Streamlining Vegetable Distribution with SCOR Analysis and Communication Strategy in Sis-Log In App

Wahyudin, Dene Herwanto, Yuliarman Saragih, Wahyudin Fitriyana, and Billy Nugraha

***Abstract*—Pandemic Covid-19 limits all direct buying and selling transaction activities, to maintain social distancing by following the government recommendation. In addition, it has caused instability in all sectors, no exception to the agricultural sector. The sector that can survive (sector of the last resort) amid the threat. The purpose of this study designed applications for agriculture with stages: (1) Business Process Analysis, (2) Analysis of Needs, (3) Modeling Use Case, (4) Activity Diagram, and (5) Entity Relationship Diagram. The method in the study used the Supply Chain Operation Reference (SCOR) approach to analyzing vegetable supply chains. In addition to the Conjoint Analysis method to find out the level of interest is relatively based on public scores. This will be the right communication strategy in the pandemic period. The results were obtained through the stripes of the SCOR, that the chains of supply vegetable commodities were considered unprofitable farmers. This is due to the sale of vegetables involving collectors and traders before the product reaches consumers. As a result, the communication strategy is to use new media adopted into Sis-Log In Apps. The conclusion of the research conducted is an application that is as needed for the agricultural sector. This hypothesis is supported by the results using a SCOR approach and the communication strategy carried out.**

***Index Terms*—pandemic covid-19, information system design, supply chain, conjoint analysis, sis-log in app**

I. INTRODUCTION

Covid-19 is an infectious disease caused by a newly discovered type of corona virus [1]. The virus that carries the disease first occurred in Wuhan, China in December 2019. Covid-19 is now a pandemic that occurs worldwide [2]. So, it is currently designated as an international health problem. The government is still implementing a policy called the new normal, where all activities are carried out with social distancing. Social distancing has a meaning of reducing activities outside the home and direct social interaction [3] In addition, it has created instability in all sectors of the economy, including the agricultural sector. The sector that can survive (sector of the last resort) in the threat of the Covid-19 Pandemic [4]. However, that does not mean that the Covid-19 pandemic does not affect farming activities [5]. Agriculture is a food security support sector that is crucial in times of economic crisis [6]. This is not only limited to survival, but also a problem of community nutrition intake [7].

Viewed from the other side, this is an opportunity for Indonesian farmers because local agricultural products host in their own country [8]. Today's people like local products because they are fresher and guaranteed their safety [9]. So that people's needs for agricultural products also increase. In addition, nutritionists also recommend that people eat healthy and nutritious food. This is to boost the immune system during an outbreak. Creativity and innovation are needed in the supply chain system. Through the sale of agricultural products directly from farmers to consumers [7]. Information technology that is currently developing is a mobile technology based on android. Currently, Android is not only a smartphone operating system that provides space for various applications [10]. However, one of the tools that can be used to design and develop various applications. So, the purpose of this writing is to make an Android-based agricultural e-marketplace that is easy to use (user friendly). The application is named Sis-Log In Apps (*Sistem Logistik Pertanian Applications*). It serves as an intermediary for buying and selling between farmers and consumers. Besides that, it follows the development of science and technology for Indonesian agriculture in the future.

II. LITERATURE

A. Supply Chain Operation Reference (SCOR)

Supply chain management (SCM) is the integration of various activities of procuring materials and services. Conversion into semi-finished goods and final products as well as delivery to customers [11]. Schroeder said that measuring supply chain performance is the first step towards improvement. The initial stage needs to be defined and determined to achieve the improvement goals. Schroeder argues that in general five important points can be measured in SCOR performance, namely Shcroeder in 2007 [12] in the form of: delivery, time, flexibility, and cost.

