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Using Social Network Analysis For Analysing The Acceptance of Islamic Mobile Banking In Indonesia

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Abstract—The purpose of the research is to find the positive and negative sentiment influencing the acceptance of Islamic Mobile Banking using Social Network Analysis. The research uses the reviews from Google Store from January 2017 to December 2018 related to the Bank Syariah Mandiri (BSM) and the Bank Muamalat. The total reviews for the research are 4472 (2489 for BSM and 1983 for Bank Muamalat). The result shows the positive sentiment for BSM mobile banking has 1407 nodes and 61537 edges. The positive sentiment of BSM mobile banking correlates with the feature of the transfer feature. For the negative sentiment, BSM mobile banking has 1811 nodes and 46926 edges which is related to an error when the customer checks the balance and transfer money. The positive sentiment of Muamalat mobile banking has 1020 nodes and 30492 nodes which correlate with the ease of use when customers use mobile banking. For the negative sentiment, Muamalat mobile banking has 531 nodes and 13691 edges which correlate with login and registration features.

Keywords— Islamic Mobile Banking, Social Network Analysis, Net Brand Reputation.

I. INTRODUCTION

Islamic banking is the bank that implements islamic principles in its transactions. In Indonesia, Islamic Bank must compete with the conventional bank which is more popular than Islamic Bank. One of the strategies to compete with other organizations, in this case, the banks, uses information technology (Neo, 1991). Some Islamic Bank in Indonesia uses Mobile Banking to compete and to increase their customer satisfaction. Customer satisfaction has a positive correlation with the Return of Assets (RoA) (Pratama, 2013). If the customer satisfaction increases, the RoA of the bank increases too.

The use of mobile banking has an impact on the convenience of customers when they make transactions. Customers can easily transfer money, check balances, and find ATM locations just using a smartphone (Olievera, Faria, Thomas, & Popovic, 2014) (Merhi, Hone, & Tarhini, 2019). The services provided by the banks affect their brand. Brand reputation is influenced by sentiment from the customer (Vidya & et.al, 2015). If a brand has more positive sentiment, it shows the bank has good services or products. Positive reputations will increase customers' trust in the bank (Lohse & Spiller, 1998) and finally, the RoA of the bank will be increased.

(Vidya & et.al, 2015) used Net Brand Reputation (NBR) technique to calculate the brand reputation of mobile phone providers from Twitter. The labeling process about the reviews, positive or negative, is done manually to be used as training data. The training data is used for the classification process using machine learning. As same as research conducted by Vidya, the researcher performed sentiment analysis to user perceptions towards brands (Giassi, Skinner, & Zimbra, 2013), but the result does not show the reason why the sentiment is positive or negative.

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Another approach to conducting brand analysis is to use Social Network Analysis (SNA). SNA is used to measure social influences on users in a mobile social network (Peng & et.al, 2017) and brand (Zaglia, 2013) (Milavanovic & et.al, 2019) (Cho, Cha, Kim, Song, & Sohn, 2014) (Dong & al, 2018) (Alamsyah, Putri, & Syarif, 2014). SNA can help the business to understand its market behavior. Research conducted by Zaglia shows that interaction between users on a network affects the brand image in photography groups (Zaglia, 2013). Zaglia's research uses qualitative research to the sentences used by group members in assessing brand cameras (Zaglia, 2013). The research related SNA using data from mobile applications or questionnaires (Milavanovic & et.al, 2019). In (Dong & al, 2018), SNA is used to analyze nonprofit-business partnership relations and to find the issue related to the business. (Alamsyah, Putri, & Syarif, 2014) uses SNA to identify how many communities are in the network using Twitter data. Keyword analysis related to brand image using SNA was conducted by Co et.al (Cho, Cha, Kim, Song, & Sohn, 2014). The research uses Twitter data related to Korean films. Visualization of keywords in SNA is done to find out the interaction of keywords with other keywords related to the film (Cho, Cha, Kim, Song, & Sohn, 2014). The purpose of this research is to find NBR score of Islamic Mobile Banking and uses SNA to find the factors influencing Islamic bank.

