Design and Development of a Crop Availability Platform for Enhanced Agricultural Supply Chain Efficiency

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Abstract - Crop Trading involves the buying and selling of crops that have been produced from the farming industries. It gives greater access for consumers or buyers to various crops, often at more affordable prices. With the use of technology, the farmers will be able to adopt modern ways of farming like this portal, as it gives more opportunities for farmers to offer their crops and expand their accessibility to buyers. This study aimed to provide a website for farmers and buyers who have problems in terms of crop trading. The researchers used Rapid Application Development as a method in making the project possible. This methodology helped the team to give much faster development and produce a high-quality system. Identifying the errors through testing and going back to design and development to find and fix the mistakes to avoid application failure. After thorough research and development, the researchers were able to meet the objectives of the application. The website will showcase different crops as what farmers are input provided their necessary information for easy transactions for buyers, showing currently available and unavailable crops in a community, if some buyers reserved their products, and a message for customers about their reservation of crops, an exhibition of most and the least profitable crops to provide support for farmers' decisions with the used of the statistical chart and chat box to enable farmers and customers to communicate.

INTRODUCTION

Project Context

In an organization, information plays an essential role because it allows us to make future decisions. The information has a great significance in decision-making since the organization offers the correct information and gives the proper decision and verdict on the organization. An information system must be set up to collect, process, store, and recover data in every organization, big or small. Such activities have been carried out in the past generation in manual methods like pen and paper, which take a great deal of time. Companies and entrepreneurs are now using modern technology to simplify their processes and services. The information system plays an essential role in the data processing and decision-making of an organization and performance of an enterprise will inevitably be impacted.

In most farmers face significant and relative problems, such as difficulty selling their products, low- buying price, and oversupply. There are situations where buyers may be dissatisfied with the product because it is not oriented to the quality standards on what they wanted it to be. Those are examples of common problems based on researchers' survey from farmers as their respondents.

Most of the lives of the people in which member of (CROPSY) located are focused on agricultural products, dining, and tourist spots in the local regions. In there is a broad range of yield and productivity in six crops. By mutual agreement, long-term relationships sell products there and the way they buy their crops individually, which reduces the possibility of meeting potential customers outside the group. CROPSY is associated with the Office of the Provincial Agriculturist (OPAG), Department of Agriculture Research Division, and local head farmers, which helps the members of the stated association of engaging different ways and strategies of farming, allowing farmers to upscale their knowledge, to expand their capabilities and to adopt modern methods of agriculture. It is essential for a company to be online, whether this is a website, an e-commerce portal, a social network page, or a combination of all three, to significantly benefit from running an online business. One has to expand the customer base and get input from the consumer because some potential customers are looking for a particular product or business through the Internet for

purchase. More than that, the online marketing business is growing increasingly over the last five years, and it is more likely that goods will be bought and sold on the Internet, but that products will be used digitally. Due to their economic growth and their rich agriculture climate, is a developing society. The researchers came up with the study to put forward a system to make substantial stocks, purchases, and sales for farmers and customers. This program is a trading platform for online selling, which would improve the efficiency of online communication and transaction for buyers and sellers.

The proposed system also provides customers with crop reservations and customers with updates when their crop reservation is ready to be picked and harvested. With the latest trends, different organizations commonly use online platforms that would help farmers adapt to smart farming or leverage advanced technology.

Therefore, this system would fulfill the modern way of trading crops and products online to gain many customers. With this portal, anyone can view what is available and in demand by interested buyers rather than the traditional way of selling it that would require a great deal of time, effort, and money.

PURPOSE AND DESCRIPTION

The primary purpose of this project is to allow farmers, loyal customers, and potential customers or wholesalers to buy and sell online as they can connect easily with each other, to promote the goods of farmers to expand their customer base, and to create faster transactions and more accessible communications between the two parties. Likewise, this project can help trade crops in the community over the Internet for more immediate reservations and selling of crops.

The site is accessible to anyone, but only the CROPSY members can sign up for the system as farmers or sellers, while buyers can sign up and use the features to reserve crops online along with the agreed terms and conditions. The project also benefits customers as they do not need to spend time and energy to see the farmers individually to reserve the crops. Additionally, with the proposed system, reservation of desired crops is a lot faster whenever and wherever customers maybe for as long as they are connected to the Internet. This project will pose a significant help not just to the farmers and buyers but also to the association that the researchers selected by equipping them with the following features: exhibiting the most and least profitable crops, as CROPSY is made with the sole purpose of helping farmers engage more in the modern ways to improve farming, with this feature they will be given an idea on what they need to focus on to improve and control the possible problems like overproduction or scarcity, Statistical data helps the association to monitor the production and maintain the quality of products by advising farmers and help them seek more opportunities.

