their produce directly to buyers.

Drawbacks: This system only provides consultation with the experts.

FarmPal provides everything required to the farmers like marketplaces, tools and seeds for farming.

System 3: Farmers Fresh Zone

Farmers Fresh Zone is an e-commerce platform in India that connects consumers with fresh, highquality produce directly sourced from farmers.

Drawbacks: This system only provides farmer to sell their production to customers

FarmPal has feature that lets farmers to buy agriculture products directly from manufacturers.

Chapter 3: System Analysis

3.1 System Analysis

The system analysis for FarmPal involves understanding the requirements and functionalities necessary to create an efficient e-commerce platform for farmers. Key components include:

- a. **User Requirements:** Farmers need easy navigation, transparent pricing, detailed product descriptions, and access to a wide range of farming equipment. Manufacturers require a simple interface to upload products, manage inventory, and promote offers.
- b. **Functional Requirements:** The platform must support product browsing, secure purchasing, order tracking, and inventory management. It should also provide user authentication, reviews, and notifications for deals and promotions.
- c. **Non-Functional Requirements:** The system must be user-friendly, secure, scalable to handle high traffic, and accessible via mobile devices for remote farmers. Fast response time and reliable customer support are essential.

By analyzing these needs, FarmPal aims to create a system that meets the technical and user expectations for a seamless and cost-effective farming equipment marketplace.

3.1.1 Requirement Analysis

The requirements analysis is broken down into two sections namely function requirements and non-functional requirements and they are discussed below.

I. Functional Requirements:

- **User Registration and Authentication:** Users (farmers and manufacturers) must be able to create accounts, log in securely, and manage their profiles.
- **Product Listing and Management:** Manufacturers should be able to add, update, and delete products, along with detailed descriptions, images, and pricing information.
- **Product Search:** Farmers should be able to search for specific equipment with the help of search box available on system.
- **Product Reviews and Ratings:** Farmers should be able to leave reviews and rate the products they purchase, while other users can view these reviews for informed decision-making.

- **Shopping Cart and Checkout:** Farmers must be able to add items to a cart, update quantities, and proceed to checkout for secure payment processing.
- **Payment Gateway Integration:** The system should support multiple payment methods (credit cards, mobile payments, etc.) for secure transactions.
- **Order Management:** Farmers must be able to view their order history, track current orders, and receive confirmation upon successful purchases.
- **Offers and Promotions:** Manufacturers should be able to create and manage promotions, discounts, and special offers, visible to farmers on the platform.
- **Order Tracking:** Farmers should be able to track their orders from dispatch to delivery with real-time updates.
- **Admin Panel:** Admins should be able to manage users, monitor platform activity, approve new manufacturers, and handle system-level operations.

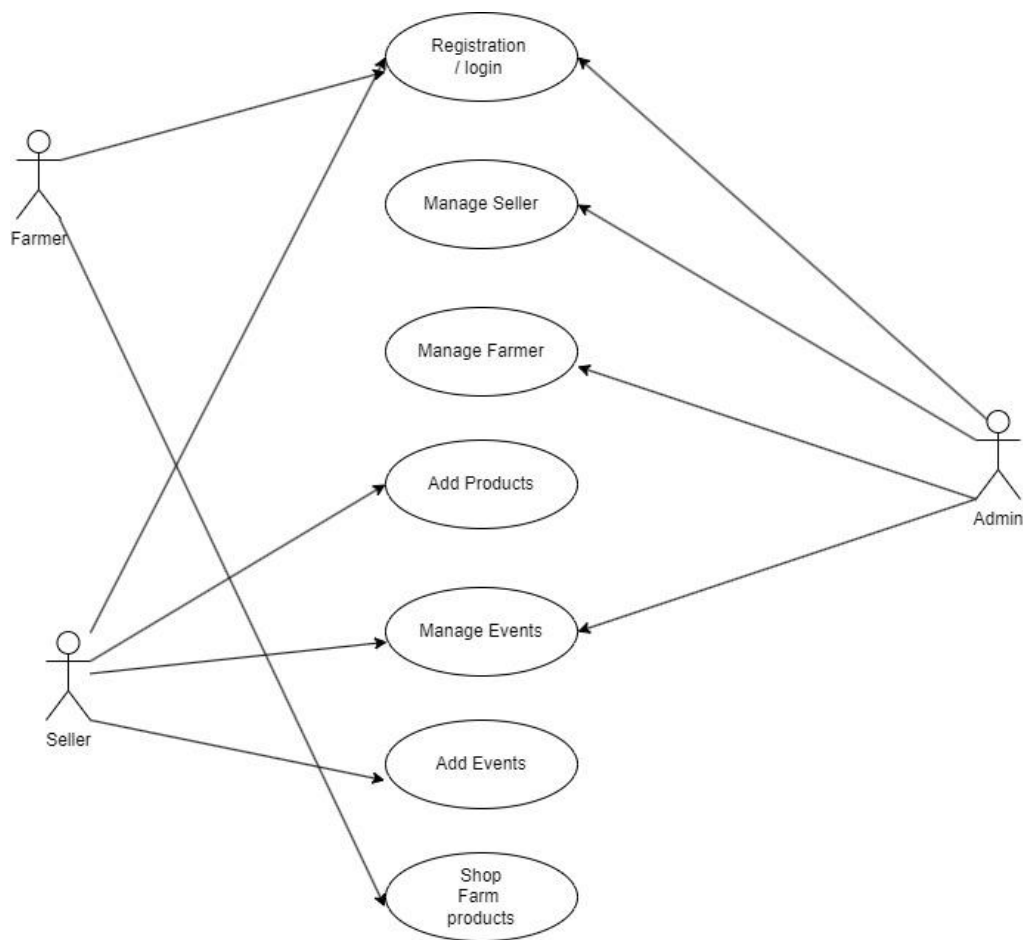


Figure 2: Use Case Diagram

II. Non Functional Requirement

The non-functional requirement of FarmPal are as follows:

- a) Responsive
- b) User friendly
- c) Reliability
- d) Performance
- e) Speed
- f) Availability
- g) Security

