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Service Quality Analysis of Tokopedia Application Using Text Mining Method

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Abstract

Shopping transformation using online applications makes it easier for sellers and buyers to make transactions. In Indonesia, there are several shopping applications, Tokopedia is one of them. Tokopedia is one of the shopping applications developed in Indonesia. To ensure users' loyalty to the Tokopedia application, quality analysis is done to determine how the application could be improved or developed. This study applied the Quality Measurement Theory to examine the mobile shopping application service quality with three variables: interaction quality, environmental quality, and outcome quality. The data used in this study are users' reviews of the Tokopedia application on the Google Play Store website. Data retrieval is done by scrapping for the period June 2020 to December 2020 with a total data of 21,616 reviews. The review data is then analyzed using the text mining method. The sentiment analysis results indicated a value of 65% positive sentiment and 35% negative sentiment. In multi-class classification, the results were 16% interaction quality, 26% environment quality and 58% outcome quality. The text network analysis determined how the word network was formed and uncovered negative words mentioned in each indicator in the mobile apps service quality.

Keywords: Service Quality Application, Text Mining, Big Data
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1. Introduction

Indonesia is a country with many mobile shopping application users. Among the many mobile shopping applications, Tokopedia is a mobile shopping application developed in Indonesia. According to SimilarWeb.com (2020), Tokopedia is inferior to other shopping applications such as Shopee and Lazada. Thus, this research took data from the Google Play Store website to study how the sentiments of Tokopedia users. The content of user reviews is studied using text mining to find out users' perceptions, experiences, criticisms and suggestions for Tokopedia. Online user-generated content (UGC) differs from the primary user method, where the former is not required to send any requests or solutions to the developer. Instead, they discuss the product's strengths, weaknesses, and effective social media use. Companies can use this information to study and improve their product services (Nga N & Ho-Dac, 2020).

Developers or companies can use user reviews to know the customer expectations and refer them to improve their existing features' quality. Positive and negative reviews given by users are helping to ensure that the feature development of the application matches the expectations of users with different backgrounds. Therefore, the sentiment analysis method is used in this research. Due to the large amount of data used in this study, the big data process is used to conduct this research. Martin-Domingo (2019) defined sentiment analysis as a big data analytic method that serves to identify sentiment polarity in expressions or judgments made by consumers. Research on customer satisfaction is essential and valuable. It must do quality research for every industry. Evaluating customer satisfaction and service quality are vital goals for service companies to survive and remain competitive in the market (Alnaser, Khalid, & Alshoura, 2014).

This research analyzes the sentiments of users' reviews of Tokopedia on Google Play Store using the sentiment analysis method. Tokopedia user reviews are grouped based on positive and negative sentiments. Next, the multi-class classification method is used to map user perceptions based on reviews with seven dimensions of multi-class classification to determine the quality of mobile shopping applications. When one dimension gets more negative sentiment than positive sentiment, it is an indication that the quality of the application features needs improvement.

