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E-Greengrocers: A Mobile Information System for Supporting Business in The Traditional Market

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Abstract— The covid-19 pandemic has affected many sides of human life. World Health Organization (WHO) and health sectors worldwide have suggested physical distancing to battle the pandemic. The physical distancing is causing many adjustments in the business implementations. For rural developing countries, grocery shopping at itinerant greengrocers may increase the risks of infection because there are direct interactions between the seller and the buyer and the habit of shopping in a crowd without concerning the physical distancing protocol. E-Greengrocers application is proposed as the innovative approach to help the traditional market support their activities with fewer contact interactions. The application is projected to facilitate a safe transaction between greengrocers and their buyers. This research was developed using the waterfall methodology and descriptive case study. Observations and the distribution of questionnaires among the itinerant greengrocers and buyers are used as a tool to obtain the necessary data. The questionnaire result shows that all users were satisfied with the features provided. More than 61% of users perceived it helpful, and 30% found it very helpful. The features facilitated minimum contact on transactions and maintained sustainable income from the itinerant's greengrocers' point of view.

Keywords— Itinerant, Greengrocers, Covid-19, Application.

I. INTRODUCTION

The covid-19 pandemic has affected many sides of human life. Less contact interaction is considered the safest way to be implemented in all kinds of transactions during this pandemic. As the smallest societal unit, the family must also begin implementing fewer contact interactions in their daily transactions, including grocery shopping at itinerant greengrocers. Shopping for food ingredients can be time-consuming if there are no prior cooking plans. In a pandemic condition, this can increase infection risks because of the long interaction time and shopping habits in crowds, which ignores physical distancing. Several shreds of evidence show how the offline markets serve as the medium of transmission [1]–[3].

Consumers who do not want to take this risk divert their shopping from itinerant greengrocers to supermarkets because they are considered more hygienic and follow health protocols. The changing option can cause the traditional greengrocers to lose significant customer numbers, resulting in a decline in the itinerant greengrocer's micro-economic level. To shorten the shopping time and reduce interactions, consumers can make pre-orders to the itinerant greengrocers. However, some problems arose when the itinerant greengrocers did not record the orders correctly, resulting in missing items.

Further, consumers cannot easily find out or contact the itinerant greengrocer's position if they need them. This situation challenges scientists worldwide to overcome this condition, especially in rural developing countries. Time and place should be considered without reducing the essence of the transaction process. A prior study on innovative shopping activities was conducted by Vidyashree [4]. Although their research was conducted before Covid-19, it provides insight that transactions may appear when the customer searches for a product in a location. The idea to transform the geo-location issue in Covid-19 will help the itinerant greengrocers keep their customers buying their products. On a larger scale, the sustainability of the microeconomic cycle will be maintained. Thus, the present research develops an electronic shopping application for itinerant greengrocers. In this application, the system will serve the customer, particularly for goods related to itinerant greengrocers offer.

The present research develops an application that can be considered an innovative tool to minimize contact. All the products will be displayed and purchased using the waterfall software development life cycle method and an exploratory case study. Moreover, this application can maintain the itinerant greengrocer's business to survive the pandemic because the transaction can be conducted with minimal interactions. Unlike any other e-marketplace, the present research develops the specific value propositions of itinerant greengrocer's real-time geo-location with the detailed items they bring. Further, unlike online food delivery that needs a third delivery party, this application supports itinerant greengrocers to deliver by themself. This application's value offering is how the loyal consumers can update their needs to the greengrocers without worrying much about interactions. Thus, the greengrocers in the food industry's bottom line can survive.

II. THEORETICAL BACKGROUND

Geo-location is a technology that combines location-based service (LBS) and Geographical Positioning Systems (GPS), which is considered an essential part of business in this digital age. Many implementations are used with GPS technology,

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such as the vehicle routing problem, shortest path, and Geographic Information System (GIS) application [4]. GIS is a framework to capture, store, process, and manage information and other things related to their spatial location on earth [5][6]. GIS can collect the data available on the mobile phone through a multifunction system using the phone site [7]. The study development using the GIS-based location search has been promising in the last few years [8]. GIS is applied in many gadgets using GPS. GIS can be utilized to capture the data and store them in a database. GIS is used extensively to facilitate the distance business process, in which the accuracy of location and time is counted as the most critical part. Many businesses, such as online delivery, retail information, and routing problems, are pretty popular and are being investigated by many research studies [9]–[11].

