Cloud Computing Based Group Buying Marketplace

Pandu Agung Setiawan[a,b,*], AndycoNicky Alim[b], Herman Budianto[b],
Joan Santoso[b], Esther Irawati Setiawan[b], Christina Esti Susanti[a],
Dyna Rachmawati[a]

[a]Faculty of Business, Universitas Katolik Widya Mandala Surabaya, Surabaya, Indonesia
[b]Department of Informatics, Institut Sains dan Teknologi Terpadu Surabaya, Surabaya, Indonesia

Abstract: There are numerous transaction models available currently. Beginning with standard transactions, wholesale, and sales, etc. Rarely do transactions utilize the group transaction model, in which multiple purchasers purchase an item at a discounted price in a single transaction. By utilizing technology such as web applications, people can engage in this model of transaction more freely, expanding the pool of potential buyers and merchants. We propose a cloud computing basedsystem that provides users with additional options for locating lower-priced products. This system adds a group transaction model without eliminating other widely used transaction models. This research system can facilitate transactions between sellers and customers. Buyers can purchase at a reduced cost, while sellers can sell more merchandise. Thus, this application for the research can serve as an additional option for buyers and vendors in transactions.

Keywords: Group Buying, Market Place, Cloud Computing.

I. INTRODUCTION

In a transaction there are many things that can be done. For example, making a discount promo or wholesale sales at a lower price. However, not all sales implement this. Group buy is an activity that combines these two features. Group buys not only offer lower prices for goods but also implement wholesale sales. The more items purchased, the lower the price will be. Interestingly, group buys do not have any restrictions on the items that can be applied to sales with group buys.

Group buys has become a major trend in China. The growth of group buys is fueled by various factors, including customer perceived value, involvement, trust, susceptibility[1]. Consumer perceived value refers to the benefits a consumer receives from buying in a group rather than purchasing individual items. Involvements mean how people try to get involved in a transaction. People usually don't want to buy in group buying, when a lot of customers in the group don't have to contributeto the transaction. Trust plays a crucial role, because customers will try to buy in group if the other members are trustworthy. Lastly, Susceptibility refers on how much consumers are influenced by the opinions of others when making a purchasing decision.

Consumers are likely to make purchasing decisions based on whether the product or service offers an experiential benefit[2]. An experiential purchase is one that provides an experience, such as a concert or a vacation. Consumers were very motivated by the opportunity to share the experience with others, as well as to gain social status by participating in group events.

The phenomenon of group buying can't be separated from the equity theory. The impact of price equity, outcome equity and effort equity are huge in group buying situations. According to the study, all of them play an important role on shaping consumers attitudes in online group buying contexts[3]. For instance, individuals are likely to participate in group buying when they perceive equitable pricing, fair outcomes, and a balanced distribution of effort among participants.

Every individual has own decision-making to involve in group buying. Brand-conscious people are involving the most in group buying, because they have a higher value on reputation and image[4]. By purchasing items as part of a group, they can benefit from lower prices, such as discounts. Therefore, brand-conscious individuals find group buying appealing as it allows them to maintain their desired reputation while obtaining products at reduced costs.

On the other hand, costs are still very important in the decision-making of consumers.High transaction costs, such as extensive search and information costs, tend to decrease purchase intention and erode trust. This is becausethey increase the perceived risks and effort involved in completing a purchase[5].

Group buys are usually done with friends or people who are already known. Rarely do buyers invite other buyers without recognizing the buyer. This causes transactions with group buyers to become increasingly scarce. Most people are forced to choose to buy at normal prices rather than aiming for a target purchase amount to get a lower price. The use of the group buy system in online transactions is also not easy. Not everyone wants

to wait for another buyer who wants to buy the same thing somewhere. Each seller has their own number of buyers, and the number of buyers is not the same every day. This makes group buy transactions even more difficult.

To increase buyer satisfaction with existing online transactions, a cloud-basedwebsite is proposed with a group buy feature where buyers can invite friends or other unknown buyers to buy the same item to get a lower price. Shoppers can create a new purchasing group or join another existing buyer group to purchase the item. With an online transaction system, buyers do not need to wait for other buyers to join in buying an item because online transactions can be done anywhere and anytime if they have an internet connection. The sales area coverage is also bigger because of the internet.