OBJECTIVE OF THE STUDY

This project's general target is to serve as an auxiliary for the improvement of crop trading using an online platform by providing a web application and data analysis that has useful information and supporting decision making for our farmers in CROPSY.

SCOPE AND LIMITATIONS OF THE PROJECT

CROPSY runs on any device that can run web browsers, such as desktop, laptops, and even mobile phones as lon as the device being used is connected to the Internet. The project focuses on reserving, buying, and selling of crops through an online website. Members of CROPSY are only allowed to sign up as potential sellers or farmers. Still, anyone can sign up from the loyal customers of our farmers or as to how we call them in the Philippines, "suki" to the people that were just getting started or wanting to start buying crops from the farmers themselves; along with the agreed terms and conditions featured on this system.

The people who are CROPSY members who also owned agricultural lands in most of the place can only sign up as farmers on the system. Customers can be anyone interested in buying crops from and anyone can sign up as customers, and they need to fill up some form for agreements that are usually concerned for future transactions. Crops' details should be updated by the farmers/sellers when actual payment and negotiation of settlements happen between both farmers and customers, and this phenomenon is excluded from the system scope. Thus the system is only a virtual site for buyers and sellers.

The system limits only the project's primary purpose; thus, problems about the crops' quality are not a concern. Technically, the proposed project focuses

only on the site's process and transactions; the crops' physical aspects are excluded.

REVIEW OF RELATED LITERATURE

This section discusses the related literature that served as the overview and basis for the study to give more reason and understanding of the project to develop clarity and comprehension in any course, it is necessary to review the various concepts, research methodologies, and analytical tools used by researchers earlier in their studies.

This would help the researchers grasp the research issue's implications more precisely and encourage researchers to update and develop the existing study system in the right direction. The earlier studies' findings will direct the researchers in the identification and comparison of hypotheses and objectives. This chapter briefly discusses the principles, research methods, analytical tools, and past studies findings that apply to this review.

RELATED LITERATURE

Countries have depended for centuries on trade in agricultural and food commodities to complement and supplement their domestic production. The uneven distribution of land resources and the impact of climatic zones on cultivating plants and animals have led to trade between and within continents. Historical patterns of settlements and colonization have led to the concept of trade patterns and infrastructure construction to support such trade.

In return, the developing country shall continue to import large amounts of other agricultural products, particularly tropical beverages, rubber, and fiber, into the developing country. Agricultural food needs will increase.

The developing countries, however, are not a regular trading bloc. While its net exports of tropical products will increase and import more and more temperate zone goods, significant net exporting of moderate zone goods will remain within the community.

In this chapter, the global trade prospects are focused, like all projections, on several assumptions regarding likely developments in policy that affect trade flows, as well as basic income, population, and productivity trends. Agricultural marketing efforts have focused on several areas, particularly infrastructure development, knowledge provision, farmers' training in marketing and post-harvest matters, and support for the development of a proper political environment

Review of Related System

This section discusses the systems and applications related to the application, which helped the researchers have an idea about algorithms and methods used for the study and development of the proposed system

Several existing systems and platforms address aspects of crop availability monitoring, trading, and supply chain management. Below is a review of key technologies, platforms, and research initiatives related to crop availability systems.

1. Digital Agricultural Marketplaces

These platforms connect farmers with buyers, improving market access and price transparency.

- Purpose: Provides real-time price and crop availability data from wholesale markets.
- Features:
  - Mandi price updates. SMS based alerts for farmers.
  - Online trading for select commodities.
- Limitations: Limited to government-regulated markets (mandis), lacks direct farmer-to-buyer transactions.

Platform: India

Mandi Trades takes up the opportunity to revolutionize life for farmers through a mobile app, substantially designed for farmers residing in India's rural areas. It's a one-step platform for Farmers where information about weather updates, crop prices, shop agricultural-based products, selling their produce, and agricultural news are all presented in one mobile application. This forum brings farmers and customers together in the farm value chain, promotes market data management and communication.

CropSwap

Crop swap is a mobile application that you can buy, sell or trade harvested fruits and veggies as well as seeds and plant starts; upload vegetables you are growing, and they will appear on the feed for everyone to see.

AgriTrade: India

This device enables farmers to sell their agricultural products straight to traders from all over India. AgriTrade is a Agriculture Marketplace android app that links farmers and traders across the whole world. In this marketplace app, farmers can list their farm products, and traders can search by the name, commodity, and position of essential agricultural products.

Farmers e-Market

A website and a mobile app are entirely dedicated to displaying and selling farmers' goods. It's a reality, not a dream. The Farmers ' Club has managed to develop a mobile farmers app. The breadth is more than one can imagine, and its Service to the public is enormous and commendable.