Location-based Service (LBS) is defined as a mobile device's location-based information based on other mobile device's requests [12][13]. LBS aims to find specific information on a user based on the location at any time and anywhere. According to Kupper, LBS is a mobile-based service that provides information already made, organized, and chosen based on location [14]. Location-based service makes it easier to search objects without manually entering the location information data since it will automatically show the position of traceable locations. After the information is sent, it will be processed and transformed into coordinates or location points.

Previous studies have discussed geo-location-based services for business [15], [16]. As for the Covid-19 pandemic, many offline business processes were transformed. Online food delivery is one example of business growth during the 2020 pandemic [17]. However, many transformations only focused on large-scale finished goods. While raw materials, ingredients, and micro group interactions were lack discussed for problem solution. Itinerant greengrocers will potentially perish if there is no intervention to facilitate the business transformation. The absence of itinerant greengrocers, especially in rural developing countries, will cause massive cost damage for rural citizens. The cost damage will cause an imbalance in microeconomics and lower the purchasing power of the weak economic rural citizens. With these problems, the present research comes with an electronic itinerant greengrocer's application approach. The buyers only need to enter the name of the product they want to buy. The application provides each registered itinerant greengrocer's reference products and location.

III. Research Methodology

The present research develops the application using the waterfall software development life cycle method [18] and an exploratory case study. The following explanations describe the stages of the application development for itinerant greengrocers over six months.

1) Analysis of the System: Several methods were conducted to achieve an accurate analysis system before the application was developed. The problem identification used in this study is the observation and survey. Specifically, the approach of interviews and questionnaire distribution to itinerant greengrocers and the people who regularly used their services are conducted.

2) System Design: The system design was conducted by developing the design into technical requirements. The technical specifications consist of the database modeled by entity relationship-diagram (ER-Diagram) notation [19], the process design modeled using Business Process Modeling Notation (BPMN) [20], and the display design.

3) System Implementation and Verification: System implementation was projected based on the system design result. The developed system underwent a validation and verification stage to make sure that the developed system was error-free and suitable for the users' needs. The verification was conducted on the end-users by using white box testing and survey data.

IV. Result and Discussion

Several problems and information were found based on the observations and interviews with several itinerant greengrocers and the customers. The itinerant greengrocers offer the products to each customer every day. Suppose the products are not sold out, and some products cannot be stored. The itinerant greengrocers usually offered the customers a significant discount until the goods sold out. In fulfilling the customer's needs, the itinerant greengrocers are usually called directly or by phone. However, sometimes the itinerant greengrocers cannot provide some products the customers requested. It may be due to misunderstanding or the shortage of the products.

Moreover, sometimes customers have difficulties looking for itinerant greengrocers when they need one. It is also difficult for customers to compare prices or availability of products when shopping at the itinerant greengrocers because the sellers do not usually arrive simultaneously, and the sellers typically serve their loyal customers.

Based on the information, there are several systems required. Firstly, it is necessary to have a feature to display itinerant greengrocers based on the nearest location to the customers so that the customers can see the sellers' location and visit the location if deemed necessary. The next one is the feature to display the greengrocers' products and the price list. Through this feature, customers can identify which greengrocers have the products needed. Customers can also compare the prices and choose the products by reviewing the seller's rating. Therefore, it is necessary to have a rating feature on the itinerant greengrocers to give a rating to the seller after the transaction based on the ability to fulfill the order, quality of the products, and accuracy. The next feature is ordering the products. In this feature, customers can order the products a few days before or on the same day if the seller has the required products. Another feature added is the daily transaction budget reminder. This feature helps the customers by reminding them whether the shopping has passed a certain amount of money that the customers have previously set.

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The system design consists of process, data, and interface design. This system was designed to be accessible on two platforms: the mobile-based application for the itinerant greengrocers and customers and a web-based application for the admin users to register the itinerant greengrocers and customers. Figureure 1 shows the use case of the mobile-based system. The process design of the system was conducted using the BPMN notation. Figureure 2 shows the BPMN diagram for the developed system.

