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Peer-to-peer Electronic Buy and Sell Platform for Agricultural Products

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ABSTRACT

Agriculture plays a vital role in people's lives. It provides adequate food supplies for mankind. In the distribution aspects, traditionally, farmers rely on intermediaries to sell their produce, resulting in diminished earnings and a limited market. While the problems in supply chain are vast and require diverse solutions, some companies focus in offering solutions in the distribution problems and create channels for farm produce without the need for intermediaries as well as its marketing. In this research, the development of an online marketplace that serves as an ecosystem for both farmers and their respective costumers to achieve meaningful and efficient trades, is presented. A business-to-business (B2B) ecommerce platform for agriculture is developed and tested. CSS and HTML for the front-end development are used while for the back-end development, the Django framework based on python language was chosen. Based on the findings, Django was shown to be an effective web framework for the e-commerce platform. Thus, they were able to make the different pages needed for the e-commerce platform that is user friendly which provides sufficient details for the users.

Key words : Precision Agriculture; Buy and Sell; Farmers; E-commerce

1. INTRODUCTION

Artificial intelligence may be the focus of most of the research projects these days due to the great software development [1] and computer technology and makes these algorithms possible given the complexity and speed requirements of such systems. These AI systems, that use deep learning or machine learning techniques [2], can be applied to various applications in robotics, bio medical engineering and agriculture. Agriculture is one of the needs in many countries in order to survive and to supply its people. Modernized farming is still taking shape in the Philippines especially in Mindanao. Mindanao has the biggest potential in terms of agriculture because of its land space, its resources, and has a better climate to do agricultural activities compared to some places in the country. Mindanao has also been called as the food basket but unfortunately, the productivity and the yields of many of the mall farmers who are small landowners have remained very low and uncompetitive [3].

The demand of agricultural products outpaces its supply and most Filipino farmers including small-scale producers, often don't know what and when to produce due to the lack of access to information, therefore, underutilizing the farmlands. Current forms of trade also prevent farmers from direct access to buyers and end users. Since the Agricultural Technology space is booming with fresh players continually entering the market, AgTech companies need to convince the farmer to make the switch and make sure that the farmer will see an obvious return of investment in Precision Agriculture [4],[5] in a relatively short timeframe to rise above the crowded field [6]. It will put agriculture field to its zenith. The proposed solution to this need is a business-to-business platform that would link farmers and buyers directly. This platform would be a web-based application and on android platform. This will help the supply chain management [7] for both buyers and farmers.

The main purpose for such project is to develop a web platform-based solution that helps the improvement of links among producers, suppliers and buyer value chains become more transparent and efficient, less manipulated by intermediaries. In addition, better accounting and traceability helps to increase the efficiency and forecasting and reduce administrative burden and fraud.

This research requires a good a stable internet communications for the system to work properly and efficiently. Fortunately, several researches have showed different methodologies to test and monitor the reliability of the communication networks under normal and chaotic conditions [8], [9] that will ensure error free information exchange [10].

Nowadays, similar computer based applications using IoT [11], [12],[13] are able to improve business communications and help improve the economy. Some of these networks use mobile phones as their platforms [14],[15],[16] to ensure the portability of online networks.

2. STATEMENT OF THE PROBLEM

This research aims to develop a web-based platform that will facilitate business-to-business transactions between farmers and their respective customers. The main purpose for this project is to develop a web platform-based solution that will help and improve the linkages among producers, suppliers, and buyers value chains to become more transparent and efficient and less manipulated by intermediaries. In addition, it incorporates better accounting and traceability to increase the efficiency and forecasting of transactions and reduce administrative burden and fraud. This will help farmers eliminate traditional intermediaries by allowing them to sell their products within the web application thru a web application that will allow sellers to provide agricultural information about the products. This will connect farmers to the buyers via the web application that will provide information about current market price to avoid loss to both sides.

