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SMART FARMER MARKET: AN ONLINE PLATFORM FOR AGRICULTURAL PRODUCT MARKETING BY FARMERS TO CUSTOMERS

Mr. Manjunatha S 1, Ms. Vidya G 2

Professor [1], Student [2]

Department of Computer Science and Applications

S.E.A College of Science, Commerce & Arts, Bangalore manjus.reddy@gmail.com1,

vidyavidya589@gmail.com2

Abstract

The fast development of digital technology and web-based applications has generated numerous chances for enhancing agricultural activities and linking farmers with customers. Despite this advancement, most farmers have continued to depend on traditional marketing processes which include the use of intermediaries, lack of market accessibility, no price transparency, and lack of information concerning agriculture. This paper presents the development of Smart Farmer Market, a web-based agricultural marketplace with a central system through which farmers will be able to directly sell their agricultural products to customers. The system has specific functionalities for Farmers, Customers, and Administrators. Farmers can perform activities such as registration, managing their profile, adding and managing products, viewing orders, monitoring sales, viewing weather information, crop disease prediction, and interacting with a multilingual voice assistant. Customers can perform functions such as searching for products, viewing product details, adding products to cart and Wishlist, placing orders, payment of orders, order tracking, and giving feedback. Administrators can perform activities such as managing farmers, customers,

products, orders, payments, and overall activities in the system. The development of the system is done using Python, Flask, HTML, CSS, JavaScript, Bootstrap, and SQLite3.

Introduction

The fast advancement of ICT has brought about many changes in the manner through which business operations and services are done. Web based application tools are increasingly being used to offer information, conduct transactions, connect users and improve access to various services. Agriculture is among the crucial sectors that ICT can be used in to enhance communication between farmers, customers and agriculture services providers.

Farmers have been depending on marketplaces, wholesalers, retailers and intermediaries to sell agricultural produce. These approaches might limit the ability of farmers to reach out to larger number of customers and even face difficulties in selling their products at fair prices. Customers on the other hand might face problems in locating agricultural produce, price comparison and buying agricultural products directly from farmers.

In order to solve these problems, Smart Farmer Market is created as a centralized online agricultural marketplace. The system links farmers and customers to a single digital platform and gives Administrators central management capabilities. Through the platform, farmers can sell their agricultural products directly while customers can locate products and buy them. The application tool incorporates weather information, crop disease prediction and multilingual voice assistant in English, Kannada, Hindi, Telugu and Tamil.

Problem Statement

Marketing of agricultural products is generally carried out in traditional manner. Farmers might not get adequate options to reach customers directly and therefore become dependent on intermediary parties and local markets. Manual processing of product details, order details, payments, and sales record could increase the burden on farmers.

Consumers might have troubles in locating agricultural products, comparing available products, making orders, and tracking purchases. Moreover, farmers need timely information regarding weather and crop diseases. Hence, the need for a centralized, secure, user-friendly, and agriculture oriented digital platform for connecting farmers with customers along with offering useful agricultural related services exists.

The Smart Farmer Market is designed with an intention to solve these problems by having features such as:

- Farmer registration and management
- Agricultural product management
- Customer product browsing and search
- Shopping cart and wish list
- On-line ordering and payment
- Order tracking
- Sales and income management for farmers
- Weather information
- Crop disease prediction
- Multilingual voice assistance
- Customer feedback and review
- Centralized administration

Literature Review

Development of digital agriculture and e-commerce platforms has gained more attention as it can be enhanced through information technology that would make communication and information more accessible along with connectivity between agricultural activities. The use of digital agriculture platforms will allow farmers access to market information, agricultural services, and customer through online methods.

Literature associated with agricultural e-commerce has discussed the benefits associated with connecting producers directly with consumers through an online platform. Such platforms can enhance accessibility for the market as well as give opportunities to farmers to have access to customers outside their local markets.

Smart farming literature has also shown the significance of decision-making based on the technology used in agriculture. Weather information will help farmers to plan their agricultural activities whereas crop disease information will allow farmers to detect any problem associated with their crops.

According to these domains, the need arises for systems that incorporate agricultural product marketing along with agricultural information system and easy-to-use digital support. Smart Farmer Market fulfils the said requirement by incorporating features like market place between farmers and customers, weather information, disease prediction and voice assistance in different languages.

Architecture of Proposed System

The proposed system of Smart Farmer Market adopts the three-layer architecture, which includes the Presentation Layer, Application Layer, and Database Layer. The segregation of the layers ensures an independent organization of the user interface, application logic, and database management respectively. Three primary user roles, including Farmers, Customers, and Administrator, have been defined within the system.