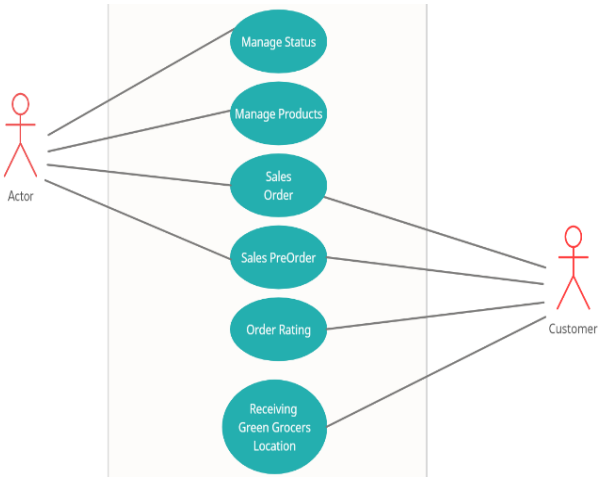

Figure 1. Itinerant Greengrocers Application

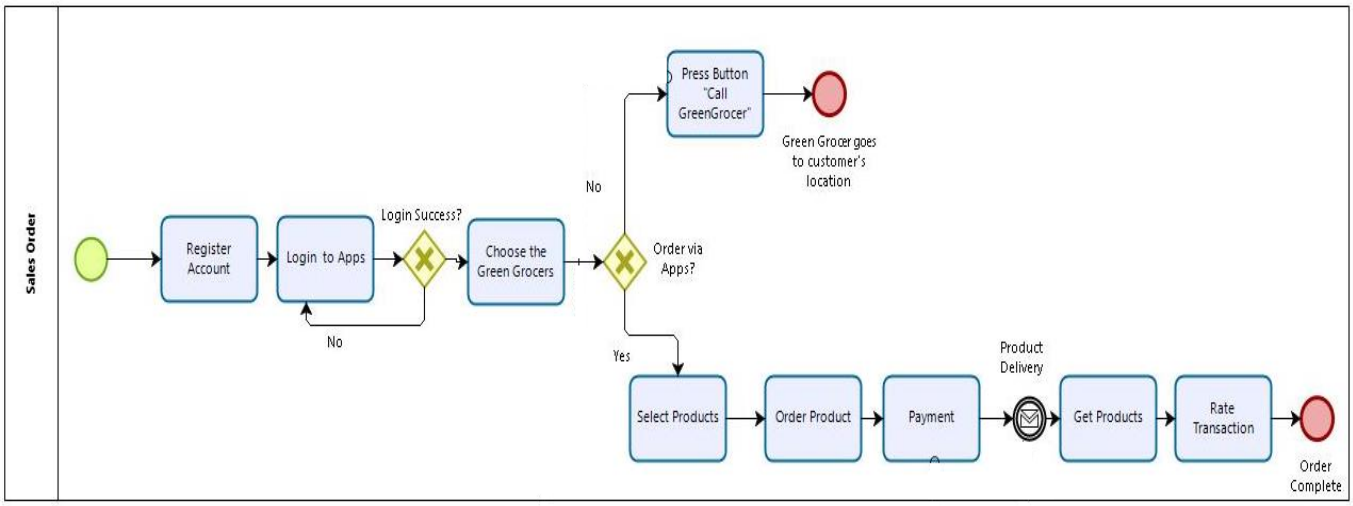

Figure 2. BPMN of Itinerant Greengrocer Application

The sales order begins with the user account registration by the customer. The successful registration will be directed to the page where the customer can choose the itinerant greengrocers. The call menu can be used if the customer wants to call the itinerant greengrocers. Customers can select the products in the application when they want to order by application. The selected products can be ordered and paid for by the system. After the payment is completed, the product will be delivered to the customer. The customer will be asked for the rate transaction to ensure that the itinerant greengrocers provide the best quality service.

Data design was modeled by using ER-Diagram to facilitate the flow of data in the application. There are ten main entities and three entities formed from the relational result. The main entities were the customers, itinerant greengrocers, delivery addresses, products, categories, rating categories, transactions, provinces, cities, and districts. The entities formed from the relation were product transactions, greengrocers' products, and ratings (see Figureure 3 [21]).