3.1.2 Feasibility Analysis

i. Technical Feasibility

The technical feasibility of the system has been thoroughly evaluated. The project team possesses the necessary technical expertise to develop and deploy the proposed system. Moreover, the chosen technology, which includes nodejs for backend development and React for frontend development, is well-suited for building a scalable and robust platform. Thus, FarmPal is technically feasible.

ii. Operational Feasibility

FarmPal has been designed with security, scalability and maintainability in mind. The system will ensure smooth operational experience. The team is confident that this system is able to fulfill all the requirements.

iii. Economic Feasibility

Being an educational project, there will not be any human resource cost. In the case of success of this project, FarmPal will generate revenue through its selling for agricultural items.

iv. Legal Feasibility

FarmPal project is legally feasible, ensuring compliance with intellectual property, data privacy, accessibility and contractual laws while promoting equal access and copyright education.

v. Schedule Feasibility

Table 1: Gantt Chart

Week	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	11 th	12 th
Requirement												
Design												
Coding												
Testing												
Operation												
Documentation												

3.1.3 Analysis

It is important to put in place robust system for users, sellers to ensure digital availability applications meet requirements efficiently and effectively, distributed application infrastructure is broken down into three main parts: User Interface, Seller Interface and Admin Backend. The ability to browse a random product is available to users. Users can request anything from the marketplace using the application. After making a payment, the order is placed and the vendor is notified about the order. The vendor then completes further processing delivering the product to the farmer's address.