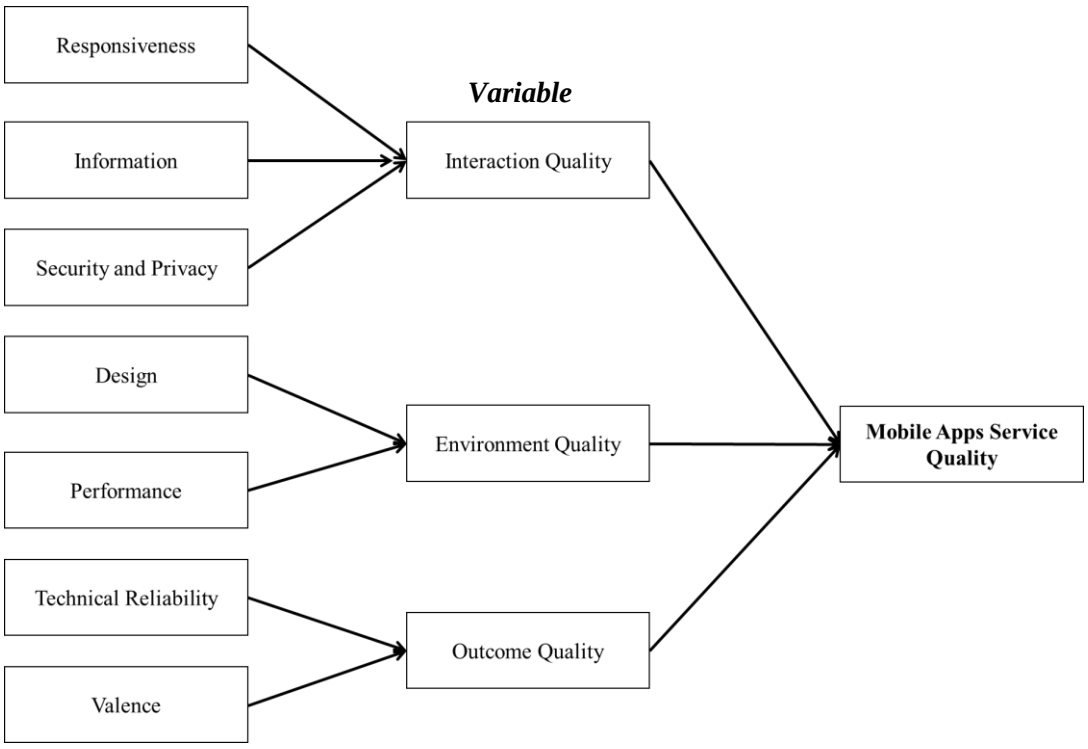
2. Literature review

The mobile shopping application provides other services apart from the interface of the seller and the buyer. In the mobile shopping application, the most attractive services from the mobile shopping application using online surveys include dimension, price, monetary, convenience, and situational value information (Rudolph, Nagengast, Melanie, & Bouteiller, 2015). This new technology in buying and selling answers the needs of consumers and sellers in processing data and instruments depending on the needs of each user (Araste, Mansouri, Foruzand, & Ganj Khanloo, 2015).

Evaluating customer satisfaction and service quality is the main goal for service companies that want to survive in an increasingly competitive market (Alnaser, Khalid, & Alshoura, 2014). One of the types of big data research is to use User-Generated Content (UGC) data. UGC sources vary, ranging from data reviews, comments, or tweets from personalities on social media that users could upload based on their respective interests (Liu, Shan, Ballet, & Fang, 2017).

Sentiment analysis is a data mining technique used to measure the emotional polarity of consumers (positive and negative) and attitudes towards a particular topic (Gitto & Mancuso, 2017). Mobile Apps Service Quality (MASQ) is a concept develops from service quality. The development of the MASQ concept is based on a dual approach of the Electronic Service Quality (ESQ) and the Mobile Service Quality (MSQ). Both ESQ and MSQ form the basis of the structured online customer reviews (Mayring, 2014). The concept of service quality construction is applicable in a mobile application context as it could define service quality as the difference between perceived and expected service quality (Wulfert, 2019). The appropriateness and validity of the MASQ variable used have been verified in the analysis of ESQ and MSQ. They are implicitly validated in Qualitative Content Analysis (QCA), which identifies associated online customer reviews for each MASQ variable. The following investigations were carried out to answer the content structuring approach of QCA (Mayring, 2015).

Figure 1: Mobile Apps Service Quality



2.1 Interaction Quality Variable

Interaction quality involves a quality variable that assesses the interaction between customers and mobile application service providers while using the offered application services, the quality of the interaction of the primary variable accompanied by Responsiveness, Information, Security and Privacy (Wulfert, 2019).

2.1.1 Responsiveness Dimensions

The mobile shopping application refers to how the application provides information to its users, solve users' problems when they are using the application, provide feedback to responses, as well as customer services that can be contacted 24/7 in the form of a chatbot, live chat, email or frequently asked Questions (FAQ) pages.

2.1.2 Information Dimensions

Information dimensions refer to the mobile shopping companion application designed to enhance the shopping experience in physical stores. Physical stores should expand their offline businesses online. All information provided on the shopping application must be up-to-date at all times.

2.1.3 Security and Privacy Dimensions

Customers' personal information gathered through online shopping, such as customers' names, addresses, and payment information, must be secured and protected.

2.2 Environment Quality Variable

Quality describes how the application excels in providing services that make customers feel comfortable using the application. Environment quality influences perceptions more than services since users could use the services provided without spatial and temporal restrictions (Wulfert, 2019). There are two aspects of environment quality: the design dimension and the performance dimension.

2.2.1 Design Dimension

Design dimension is related to the User Interface (UI) visual aesthetics, how the application is easy to use and easy for users to understand. It refers to the application's visual appearance and how each customer subjectively feels about the design quality.

2.2.2 Performance Dimension

Mobile shopping applications must be able to operate smoothly without interruptions. The application must accommodate 24 hours usage without errors, especially during midnight sales or specific dates on massive discounts.

2.3 Outcome Quality Variable

Outcome quality is the results of using the mobile shopping application, whether users feel that they are facilitated in buying, matching customers' search or otherwise. Outcome quality is affected by the technical reliability dimension and valence dimension.

2.3.1 Technical Reliability Dimensions

The technical reliability dimension determined whether the application performance is according to the described specifications. The application must run consistently and smoothly. Since content updates have entered into information quality, updates in technical reliability dimensions have to incorporate technical updates from mobile applications such as adding, improving, removing features, fixing technical problems, and adjusting security mechanisms.

2.3.2 Valence Dimensions

Valence describes how users perceive the applications that have been used. Users with a positive experience when using mobile apps will give good reviews and influence the valence dimension of the application.