This study discusses the use of cloud computing in a web-based system. The need for efficiency and effectiveness in the implementation of the group buying process is very necessary especially in terms of improving or maintaining the quality of learning outcomes. Implementation in the system really needs to be supported by reliable technological capabilities. Using cloud computing-based technology in the group buying process can increase efficiency and effectiveness in improving the performance of the system.

Cloud computing[12], [13]is a paradigm of computing in which resources such as processors, storage, networks, and software are abstracted and offered as internet-based services via remote access patterns. Some of the most important characteristics of cloud computing include on-demand accessibility, simple control, and virtually unlimited scalability. Cloud computing is represented by Google Cloud, Amazon Web Services (AWS), Firebase, and others. Our proposed system uses AWS Lightsail for the platform.

RESTful web APIs, which are web services that follow the principles of REST (Representational State Transfer) architecture. RESTful web APIs use HTTP as the system protocol and support multiple data formats, such as JSON, XML, HTML, and RDF and are needed for incorporating the required features in this research.

This article is divided into four sections. The first section addresses the introduction and context. The methodology is described in the second section. The fourth section describes the results and discussion, while the final section outlines the conclusions.

II. RESEARCH METHODOLOGY

Our proposed system employs the waterfall methodology. Development begins with planning the design of the application, followed by planning the design and flow of the algorithm, writing code, testing the program, releasing the product, and, if errors or defects are discovered after the application has been created, fixing them. This method is utilized because it is suitable for small to medium-sized undertakings and does not require an excessive amount of money or resources.
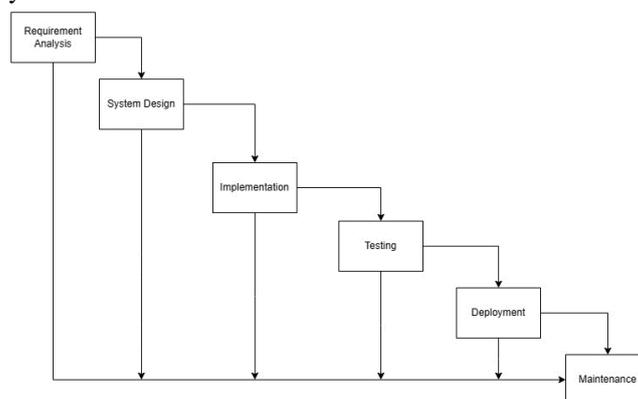

Fig. 1 Waterfall Metodology

A. Requirement Analysis

Requirements analysis is carried out to get what is needed by the application. This requirement is in the form of any process and features to support this application. The steps needed are identifying actors, analysing data, identifying requirement, and making use case diagrams.

In Figure 2, it can be seen that to use the features available in the application, users must first log in, except to view products. Before being able to log in to the application, users must register their account. Buyer can buy a product using the group buy feature, the buyer has 2 options: create a group or join an existing group. Every time a buyer wants to buy a product, join a group or create a new group, they will go through a payment process using the provided payment service and will be charged an administrative fee of IDR 5,000 which will

go into the application's revenue. In a group, buyers can interact with other buyers through the provided group chat feature.

Buyers can favorite or add products to their wishlist. In addition, buyers can also view their transaction history and register as a seller through their profile. When registering as a seller, important data will be requested as a requirement for opening a store.

Sellers can add products to be sold and choose whether or not the products sold can use the group buy feature. If the seller chooses to activate the group buy feature, additional input will be requested in the form of how much the price of goods per purchase with a certain number of goods. In addition, this price is not only valid for group purchases but can also apply to purchases from a single buyer. To attract buyers' attention, sellers can also create vouchers that can only be used on the seller's products or post promotions.

Admins have the same features as sellers with the addition that admins can create vouchers that can be used for any product. In addition, admins can view a list of users reported by other users and have the authority to ban reported users.
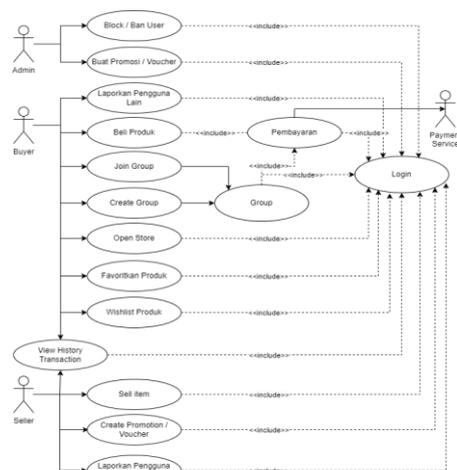