B. Marketing Communication Strategy

Marketing communication is a form of communication that aims to improve and strengthen marketing strategies so that it can help increase the marketing of the business that is owned [13]. As for achieving these goals, sellers can use two

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strategies, namely media strategy and message strategy [14]. In this communication strategy, several attributes are determined with several levels in it based on actionable or rational to be realized [15]. Marketing requires doing three main steps including market segmentation, targeting target markets, and establishing market positions [16]. Positioning is a strategy to support marketing communication, which is inseparable from segmentation and market targeting activities [17]. Marketing communication strategy is also defined as the dissemination of information and determining the positioning of the related platforms [18]. Marketing strategies that can be used in general, there are several strategies including message strategy, media strategy, and new media strategy [19] with details as follow:

- Message strategy, can be in the form of a store appearance in e-commerce, both product photos and descriptions that are conveyed about the products offered by a shop in e-commerce [20].
- Media strategy, is used to convey messages to consumers ¬ e-commerce [21].
- New media strategy, developing technology now supports the development of new media very rapidly [14], in addition, with features in such a way as to meet the desires of its users [20].

C. Conjoint Analysis

Conjoint analysis, one of the methods of multivariate analysis, uses stimuli given to respondents to provide an overall assessment in the form of a rating [22]. The conjoint analysis aims to determine a person's perception of an object. The result is the respondent's desire for an object, be it a product/service. The basic model of calculation is as follows [23]:

$$U(X) = \sum_{i=1}^{m_i} \sum_{j=1}^{k_i} a_{ij} x_{ij} \quad (1)$$

$U(X)$ = Total Utilities
a_{ij} = The utility value of the I attribute (i=1,2,3,…,m) and level to-j (i=1,2,3,…,k)
k_i = Amount level to-j
m_i = Amount level to-i
x_{ij} = Variable attributes dummy to-i level to-j (1 = level appear; 0 = not appear)

D. Commerce and E-Marketplace

The definition of electronic commerce comprises of purchase, sale, and marketing of goods and services through electronic systems [24]. Such as radio, television, and computer networks or the internet [25]. In addition, e-commerce is the process of buying and selling or exchanging products, services, or information via computers [26]. Meanwhile, according to Laudon, e-commerce is a process of buying and selling products electronically. This is done by consumers and from company to company with computers as the intermediary for business transactions [27]. So, at this papaer it will take advantage of the development of e-commerce in the agricultural sector [28]. This is because e-commerce has a good chance of being used in the Covid-19 Pandemic [22]. According to [29], marketplace are interactive electronic business community forums that provide markets. Through the work system, companies can take part in B2B e-commerce and/or other e-business activities.

E. Android dan Unified Modelling Language (UML)

Android is the first platform that is open in development and comprehensive for mobile devices. The software is enabled to run mobile devices without thinking about the ownership constraints that hinder mobile technology innovation [30]. Unified Modeling Language (UML) is a modeling language for object-oriented paradigm systems or software. The basic concept abstraction of UML consists of: structural classification, dynamic behavior, and model management. This can be understood through main concepts as terms that will appear when making diagrams and views. UML defines various diagrams like use case diagrams, class diagrams, state chart diagrams, activity diagrams, sequence diagrams, collaboration diagrams, component diagrams, and deployment diagrams [31].

F. Literature Review

The following are some of the results of writing/previous research which are used as parameters in conducting research. The writing/research underneath relates to a similar research methodology. Research conducted by Deni Apriadi and Arie Yandi Saputra: The results show that this *marketplace*-based *e-commerce* application can be used by farmers in marketing their agricultural products directly to consumers [32]. Research conducted in [33], the results of the study show that the results of the implementation of the system for the sales application of farmer group crops for consumers are to build an *android*-based *mobile* application for selling crops with the *Kotlin* programming language into the *android* operating system *platform*. The results in [34] show that the agricultural product marketing information system in Enrekang Regency has been successfully created and can be used as a reference by the community to obtain information about the price of agricultural and plantation crops easily and precisely because this application process runs in real-time. Likewise, the results of research conducted by [35] and [36]. Meanwhile, several other previous writing/research results are used as an alternative research parameter. The results in [37] show that applications for agricultural products market facilitate farmers to market their products quickly and efficiently to find vegetables or fruit sold in Indonesia, and transactions between buyers and farmers become easier and faster. The results in [38] indicate the mobile application can ensure that it is beneficial and beneficial for both farmers or producers and consumers. This is in line with the results conducted by [39]-[41].