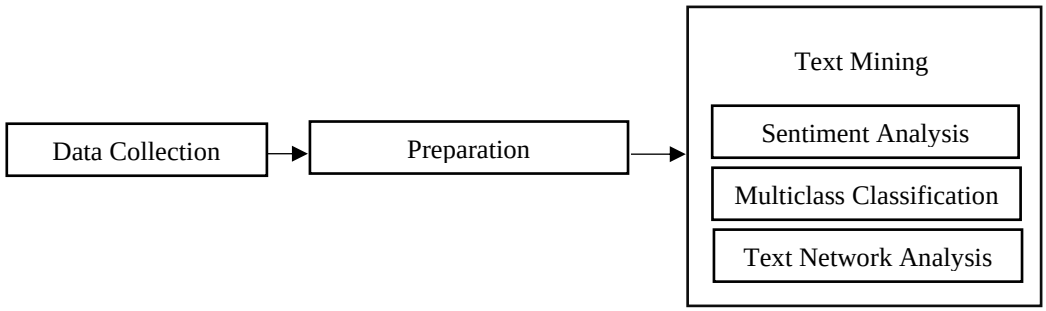
This paper research users' reviews based on User-Generated Content (UGC) created by users of a media they used. Users' reviews are information and opinion in text or audiovisual data published on the internet (Paulussen, 2019). UGC format has various kinds of textual to audiovisual in videos or photos. The posting can be in various media to determine users' perceptions of who have used the service or application. One of the types of big data in research is using UGC data because the sources vary from data reviews, comments, or tweets from personalities on social media that they upload based on their respective perceptions (Liu, Shan, Ballet, & Fang, 2017).

Based on review data, technology is used to store data or as a tool in doing work. However, technology can be a tool for analyzing widely available data at a lower cost. Companies are taking data to use it at new levels, using information technology to sustain accurate and stable business experiments that guide decision-makers and examine the output, business models, and regeneration in the customer experience. Sometimes, new trends help companies make real-time decisions (Alsghaier, Akour, Shehabat, & Samah, 2017).

3. Methodology

Based literature reviewed, the research workflow is designed as Figure 2.

Figure 2: Research workflow



Source: Researcher

3.1 Data Collection

Data collection was done by scrapping using the Python programming language; the data source was from the Google Play Store on the Tokopedia application page. The data that has been successfully retrieved is data for seven months, with reviews and the application version reviewed for application users. The data obtained from June 2020 to December 2020 were 21,616 data reviews. The data that has been obtained is then cleaned of irrelevant reviews.

The data collection carried out in this study is the collection of user review data for Tokopedia application on Google Play Store website using scraping techniques, and the tools used are WebHarvy. Secondary data from this research includes user reviews published on the google play store website. Secondary data from this research includes user reviews published on the google play store website. Secondary data is that large-scale data is collected, such as big data (Saunders, Lewis, & Tornhill, 2016).

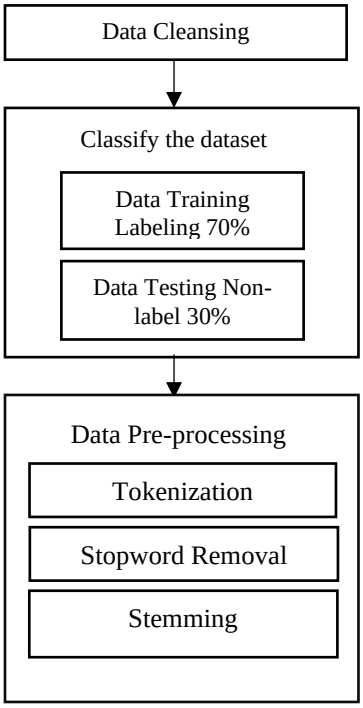
The data collection technique used in this study is included in research that uses document analysis. Using the text mining technique, the process will be carried out by searching for data whose source is a written source that reflects the use of synchronous language (Subroto, 1992). With document analysis itself, what will be analyzed is the content or content in the document. The development of applications with various services for various needs makes companies and start-up companies try to provide the best details of their services by providing information on the google play store website. The data provided is in user names, ratings, reviews, developer companies, and the company's website. The things mentioned earlier can be used as material for conducting document analysis and can be used for this research. This data is in the form of material in text, numbers, and non-text such as images or videos, which can carry out qualitative or quantitative analyses (Saunders, Lewis, & Tornhill, 2016). The documents in this study are in the form of information on the Tokopedia application review found on the Google Play Store.

3.2 Data Preparation

The data cleansing stage is carried out to clean up review data that has been successfully scraped whose reviews are not relevant to what will be studied. The purpose of the research, meaning an inappropriate review, is when there is a review in the form of

advertisements or spam whose contents are not information from the application, the data is called noise data and must be cleaned because the reviews in the form of advertisements and spam are meaningless. The data obtained and cleaned from inappropriate reviews are then processed into training data and test data. The training data contains a collection of data that has been cleaned. The training data is given a label for the next grouping stage to be studied by machine learning, and the label is given based on the dimensions of the mobile app's service quality. A proportional division is carried out in distributing training data and test data using the 70:30 ratio. The meaning is 70% data as training data and the remaining 30% as test data from all the data obtained (Ting & Tsang, 2011). This data sharing will be carried out in the data preparation process to maximize the results obtained. The summary of the data preparation workflow is shown in Figure 3.

Figure 3: Data Preparation workflow



Source: Researcher

3.3 Text Mining

The classification process using Binary Classification categorizes the initial data based on two different classes. Classification using the binary classification technique is more straightforward because each item in the document is classified into one of two predetermined categories (Jo, 2019). Data pre-processing is presented in Table 1. The example for sentimental analysis is presented in Table 2.