Fig. 2 Use Case Diagram

B. Design

After conducting a requirements analysis, it is necessary to move on to concept design and system design. This design process describes architectural design, database design, data flow diagram design and application interface design. Our system architecture, which incorporates cloud-based technology, is depicted in Figure 3.
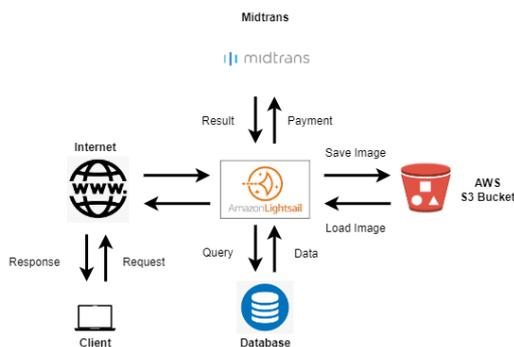

Fig. 3 System Architecture

Figure 3 shows that the application is cloud-based. The framework, that used to create the web application, is Laravel, The application will be deployed through Amazon Lightsail, because it can make the performance of the application lighter.

The application is connected to a web service that serves to interact with the server. There are several files in the form of images from user input that will be uploaded to AWS S3 Bucket. This application uses Midtrans as a payment gateway when transactions are made.

C. Implementation

Implementation is conducted with reference to the system's analysis and design. The implementation employs multiple programming languages, with PHP serving as Laravel's primary language.[14] framework and JavaScript for the server side with Node.js[15].

Laravel Framework cloud support the creation of a database schema, seed the database with sample data, display blog posts and comments, add authentication and authorization, and implement pagination and validation. Introduces some of Laravel's advanced features, such as Eloquent ORM, Blade templating engine, IoC container, bundles, events, filters, and RESTful controllers. Also, provides a reference section that lists all of the Laravel commands, methods, properties, and configuration options.

D. Testing

Users conduct black box testing on application functionality, while developers conduct white box testing. Testing is conducted to determine whether the efficacy of the system matches the results of the design.

E. Deployment

We incorporated Cloud Computing Technology and use. AWS Lightsail[10] for deployment. The steps to use AWS Lightsail for deployment are as follows:

1. Creation of Instance

The instance creation process on the official AWS Lightsail website can be initiated by logging in. The "Instance" column should be navigated to and "Create instance" should be clicked. The desired platform, Linux in this case, can be chosen. The desired blueprint should also be selected. Two options are offered by AWS Lightsail, namely "Apps and OS" and "OS only". In this case, "Apps and OS" is chosen and "Nginx" is selected. The desired instance plan should be chosen based on budget and performance requirements. For applications with lower requirements, the lowest option can be selected. The instance will be processed and created by AWS Lightsail based on the selection made. It takes a few minutes before the instance becomes available for use.

2. Deploying the Application of AWS Lightsail

The application can be uploaded to GitHub by creating a new repository and uploading the application folder. The terminal of the instance can be opened by accessing the terminal icon in the instance list. The application can then be pulled from the GitHub repository and deployed on the AWS Lightsail instance using the appropriate command lines in the instance terminal.

3. Creation and Connection of Database

The "Database" column should be navigated to and "Create database" should be clicked. The desired database, MySQL in this case, should be chosen. The desired database plan should be selected based on budget and performance requirements. The necessary steps should be followed to connect the new database to the application.

4. Creation and Connection of S3 Bucket

The "Storage" column should be navigated to and "Create bucket" should be clicked. The desired bucket plan should be chosen based on budget and storage requirements. The necessary steps should be followed to connect the new S3 bucket to the application, which may include the addition of new environment variables (AWS_ACCESS_KEY_ID, AWS_SECRET_ACCESS_KEY, AWS_DEFAULT_REGION, AWS_BUCKET, and AWS_URL). To obtain the access key and secret access key, the "Permissions" tab on the bucket details page should be accessed, and a new access key should be created. It is important to note that the AWS_SECRET_ACCESS_KEY can only be viewed once during its creation, so it should be securely saved.

F. Maintenance

Maintenance is conducted by using Cloud Watcher technology to analyze the performance in the cloud platform.

III. RESULTS AND DISCUSSION

In this section, we will discuss the results and system testing on the features that have been made in this application and. With these experiments, it will be known the shortcomings of this application and these deficiencies can be corrected immediately.