Here are some of the previous studies are used as parameters in this study: The standard framework of criteria and processes to improve the supply chain capabilities [42], Causes/Effects, the SCOR Standard, and Mutual Solution (CESM) [43]. Moreover, the model developed in [44] provides a general framework to promote a better understanding of a particular customs supply chain using mapping. The integration of JavaScript-based front-end with the SCOR-based database operation is ready for mobile and desktop usage [45]. The method considered in [46] is new in the performance evaluation framework by using a SCOR

model.

The formulas of calculating the reliability in combined systems, the reliability of each system and ultimately the whole system is investigated in [47]. The research in [48] shows a constant decrease in sales, number employees, total assets, and profit after the global recession. The framework considered in [49] will guide the practitioners to plan their investments to build a robust data-driven agri-food supply chain. The discussion of this study is followed by presenting the results of a survey on the relationship of relational capability and organizational culture capability on supply chain operational performance [50].

Research conducted in [51], based on the four decision areas, presented a SCOR model version 4.0 (Plan, Source, Make, Deliver). While following some of the previous research that used the parameters of the alternatives in this study. Big data also have the potential to revolutionize supply chain dynamics [52]. Today, the implementation of supply chain management is one of the foundations of e-business infrastructure around the world [53]. The study of combined resource-based theory in improving supply chain performance can be seen in [54]. Research conducted in [55] is based on Version 11.0 of the SCOR-model: plan, source, deliver, return and enable. Supply chain operations reference (SCOR) model is developed and maintained by the supply chain council (SCC) [56][57].

Several studies presented the recommended improvements are to provide training on-demand analysis [58] and purpose of evaluating and improving supply chain operations' performance [59]. The SCOR model [60] assists in better map and analysis of the entire supply chain. The company's views on ensuring the transformation effect of supply chain digitalization are studied in [61].

III. METHODOLOGY

The following are the steps taken in developing Sis-Log In Apps. See Fig. 1.

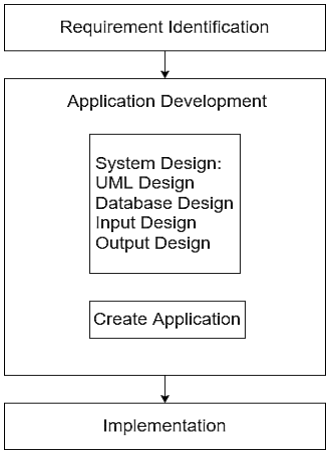


Fig. 1. Sis-Log In Apps Development Flowchart.

Based on Fig. 1 above are the stages/flow of development that has been carried out. Before the development stage, problem identification is carried out. This aims to determine the formulation, objectives, and benefits of the results of the research carried out. This research uses literature and field studies. In literature studies based on the results of literature reviews, such as journals/books/proceedings. Meanwhile, in a field study through a farming group in Telukjambe District, Karawang. The data analysis technique in this study consists of the development stage. These stages consist of: (1) system design, (2) UML design, (3) database design, (4) input design, and (5) output design.

Furthermore, designing/building applications as needed. However, this time the user is a farmer, the interface design will be designed with the expectation of being user-friendly. This is to make it easier for farmers to use smartphones. This is because agriculture in Indonesia is still lagging the development of science and technology. After the previous stages were well realized, the next is the implementation carried out on several farmer groups located in Telukjambe Timur District, Karawang Regency.

A. Sis-Log In Apps Design Process

The design process consists of 5 processes, with the following explanation:

- Business Process Analysis, the results of a social demographic survey on the impact of Covid-19 by the Central Statistics Agency (BPS), released in June 2020, showed that nine out of 10 respondents chose to shop online (online). Compared to shopping at supermarkets or traditional marketplace. The system that will be designed is an Android-based application for buying and selling vegetable agricultural products. This application can be accessed by farmers and consumers. In addition, it presents the types of vegetable products, descriptions, photos, and prices of products as well as farmer contact information for ordering.
- Needs Analysis, Functional requirements are obtained through an online questionnaire along with the results obtained from business process modeling. Things that play a role in the application consist of farmer groups as sellers of crops and consumers as buyers of crops. Table I shows a list of the needs of the farmer groups of 9 functional needs.