Presentation Layer

The Presentation Layer offers the interface through which Farmers, Customers, and Administrators can use the Smart Farmer Market. HTML, CSS, JavaScript, and Bootstrap have been used in developing the Presentation Layer.

Application Layer

The Application Layer consists of the core business logic of the Smart Farmer Market. Python and Flask have been adopted for the implementation of authentication, role-based access, farmer management, customer management, products, cart, Wishlist, orders, payment, tracking, weather information, disease prediction, voice assistant operations, feedback, and administration activities.

Database Layer

The Database Layer stores and fetches the data necessary for the functioning of the application. SQLite3 has been used for storing the structured data related to administrators, farmers, customers, products, categories, cart, Wishlist, orders, order items, payments, feedback, weather information, disease prediction, and voice assistant.

System Components

User Interface Module

User Interface Module serves as the main interaction medium between Users and Smart Farmer Market System. The User Interface Module facilitates a well-organized and efficient interface for Farmers, Customers and Administrators.

Authentication and Authorization Module

It takes care of the user registration process, login process and provides access based on their roles. Farmers, Customers and Administrators have access to functionalities based on their requirements.

Farmer Management Module

Farmers can register and manage profile, add, update and delete products, manage quantity, view orders, sales and income, access weather data, disease prediction and voice assistant.

Customer Management Module

Customers can register and login, manage their profile, browse/search products, see product detail, shopping cart and wish list functionality, order placing and payment process.

Product Management Module

Farmers can add and manage products in the market place. Products include product name, description, category, price, quantity, and product image.

Cart and Wishlist Module

The Cart Module allows the customers to store products temporarily and manage quantities before check out. The Wishlist Module allows the customers to store their favourite products.

Ordering and Payment Module

Order Module deals with purchases, customer, farmer details, products, quantity, amount, delivery details, and order status. Payment Module deals with payments and transaction details linked to orders.

Weather Information Module

This module gives farmers information on the weather like location, temperature, humidity, forecast, and weather conditions available.

Crop Disease Prediction Module

This module helps farmers to recognize the possible crop diseases with crop related images or data and predict possible disease, its symptoms, treatment information and predictions.

Multilingual Voice Assistant Module

Voice Assistant works in English, Kannada, Hindi, Telugu, and Tamil languages. It is capable of processing voice commands and giving responses related to farming and system functionalities.

Feedback and Review Module

Customers will be able to give rating and reviews regarding their purchasing experience and agricultural products.

Administrative Management Module

Administrators will be able to manage farmers, customers, products, categories, orders, payments, transactions, feedbacks, and system activities.

Database Management Module

The Database Management Module is responsible for database management functions such as storing and retrieving data related to the marketplace and agriculture via SQLite3 database engine.

Methodology

Requirement Analysis

The functional and non-functional requirements are determined by analysing the requirements of Farmers, Customers, and Administrators.

System Design

The system design includes architecture design, database design, ER Diagram, use case diagram, activity diagram, sequence diagram, and data flow diagram.

Implementation

The Smart Farmer Market is implemented using Python, Flask, HTML, CSS, JavaScript, Bootstrap, and SQLite3.