The following is a view of the web that has been made. Figure 3 displays the main page of the application. The main page is the start page that displays all categories and some of the featured products.
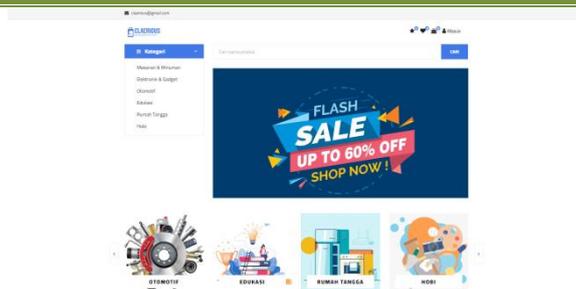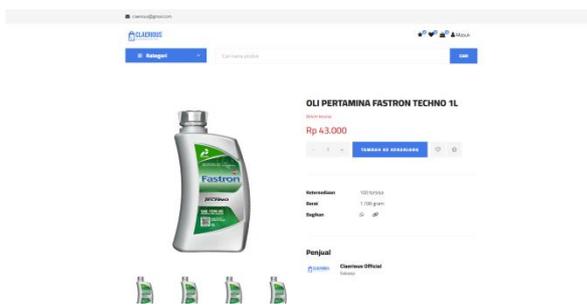
Fig. 4 Homepage

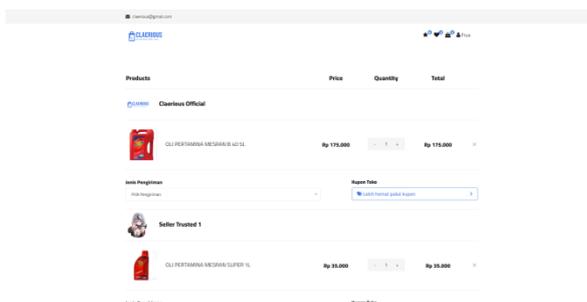Fig. 5 Product Details Page

Fig. 6 Shopping Cart Page

Figure 5 shows the product detail view. There are various buttons that have their respective functions. These buttons are the add to cart, add to wishlist, and favorite buttons. In addition, at the bottom of the page there are 3 columns, namely the description, review, and group columns. In the group column, users can create new groups or join groups already created by other users.

Figure 6 shows the shopping cart view. When the user has items in the shopping cart, the user can select the type of delivery and the voucher they want to use and then proceed to the payment process. Payment can be seen in Figure 7 below, where the user is given a choice of several payment methods that can be used to complete the payment.
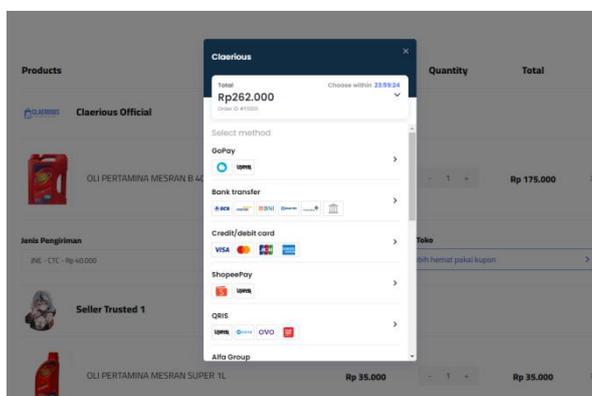
Fig. 7 Payment Page

The experimentswere carried out by distributing questionnaires to users and experts. With this questionnaire we can see the advantages and disadvantages of this application. The following are the results of completing the questionnaire that has been given by several respondents.
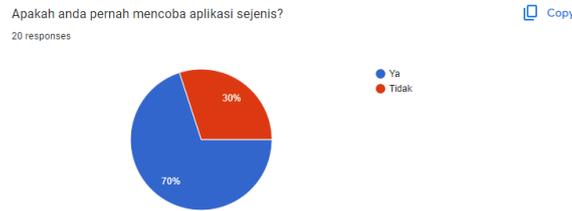

Fig. 8 First Question

Figure 8 is a diagram of the question "Have you ever tried a similar application?" Figure 7 is a visual representation of the responses collected from the distributed questionnaires. This questionnaire was completed by a total of twenty individuals. 14 individuals responded with a percentage of 70%, while 6 individuals responded never with a percentageof 30%.
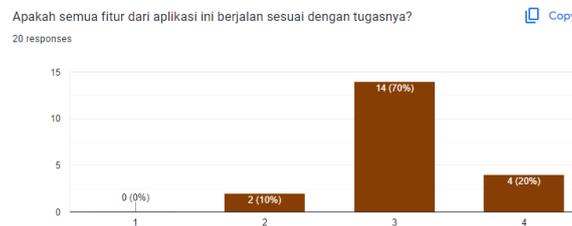