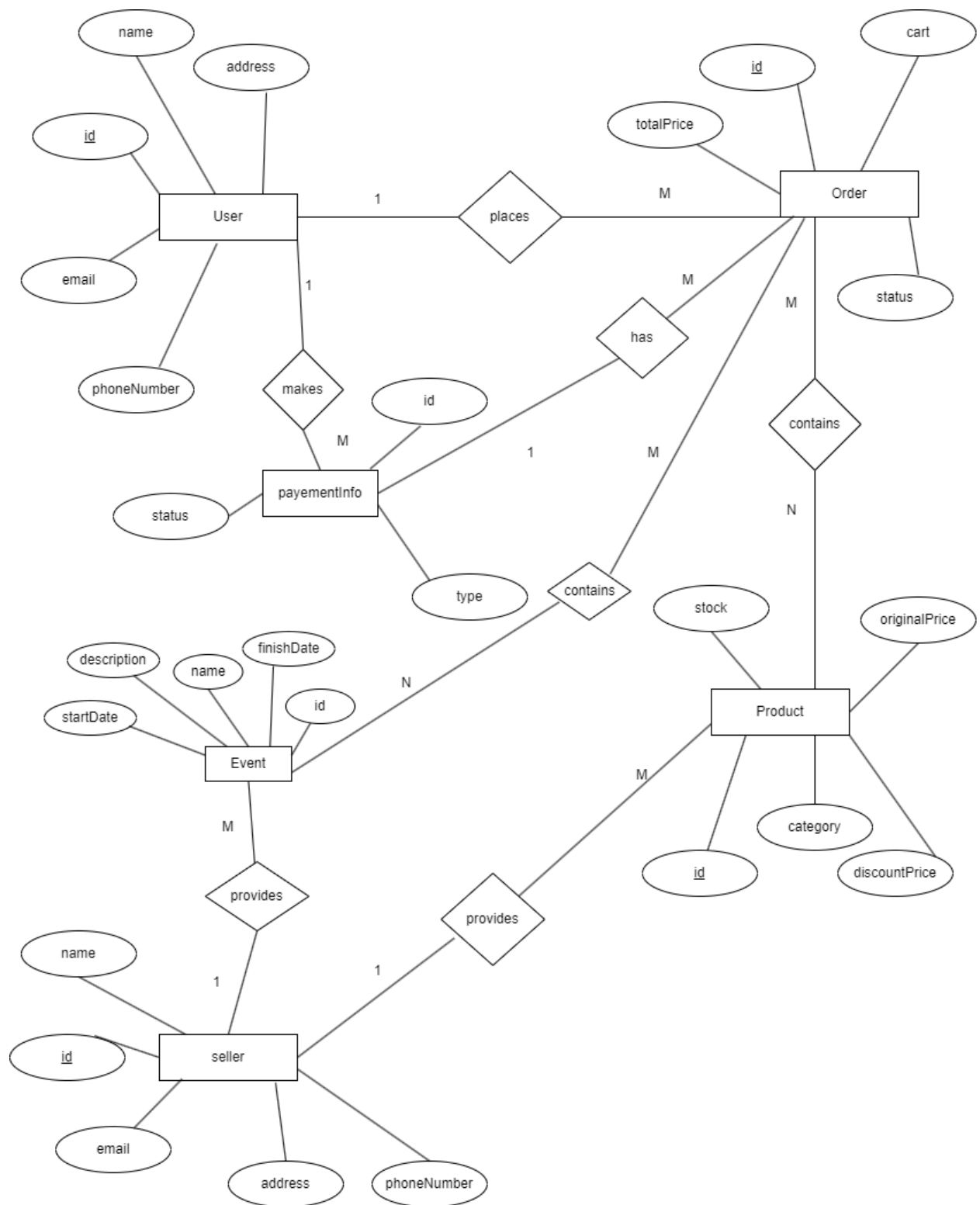


Figure 3: ER Diagram

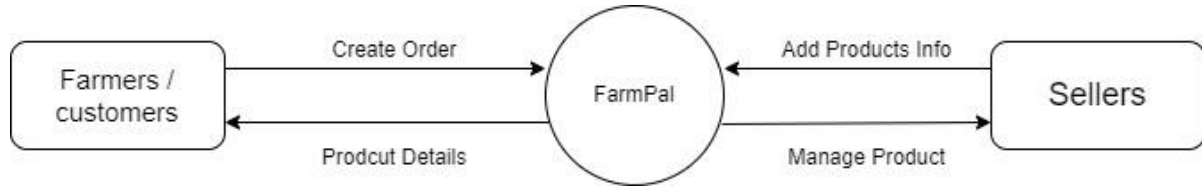


Figure 4: Context Level DFD

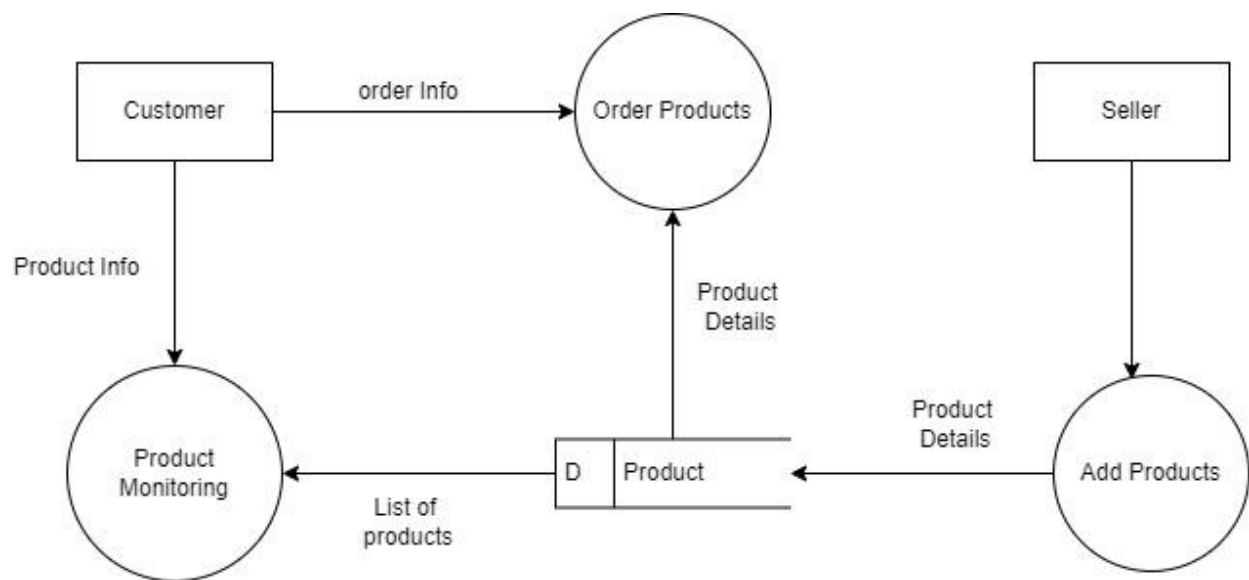


Figure 5: Level 1 DFD

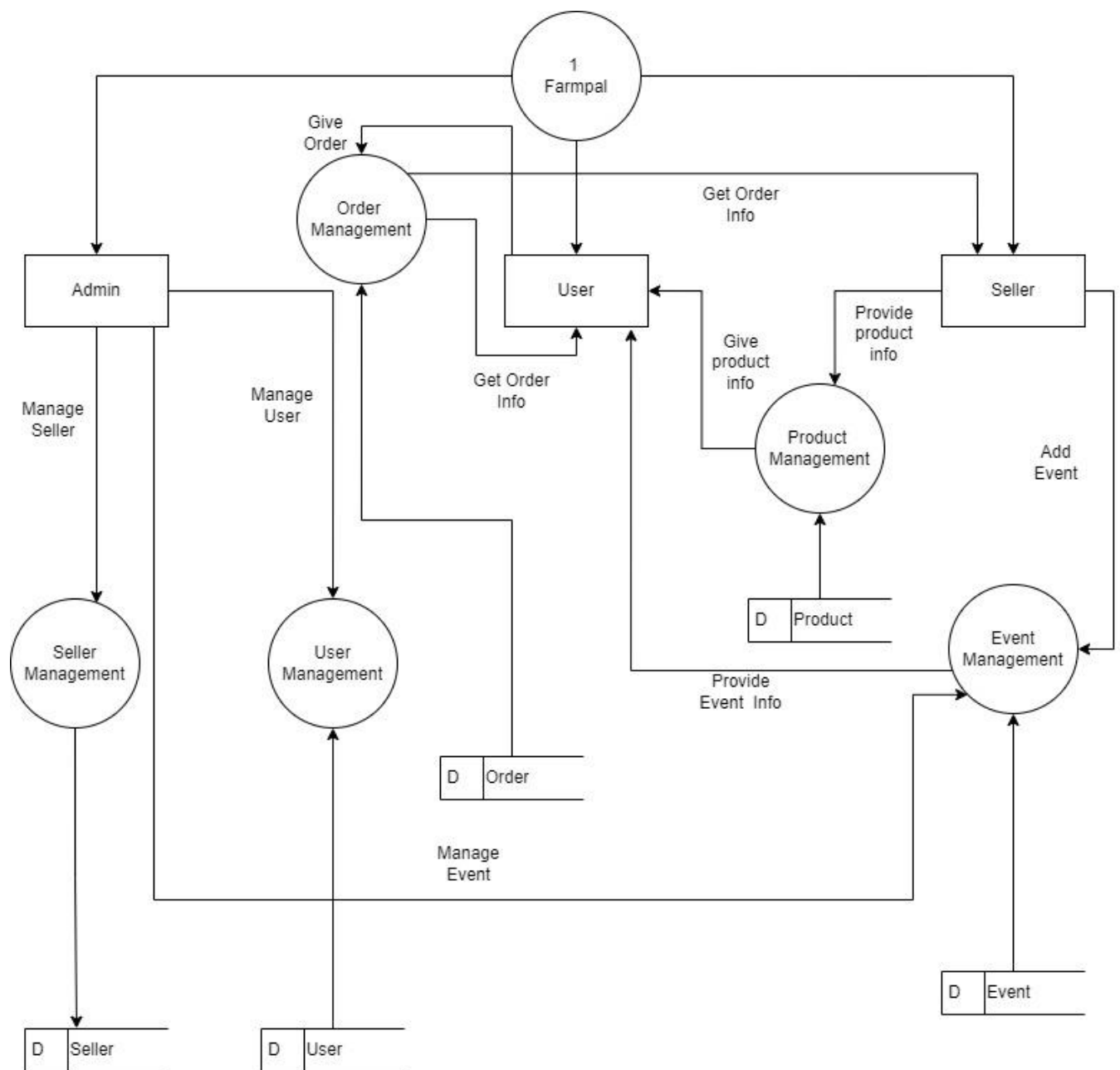


Figure 6: Level 2 DFD

Chapter 4: System Design

4.1 Design

Flow Chart:

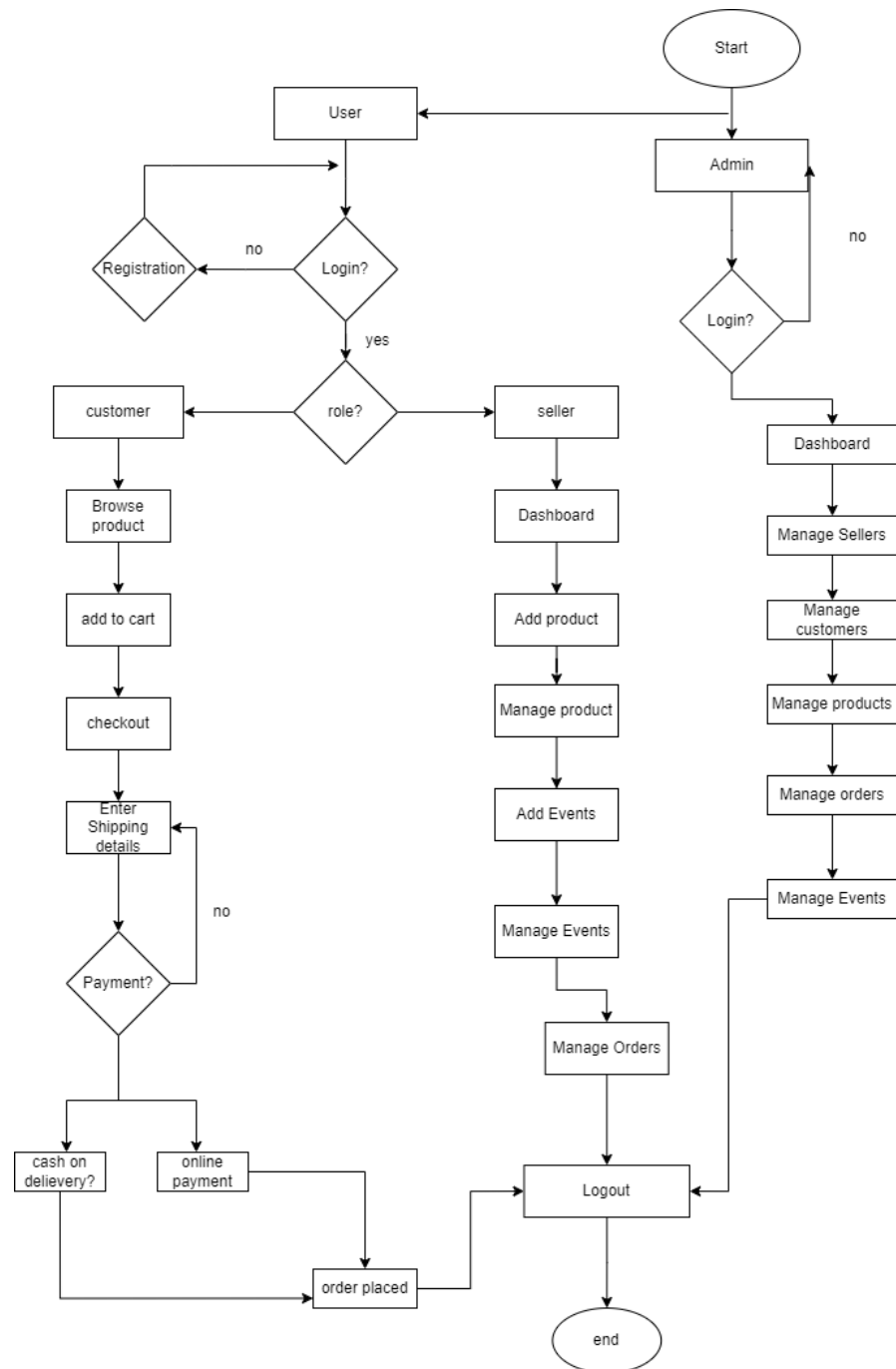


Figure 7: Flow chart of system

User Interface Design

The user interface (UI) design for FarmPal focuses on simplicity, accessibility, and ease of use to cater to its primary users: farmers, manufacturers, and administrators. The platform aims to streamline the purchase of farming equipment, seeds, and fertilizers directly from manufacturers, enhancing the purchasing experience and supporting informed decision-making.

General Design Principles:

Clean and Intuitive Layout: Simple, easy-to-navigate interface with minimal clutter.

Responsive Design: Optimized for both desktop and mobile use, ensuring accessibility in rural areas.

Consistent Design Language: Uniform color schemes, typography, and iconography across all pages for a cohesive experience.

Key Pages and UI Elements:

Home Page:

Features a search bar, product categories (Equipment, Seeds, Offers), and featured products/offers from manufacturers.

Product Detail Page:

Displays product images, detailed descriptions, reviews, ratings, and an “Add to Cart” option.

Shopping Cart Page:

Displays items added to the cart, with options to update quantities, remove items, and proceed to checkout.

Checkout Page:

Users enter their delivery and payment details, review order summaries, and place orders securely.

Order Tracking Page:

Provides real-time tracking and order status, with estimated delivery status and product details.

Seller Dashboard:

Allows manufacturers to manage products, events and track orders.

Admin Dashboard:

Enables system administrators to manage users, oversee orders, monitor transactions, and manage sellers.

User Experience (UX) Considerations:

- **Simplicity:** Ensures ease of use for farmers with limited technical skills.
- **Guided Flows:** Onboarding tutorials and clear navigation help first-time users.
- **Fast Load Times:** Optimized for low-bandwidth areas to ensure quick loading.
- **Multilingual Support:** The platform can be offered in multiple languages to cater to diverse regions.
- **Design Tools and Technologies:**
 - Modern UI frameworks like Tailwind or Material UI for responsive design.
 - Fonts like Roboto or Open Sans for readability.
 - Color schemes centered on agricultural themes (green, white).

This design prioritizes a user-friendly interface that enhances the purchasing experience for farmers, allowing them to easily find, compare, and buy agricultural products directly from manufacturers, while giving manufacturers a platform to manage their listings and orders efficiently.