It may be used by a farmer or the public to buy or sell their agricultural products, livestock, poultry, fish, dairy and other agricultural products, nurseries and gardening goods, etc. It's an excellent place to sell and buy used cars, farm machinery, agricultural innovations, plants, bulbs, and homemade.

Related System Matrix

Differences and similarities of CROPSY related to existing systems are shown in Table 1. It shows in the table that most of the related systems have User Profiling where they can see the information of users like name, address, and contact number.

The second most common feature. short message that the system sends to people about news and updates within a short period.

The least common features are stages of crops and Weather updates. In Data Statistics, Crop Analyzing philosophy is based on various data collected from different sources like Statistical data.

Stages of Crops indicate the locations of crops from seed to fully grown and ready to harvest crops Stages of Crops indicate the stages of crops from seed to fully developed and ready to harvest crops. In the Weather forecast, In the developing fields of precision agriculture, weather

Information plays an increasingly important role, a farming Apart from all the existing systems' common features, "CROPSY" has features that enable the user to use Location- Based Service (LBS) and Reservation.

Location-Based Service helps the buyer to locate on what specific locations are crops located. Reservation plays an essential role in this system for buyers and sellers' convenience based on the availability and condition of crops.

Technical Background

The chapter describes the ways of technicality used by the researcher to create and finalize the function of technical processes.

Project Technology

MERN Stack is website builds that follows model, view, and controller-based architectural patterns, and it has an expressive, elegant syntax, which makes it object- oriented. Laravel strives to make the development process friendly to the developer without losing the flow of the system. The researchers chose this framework for the performance, features, and scalability it provides. It takes the pain out of development by easing everyday tasks used in most web projects, such as authentication, routing, sessions, and caching. Also, this framework allows researchers. This javascript library makes it easy to subscribe to channels and listen for events broadcast by their website, which helps them implement chat boxes to their website.

SMSGateway.me

SMSGateway.me is a website that allows users to turn their Android phones into an SMS gateway, enabling users to send and receive SMS messages programmatically using their API. An SMS API is a well-defined software interface allowing code to send short messages through an SMS gateway Considering that the SMS communications and internet infrastructures are separated mainly, SMS APIs are mostly used to address the gap between telecommunications carrier networks and the wider web. The researchers utilized this Service to give their system the ability to send SMS notifications to the users - buyers and farmers about their transactions to help them be updated or to affirm them that their orders went through, by way of SMS notification, so that even though the users are not connected to the Internet, they are still being notified.

HTML5

The researchers used this tool to create interactive web pages, arranging graphics, aligning media context like resizing images and videos added or linked to the page, formatting texts like changing font including weight,

size, and font-family, modifying it to either regular, bold, or italic, headings and also to link other web pages within the system by clicking on special text called hyperlinks which bring you to the next page, you can go to any place on the Internet whenever you want by clicking on the links. In simple words, HTML was used to change the look and style of the page, more importantly, on the content.

MySQL

The researchers used MySQL for data storing in an open-source database executable for all platforms that will keep all the data stored by the system. This tool was used as the system's primary

METHODOLOGY

The Construction phase ensures that the system is easy to understand and use. This phase enabled the team to test if CROPSY has effectively incited the features that are needed to be accomplished. From working software, the researchers used different technologies to achieve the objectives of the study. After the framework is created, it must be put through a set of tests to guarantee that each component performs agreeing to the client prerequisites. After identifying the errors through testing, the team went back to user design and development to fix and find the mistakes to avoid application failure.

Within this chapter, the initial section discusses the following program architecture specifications.

Figure 3. Rapid Application Development Model The mechanism for enhancing the strategy generated to produce prompt device performance is shown in Figure 3. The researchers used this strategy because it is designed to enable much faster advancement and higher quality structures than the traditional life cycle. In addition to producing a more reliable product in less time, rapid application creation often ensures superb customer service that perfectly suits the researcher's needs [15]. This model was used to describe a software development method that emphasizes rapid prototyping and iterative delivery. The phase required less long term planning

Requirements Planning

Prerequisites are arranging start with an assembly or arrangement of gatherings. In this arrangement, the group sets up a shared understanding of the improvement venture's target in common and the framework in specific. The group had moreover analyzed the scope of the proposed framework and its necessities.

Data Gathering

The Researchers conducted a formal investigation about the process of selling of crops. The respondents are the farmers who are members of CROPSY.

