

MyAgriShop: Linking Rural Farmers With Consumers To Increase Vegetable Sale and Improve Food Distribution During Covid-19 Pandemic and Beyond

Siti Hasnah Tanalol¹, Aslina Baharum^{1#}, Nordin Saad²,
Januarius Gobilik³, Mohd Nasir Samsulbahri⁴

¹ UXRL, Faculty of Computing and Informatics, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, MALAYSIA.

² IRRG, Faculty of Computing and Informatics, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, MALAYSIA.

³ Faculty of Sustainable Agriculture, Universiti Malaysia Sabah, Locked Bag 3, 90509 Sandakan, Sabah, MALAYSIA.

⁴ Labuan Faculty of International Finance, Universiti Malaysia Sabah, Labuan International Campus, 87000 Labuan FT, MALAYSIA.

#Corresponding author. E-Mail: aslina@ums.edu.my; Tel: +6088-320000; Fax: +6088-435324.

ABSTRACT Throughout the history of the vegetable industry in Sabah, farmers in rural areas, especially in Kundasang, have faced intermittent a problem to market the vegetables and fruits from their farms. This problem has intensified during this Covid-19 pandemic and probably beyond this period, as consumers and middle persons are limited due to the movement control order (MCO) to curb the disease but also because of the self-imposed discipline by households to travel less frequently to avoid being contracted with the disease. Farmers who usually sell their produce wholesale to hotels and restaurants directly or through distributors have an excess of highly perishable produce. Established vegetable supply chains, whether direct wholesale in contract farming, government agency intermediaries, or private intermediaries, are not active during the MCO. The MCO does not restrict the Inter-district movement of vegetables; however, farmers, particularly smallholders, do not have enough appropriate paperwork, networking, communications, assets, pricing strategy know-how, and financial resources to move their vegetables in high demand, *i.e.*, households. These farmers also lack technological knowledge to extend the shelf life of their produce. To date, on-site scaled-up industrial factory to process their vegetables and fruit harvests is not economically sustainable. It is expected that the loss of income during the MCO will jeopardize smallholder farmers' ability to make a comeback after the MCO and Covid-19 are over. Because of the same MCO, households, on the other hand, could not purchase vegetables and fruits, as supermarkets and fresh markets have limited operating hours, while night markets, *Tamu*, and roadside vendors are all closed. This unexpected poor supply of vegetables could lead to a bigger health issue since, as a whole, Sabahan and the larger Malaysian society consume fewer vegetables and fruits than recommended for optimum health. Considering these problems, MyAgriShop was invented as an App to link rural vegetable farmers directly with consumers, specifically households, to increase vegetable sales and improve food distribution during the Covid-19 pandemic and beyond. This app could offer a better bargain between smallholder farmers and households, as the negotiation is direct and without the involvement of a third party.

KEYWORDS: Supply chain; Rural area; Mobile apps; Covid-19; Agriculture

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INTRODUCTION

In Sabah, farmers in Kundasang are the major producers of highland vegetables, where around 1,000 farmers operate small and large vegetable farms ranging from one (1) to 400 acres. The total output of vegetables in Kundasang is estimated at 100 tonnes daily (Othman, 2020). However, fruit and vegetable farmers and stall operators in Kundasang had encountered serious challenges when the country declared a Movement Control Order (MCO) starting March 18, 2020. Under this order, all citizens were required to stay at home 24 hours. Only one member of the family was allowed to go out to purchase necessities (Tang, 2020). They had never lived under this order and had never had any preparation on how to go on with farming and to sell their produce. Consumers and middle persons had also experienced similar situations. They were not able to reach the farmers. As a result, unsold vegetables and fruits increased and were left to rot at roadsides or in collection centers.

According to the Sabah Kundasang Agriculture Operators Association President, Mr. Simon Lee, Kundasang farmers sold up to 100 tonnes of fresh produce daily before the MCO was enforced. However, since the MCO was enforced to curb the spread of the Covid-19, he said, lorries from Sarawak and Brunei had stopped coming in, resulting in a 90 per cent drop in sales (Yee, 2020; Nasrah, 2020). During this period, the opposite scenario happened. Unsold and spoiled vegetables and fruits were 100–300 tonnes a day. It was reported that more than 300 vegetable traders in Kundasang had suffered losses (Yee, 2020; Nasrah, 2020). The farmers did not have an existing system to sell and distribute their products effectively and efficiently. Both the farmers and traders lacked a support system. For example, they did not have a method to predict the volume of agricultural product orders or production, information to process to mitigate the uncertainty of the market demand, and a list of potential farmers, middle persons, or consumers. The problem can be as simple as the vegetable market demand in neighbouring districts is high, but farmers in Kundasang are not aware of it. At the same time, vegetable traders in those districts do not have the information about the vegetable output in Kundasang or at least from several farmers in this area. In the history of the vegetable industry in Sabah, this simple problem, however, is not unique to Kundasang; it is known to happen in many places in the state. In any district, no authority really has complete information about farmers and the output of their farms, traders and the volume of vegetables they traded, and consumers and their daily vegetable demand.