Table 1: Data pre-processing

Raw Data	*When browsing the Flash Sale, I could not scroll down to the end because it refreshes the Flash Sale Window. Please solve this problem.*
Tokenization	*When, browsing, in, the, Flash, Sale, I, couldn't scroll, down, to, the, end, because, it, refreshes, the, Flash, Sale, Window, Please, solve, this, problem,*
StopWord	*browsing in the Flash Sale, I couldn't scroll down end because it refreshes. Please solve this problem*
Stemming	*coudn't scroll down end solve this problem*

Table 2: Example of Sentiment Analysis

Review	Sentiment
"On this app, you can buy the right things with this app. And even if you are at home, you can buy what you want and then the one who delivers will take care."	Positive Sentiment
"Remove notif they are the worst of the worst, lazy delivery people only one try, and they won't care if it already paid, and the security of this app are the worst."	Negative Sentiment

Multi-class classification is carried out by classifying several classes, the problem of text classification is a process where text documents are entered into one or more predetermined categories or classes whose contents are by the text content processed by the natural language method (Gürcan, 2018).

Table 3: Example of Multi-class Classification

Review	Sentiment
Interaction Quality	
"Tokopedia getting less and less supportive to users, unable to contact customer service after 5 pm. every time need to get around and round with auto BOT before can get through to talk with a live agent."	Responsiveness
"Easy to use. Informative. Clear illustration and description of the products."	Information
"Remove notif they are the worst of the worst, lazy delivery people only one try, and they will not care if it already paid, and the security of this app are the worst."	Security and privacy
Environment Quality	
"Tokopedia may improve its design to be more user-friendly. Do not make it hard for users to find vouchers and other offers."	Design
"Okay, if y'all doesn't have any idea how this app works then you'll probably get confused. Yes, it's me who's already angry and confused, why? I can't even find the "add to cart" and that thing annoys me a lot. I've done some research and none of them are useful. The product that I wanted is on Tokopedia ONLY so I'm figuring it out how to do this. Please, please fix this issue."	Performance
Outcome Quality	
"Very problematic search function on the app has more rubbish than hits. Ordering on the app is a pain as it takes some time to find the exact items. Flash sales page keeps refreshing every 20-30 seconds, forcing the page to reload, making it difficult to browse. However, the payment process is simple & straightforward. Points gained from the games are useless. Also need to make an easier way to report on scamming & cheating vendors. No doubt the developer still needs plenty of work on this app."	Technical Reliability
"If only I could just rate this 0 stars, this would get 0 stars because I had a very stressful time dealing with Tokopedia pay. I even cashed in a large amount of money but was not able to use it because of their issue, which has been going on for months now I have no way of getting my money back."	Valence

4. Findings

From the results of data processing using Rapid Minner Process musing the text classification method with sentiment analysis, the results can be seen from Tokopedia application user comments divided into negative and positive sentiments.

4.1 Sentiment Analysis Tokopedia

Negative sentiment is information based on review users of Tokopedia online shopping application that they are not satisfied with the services or features in the Tokopedia application. This negative sentiment can be something basis for the improvement and development of Tokopedia for the future. The features and services provided can be improved and can be. Find any shortcomings that must be fixed and improved by the service and the improvement of its features. Based on reviews data from Tokopedia users who are satisfied with the services and features that Tokopedia provides for its users. It is good that these positive results can be maintained in the future developed. Figure 4 presents the result of the percentage of negative and positive sentiments.

Figure 4: Sentiment Analysis

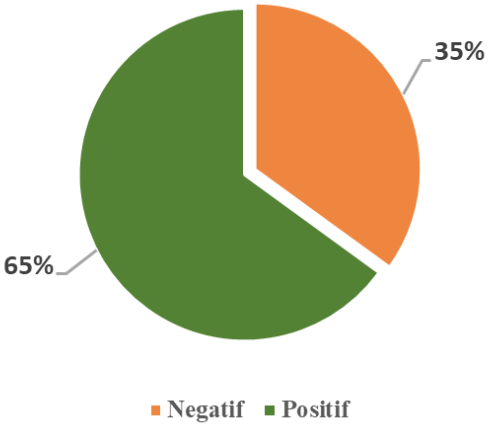


Figure 4 shows that a review of Tokopedia shopping application users based on seven months review from June 2020 until December 2020, illustrating the results that review on the Google Play Store, Tokopedia gets 65% positive sentiment and 35% negative sentiment that Tokopedia gets from their users, so from the diagram and data that have been obtained, it can be concluded that most of the Tokopedia application users

are satisfied with the services and features that the Tokopedia application provides, this is a pretty good result. However, there are still quite a large number of negative sentiments. There are still some users who feel not satisfied with using the Tokopedia application.

4.2 Multi-class Classification of Tokopedia

The results of this multi-class illustrate how many reviews have been collected for seven months and are divided based on each dimension to find out the distribution of reviews and how the sentiment of application users, and the experience of Tokopedia application users.

