Optimization Metrics Model: The Mobile Wallet for Merchant Ecosystem

R Syah1*, M K M Nasution1, E B Nababan1 and S Efendi1

1 Fakultas Ilmu Komputer dan Teknologi Informasi, Universitas Sumatera Utara, Padang Bulan 2015, Medan, Indonesia

*Email: bayurahmadsyah45@gmail.com

Abstract. Finance Technology (FinTech) is a combination of financial services and technology that ultimately changes the business model. Appears as changes in people's lifestyles are currently dominated by users of fast-paced information technology. Financial technology provider which includes payment systems, market support, investment management, and risk management, loans, financing, and capital providers, and other financial services. North Sumatra has 33 municipal districts with an area of 72,981.23 km² and a population of 13,937,797 people, with a density of 191 people / km². Each city district has various. Percentage of user demographics ranging from 0.07% to 66.9% spread in North Sumatera Province. This can be seen from each region having different interests and abilities. Each district has various merchants that are built on every corner or roadside sample of 1,300 user data. LRM method to transaction types is divided into two with a merchant transaction frequency value of 263 and transaction biller 448.

1. Introduction

Fintech based on Bank Indonesia Regulation Number 19/12/PBI/2017 is the use of financial system technology that produces new products, services, technologies and/or business models and can have an impact on monetary stability, financial system stability, efficiency, smooth flow, security, and the reliability of payment system [1]. Financial technology provider includes payment systems, market support, investment management, and risk management, loans, financing, and capital providers, and other financial services. Electronic-based customer management relations data mapped and located in the area of North Sumatra Province, especially in Medan, is popular. Merchant is a seller of goods/services that have a business (physical store) and an online store that collaborates with the Bank in providing payment receipt services via e-money bank concerned [1]. Merchants are divided into two, individual merchants and legal entity merchants. An individual merchant is an individual owned merchant without being based on the procedures and conditions for establishing a legal business. While a legal entity merchant is a merchant established based on the procedures and provisions for the establishment of an incorporated business entity. Data mining is currently diverse and large in number which contains the integration of traditional data analysis methods [2]. However, the factors that arise in the fintech to the merchants are very competitive so there is a need to anticipate the relationship behavior that will be poured into the information base. Today's digital-based social network analysis industry, and the technology for handling payment transactions in the banking sector, continues to evolve to meet current needs. Transaction types are divided into two with a merchant transaction frequency value of 263 and transaction billers of 448 spread across 33 municipal districts in North...
Sumatra Province. A large number of merchants and digital businesses will certainly invite us to adjust the needs of customers (users) [3]. Therefore, this paper takes on the analysis of social network information in the mobile wallet ecosystem of merchants.

2. Related Works
More than hundreds or even millions of people use financial technology every day, this is shown from various business process standards set in each policy [1, 2]. Mobile Wallet or abbreviated as M-Wallet is a payment method that uses a mobile phone or cell phone as a means of a transaction [2]. Mobile Payment that is widely known by mobile users is in the form of a banking product called Mobile Banking or abbreviated as M-Banking [1]. Through M-Banking services, we can check the balance of our savings account at the Bank, transfer money, pay bills, including the purchase of top-up cellular phone credit [5]. This is, of course, necessary to apply a method to display data and review predictions that arise from this relationship. Based on the definition of social network extraction like finding new representing data patterns [3,4,9] in this case, the social network extraction of merchants is highly competitive [6]. But Linear Regression Model (LRM) can be one of the methods of social impact to disregard structure data by looking at the relationship between user behavior with the merchants [7]. In this paper, of course, the application of the Linear Regression Model method is not easy with traditional methods [3,4,11]. Financial technology is the result of a combination of financial services and technology that eventually changes the business model from conventional to moderate, which initially paying face to face and bring some cash, and now can make long-distance transactions by making payments that can be done only in mere seconds. [1, 2].

3. Material and Method
This research was taken from the last 3 years of 448 total Biller and 264 merchants spread across 33 municipal districts of North Sumatra Province.