II. METHODOLOGY

Objects of the research are Islamic Mobile Banking from Bank Syariah Mandiri (BSM) and Bank Muamalat. The steps of the research are data collection, data processing, and graph analysis. Data is collected from the Google Store which is consists of customer reviews of Islamic Mobile Banking in Indonesia (Muamalat and BSM) from January 2017 to December 2018. The total data of BSM mobile banking is 2489 and Muamalat Mobile Banking is 1983.

In the data processing, the review which has four and five stars will be clustered as the positive sentiment. The review which has one and two stars will be clustered as the negative sentiment. The review which has three stars will be clustered as the neutral sentiment. Furthermore, noise such as punctuation, stopwords, preposition from the text will be eliminated, so the final text just consists of the main idea. Furthermore, the text will be stemmed using Indonesian stemmer and normalized by Indonesian Structure. In data processing, the sentences of the text are also transformed into words. This process uses Regular Expression. After data processing, data will be represented using TF-IDF to get the TF-IDF matrix. A high TF-IDF shows the words have a strong relationship with the sentences or text (Cho, Cha, Kim, Song, & Sohn, 2014). The TF-IDF matrix is used to make a graph.

III. RESULT

Based on Figure 1, the brand reputation of BSM has more positive than Muamalat. The NBR value of BSM is 8.60% which is 1.3 greater than the NBR of Muamalat. The result if we compare with the research was conducted by (Porwanto, 2019), shows that the performance of BSM, including their RoA, is better than Muamalat. (Porwanto, 2019) uses a survey to get their result. In 2018, there is an award (Top Brand Award) for Islamic banks in Indonesia that shows BSM has a better performance than Muamalat (BSM brand index is 27.6% and Muamalat is 4.20%) (Brand, 2020).

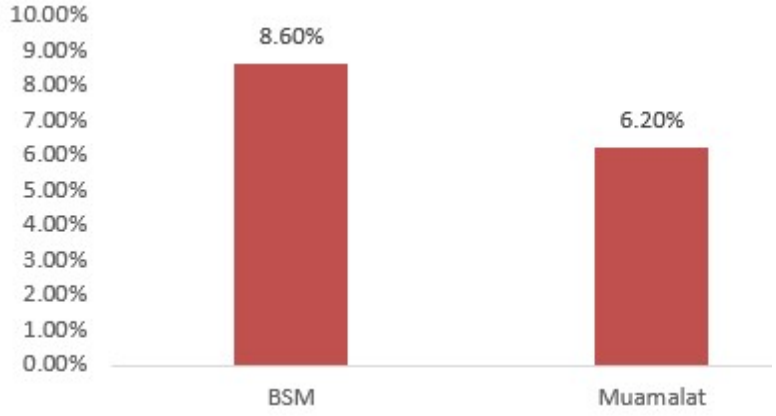

Figure 1 The NBR of BSM and Muamalat

The overview of the graph for BSM's sentiment can be shown in Table 1. Graph analysis uses an undirected approach. For BSM, the positive sentiment has 1407 nodes and 61537 edges. If we compare the positive and the negative sentiment of BSM network, the number of words owned by the negative sentiment is more than the positive sentiment. The factor that caused

positive sentiment for BSM Mobile Banking is shown in Figure 2. In the network, there are the words: an application (aplikasi), transaction (transaksi), transfer, mobile, feature (fitur), help (bantu), buy (beli), good (baik), bank. So, the factors influencing the positive sentiments are related to the transfer features in the mobile banking application. Whereas, the factor that caused the negative sentiment is an error when the user wants to check receipt of transfer (**Error! Reference source not found.**). In the negative network or BSM, there are the words error, always (terus), use (pakai), check (cek), balance (saldo), application (aplikasi), transaction (transaksi), help (tolong), good (baik).