Figure 5: Multi-class Classification

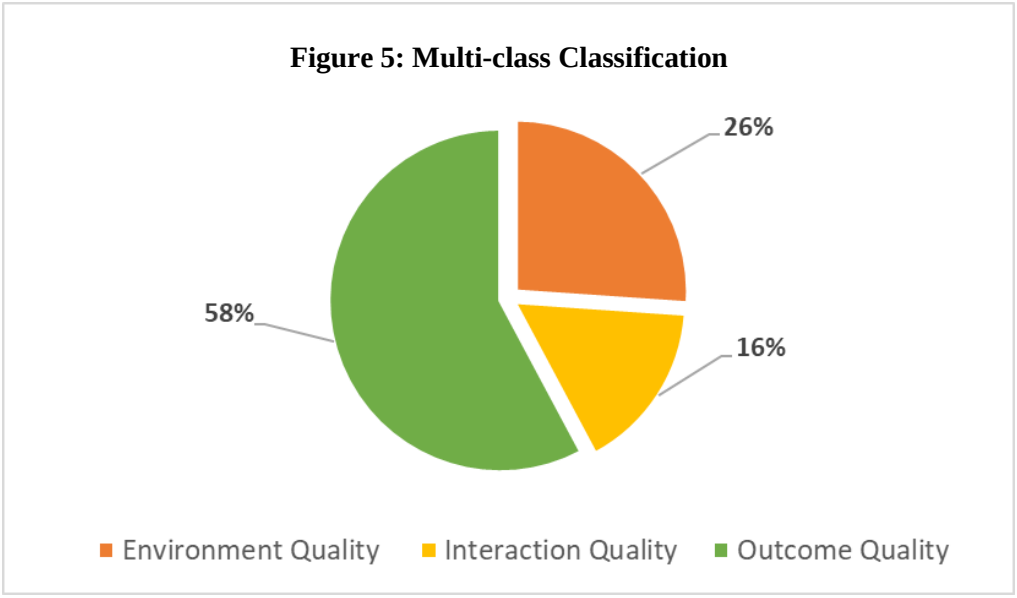
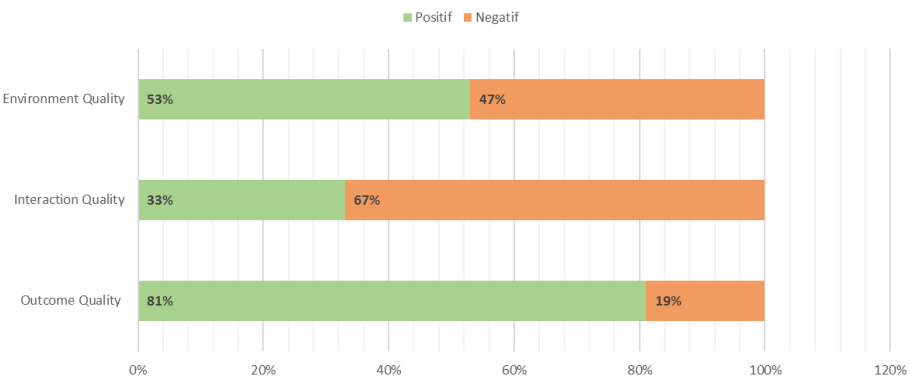


Figure 5 shows that the number of reviews by Tokopedia users has a percentage of 58% commenting on outcome quality, where they discuss how their final perceptions are after using the Tokopedia shopping application. The second place with the most is in Environment quality dimension with 26%. The last one is the interaction quality dimension, which has 16% of all comments given by users to the Tokopedia application

Within this dimension, an analytical sentiment represents every comment given by its users. More specifically, it will be explained and described in the graph below.

Figure 6: Percentage Sentiment Mobile Apps Service Quality



	Outcome Quality	Interaction Quality	Environment Quality
Positif	81%	33%	53%
Negatif	19%	67%	47%

There are negative and positive sentiments in each dimension of the mobile apps service quality from the percentage described above. In the environmental quality variable, the percentage of negative comments was 47% and, positive comments regarding the environmental quality variable were 53%. Furthermore, the second is the interaction quality variable. There are 33% comments about interaction quality regarding positive sentiments and 67% regarding negative sentiment, and the last one is the outcome quality variable which results in 81% positive sentiment and 19% negative sentiment from reviews of Tokopedia in Google Play Store.

4.3 Text Network Analysis of Tokopedia

The next stage is using text network analysis to determine the quality of the Tokopedia shopping application published on the google play store from June 2020 to December 2020. The results show how users comment about the Tokopedia application shopping service. The process of text network analysis carried out in this study is to see how the service quality of the Tokopedia shopping application is.

At the stage of doing text network analysis because for each dimension of the word that appears a lot and it is difficult to find how the user comments network is, then on each dimension of each indicator, a text network analysis stage is carried out to find out more about how the comments of Tokopedia application users on Google Play Store. Using this method will identify what words often appear to determine the quality of the

application, and this can be used as material to make improvements or develop the application.

The next step to do this is the first by calculating the number of frequencies of each word first by using Wordij, so that word pairs also appear from the user's review of the application. The next step is to visualize the word by knowing its relationship using the Gephi application in a word network. The result is that the word network appears in nodes and edges.

4.3.1 Text Network Analysis Interaction Quality

The interaction quality determines how the text network is formed from the Tokopedia application user's reviews on their interaction between the Tokopedia shopping application and the Tokopedia service provider. In this variable, there are three dimensions: information, responsiveness, security, and privacy. Figure 7 is a picture of the results of the word network formed for the three dimensions on the Interaction Quality variable.