TABLE I
FUNCTIONAL NEEDS OF FARMER GROUPS

Code	Information
SL01	*login* and *logout*
SL02	Looking at farmer's account
SL03	Editing farmer's account
SL04	Increasing crop yields
SL05	Displaying crop yields
SL06	Changing crop availability
SL07	Deleting the crop
SL08	Changing the price of the crop

Whereas Table II shows a list of functional requirements on the consumer side, with the acquisition of as many as 7 functional requirements.

TABLE II
CONSUMER FUNCTIONAL NEEDS

Code	Information
SL01	*login* and *logout*
SL02	Looking at the buyer's account
SL03	Editing buyer's account
SL04	Displaying a list of farmer groups
SL05	Displaying crop yields
SL06	Looking for crop products
SL07	Seeing farmer profile

B. Modeling Use Case (User Interaction with The System)

Use case diagram modeling is obtained through documentation of the functional requirements of the user. In addition, it is useful to provide an overview of the functions that are owned in the application. From the results of the defined functional requirements analysis, a use case is obtained, see in Fig. 2.

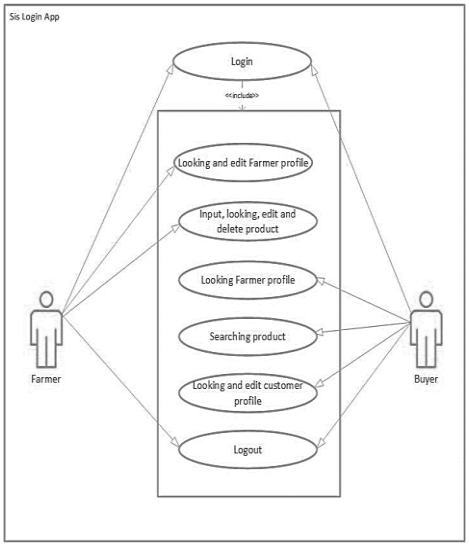


Fig. 2. Modeling Use Case Sis-Log In Apps.

C. Activity Diagram

The design process consists of 5 processes, with the following explanation:

--Activity Diagram for the user list

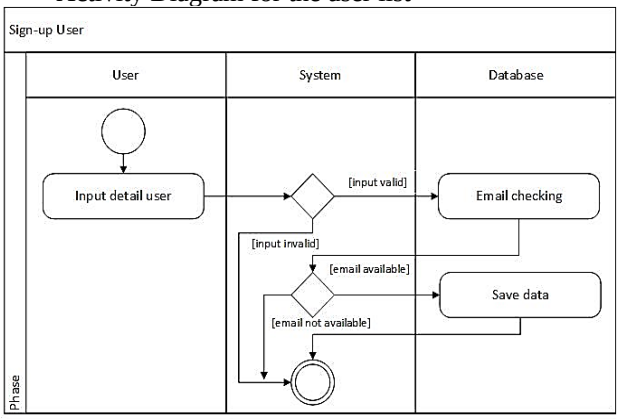


Fig. 3. Activity Diagram for the user list.

In Fig. 3 above is an activity diagram for a list of users. This is to register a farmer or buyer account. Users must enter some data first. The data entered will be checked via email whether it is available or not. If all data is valid, the account registration is successful.

--Activity Diagram for logged in user

Fig. 4 is an activity diagram for logged-in users, namely farmers and buyers. The data entered into the application is the username in the form of an email and password. If the username and password are valid, the user will be directed to the home interface.

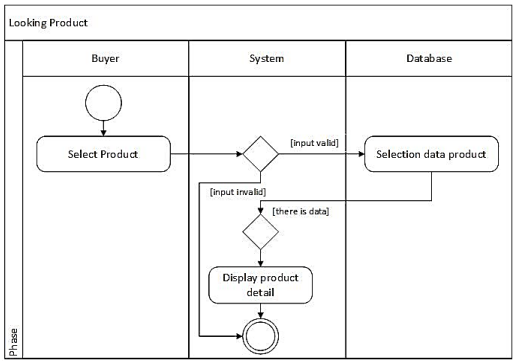


Fig. 4. Activity Diagram for logged in user.