The application was implemented with the android studio platform with Java Programming Language. The web service was developed by using Sublime Text with PHP programming language. Figure 4 shows the display of the application of itinerant greengrocers. The verification of the application was conducted by white-box testing. After passing the verification stages using white-box testing, the system was validated using the user acceptance survey. The survey was conducted by distributing questionnaires to 20 customers and 20 itinerant greengrocer respondents. The questionnaire asked the respondents' responses concerning the system's main feature, representing the needs identified from the analysis result. A scale measures the responses from 1 (unhelpful) to 4 (very helpful). The validation results are shown in Tables I for customers and Table II for itinerant greengrocers.

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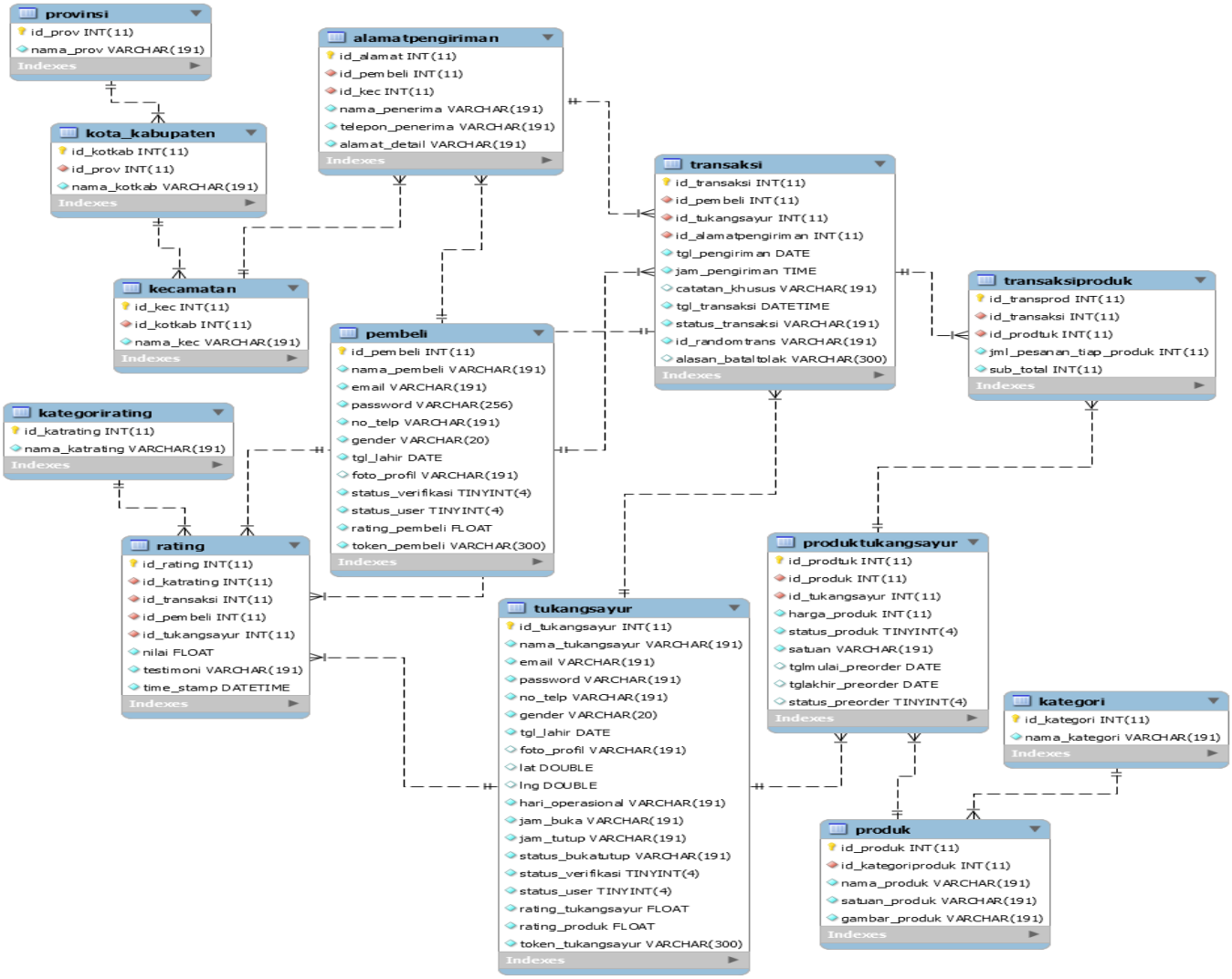