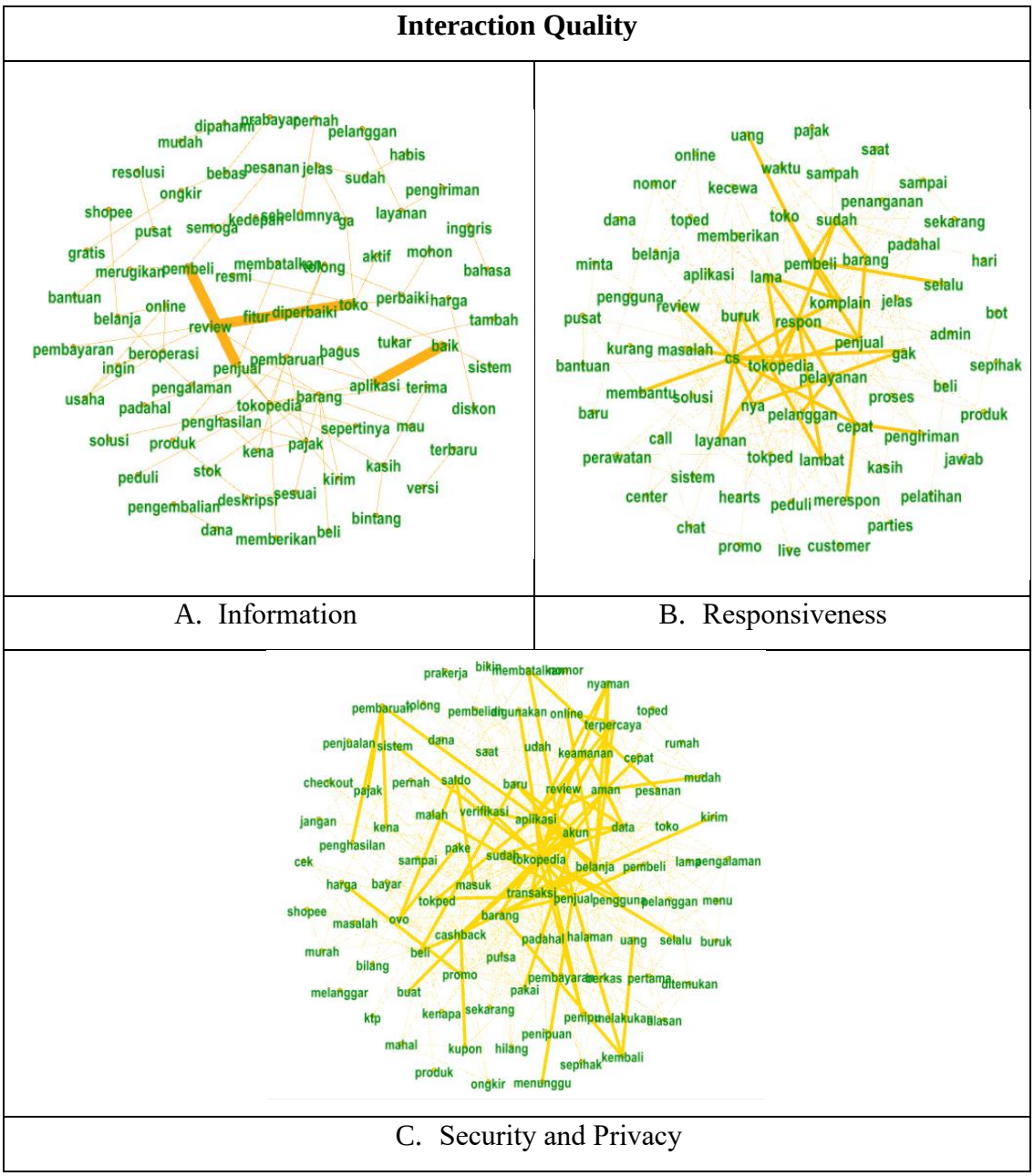
Information Dimensions

From the word network analysis results, the information dimension refers to information referring to the quality of the information provided through application services and informative benefits so that benefits can be derived from it (Wulfert, 2019). In the shopping application, FAQs and information from each store are important for shopping application users. The application must have standards to make it easier for users to know how their products are in-store descriptions. Application users expect detailed and up-to-date information. When the application provides detailed information, the quality will increase (Stiakakis and Petridis, 2014).

In the information dimension, the results of the analysis show that *"help center"* and *"taxable income"* are words that often appear. This word coincides with the issuance of a new regulation from the government regarding income taxes collected from online sellers. This may not have educated Tokopedia sellers about how this policy affects the discounts that Tokopedia sellers must pay. Help center is another word that often appears in Tokopedia comments, and this refers to the information and descriptions provided by Tokopedia to make it easier for sellers and buyers to know the rules and procedures for

conducting transactions on Tokopedia, every new information should always be updated so that users can be more informed. Easy to find information. Since shopping applications are companion applications designed to enhance the shopping experience compared to physical ones, shopping applications must wisely expand the information available offline (Wulfert, 2019).

Figure 7: Text Network Analysis Interaction Quality



Responsiveness Dimensions

The results of the text network analysis are to find out what are the negative word relationships that are related and to find out how users evaluate the responsiveness dimension. This dimension discusses how the customer service provided by the application provides responsiveness, thereby affecting the overall perceived service quality (Wulfert, 2019). In this case, Tokopedia can monitor the chat performance of each store on Tokopedia. Besides that, Tokopedia also sets standards for its sellers to always be responsive in serving their customers.