Wireframe Design of system:

Wire-framing is a process where designers draw overviews of interactive products to establish the structure and flow of possible design solutions.

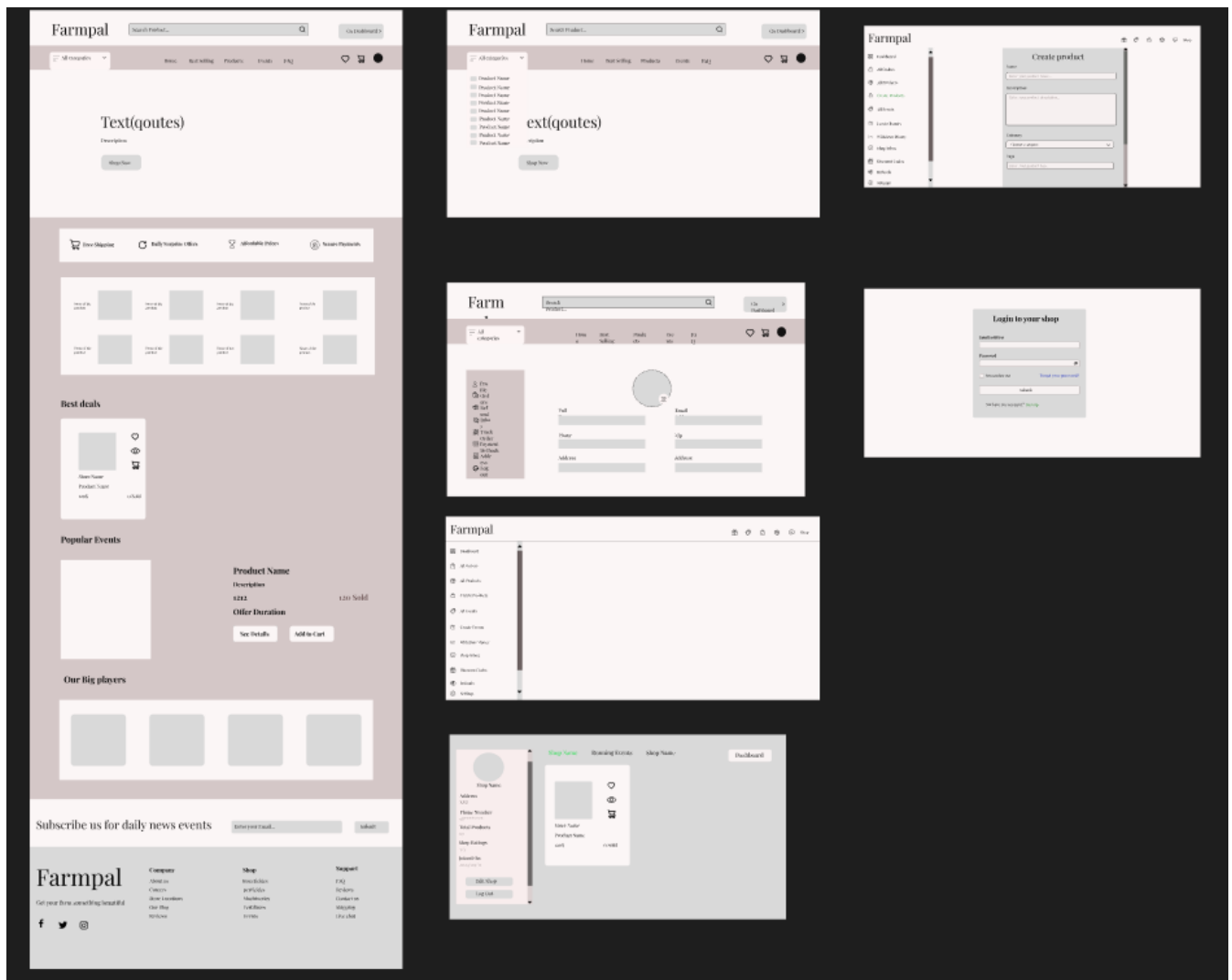


Figure 8: WireFrame Design of the system

Database Design:

A NoSQL database structure is a way of organizing data in a database that is different from traditional relational databases. Instead of using tables with predefined schemas, NoSQL databases use flexible data models that can manipulate data types, such as documents, key value pairs or column stores that span NoSQL databases are used to process large amounts of data and scale horizontally across multiple servers. Designed to be, making it ideally suited for modern applications with complex and dynamically changing data needs. This database prioritizes flexibility, scalability and efficiency over strict consistency to efficiently store and retrieve data in distributed environments.

Users
Id: string
fullName: String
email: String
Password: String
phoneNumber: Number
addresses: String
role : String
avatar: String
createdAt: Date

Seller
Id: string
fullName: String
email: String
Password: String
phoneNumber: Number
addresses: String
role : String
avatar: String
createdAt: Date

Event
Id: string
name: String
Description: String
Category: String
status: String
start_Date: Date
finishDate: Date
Tags: String
originalPrice: Number
discountPrice: Number
Stock: Number
Images: String
reviews: String
ratings: Number
ShopId: String
Shop: Object
sold_out: Number
created At: Date

Order
Id: string
cart: Array
ShippingAddress: Object
User: Object
totalPrice: Number
status: String
paymentInfo: Object
paidAt: Date
deliveredAt: Date
createdAt: Date

Product
Id: string
name: String
Description: String
Category: String
Tags: String
originalPrice: Number
discountPrice: Number
Stock: Number
Images: String
reviews: String
ratings: Number
ShopId: String
Shop: Object
sold_out: Number
created At: Date

Figure 9: Schema Design For Database

4.2 Algorithm Details

Content-Based Filtering

Content-based filtering is a recommendation system approach that suggests items to users based on the characteristics or features of items they have previously interacted with. This method relies on the attributes of the items and a user's history or preferences, rather than on interactions between users (as in collaborative filtering).

- **Similar Product Recommendation:**

In product recommendation system, the goal is to suggest items similar to a product a user has viewed or interacted with. One effective way to achieve this is by comparing the product descriptions and finding products that are semantically similar. Cosine similarity is a technique commonly used for this purpose, which measures the similarity between two product descriptions by treating them as vectors in a multi-dimensional space.