3. METHODOLOGY

The proposed project is called "AgroPlus,". It will follow a business-to-business (B2B) model. A website following the B2B business model sells its products to an intermediate buyer who then sells the product to the final customer. As an example, a wholesaler places an order from the company's website and after receiving the consignment, sells the product to the final customer who comes to buy the product at one of its retail outlets.

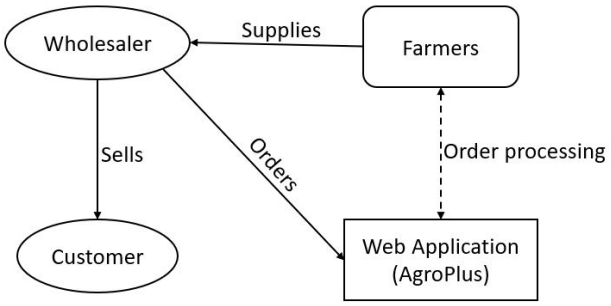

Figure 1: Over-all Concept of the Project

Figure 1 shows the over-all concept of the study that the wholesalers have direct link to the famers via the proposed Agroplus web application. This system minimizes contacts with intermediaries and thus improves the economy by having the optimal costing of commodities for the buyers and optimal sales for the farmers.

The web app development is a collaborative process between the front-end designers and the back-end developers. The basic system architecture of the project includes the seller and the buyer side. It contains the same features available in the system for both of the end users. After registering or logging in, the user can either upload a product that they wanted to sell with its basic description that they needed to fill up or the user can search and view products that they wanted to purchase. They would then add them to the virtual shopping cart and proceed to checkout for the payment. Farmers can also check on the updated market price of certain products on a certain area to help them avoid economic loss when selling their products.

There is always an admin in any online portal that handles all the back-end system for managing the response of the user's request. The admin can also monitor the sellers' products to avoid unnecessary products being uploaded.

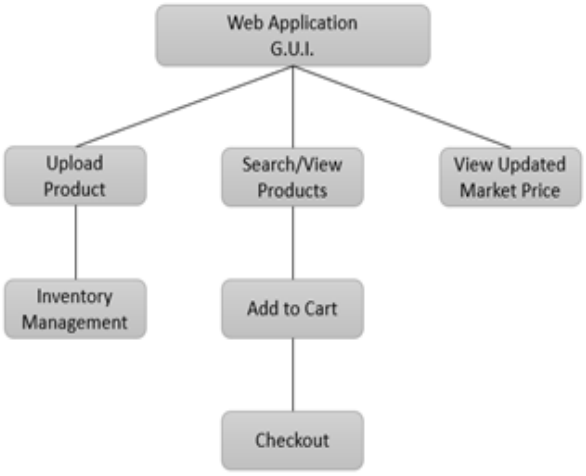

Figure 2: System Software Architecture Design

Figure 2 shows the systems software architecture that illustrates the basic functionalities and contents of the web application software. The front end uses CCS and HTML while the backend uses JAVA script.

4. RESULTS AND DISCUSSION

The software underwent different tests procedures in order to assess the reliability of the system. These tests are as follows

4.1 functionality testing

It is used to verify that all functionality of the designed web platform in line with the specification that describes how the functionality should work. During functional testing, actual system usage is simulated. Functionality testing therefore includes link testing, test forms, cookies testing, validating HTML and CCS and database testing

4.2 Usability Testing

It is the process by which the user-computer interaction characteristics of a system are measured and weaknesses are identified for correction.

4.3 Compatibility Testing

The designers also tested the capability of the web application's compatibility of running on different hardware or operating system.

4.4 Performance Testing

This is hosting the website on a cloud server in order to manage potential huge volume of incoming visitors.

4.5 Security Testing

The system was tested and uncovered vulnerabilities of the system and determined that the data from its users such as passwords must be protected from possible intruders.