The second dimension of the interaction quality variable is responsiveness. The responsive dimension is defined for today's shopping applications as the ability of sellers in the application and the application itself to promptly and courteously resolve customer problems related to problems that occur in shopping applications (Wulfert, 2019). the results of this dimensional analysis show the words "*slow customers service response", "solution center", "service",* the number of complaints about slow customers service responses, less than optimal service and not providing solutions, making these negative words that often appear on the responsiveness dimension. The slow service could be due to the lack of Tokopedia customer service. This causes many customer complaint queues to occur so that Tokopedia handles the maximum number of user problems.

Security and Privacy Dimensions

On the dimension of security and privacy to find out how Tokopedia can protect data from users of the Tokopedia shopping application. Security and privacy have a very strong impact on the service quality of any application (Stiakakis and Petridis,2014). Issues related to security and privacy are relevant in all phases of commerce, from formation to sale (Wulfert, 2019). Tokopedia is responsible for protecting all user data, lest there be much fraud due to unsafe data. The last dimension of this variable is security and privacy; for security and privacy, (Wulfert, 2019) interpret this variable more broadly, in addition to maintaining data from application users, this also includes a sense of security when interacting with an electronic service.

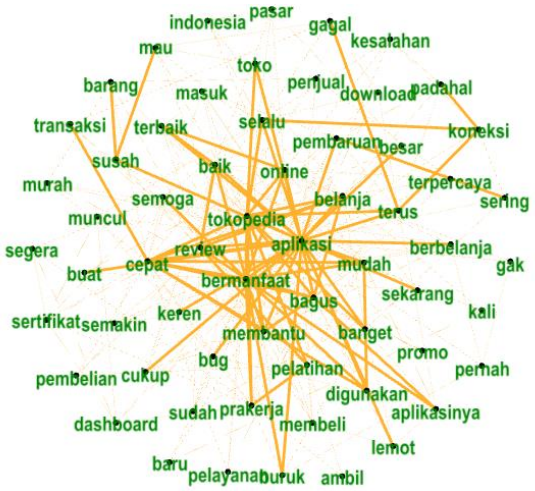
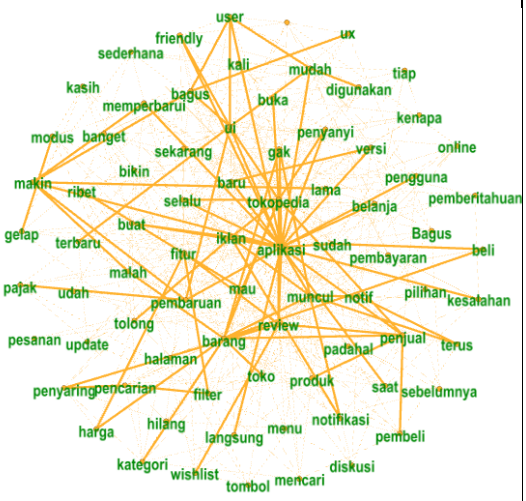
Customer-related information is the customer's personal information such as name, address and customer-related purchase information. Therefore the responsibility of the application is to protect the data of its users. In this dimension the words, *"bad security experience*", *"promotion fraud", "seller commits fraud", "poor application*

security", *"lost payment transaction"*, *"account data security"*, many words that appear and are related to this dimension, they feel the account security and bad experience when using the Tokopedia application, the words that appear along with the issue that Tokopedia was selling and buying data at that time, news of this data sale and purchase appeared in May 2010, and comments on complaints about the bad security experience appeared in June 2020.

4.3.2 Text Network Analysis Environment Quality

The environment quality variable provides an overview of how the application can provide convenience for all shopping activities using the application. In this variable, there are two dimensions; there is performance and design. Figure 8 presents the results of word network formation on two dimensions of environmental quality.

Figure 8: Text Network Analysis Environment Quality

Environment Quality	
	
A. Performance	B. Design

Performance Dimensions

The results are seen in the performance dimension, there are negative words for *"error"*, *"connection"*, *"slow"*, *"to long waiting"*, *"difficult"*, *"update"*, *"download"*. The dominance of these negative words illustrates difficulties with updating and the difficulty of using the application due to several errors in the application that make application

performance not too optimal. Judging from the related negative words, it can be seen what things need to be improved from the performance dimension, this dimension relates to how the shopping application can provide an overall response from the shopping application itself, also the application must be considered to operate smoothly without interruptions or bugs. Several authors mention that the performance variable is an important aspect of measuring electronic service quality (Wulfert, 2019). In this case, it will be known how Tokopedia can overcome the problem of bugs or heavy applications because of its many features or when many are accessing it simultaneously.