- **Cosine Similarity:** Cosine similarity calculates the cosine of the angle between two vectors. The smaller the angle, the more similar the two vectors (and hence the two product descriptions). It ranges from -1 (completely dissimilar) to 1 (completely similar). For product recommendations, we compute the cosine similarity between the description of a selected product and the descriptions of other products.
- **Vectorizing Descriptions:** Since product descriptions are textual data, they must be converted into numerical vectors before cosine similarity can be applied. One common method to achieve this is **TF-IDF (Term Frequency-Inverse Document Frequency)**, which converts text into a numerical representation based on the frequency of words in a document while giving more weight to important words.

Steps for Recommendation:

1. **Vectorize Product Descriptions:** Convert each product description into a TF-IDF vector.
2. **Calculate Cosine Similarity:** Compute the cosine similarity between the target product's description and every other product's description.
3. **Sort by Similarity:** Rank the products based on their similarity scores, with higher scores indicating more similar products.

4. **Recommend Products:** Select the top-N products with the highest similarity scores and recommend them to the user.

Category-based Filtering

Category-based filtering is a recommendation method where items are suggested to users based on their interest in predefined categories. Each item in the system is assigned to a category, such as Seeds, Fertilizers, or Farming Equipment, which helps classify products efficiently.

When users interact with items by browsing, purchasing, or clicking on them the system records these interactions and identifies the categories they are most interested in. For instance, if a user frequently explores the Seeds category, the system will recommend more products from that same category.

This method is straightforward and effective for providing users with relevant recommendations based on the categories they engage with, making it a useful approach for platforms with well-defined product classifications.

Chapter 5: Implementation and Testing

5.1 Implementation

The tools and development method used for development of the system is deal within the implementation phase. This phase of system development is to translate the system design into source code. The main goal of the phase is to write source code and internal documentation so that conformance of the code to its specification can be easily verified and debugging, testing and modification are eased. FarmPal is a web application easily accessible by specific users. It has easy user interface design and it is so user friendly that an unknown user can easily use it without any complexity.

5.1.1 Tools Used

- Editor: Text editor for the development of the system use the Visual Studio Code
- Design: Figma
- Front End Development: The user interface of the system where normal users interact with the system. Front end consists of different coding tools where the codes are written to develop the system. FarmPal uses the following front-end tools:
 - i. HTML
 - ii. CSS
 - iii. JavaScript, React JS, Next JS
 - iv. Tailwind CSS
- Back End Development: The language and database used by the system are:
 - i. Backend: Node JS, Express JS, Mongoose
 - ii. Database: Mongo DB
- CASE Tools For documentation:
 - i. MS Office
 - ii. Draw.io

5.1.2 Implementation Details of Modules

1. User Interface Module

Objective: Provide a seamless and user-friendly interface for farmers to browse products, view details, and make purchases.

Product Browsing:

Product List View: Displays a list or grid of products (seeds, fertilizers, equipment) with filter and search options.

Product Detail Page: Shows detailed information about a selected product, including specifications, price, and manufacturer details.

Cart and Checkout:

Shopping Cart: Allows users to view and manage items they wish to purchase.

Checkout Process: Facilitates the purchase process including user details, shipping options, and payment integration

Account Management:

User Registration and Login: Users can create accounts, log in, and manage their profiles.

Order History: Users can view their past orders and track the status of current orders.

Components:

Product List Component: Displays a list of products.

Product Detail Component: Shows detailed information for a single product.

Cart Component: Manages the shopping cart and checkout process.

User Account Component: Handles user registration, login, and profile management.

2. Backend API Module

Objective: Handle requests from the frontend, manage product data, and facilitate interactions between farmers and manufacturers.

Product Management:

Product Catalog: API endpoints for retrieving product lists, categories, and details.

User Management:

Authentication: Endpoints for user registration, login, and authentication.

User Profile: Endpoints to manage user profiles and order history.

Order Processing:

Cart Management: Endpoints to manage shopping carts and handle checkout requests.

Order Management: Endpoints for order creation, tracking, and history.

Integration with Manufacturers:

Product Listings: Manufacturers can list new products and update existing ones.

Offers and Events: APIs for manufacturers to create and manage promotional offers and events.

Modules:

Product API: Manages product-related requests.

User API: Handles user authentication and profile management.

Order API: Manages shopping cart and order processing.

Manufacturer API: Allows manufacturers to manage product listings, offers, and events.

3. Database Module

Stores and manages data related to products, users, orders, and manufacturers

.

4. Security Module

Implementation Details:

Data Protection:

Encryption: Encrypt sensitive data such as passwords and payment information.

Access Control:

Authentication: Secure user login and access to personal data.

Authorization: Control access to various parts of the system based on user roles.

Modules:

Security Middleware: Handles encryption, authentication, and authorization.

5.2 Testing

After the implementation of all codes, the testing process is done. At first unit testing is done for each modules to check each and every functionalities perform well and then as a whole system testing is done to check if the integrated modules work perfectly with each other's coordination.

5.2.1 Test Cases for Unit Testing

Table 2: Test Case for Unit Testing

S.N.	Test Case ID	Test Description	Steps Executed	Expected Result	Pass / Fail
1.	UT-001	Entering Wrong Login Details	Incorrect Login details was entered	Message showing invalid login details should be displayed	Pass
2	UT-002	Entering Right Login details	Login detail was entered	Logged in and landed to landing page	Pass

3	UT-003	Adding Products	1. Go to Shop dashboard 2. Click on Create Products 3. Add desired Products	New Product should be added.	Pass
3	UT-004	Adding Events	1. Go to Shop dashboard 2. Click on Create Events 3. Add desired Event	New Event should be added	Pass
4	UT-005	Placing Orders	1. Click on Add to Cart on desired product. 2. Click on Buy 3. Select payment option and place order.	The order should be placed and displayed in order page.	Pass
5	UT-006	Payment System Integration	1. Place order and click on checkout options and select payment and pay through paypal	Payment should be successful and payment info should integrate with database	Pass
6	UT-007	Event time system checking	1. Add Event 2. Give start date and end date	Event should End after the time cross the given end date	Pass

7	UT-008	Checking the chat System	Send message from seller to user and vice versa	Messages should be sent and received by both users	Pass

5.2.2 Test Cases for System Testing

After logging in, the user was able to access various features of the web app, such as placing orders, payment using stripe, paypal, browse products and event and communicate with sellers. And for the seller they were able to create product, event and manage them too.