--Activity Diagram for Product Input

In Fig. 5 is an activity diagram for product input. Farmers who want to sell products must enter product details. Meanwhile, if the product data is invalid then sales cannot be made. If all the data is valid then the data will be stored in the database.

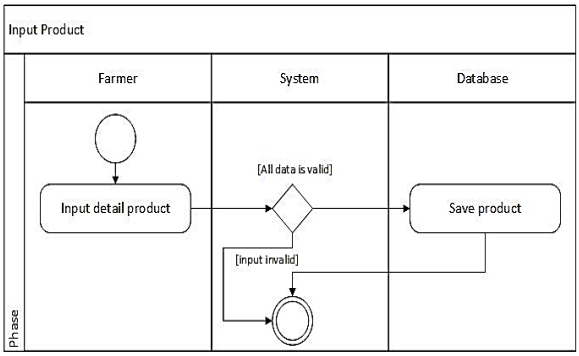


Fig. 5. Activity Diagram for Product Input.

--Activity Diagram of Finding Products

In Fig. 6 is an activity diagram looking for products sold by farmers. Users who search for agricultural products will enter the product name or keyword. Then the product name or keywords will be searched in the database and displayed in the system.

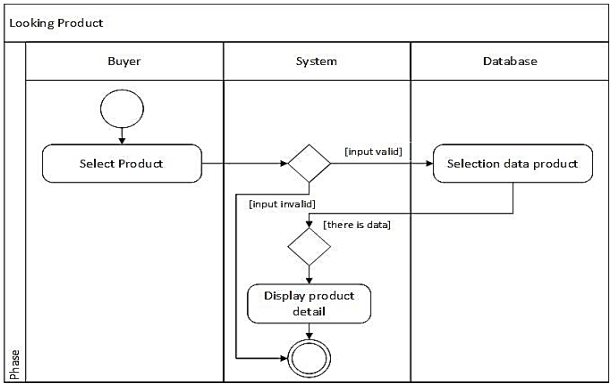


Fig. 6. Activity Diagram for Finding Products.

--Activity Diagrams to View Products

In Fig. 7 is an activity diagram to see the products sold by farmers. Users who view agricultural products will choose the appropriate product. Then the product ID obtained will be searched in the database and displayed in the system.

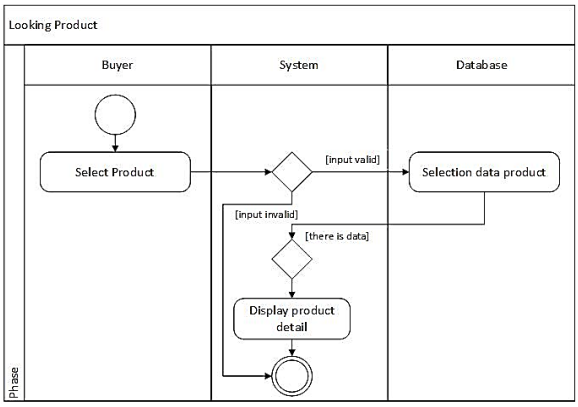


Fig. 7. Activity Diagram to View Products.

D. *Entity Relationship Diagram (ERD)*

This database design is used to carry out the coding process. In the entity-relationship diagram, you will see the attributes in the entity and the relationship between the entities. The results of the identity relationship diagram that have been designed are as in Fig. 8.