Design Dimensions

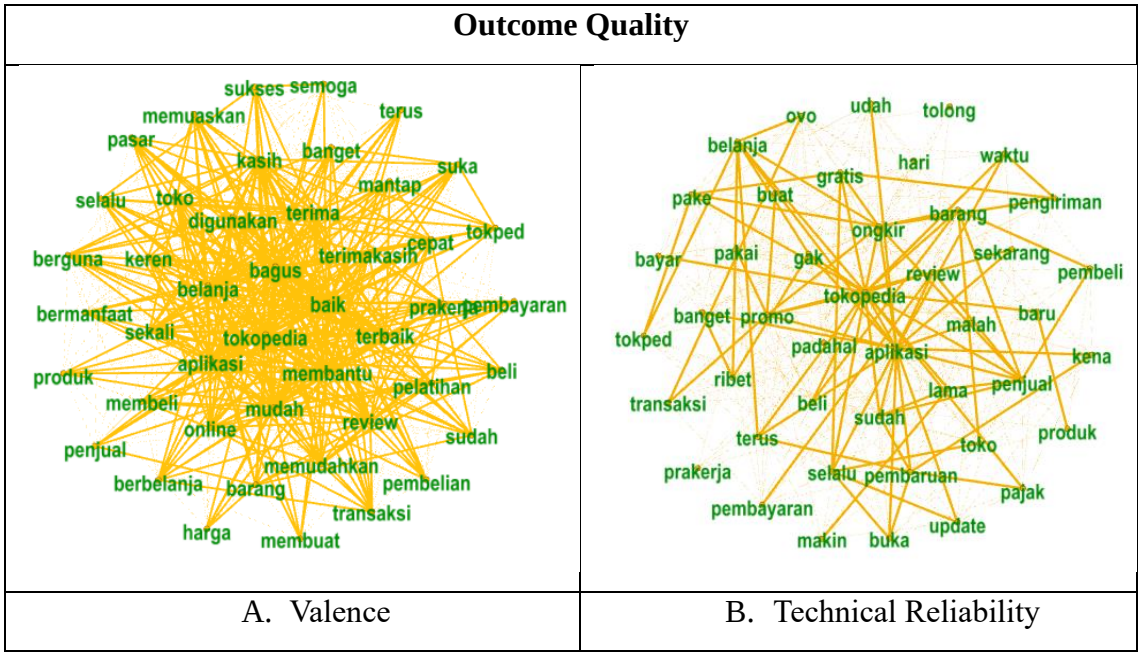
For the design dimension, which relates to the visual aesthetics of the User Interface (UI) of the mobile application and features for more efficient retrieval of information such as the internal search engine and filters. Several authors have shown that the visual design of an e-service or m-service strongly influences the perception of application quality and the overall picture (Stiakakis and Petridis, 2014). The second dimension is "design", in this dimension, design refers to "visual appearance and applications that can be seen or heard" (Collier and Bienstock 2006) of mobile applications including *"colors, animations, images, text, for pedestal, and sound*" (Collier and Bienstock, 2006, p. 264).

This means how Tokopedia provides comfort with the display it provides. In this dimension the words that often appear are *"updates are even more complicated", "UI is getting more complicated", "application takes longer", "application notification error", "please notify Tokopedia ads", "love dark mode", "love choice of language",* the word is a word that often appears for the design dimension, many comments complain about advertisement notifications from Tokopedia that often appear and interfere with activities when using mobile phones.

4.3.3 Text Network Analysis Outcome Quality

The last is the outcome quality variable, on the valence indicator the words that appear tend to be words of user experience who are satisfied with the Tokopedia application, while for the word network, the Technical reliability provides an overview of how the technical experience after using the Tokopedia application.

Figure 9: Text Network Analysis Outcome Quality



A. Valence B. Technical Reliability

Valence Dimensions

In this dimension, the word network formed shows word relationships where users provide comments to describe how they feel after using a shopping application. The valence dimension describes the customer's feelings after experiencing the service through a shopping application. These feelings can be anything between “good or bad” (Stiakakis and Petridis, 2014).

In this dimension, it is known that the word network formed tends to user satisfaction after using the Tokopedia application; the word network formed is complex with thick and similar to each other. Because in this dimension, the thing discussed is how to measure customers' feelings about online purchases and their relationship with trust after making a shopping transaction (Wulfert, 2019).

Technical Reliability Dimensions

The services promised by shopping applications must be operated “accurately and consistently” in line “with the promise/guarantee of the provider” (Stiakakis and Petridis, 2014, p. 944). The shopping app must operate properly without crashes, glitches, or malfunctions. The technical reliability dimension, in this dimension the words that often appear are *"shopping is complicated" "continuing to update", "updates are even*

complicated" This complaint can be made possible because of updated changes made by Tokopedia, they are not used to the new design so that users find it difficult with Tokopedia's latest transaction process.

5. Conclusion

Freedom of opinion and giving opinions on the internet make it easy for the public to convey their views of products and services in the market. The availability of feedback columns for users' reviews on the Google Play Store makes gathering inputs and ideas to improve application features easy. Users' reviews could match the value that the users would spend shopping online. Besides that, there is also an intense competition where the increasing number of online shopping applications in Indonesia indicates how online shopping applications should improve in their Mobile Apps Service Quality.

Using reviews and testimonials from application users to develop and improve an application is practical and effective. The use of big data is one effective way to gain feedback and improve on existing applications available on the internet and social media.

This study's results illustrated that review data published on the Google play store or Apps Store could help application developers evaluate their applications' performance and suggest how to better improve it further for future use. The importance of data in decision-making can be very useful for the continued success of an application that can also benefit users.

For future study, the number of comments from application users on other social media could be analysed to compare the quality of multiple application services. Other data sources from social media such as Twitter and other websites such as AppStore can also be used to analyze similar research.

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