Table 1 Overview BSM Network

Overview Network	**Positive Sentiment**	**Negative Sentiment**
Nodes	1407	1811
Edges	61537	93598
Average Degree	43.856	51.823
Network Diameter	6	4
Graph Density	0.031	0.029

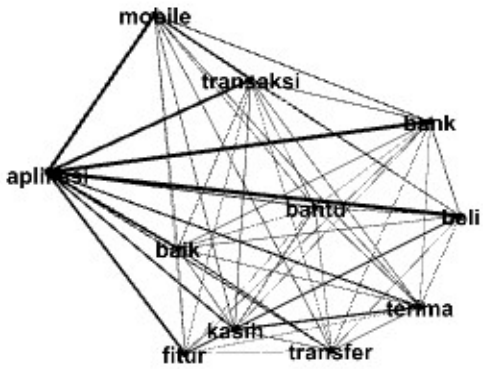

Figure 2 The positive Network of BSM

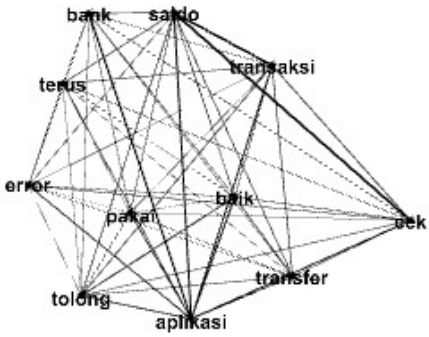

Figure 3 The negative Network of BSM

Table 2 shows the element of the graph of Muamalat mobile banking. In Table 2, the positive sentiment is more dominant than the negative sentiment. The positive sentiment has 1020 nodes and 30492 edges whereas, the negative sentiment has 531 nodes and 13691 edges. Figure 4 shows the factor that influences the positive sentiment of Muamalat is the ease of use in the payment transaction. In the positive network, there are the words: Muamalat, application (aplikasi), banking, mobile, easy (mudah), transaction (transaksi), pay (bayar), thanks (terima kasih), bank, help (bantu). For the negative sentiment, the factor that influences is an error when the user wants to log in (Figure 5). In the negative network, there are the words: application (aplikasi), help (tolong), please (mohon), always (terus), banking, open (buka), mobile.

Table 2 Overview Muamalat Network

Overview Network	**Positive Sentiment**	**Negative Sentiment**
Nodes	1020	531
Edges	30492	13691
Average Degree	30	9.6
Network Diameter	6	1
Graph Density	0.029	1.067

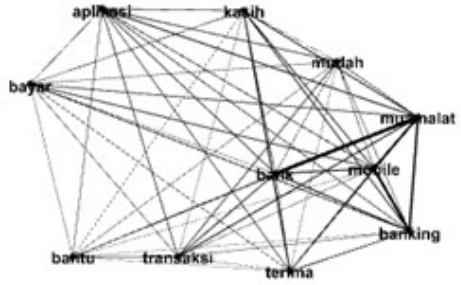

Figure 4 The positive network of Muamalat

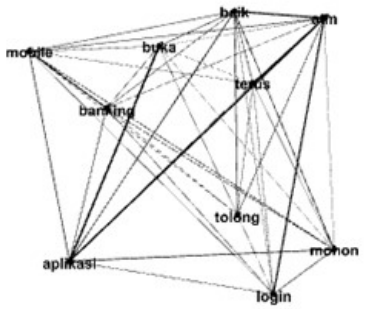

Figure 5 The negative network of Muamalat

IV. CONCLUSION

Net Brand Reputation (NBR) is influenced by customer reviews related to customer satisfaction. Customer satisfaction also influences Return of Assets (RoA) of an organization, in the case of Islamic Banking. NBR for Bank Syariah Mandiri (BSM) is more positive (8.60%) than Muamalat (6.20%). The factor that caused positive sentiment for BSM is the feature of transfer banking and negative sentiment for BSM is caused by the error when the user wants to check receipt of the transfer. For Muamalat Bank, the factor that caused positive sentiment is the ease of use in the payment transactions, and the factor that influences negative sentiment is the error when the user wants to login application.

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