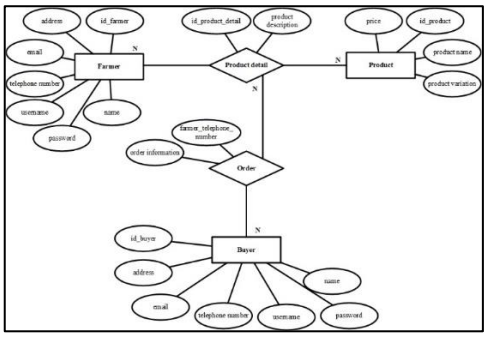
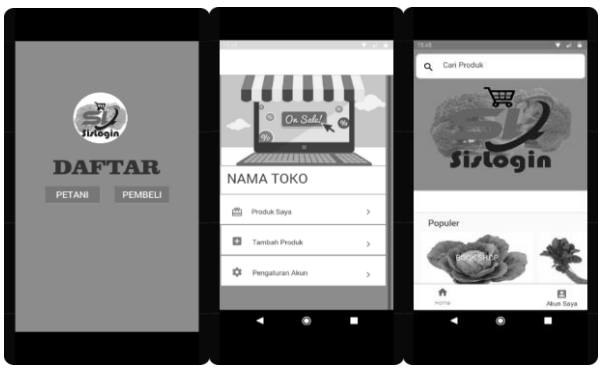


Fig. 8. Activity Diagram for Viewing Products.

IV. Results And Discussion

Sis-Log In Apps is a buying and selling application specifically designed for commodity vegetable farmers. In this application, farmers can sell vegetables directly to consumers without intermediaries. The purpose of this application is to cut the chain of selling vegetables from farmers to consumers. So that farmers can enjoy the same selling price as on the market. In addition, this application is to make it easier for consumers to find and fulfill their daily vegetable needs. The general description of the application is shown in Fig. 9.



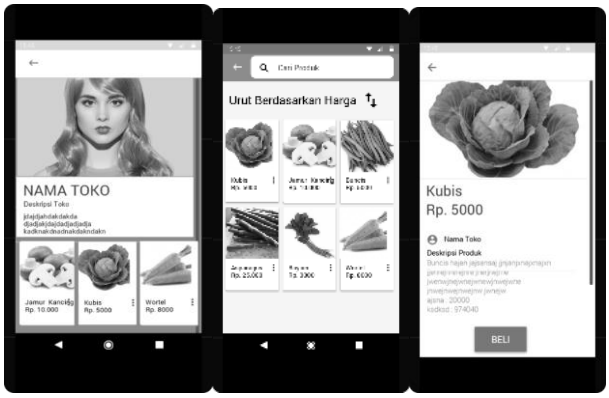


Fig. 9. Sis-Log In Apps (in Indonesian).

The initial condition before using Sis-Log In Apps, selling vegetables from farmers to consumers experienced several stops. Namely, for collectors and traders, the illustration is as in Fig. 10.

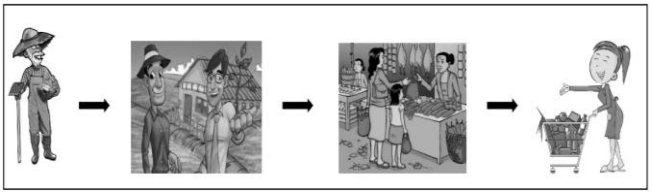


Fig. 10. Illustration of vegetable commodity sales distribution chain before the implementation of e-commerce applications.

Fig. 10 illustrates the distribution flow of vegetables from farmers to consumers. Vegetables have had several stops, namely collectors and traders. This results in the price sold to consumers tend to be high and are inversely proportional to the price given by farmers. In addition, there is also a mismatch in the profit margin obtained by farmers compared to collectors and traders. Meanwhile, the impact of this distribution flow on vegetables is a decrease in the quality and freshness of the vegetables sold. In terms of making supply chain processes and transactions simpler. Then the roles of wholesalers and retailers or traders are replaced by the Sis-Log In Apps application as shown in Fig. 11.

Fig. 11. Illustration of vegetable commodity sales distribution chain after the implementation of e-commerce applications.