Different farm owners within Bukidnon are interviewed about the effectiveness of their agricultural marketing. They are also allowed to test the web app to determine the things needed to improve the said web application. The result is shown in figure 3 below

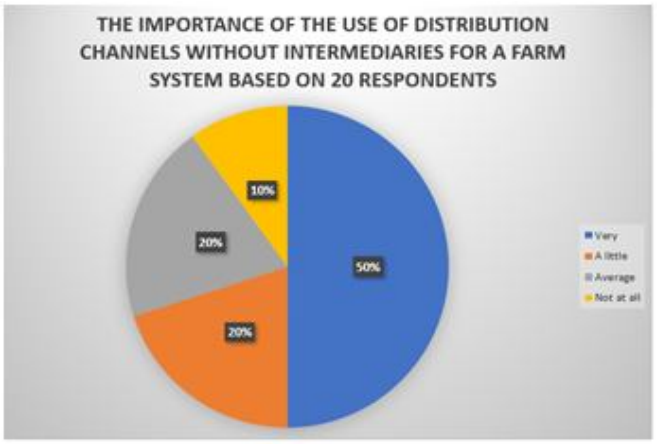

Figure 3: Results from Survey from 20 Farmers

The data above shows the result of the survey of how important is the use of distribution channels without intermediaries for a farm system. 20 respondents were interviewed at Bukidnon and half of them responded that it is indeed important to have an agricultural marketing without the traditional intermediaries. 20% of the respondents answered "a little" and "average" because they were not completely aware about other unconventional methods in reaching the market.

Lastly, 10% of them responded with "not at all" because they were not aware about the better options when it comes to the uses of distribution channels.

The system also allows the farmers to post their products in the web application. This feature is shown in figure 4 below.

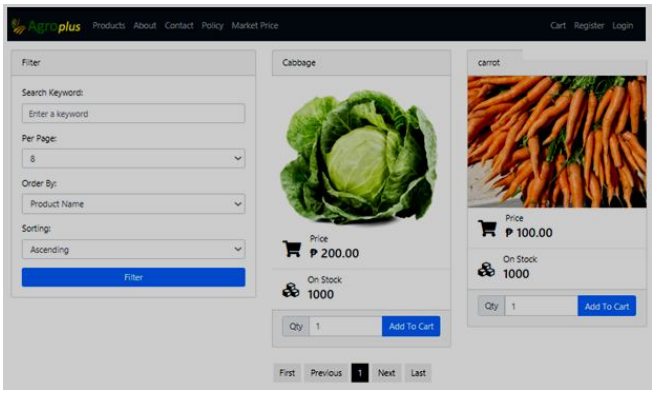

Figure 4: Products Posted by Farmers

The web-based platform allows farmers to sell their products without the need of traditional intermediaries. The interface where farmers can directly upload a photo of their product with the corresponding information after they register or log in on the web-app is shown in figure 5. After uploading the product, it would directly reflect to the products page and the platform's database.

Figure 5: Django Administration

One of the most powerful parts of Django is the automatic admin interface. It reads metadata from the models to provide a quick, model-centric interface where trusted users can manage the content of the site. The figure above shows the main interface of the site administration where the admin can monitor the users and their upload. The admin can remove uploaded products when necessary.

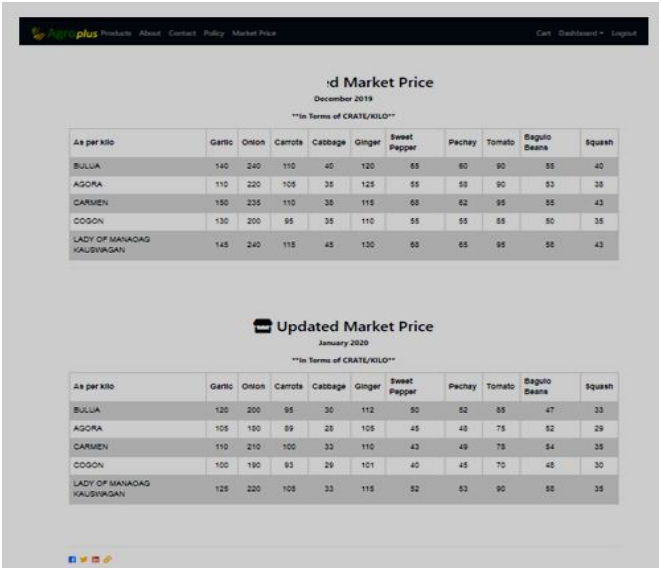

Figure 6: Updated Market Price

Some farmers are unaware about the commodity prices and sell their products at low prices to the traditional intermediaries resulting in huge loss for the farmers. Figure 6 above shows the interface of the updated market price. This will serve as the farmers' guide or basis when they sell their products. Since there are multiple markets, the prices may vary for a particular product