Figure 3. ER- Diagram Of Itinerant Greengrocer Application

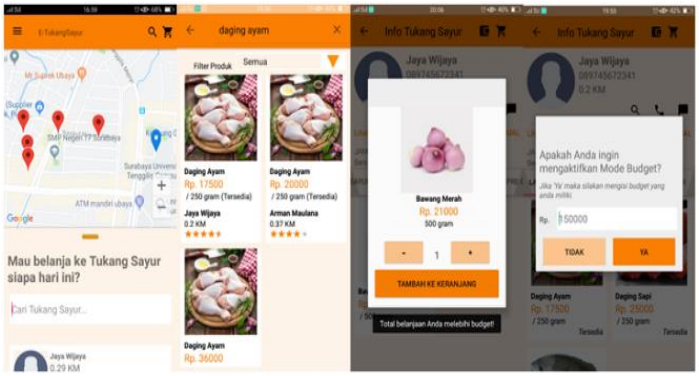

Figure 4. Mobile-based Itinerant Greengrocer Application Interface

From the questionnaire result, customers and itinerant greengrocers have perceptions in-between scores 3 and 4, which are helpful and very helpful. The average trends of the answers are a score of 3, indicating potential improvements for customers and mobile greengrocers' usage.

Finally the application was developed according to the users needs and can facilitate the transformation of itinerant greengrocer's activities. Further, the application can minimize customers' interaction in the crowded situation to break the Covid-19 pandemic spreading.

TABLE I
Customers Questionnaires Recap

Feature	1	2	3	4
Displays the location of the nearest itinerant greengrocers in real-time			55%	45%
Product search and filter features			70%	30%
Itinerant greengrocers search feature.			65%	35%
Itinerant greengrocers call feature.			70%	30%
Itinerant greengrocers rating feature			70%	30%
Budget Limit Feature			75%	25%
Order Feature			55%	45%
Chat Feature			80%	20%

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TABLE II
Greengrocer Questionnaire Recap

Feature	1	2	3	4
Online sales feature through the itinerant greengrocer application.			60%	40%
Receive and Reject Features			40%	60%
Order Feature			40%	60%
Chat Feature			80%	20%

V. CONCLUSION

In this research, it can be concluded that the application can help facilitate the transaction between the itinerant greengrocers and the customers. This application has features that support minimal contacts, such as the part to order and sell online, the feature to limit the budget, and the feature to review the similar products that the greengrocers carry to help decide where to buy. The feature is to know the greengrocers' position and the products they carry, including the price lists. Other features that support minimal contact include knowing the greengrocer's position and the products. Overall, the questionnaire result shows that 68% of customers consider this application helpful, and 33% find it very helpful. Similar results were obtained from the greengrocers. 55% of respondents consider the application features useful, and 45% find them very helpful.

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Akhmad Fahruzi, Marselinus Amalia Lamanele, Trisna wati

113-119

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PDF

E-Greengrocers: A Mobile Information System for Supporting Business in The Traditional Market

Dhiani Tresna Absari, Liliana, Bambang Prijambodo

120-124

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PDF

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Mira Suryani, Rispansah Sakti Rusidiawan, Rudi Rosadi

125-131

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PDF

Analysis and Design of Employee Attendance Application System Using RFID E-KTP Technology with ICONIX Process Method

Mohammad Farizd, Brillyan Putra Pradana, Dwi Shahita, Seftin Fitri Ana Wati

132-142

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PDF

Design Of Interactive Smart Mirror System for Digital Information Display Based on Multitasking Approach Using Raspberry Pi

Sandra Nwokoye , Azubuike Aniedu, Chukwunenye Okafor, Austine Nzemalu

143-147

https://doi.org/10.25139/inform.v7i2.4757

PDF

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Mochamad Bachtiar, Iwan Kurnianto Wibowo, Nur Cahyo Ihsan Prastyawan, Maretha Ruswiansari, Hendy Briantoro, Nofria Hanafi, Niam Tamami, Hendhi Hermawan, Eko Budi Utomo

148-155

https://doi.org/10.25139/inform.v7i2.4687

PDF

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Talitha Syahla Janiar Arifin, Wahyuningdiah Trisari Harsanti Putri, Tia Rahmania

156-161

https://doi.org/10.25139/inform.v7i2.4472

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Diyah Utami Kusumaning Putri, Dinar Nugroho Pratomo

162-168

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