It can be seen in Fig. 11, Sis-Log In Apps acts as a direct link between consumers and farmers. Consumers can find the vegetables they need, then they are connected directly to the farmers who provide them. Furthermore, farmers will send vegetables to consumers directly, so that the vegetables obtained by consumers are of high quality. This is because it comes directly from the farmer. In addition, farmers can enjoy high prices, whereas previously high prices were only enjoyed by collectors and traders. The supply chain is an important aspect that needs to be considered to determine the success of the distribution of vegetables that will be or have

been processed. Aspects that can be measured to determine supply chain performance are in terms of effectiveness and efficiency. Effectiveness uses supply chain operation reference (SCOR) analysis and to measure efficiency uses marketing margins and farmer's share. The supply chain process with supply chain operations reference (SCOR) analysis consists of five processes: planning (plan), procurement (source), production (make), delivery (deliver), and return (return). However, in this study, only the planning, delivery, and return processes are used. The explanation of the SCOR components in the vegetable supply chain in the Sis-Log In Apps application is as follows:

--Planning Process (Plan), the planning process is a process carried out in the supply chain activities, starting from production planning, commercial vegetable delivery plans, and return plans. At the time of the research, the planning in the vegetable business had been implemented quite well. Starting from planning and making Sis-Log InApps as a new marketing medium for farmers directly to customers. Apart from planning applications, farmers make plans in terms of growing vegetables.

--Delivery Process (Deliver), the process of sending commercial vegetables is carried out by farmers directly. Before sending, there is a transaction process and agreement made. First, buyers find and select the vegetables they need through the application. Then the consumer makes contact with the farmer regarding the details of the purchase that will be made. After an agreement is made, the farmers then send the ordered vegetables to consumers directly. Delivery of vegetables to customers requires transportation costs. Transportation costs can be agreed upon when contact is made at an earlier stage.

--Return Process (Return), there are not many repayments made during vegetable transactions. When there is damage to the goods during delivery, the goods are not returned. However, minus the kilogram volume or reduce the price.

The supply chain performance attributes in this study. As in Table III. In addition, to create a positioning on the Sis-Log In Apps platform using simple actions.

TABLE III
SUPPLY CHAIN WORK ATTRIBUTES

Work Attributes	Matrix	Buyer
Reliability	Order fully delivered	Orders sent are almost 100% fulfilled by farmers registered on the application.
	Delivery performance	Deliveries made by farmers are under mutually agreed agreements. So that the delivery is scheduled, and the departure and arrival time can be estimated
	Documentation accuracy	When receiving an order, the buyer will receive an invoice/receipt brought by the farmer. It is provided for purchase details and as proof of transaction.
	Item condition	Damage to goods received during the trip. The farmer only cuts the number of scales or reduces the price.
Responsiveness	Delivery cycle time	Vegetables are sent by farmers according to the agreed time during the communication process.
Cost	delivery	Shipping costs are borne by the buyer based on the distance travelled by the farmer.

In this study, based on actionable, several attributes and their levels can be applied, as in Table IV.

TABLE IV
ATTRIBUTES AND ALTERNATIVES FROM E-COMMERCE SIS LOG-IN-APPS

Attributes	Alternative
Display	Product photos
	Photos and videos of the product
Entertainment features	Coin-generating game
	No entertainment features
Live feature	Live chat
	Live video and chat

In Table IV, there are three attributes with each attribute having two levels or alternatives in it. With these three attributes, it is hoped that they will be able to build a positioning in the eyes of the user. To strengthen from the basis of the marketing communication strategy. Then a further analysis was carried out using conjoint analysis. In the initial stage, it was to form stimuli consisting of eight stimuli with a combination of the three previous attributes. As for the eight stimuli in Table V.

TABLE V
STIMULI CARDS FROM E-COMMERCE SIS LOG-IN-APPS

No	Shop Display	Entertainment Features	Live feature
1	Product photos	Coin generating game	Live chat
2	Product photos	Coin generating game	Live video and chat
3	Product photos	No entertainment features	Live chat
4	Product photos	No entertainment features	Live video and chat
5	Product photos and videos	No entertainment features	Live chat
6	Product photos and videos	Coin generating game	Live video and chat
7	Product photos and videos	No entertainment features	Live video and chat
8	Product photos and videos	Coin generating game	Live chat

In Table V, eight stimuli cards will be made in the questions to be asked to the respondent. This is to get a rating with a rating range of one to ten. The higher the rating is given by the customer, the more the customer likes the combination of stimulation cards that are made. The rating that has been given to the user is random for the eight stimulation cards. Then the calculations are processed using SPSS software version 23. To get an estimate of utility value, estimate importance value, and correlations. The results of the conjoint analysis calculation are obtained as in Table VI.