Fig. 9 Second Question

Figure 9 is the graphic questionnaire result of the query "Are all of this application's features operating as intended?" Four individuals provided a value of four with a percentage of 20%, fourteen individuals provided a value of three with a percentage of 70%, and two individuals provided a value of two with a percentage of 10%.
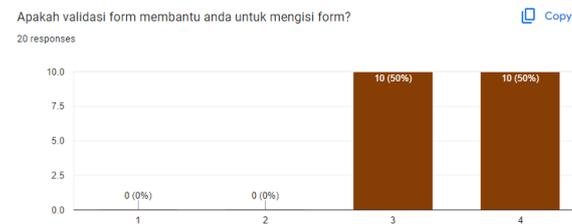

Fig. 10 Third Question

Figure 10 is a diagram of the question "Does form validation help you to fill out the form?" Twenty individuals have responded to this query. Ten individuals assigned a value of 4 with a percentage of 50% and ten individuals assigned a value of 3 with a percentage of 50%.
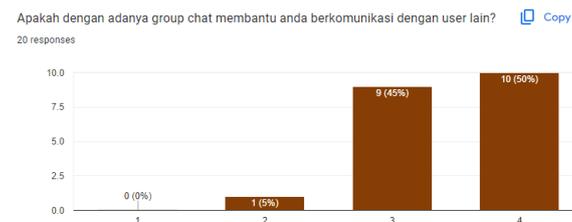

Fig. 11 Fourth Question

Figure 11 depicts the question, "Does a group chat facilitate communication with other users?" Twenty individuals have responded to this query. Ten individuals provided a value of 4 with a percentage of 50%, nine individuals provided a value of 3 with a percentage of 45%, and one individual provided a value of 2 with a percentage of 5%.
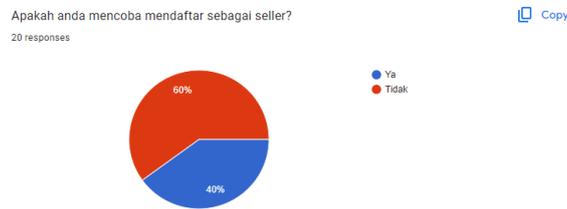

Fig. 12 Fifth Question

"Are you trying to register as a seller?" results is depicted in Figure 12. Twenty individuals responded to this query. 8 individuals responded affirmatively with a percentage of 40%, while 12 people responded negatively with a percentage of 60%.
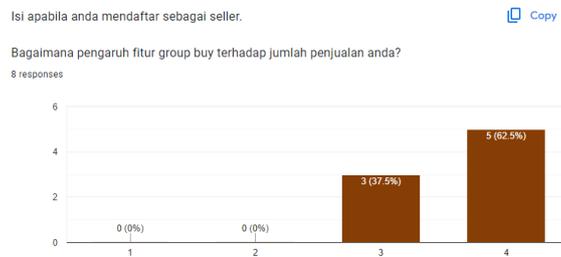

Fig. 13 Sixth Question

Figure 13 depicts the question "How does the group buy feature affect your sales volume?" Eight individuals responded to this query. 5 respondents assigned a value of 4 at a rate of 62.5%, while 3 respondents assigned a value of 3 at a rate of 37.5%.
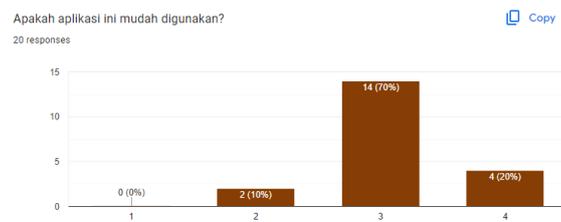

Fig. 14 Seventh Question

Figure 14 depicts the inquiry, "Is this application easy to use?" Four individuals provided a value of four with a percentage of 20%, fourteen individuals provided a value of three with a percentage of 70%, and two individuals provided a value of two with a percentage of 10%.
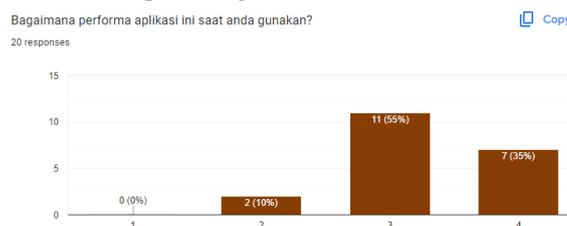