The written survey conducted found out that common problems include lack of financial support, crop failure, and unsteady buyers. CROPSY helps the farmers with their financial needs by giving them financial support and weekly training and workshops that focus on improving their farming; on the other hand, it allows the researchers to be part of this association by helping the farmers improve selling their crops

System Requirements

During requirements planning, the researchers have identified the following system requirements: the laptop/pc, and smartphone devices for developing and testing the application, the software tools requirements to establish the application design, which includes the tentative layouts of the user interface, which is the low fidelity prototype. It shows the mockup design

Usability & Compatibility

The system is a Web-based application that will run on PC or Mobile Phone as long as it is connected to internet connections. We also assured that the users could easily understand the system. Concerning that, during the implementation, the researchers will conduct basic training to understand using the system. This system's development redounds the benefit of farmers whose members of CROPSY, Digos City Davao del Sur, and the buyers from different locations.

Recovery

The system can be efficiently restored and recovered through MySQL. The user who has experience with the proposed program will modify the program and has a way to fix it.

Availability
The system can be accessed when the PC or Mobile Phone is connected to Internet Connection. Some features are only visible to different users. The farmers can both view the menu and farmers' page to post their available crops. The buyers can only view the homepage in which they can make the reservations.

Hardware & Software Requirements
To run the system in the computer, it requires a computer device or mobile phone that has at least one gigahertz (GHz) processor to run a search engine correctly, minimum RAM would be 1GBto make some tasks more accessible, the system will run in any operating system. It should have an internet connection; any search engines are compatible with this web- based system.

Analysis
It has become a crucial part of developing an information system. The various diagram structures work as to the whole system where the data is stored and records. They are essential in creating information systems as it helps understand procedures, programs, and structures and provides a systematic flow of events and processes of activities. The process flow of Web-Based Management System for Cropsy Agricultural Trading Portal is where the admin can view, manage and trace activity, reports, and assessment on every transaction from farmers to buyers and buyers to farmers. Also, to help our farmers' decisions, the exhibition of graphs shows the most profitable crops. Furthermore, the data are being collected; it is where analysis is being processed. It requires several operations to resolve the technical analysis issues and the requirement specification. This is where analysis becomes more iterative because the data being processed is continuously collected and analyzed simultaneously.

Coding
essential for implementation is system development. And the developer used some programming tools to make the program a success; the supporters used Visual Studio Code as a code-writing software editor. The researchers used HTML, CSS, JavaScript Languages with support from the Bootstrap platform, and Sass, a CSS

Testing
A procedure that should be worked out during the production process takes place in the testing phase. Testing was one of the software's most critical phases because it can assess the system's consistency and identify bugs and errors. The CROPSY was the selected association of the researchers to conduct a test with regards to understanding the risks of software implementation. The researchers conducted testing, which is the unit testing and user acceptance testing. The researchers also showed the alpha test and beta testing of the CROPSY. These tests are the process of evaluating a system if the software meets the user requirements.

Unit Testing
The development team performed this. Unit evaluations include testing of individual components or systems. It is usually written and run by advocates to ensure code fulfills its purpose and performs as intended

User Acceptance Test
Researchers conducted the final testing, which allowed the users to test and perform the system concerning the requirement agreed upon. After the development process, the researcher administered alpha and beta testing.
Alpha Testing is a type of acceptance testing: performed to identify all possible issues and bugs before releasing the system to the CROPSY Association. After this, the researchers step on the Beta Testing was performed by a real user of the software application to a natural environment. The researchers demonstrated the reliability and usability of the system and tested by the Staff of the CROPSY Association.

Implementation
The system developed in the rapid construction stage becomes operational in this stage. Cutover is the last stage of the RAD Model, wherein the team successfully passed the implementation as it is already hosted online and testing phase. This only affirms that CropLook is functional and ready to deploy.

Maintenance
In the maintenance phase, the system would assure that it is useful to use in the CROPSY Association. In

this stage, it seeks to review the stages of diagnosis and technical maintenance indicators. The researchers do not conduct maintenance yet in the said institution because it is not yet deployed. But if the system will be deployed in the institution, the researchers should provide support to meet users' unwavering needs.

Conclusion and Recommendations

This chapter contains the conclusion of the study based on the results gathered and the researchers' recommendations to improve the application.

CONCLUSION

The following are the conclusions drawn by the researchers of this project to wit:

1. The researchers were able to host an online platform that lets the user reserve, buy and sell crops for CROPSY. This platform will enhance the manual and usual process of selling of products.
2. The system was able to implement the SMS notification that will help the farmers or buyer connect to their clients.
3. The researchers were able to exhibit the most and least profitable crops to support for farmers' decisions with the use of statistical chart. This also help the farmers to monitor what are the top 10 most bought crops within a month given the exact number of crops that has been sold out.
4. The researchers were able to implement the real time I app that could help farmers to communicate easily.
5. The system was able to display the available.

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