Other than the supply chain problem, including the delivery constraint, vegetable quality is another issue. Around 90% of the vegetable traders in Kundasang and, in fact, around Sabah are using lorries for distribution purposes (Yee, 2020). Usually, these vehicles are not equipped with temperature control to extend the shelf life of the vegetables. When there are traffic problems and severe delays of travelling, a significant amount of the vegetables is spoiled during the transportation. The value of the vegetable decreases, or customers decline to buy them. During this Covid-19 pandemic, traffic problems are expected to be infrequent, as not many vehicles have been allowed on the roads, but the issue about quality is still a major concern because the vegetables have been harvested and left in a collection stall at the roadside for some days before the lorries could pick them. One of the authors of the present paper had experience helping clients to purchase vegetables directly from production areas to ensure that only quality vegetables are obtained.

In order to solve this chain of problems, a digital system needs to be developed to link the farmers, traders, distributors and customers, but especially between the farmers and households during this Covid-19 pandemic and beyond, to improve vegetable sale distribution and health standard. It has been commented that Sabahan and the larger Malaysian society consume fewer vegetables and fruits than recommended for optimum health. This digital system will help farmers to have a better deal with households. Through the system, distribution of agricultural products could be arranged once the order is placed, and the immediate delivery could at least ensure the product quality for the customers. This web service can help distributors find the nearest, most suitable route in the shortest time. This is a great relief for customers who otherwise have no option but to refuse products because of the spoiled vegetables. The farmers are also able to estimate the distribution channels and the volume of purchase orders. This will help to reduce instability in the relationship between supply and demand in the Kundasang fruit and vegetable market during the pandemic and beyond. In the present paper, MyAgriShop App was introduced as one of the digital systems that vegetable farmers and traders in Kundasang could use to mitigate the problems encountered during the Covid-19 pandemic and beyond.

MyAgriShop Mobile Application

MyAgriShop App is inspired by the situation caused by the Covid-19 MCO. The main goal was to help farmers in Kundasang who were having problems selling their products to other parts of Sabah. It is a platform to buy fresh vegetables and fruits directly from the farmers at Kundasang, Sabah. Once the product is purchased, a runner registered in this App will then deliver the purchased agricultural products to the customers' doorstep. MyAgriShop would be another solution to assist the rural farmers in Kundasang to improve sales by linking them up with urban consumers, and at the same time, it gives urban consumers access to more agricultural products directly from the farmers. In fact, it can be used by farmers and households in any place in Sabah and Malaysia beyond this Covid-19 period. MyAgriShop would be another solution to assist the local farmers by linking up the urban and rural areas in Sabah, giving urban consumers access to more agricultural products directly from the farmers.

BUSINESS MODEL INNOVATION FOR FOOD SUPPLY CHAIN

Food Supply Chain

According to Nosratabadi *et al.* (2020), there are several stages in the food supply chain (FSC) where food moves from farmers to end-users. At each level of the chain, value is added to the product by each FSC player. According to van der Vorst (2000), FSC consists of farmers, food processors, distributors, consumer handlers and retailers. Thus, along with the supply chain, the chain, called the value chain, allows value/values to be added to the product in each step. In other words, in order to produce the final product from raw materials and deliver it to the end-user, many actors perform at every stage of the FSC.

Taylor (2012) applied value flow (VCA) analysis involving farmers, major processors, and retailers and dug through a rigorous examination of lean supply chain mechanisms showing performance, efficiency, profitability, and relationships between supply chain components have much room for improvement.

Business Model Innovation

Business model innovation (BMI) uses a new approach to commercializing the underlying assets (Gambardella & McGahan, 2010). In other words, business logic and value propositions change when BMI occurs. BMI is a business strategy to capitalize on change and create a competitive advantage (Nosratabadi *et al.*, 2020).