Fig. 15 Eighth Question

Figure 15 is a diagram illustrating the query "How does this application perform when you use it?" 7 respondents assigned a value of 4 at a rate of 35%, 11 respondents assigned a value of 3 at a rate of 55%, and 2 respondents assigned a value of 2 at a rate of 10%.
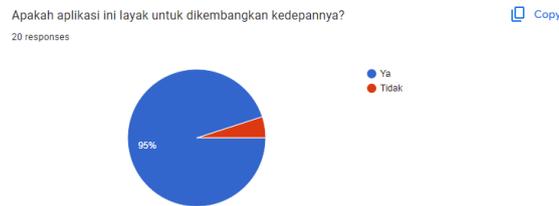

Fig. 16 Eighth Question

Future development of this application is feasible according to the diagram in Figure 16. There were a total of 19 affirmative responses and only one negative response.

IV. CONCLUSIONS

This section will discuss the conclusions and suggestions made during the development of this research. Group buy is an important feature in the research application. Through this feature, most buyers get goods at a lower price, as expected. On the seller side, the number of items sold has increased because of this feature. This application is providing convenience to help the two actors to answer their wishes.

From the questionnaire it is known that the application is running well but requires some minor improvements. Some criticism and suggestions are given so that in the future the application will be better, namely the appearance is made more attractive by adding animation, it is necessary to improve some parts of the application where the performance can be felt unstable, and the user flow is still a bit confusing for people who are using the application for the first time.

REFERENCES

[1]. V. M. Sharma and A. Klein, "Consumer perceived value, involvement, trust, susceptibility to interpersonal influence, and intention to participate in online group buying," Journal of Retailing and Consumer Services, vol. 52, p. 101946, 2020.
[2]. J. Agarwal, G. Das, and M. T. Spence, "Online group buying behavior: A study of experiential versus material purchases," Psychol Mark, vol. 39, no. 10, pp. 1946–1963, 2022.
[3]. W. M. Lim, "An equity theory perspective of online group buying," Journal of Retailing and Consumer Services, vol. 54, p. 101729, 2020.
[4]. A. Klein and V. M. Sharma, "Consumer decision-making styles, involvement, and the intention to participate in online group buying," Journal of Retailing and Consumer Services, vol. 64, p. 102808, 2022.
[5]. J. M. Garcia, O. B. D. L. Freire, E. B. A. Santos, and J. Andrade, "Factors affecting satisfaction and loyalty to online group buying," Revista de Gestão, vol. 27, no. 3, pp. 211–228, 2020.
[6]. Y. Yudhanto and H. A. Prasetyo, Panduan Mudah Belajar Framework Laravel. Elex Media Komputindo, 2018.
[7]. F. Doglio, Doglio, and Corrigan, REST API Development with Node. js, vol. 331. Springer, 2018.
[8]. A. Nandaa, Beginning API Development with Node. js: Build highly scalable, developer-friendly APIs for the modern web with JavaScript and Node. js. Packt Publishing Ltd, 2018.
[9]. R. Ramakrishnan, J. Gehrke, and J. Gehrke, Database management systems, vol. 3. McGraw-Hill New York, 2003.
[10]. L. Richardson, M. Amundsen, and S. Ruby, RESTful Web APIs: Services for a Changing World. " O'Reilly Media, Inc.," 2013.
[11]. A. Ehsan, M. A. M. E. Abuhaliqa, C. Catal, and D. Mishra, "RESTful API testing methodologies: Rationale, challenges, and solution directions," Applied Sciences, vol. 12, no. 9, p. 4369, 2022.
[12]. W. Hartanto, "Cloud Computing dalam Pengembangan Sistem Pembelajaran," Jurnal Pendidikan Ekonomi: Jurnal IlmiahIlmu Pendidikan, Ilmu Ekonomi dan Ilmu Sosial, vol. 10, no. 2, 2017.
[13]. A. Sunyaev and A. Sunyaev, "Cloud computing," Internet Computing: Principles of Distributed Systems and Emerging Internet-Based Technologies, pp. 195–236, 2020.
[14]. S. McCool, Laravel starter. Packt Publishing, 2012.
[15]. N. Js and N. Js, "Node Js," Obtenido de https://nodejs. org/es, 2020.