TABLE VI
UTILITIES

Attribute	Alternative	*Utility Estimate*	Std. *Error*
Shop display	Product photos	,441	,153
	Photos and videos of the product	-,441	,153
Entertainment features	Coin generating game	-,015	,153
	No entertainment features	,015	,153
Live feature	Live chat	,176	,153
	Live video and chat	-,176	,153
(*Constant*)		7,838	,153

In Table VI, the utility attributes of each alternative are obtained. This utility value shows the level of importance of each alternative attribute. Each alternative for the same attribute always has the same utility number. The difference is that there are alternatives that have a positive value, while other alternatives have a negative value. The alternative that has the maximum utility value is the most preferred. A positive value on alternative utility indicates that the alternative is more preferred by the respondent. On the other hand, a negative utility value indicates that there are fewer alternatives chosen by the respondent. It can be seen in Table VI. The highest utility values are found in the store display attributes with product photos. This is an alternative because it has a utility value of 0.441. In the second place, there is a live feature attribute with live chat alternatives having a utility value of 0.176. Whereas in the last sequence there is an attribute of entertainment features with an alternative without entertainment features having a utility value of 0.015. The importance value results are in Table VII.

TABLE VII
IMPORTANCE VALUES

Attribute	Importance Values
Shop display	46,547
Entertainment features	29,440
Live feature	24,013

In Table VII, the importance value of each attribute is obtained. This value shows the attributes that influence the e-commerce positioning of Sis-Log In Apps [62]. In Table VII, it shows that the most important attribute is the appearance of the shop with an importance value of 46.547%. In addition, it is followed by additional feature attributes with an importance value of 29.440% and attributes of live features with an importance value of 24.013%. The result of correlations is in Table VIII.

TABLE VIII
CORRELATIONS

Correlations		
	Value	**Sig.**
Pearson's R	0.841	0.004
Kendall's tau	0.764	0.004

In Table VIII, the value of the correlations is used to determine the validation of the results from the conjoint analysis. This is to predict the preferences of Sis-Log In Apps e-commerce users. It can be seen in Table VIII that the Kendall's tau correlations value is 0.764 with a significance of 0.004 (less than 0.005). It can be concluded that it shows the preference for estimation obtained from the conjoint analysis. Apart from that with actual preferences have a strong relationship. So that the conjoint analysis has high predictive accuracy.

V. CONCLUSION

The Android-based marketplace application can be used by farmers in marketing agricultural products directly to consumers. So that the marketing distribution chain can be cut, this of course will have an impact on farmers' profits. Based on the results of the supply chain operation reference (SCOR), farmers can save time and money. In addition, buyers who buy agricultural products can help the local government in the welfare of farmers. On the other hand, consumers also get agricultural products at lower prices. Because product purchases can be made directly through farmers. So that the results of the quality and price of the vegetables are more guaranteed. Meanwhile, the results of the conjoint analysis show that the most preferred and needed alternative by users is a shop display in the form of product photos. Without any entertainment features, with the addition of a live chat feature in the application. The three alternatives of each attribute are the most preferred by respondents. Adding three attributes and each alternative can build the positioning of Sis-Log In Apps in the eyes of the user. So that the achievement of positioning can support in terms of marketing.

The suggestions that can be given for further research are the design of information systems regarding adding back features. In addition, this application is only limited to a few agricultural commodities. In the future, it is recommended to add more agricultural commodities. Furthermore, payments are also made outside of the application. Therefore, it is better if you add a payment feature through the application by using a payment service partner. The Google Position System (GPS) feature also needs to be improved again. This is to make it easier to map the product search process based on the location of the nearest farmer.

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