The business model concept provides the ability to plan and analyze a business's value to its customers (Nosratabadi *et al.*, 2019). The business model describes the position of a business in the value chain (Moleh *et al.*, 2019; Kumar *et al.*, 2017).

Disruptive business models generate new value and markets by redefining the food supply chain Berti *et al.* (2018) proposed. They introduced a digital food hub, an online marketplace, which facilitated efficient communication between local food producers and consumers.

METHODOLOGY

The development phase will require programming skills to develop the proposed system using the suitable programming language and framework. This study uses a web application platform. Once the application's features and functionality have been defined and determined, and the design User Experience (UX) and User Interface (UI) have been tested for performance and meet the requirements outlined during the analysis phase, a rapid prototype will be built. Its main objective is to narrow down APIs, push notification services, analytics tools, user engagement platforms, and the types of databases that applications need based on features.

Once the framework and storyboard are completed, it's time to build an interactive and high-fidelity prototype. This prototype will provide a first look at the mobile applications of interest. This will help validate functions and assumptions and help understand the scope of work. The prototype will be tested by potential users and fix any shortcomings or UI / UX issues posed by them at this stage. Then, the prototype will be the basis for starting to build actual mobile applications.

As it develops, the application will go through several phases. In the alpha phase, core functions are present but not tested. The app is still a very car, and non -core functionality is non -existent. Alpha software is unstable and can cause data corruption or loss. Alpha software may not contain all features designed for the final version. The alpha phase usually ends with a feature freeze, indicating no more features will be added to the software. Currently, the software is said to be complete.

The beta phase begins when the software is complete but may contain a number of known or unknown bugs. In the beta phase, most of the proposed functions are combined. The app has also gone through mild testing and bug fixes, although there may be some issues. The application can be released to a selected group of external users for further testing at this stage. The process of delivering a beta version to users is called a beta release. This is usually the first-time software is available outside of the organization that developed it.

For the testing phase, testing will be performed as early and as often as possible. The original design and planning documents will be referenced while constructing various test cases. During this phase, various types of testing include usability, compatibility, interface, service, performance, operational, and safety testing. In addition, previously cleaned features in each version of the app will also be re-tested to make sure the feature works.

Once the bugs in the beta phase are fixed and tested, the app will move into the release candidate phase, where it is ready for release. The objective of the launch phase is to get your app in the hands of as many users as possible. When the mobile app is in the hands of the user, feedback will come in, and the feedback will be included in the next version of the app. Figure 1 shows the flow chart of the MyAgriShop process, starting with the Search for the product until the Money collection process.

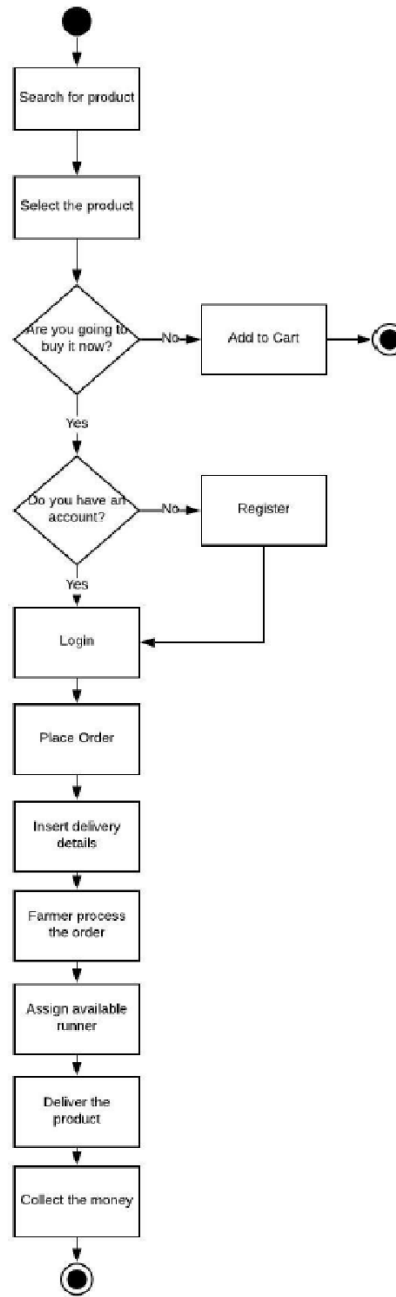


Figure 1. Flowchart of the MyAgriShop Process

RESULT AND DISCUSSION

MyAgriShop App is one of the alternative solutions that the farmers and traders can use in Kundasang in order to ease the problem encountered during the Covid-19 pandemic and beyond (Baharum *et al.*, 2021). The MyAgriShop mobile apps display the top-selling item, recently added, and deals of the day on the tab on the front page. With one click of a particular tab item, details will be displayed, and users can manage the quantity of the item they want to buy. Figure 2 shows the user interface design for the Home page and Product page of the app.