The system testing involved testing each of these features to ensure that they were functioning correctly and efficiently. During the system testing phase, various types of testing were conducted, such as functional testing, usability testing, performance testing, and security testing. Functional testing was performed to ensure that the system was meeting all the functional requirements specified in the requirement analysis phase. Usability testing was done to ensure that the system was easy to use and navigate for the end-users. Finally, security testing was performed to ensure that the system was secure and protected against any unauthorized access or data breaches. Overall, the system testing phase was critical in ensuring that the system was functioning correctly and efficiently and meeting all the requirements specified in the requirement analysis phase. The testing also revealed errors in the system, which were then addressed and resolved to ensure that the system was reliable, efficient, and user friendly.

5.3 Result Analysis

During the successful completion of the testing phase signifies the comprehensive development process, which involved various stages of planning, design, implementation, and testing. The system has undergone several rounds of testing, including API testing, unit testing, and system testing, to ensure that it meets the functional and non-functional requirements specified in the requirement analysis phase. The API testing was performed to test the communication between different modules of the system, ensuring that all the components were communicating effectively and efficiently. The unit testing was conducted to test individual modules of the system to ensure

that they were working correctly and efficiently. The system testing was performed to test the system as a whole, ensuring that all the components were integrated and functioning correctly. All the functionality of the application was running smoothly, and all the test cases were successfully passed. The testing phase also helped to identify any bugs or errors in the system, which were then addressed and resolved. The successful completion of the testing phase indicates that the project is ready for submission. However, it is essential to note that the system is not a static system and will require continuous maintenance and updates to ensure that it remains relevant and up-to-date. Therefore, future enhancements and updates to the system should be considered to keep up with the changing user needs and technological advancements. In conclusion, the successful completion of the testing phase is a significant milestone in the development of the system. The system is now ready for submission, and the results obtained from the testing phase demonstrate that the system is reliable, efficient, and user-friendly. However, it is crucial to keep in mind that the system will require continuous maintenance and updates to ensure that it remains relevant and up-to-date. The final application is running efficiently without any performance deficiency. All the functionality of the application is running well. Thus, after analysis of results achieved from different testing phases, the project is finalized and ready for submission.

Chapter 6: Conclusion and Future Recommendations

6.1 Conclusion

The FarmPal e-commerce platform project concludes with the successful creation of a user-friendly, comprehensive marketplace that directly connects farmers with manufacturers, eliminating the need for intermediaries. This project addresses key challenges faced by farmers in sourcing and purchasing farming equipment, seeds, and fertilizers by offering a streamlined digital platform.

Through its various modules such as product browsing, order management, manufacturer integration, and user account management the platform ensures an efficient, cost-effective, and accessible buying experience. Additionally, the incorporation of features like product filters, notifications, and secure transactions enhances both usability and security.

The system's backend supports real-time interactions between farmers and manufacturers, promoting transparency, and providing direct access to offers and promotions. Moreover, the analytics and reporting module offers valuable insights into sales performance and user behavior, helping manufacturers make informed decisions.

Ultimately, FarmPal enhances agricultural procurement by improving accessibility, reducing costs, and supporting informed decision-making for farmers, all while fostering a direct and beneficial relationship between buyers and sellers

6.2 Future Recommendations

Looking ahead, FarmPal can explore the integration of recommendation systems powered by machine learning. This would enable users to receive personalized suggestions for agricultural products based on their preferences and requirements. Integrating a variety of payment methods, including local and global gateways, and offering microfinancing options would make purchasing expensive equipment easier and more accessible for farmers. Incorporating logistics management and real-time delivery tracking can improve transparency and the overall user experience. Providing estimated delivery times and shipment tracking helps users plan their purchases better. Scaling the platform to serve international markets by partnering with manufacturers and logistics

companies globally can enhance its reach, offering cross-border agricultural products to a broader audience. Implementing block-chain technology could ensure supply chain transparency, traceability, and authenticity of farming products, helping farmers verify the source and quality of the goods they purchase. Adding social features such as community forums or chat groups would allow farmers to share experiences, reviews, and best practices. This peer-to-peer knowledge exchange can create a supportive community around the platform.

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Appendices

Popular Events



Power Weeder MD6

95645 jasouhdasoiudb

~~1299~~ 1199

120 sold

14 days 10 hours 26 minutes 19 seconds

See Details

Add to cart

FarmPal



Go Dashboard >

All Categories

Home

Best Selling

Products

Events

FAQ




Only The Best For Your Farm


Lorem ipsum dolor sit amet consectetur adipisicing elit. Totam consequatur impedit quis cum sapiente culpa, voluptates illo, labore repellat nobis alias accusamus vero ipsa ex corrupti quibusdam enim minus delectus!

Shop Now


Best Deals




Jhon Deere
MK3004 WHEEL TRACTOR
★★★★☆
\$ 10499 231 sold
\$ 10488




Supeer Bio
Vanguard 1500
★★★★★
\$ 26 28\$ 57 sold



Test
Rice Mill
☆☆☆☆☆
\$ 195 200\$ 56 sold



Muktinath Agro
Onion
☆☆☆☆☆
\$ 1.6 1.7\$ 11 sold



Test
Power Weeder MD6
★★★★★
\$ 1199 1299\$ 2 sold

FarmPal



Dashboard

- All Orders
- All Products
- Create Product
- All Events
- Create Event
- Withdraw Money
- Shop Inbox
- Discount Codes
- Refunds
- Settings

Overview

Account Balance (with 10% service charge)
\$10383.12
[Withdraw Money](#)












All Orders
2
[View Orders](#)

All Products
1
[View Products](#)

Latest Orders

Order ID	Status	Items Qty	Total	
66e49adadeca7596a6...	Delivered	1	US\$ 11536.8	→
66e06edd091730fb17...	Delivered	1	US\$ 11536.8	→

1-2 of 2 < >

-  Dashboard
-  All Orders
-  All Products
-  **Create Product**
-  All Events
-  Create Event
-  Withdraw Money
-  Shop Inbox
-  Discount Codes
-  Refunds
-  Settings

Create Product

Name *

Enter your product name...