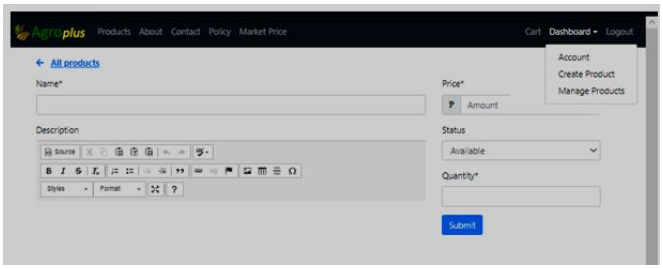

Figure 7: Add Products

The web-application allows sellers to not only upload certain products but its information as well. Figure 7 above shows the uploader/seller's input on a certain product. The following information includes the price, quantity, date when it was posted, status (whether product is out of stock or still available), name of product, and description. On the buyer's side, they will see the information on the product page as the figure shown above. From this, the buyer can now then decide whether to add a certain product to his/her virtual cart, then proceed to checkout for payment. The graphical user interface for the cart is shown in figure 8.

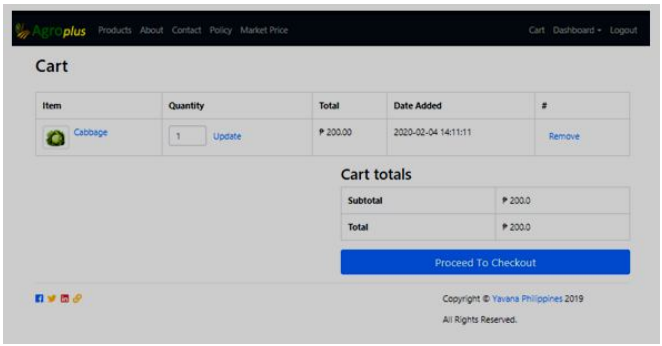

Figure 8: The Cart

When a buyer decided to purchase a product, he/she can add a certain product to his/her virtual shopping cart. This page then shows the full list of the products that they added to their cart with the corresponding details such as the quantity and the price. The buyer also has the option to remove a certain product in his/her cart when he decided not to purchase it instead.

After checking the products on the virtual shopping cart, the buyer can then proceed to checkout for payment. All he/she needed to do is to fill up the necessary information for the shipment and then choose a payment method. The payment method has not fully yet applied in this web app since it requires third party partnership for approval.

The data in figure 9 shows the results of the survey from both the seller and buyer side of how likely they are to incorporate technology in their respective business. 20 respondents are interviewed at Bukidnon and 13 of them or 65% of them responded that they would most likely want to incorporate technology in their business after discussing to them the proposed project. 5 people or 25% of them had an average respond. These 5 respondents still had second thoughts on leaving their traditional ways behind but were still interested about the proposed project. Lastly, 10% of the respondents were least likely to incorporate technology in their business. These two people were not fond of using technology since they are used to traditional ways of running their respective business

Figure 9: Acceptance Level

5. SUMMARY AND CONCLUSION

This research developed and presented the back-end of the Business to business project operating the website through the use of Django with Phyton programming language and the front-end of the project through digital interaction using HTML, CSS and JavaScript.

Based on the findings, it is observed that Django is an effective web framework to the e-commerce platform. Thus, they were able to make the different pages needed for the e-commerce platform that is user friendly and provide sufficient details for the users.

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