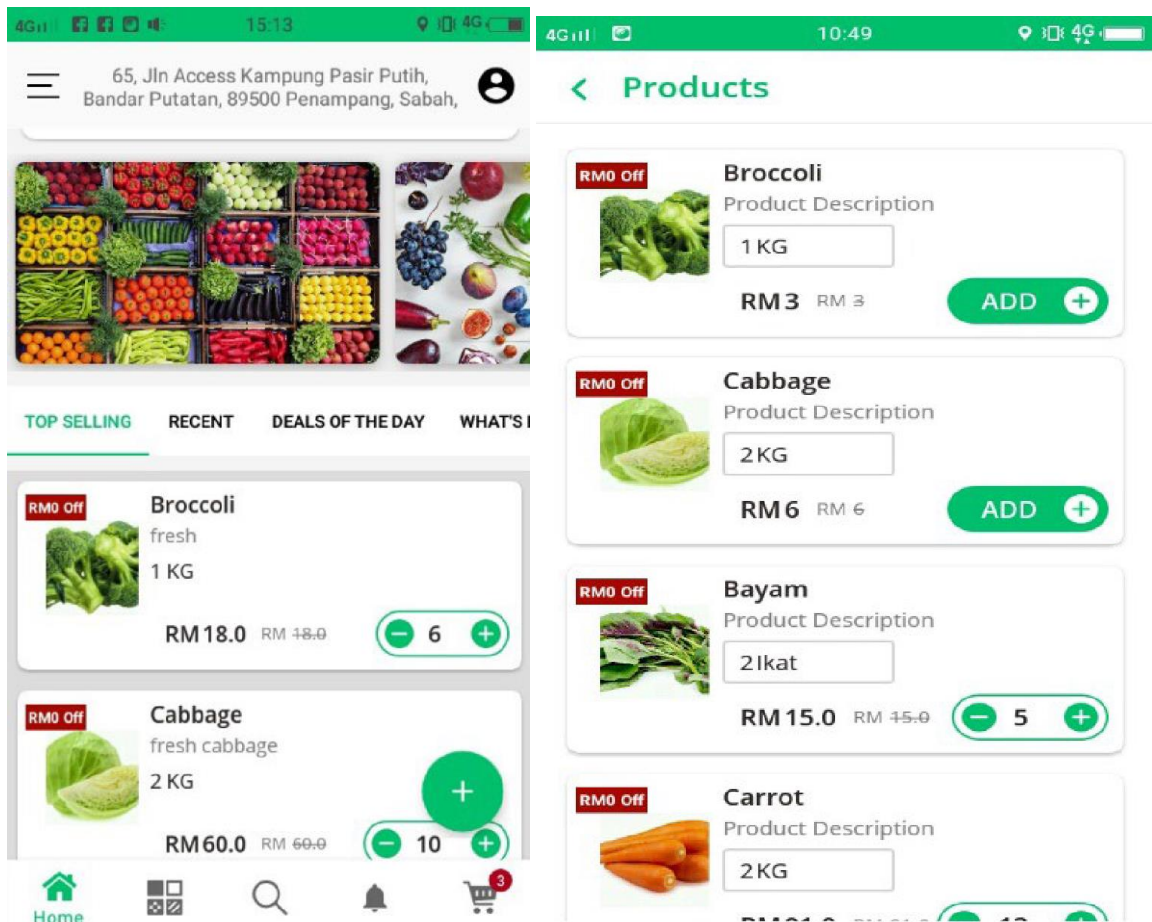


Figure 2. GUI of Customer Order

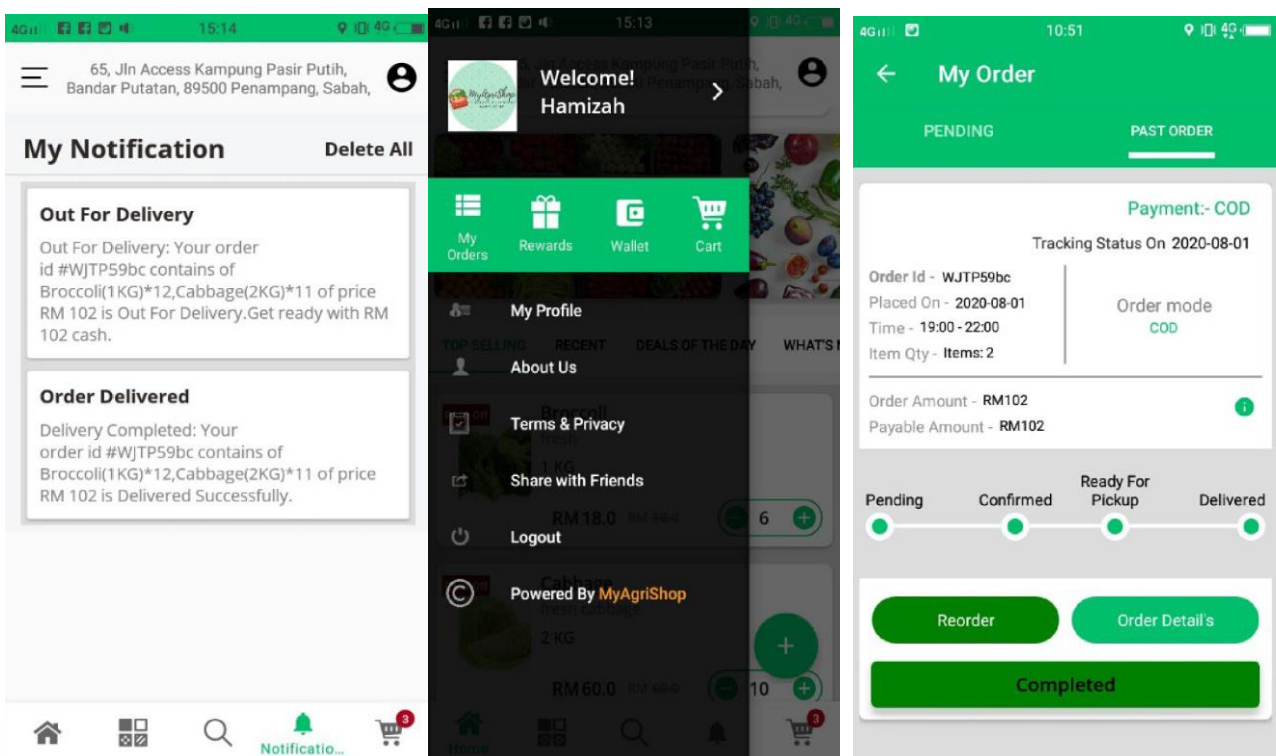


Figure 3. Notification and Order Summary

Notification features can be accessed from the Navigation Drawer available on Home Page, as shown in Figure 3. On click of the Notification bell, it will display the user's order status, the order has not been delivered, or the order out for delivery. The application will notify the user frequently regarding their order.

CONCLUSION

This study indicated that MyAgriShop could function well to link rural farmers with households. The farmers in this study had registered in the program and become its users. In other words, if the MyAgriShop app is used, it can increase vegetable orders and indirectly improve food distribution during Covid-19 and beyond. However, this study found that the rural farmers were slow to adapt to new approaches, for example, the use of the digital app to improve the marketing and selling aspect of their business, although they have used smartphones and have done online purchase using other general apps. Their interest in this study was high, but they were not able to use the app fully where they returned to use old options, for instance, WhatsApp, in their business. This problem is one of the factors that need to be noted by any app developer when producing a smart app to increase vegetable sales and improve food distribution. Thus, to evaluate user experiences in terms of usability and social acceptance from the real user. After the development of the tool, it will be evaluated based on the usability of the tool for the use of the target audiences. Hence, a series of usability testing of the tool will be conducted with the potential respondents who will be using the tool. Thus, respondents from the first phase will be contacted to test the application/tools. A total of 100 users among the farmers will be selected to use the intended mobile web application in order to assess its usability and social acceptance. A questionnaire survey will be given to users, and the outcomes will be analyzed after using the application. Statistical analysis will be conducted to analyze the results obtained. User experience assessments will primarily be measured using assessment methods similar to observing participants perform tasks in controlled conditions (usability tests), gathering user attitudes about application experience in surveys, or asking interface experts to evaluate applications using guidelines and heuristics, often called inspection methods or expert reviews.

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