Description *

Enter your product description...

Category *

Choose a category












Tags

Enter your product tags...

Original Price

Enter your product price...

Price (With Discount) *

-  Dashboard
-  All Orders
-  All Products
-  Create Product
-  All Events
-  Create Event
-  Withdraw Money
-  **Shop Inbox**
-  Discount Codes
-  Refunds
-  Settings



Sudip Pandey



hello

1 day ago

hello there

1 day ago



Enter your message...



FarmPal

Search Product...

All Categories


Home

Best Selling

Products

Events

FAQ



Rice Mill

Capacity: 120-150 Kg/hr Power: 2.5 Hp Weight: 640x400x1165 mm Body Material: Iron Mill Type: Electric


195\$ ~~200\$~~

-

1

+

Add to cart



Test

(4.00/5) Ratings


Send Message

1 items

+

1

-



Rice Mill

\$195 * 1

US\$195

Item added to cart successfully!

Checkout Now (USD\$195)

FarmPal

Search Product...

Go Dashboard >

All Categories

Home

Best Selling

Products

Events

FAQ

0

1

000000

1.Shipping

2.Payment

3.Success

Shipping Address

Full Name

Email Address

Kapil Pokhrel

shekharthapa6767@gmail.com

Phone Number

Zip Code

Country

City

Choose your country

Choose your City

Address1

Address2

Choose From saved address

subtotal:

\$195

shipping:

\$19.50

Discount:

-

\$214.50

Coupon code

Apply code

Go to Payment

Source Code:

```
// Helper function to tokenize and clean the text
function tokenize(text) {
  return text
    .toLowerCase()
    .replace(/[^a-zA-Z0-9 ]/g, '')
    .split(' ')
    .filter(token => token.length > 0);
}

// TF function: Count word frequency in a single document
function termFrequency(term, document) {
  const tokens = tokenize(document);
  const count = tokens.filter(token => token === term).length;
  return count / tokens.length;
}

// IDF function: Inverse document frequency across all documents
function inverseDocumentFrequency(term, documents) {
  const numDocsWithTerm = documents.filter(doc =>
tokenize(doc).includes(term)).length;
  return Math.log(documents.length / (1 + numDocsWithTerm));
}

// TF-IDF vector for a document
export function calculateTfidfVector(document, documents) {
  const tokens = tokenize(document);
  const uniqueTokens = [...new Set(tokens)];
  const tfidfVector = uniqueTokens.map(term => {
    const tf = termFrequency(term, document);
    const idf = inverseDocumentFrequency(term, documents);
    return tf * idf;
  });
  return tfidfVector;
}

// Cosine similarity between two vectors
export function cosineSimilarity(vecA, vecB) {
  const dotProduct = vecA.reduce((sum, a, idx) => sum + a * vecB[idx], 0);
  const magnitudeA = Math.sqrt(vecA.reduce((sum, a) => sum + a * a, 0));
  const magnitudeB = Math.sqrt(vecB.reduce((sum, b) => sum + b * b, 0));
  return dotProduct / (magnitudeA * magnitudeB);
}
```



```

const SimilarProducts = ({ data }) => {
  const { allProducts } = useSelector((state) => state.products);
  const [productData, setProductData] = useState();

  useEffect(() => {
    if (data && allProducts?.length) {
      // Exclude the current product from the list of products
      const otherProducts = allProducts.filter(
        (product) => product._id !== data._id
      );

      // Get descriptions for all other products
      const allDescriptions = otherProducts.map(
        (product) => product.description
      );

      // Calculate TF-IDF vector for the current product's description
      const dataVector = calculateTfidfVector(
        data.description,
        allDescriptions
      );

      // Calculate similarity scores for each other product
      const similarityScores = otherProducts.map((otherProduct) => {
        const otherProductVector = calculateTfidfVector(
          otherProduct.description,
          allDescriptions
        );
        const similarity = cosineSimilarity(dataVector, otherProductVector);
        return { product: otherProduct, similarity };
      });

      // Sort products by similarity in descending order and take top 3
      const sortedSimilarProducts = similarityScores.sort(
        (a, b) => b.similarity - a.similarity
      );

      // Set the sorted product data to the state
      setProductData(sortedSimilarProducts.slice(0, 3));
    }
  }, [data, allProducts]);

  return (
    <div>
      {data ? (

```

```

    <div className={`p-4 ${styles.section}`}>
      <h2
        className={`${styles.heading} text-[25px] font-[500] border-b mb-5`}
      >
        Similar Product
      </h2>
      <div className="grid grid-cols-1 gap-[20px] md:grid-cols-2 md:gap-[25px] lg:grid-cols-4 lg:gap-[25px] xl:grid-cols-5 xl:gap-[30px] mb-12">
        {productData &&
          productData.map(({ product }, index) => (
            <ProductCard data={product} key={index} />
          ))}
      </div>
    </div>
  ) : null}
</div>
);
};

export default SimilarProducts;

```

```

import React, { useEffect, useState } from "react";
import { useSelector } from "react-redux";
import { productData } from "../../static/data";
import styles from "../../styles/styles";
import ProductCard from "../Route/ProductCard/ProductCard";

const SuggestedProduct = ({ data }) => {
  const { allProducts } = useSelector((state) => state.products);
  const [productData, setProductData] = useState();

  useEffect(() => {
    const d =
      allProducts && allProducts.filter((i) => i.category === data.category);
    setProductData(d);
  }, []);

  return (
    <div>
      {data ? (
        <div className={`p-4 ${styles.section}`}>
          <h2
            className={`${styles.heading} text-[25px] font-[500] border-b mb-5`}

```

```

    >
      Related Product
    </h2>
    <div className="grid grid-cols-1 gap-[20px] md:grid-cols-2 md:gap-
[25px] lg:grid-cols-4 lg:gap-[25px] xl:grid-cols-5 xl:gap-[30px] mb-12">
      {productData &&
        productData.map((i, index) => (
          <ProductCard data={i} key={index} />
        ))}
    </div>
  </div>
) : null}
</div>
);
};

export default SuggestedProduct;

```