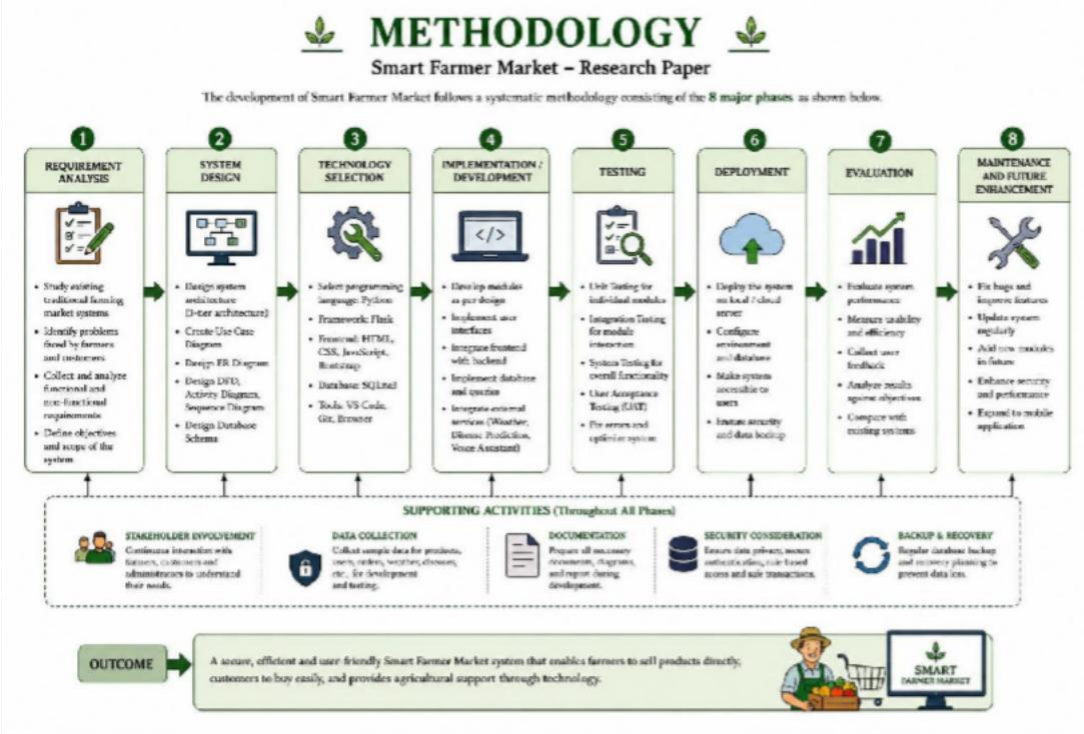
Testing

The system is tested functionally, unit tests, integration test, system test, and user tests.

Evaluation

The evaluation is done on the basis of usability, functionalities, performance, accessibility, security, and direct product marketing from agriculture.

Figure 1: Methodology



Data Security and System Management

Authentication

The access to system security features is available only for registered and authorized users.

Role-Based Access Control

Farmers, Customers, and Administrators have distinct access privileges due to their different roles.

Information Protection

Details about users, products, orders, payments, and agriculture are stored and retrieved through suitable application components.

Transaction Management

Orders and payments data are kept systematically in relation to specific customers and orders.

Data Validation

Data validation is used in order to avoid incorrect and incomplete information.

Privacy Protection

Information about users is restricted to appropriate functions and users in order to protect private data and transaction information.

Limitations

- The web-based marketplace and information services require a stable internet connection.
- The information about the weather is provided by an external weather service.
- The accuracy of disease prediction may depend on the quality and suitability of the uploaded crop images or input information.
- Users with low digital literacy may need to get initial instruction
- The payment option may depend on the payment service selected.
- System performance may deteriorate due to the increase in the number of users and transactions.
- The delivery of the products is not within the scope of the web application.
- Ongoing maintenance and upgrades are required.
- Voice assistant performance may depend on language recognition and microphone quality.

Challenges

- Safe management of farmer, customer, order, and payment information.
- Fair authentication and role-based authorization.
- Maintenance of product information uploaded by various farmers.
- Ensuring accuracy of inventory and orders information.
- Secure handling of payment and transactions records.

- Safe and timely provision of weather information.
- Simultaneous improvement in disease prediction accuracy.
- Multilingual assistance through the voice assistant.
- Development of an easy-to-use interface for all user digital literacy level.
- Good performance in spite of many users and products in the database.
- Avoidance of inaccurate, incomplete or duplicate information.
- Reliable order tracking and transactions records.
- Data backup to protect database from losing any data.

Future Scope

- A separate mobile application can be created.
- Crop disease detection can be enhanced using AI and deep-learning methods.
- Crop and product recommendation system using AI can be developed.
- Real time weather alerts and agricultural notifications can be provided.
- Voice based farmer dashboard can be developed.
- Languages of more regions can be supported.
- Real-time product and delivery tracking facility can be implemented.
- Secure real time payment gateways can be implemented.
- Automatic generation of digital invoices and transaction receipts can be implemented.
- Farmer analytics and sales reporting system can be developed.
- Price prediction and agricultural market trends analysis can be developed.
- Crop recommendation system based on soil, weather and location can be developed.
- Cloud deployment can increase scalability and backup abilities.

- Agricultural services of government and other agricultural platforms can be integrated.
- Blockchain technology for transaction and supply chain tracking can be considered.

Conclusion

Smart Farmer Market provides a central web-based method for bringing together farmers and customers within a digital agricultural market. This framework allows farmers to directly control and sell their agricultural goods, while the customer is able to browse for products, order them, pay for them, track their purchase, and give feedback.

In addition to these functions, the framework goes beyond the limits of e-commerce by offering weather details, crop diseases predictions, and a multilingual voice assistant. The availability of the languages of English, Kannada, Hindi, Telugu, and Tamil makes it easier for farmers.

Using Python, Flask, HTML, CSS, JavaScript, Bootstrap, and SQLite3 proves to be an appropriate technical basis. Therefore, the Smart Farmer Market illustrates how web technologies can facilitate communication between farmers and customers, market agricultural products, provide farming information, and create a convenient digital environment for farmers and customers.

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