Table 1. Merchant Growth on Mobile Wallet.

| Indicator          | Type    | Level | Value                          |
|--------------------|---------|-------|--------------------------------|
| Variant Transaction| Random  | 40    | 1500; 3000; 3001; 4200; 5500; 6500; 7000; 8000; 9000; 9500; 10000; 12000; 13000; 14500; 15000; 16000; 18500; 19000; 20000; 24000; 25000; 27500; 29500; 30000; 31000; 36000; 40000; 42500; 45000; 48000; 50000; 60000; 70000; 72000; 75000; 85000; 90000; 100000; 140000; 185000 |
| Name Merchant      | Fixed   | 49    | ABU BAKAR NL; ANEKA GORENGAN NL; APOTEK MAJU LK; BENNYNATANAEI SINAGA; BUBUR AYAM BPK SUPARMAN; BURGER BUNENG LK; FRANS PEBRIAN LUBIS; FRISTI CELL NL; GALON RENDI LK; IBRAHIM YUSUF; INDOMARET; IR.ONE S; KEDE JON NL; KFC Adam Malik Medan; KFC Asia Mega Mas Medan; KFC BTC Mareland; KFC Cemara Asri Medan; KFC CENTER POINT MEDAN; KFC SETIABUDI HOME CENTRA; KFC Simpang Mataram Medan; MARIANA BR SINAGA; MIEACEH ANDRE; MIE AYAM PALANGKARAYA; MILALA BENGKEL; PERCETAKAN EKA; POP ICE WANTI; RM RENI; RUJAK JELANI; RUJAKJELANI-SALES MEDAN 3 ZULVAN -; SALES MEDAN 3ZULVAN SUHADA; SAMBELAN BU SRI; SATE BANG JON LK; |

Table 1 shows that the growth of merchants increased by 50% each year. The Merchant Classification has already been acquired with system rules according to the Bank that has applied the rules to the Merchant [1, 2]. The first step taken by prospective Merchants is to
register first as a partner with the data needed correctly, this data will automatically be stored in the company database as an identification ID that the Merchant has officially cooperated by first agreeing to the terms and conditions in a company [12, 13]. The second step, after the registration process is complete, the Merchant then has a virtual office that functions as a mediator in accepting Virtual Discounts and Virtual Currency transactions that will be transferred by prospective buyers. In this case, the identity of the buyer will be easily recognized by the Merchant because in the process of the transaction between the buyer and the Merchant the virtual discount or virtual currency will be transferred to the Merchant's virtual office are already known. In the third step, after the transaction process occurs, the Merchant directly sends the products agreed upon by both parties in terms of product form, quantity, and shipping costs.

![Diagram of Merchant Ecosystem](image)

**Figure 1.** Classification of Merchant Ecosystem.

### 3.1. Relationships and models
The data sources were obtained in the form of collections of information on the Database server. Descriptions were built and modeled based on data available from the data sources (Bigdata) [7]. With this study, it was expected to produce a standard model so that it can be used by the needs of industry and society. Most commonly used data models or database platforms in a conventional system that structure, but in big data, most of it is a no-relationship database structure like Figure 1.
### Table 2. Deviation value of data.

| Term         | DF Num | DF Den | F-Value | P-Value |
|--------------|--------|--------|---------|---------|
| Month        | 1.00   | 213.00 | 1.44    | 0.232   |
| Name Merchant| 48.00  | 213.00 | 0.69    | 0.936   |

Summary model for optimization metrics

| S         | R-sq | R-sq(adj) | AICc | BIC   |
|-----------|------|-----------|------|-------|
| 19777.3   | 13.59% | 0.00%     | 4892.74 | 4899.41 |

3.2. Implementation model

The procedure of activities was based on the method developed each year. Last year's activities will obtain a procedure that can be implemented to produce methods to provide simple information. The framework of research can be seen in Figure 2:

![Figure 2. Architecture Metrics Model.](image)

In this study, multiple regression [5,6] was used to produce behavioural relationships and model between resources data seconder. In multiple regression, the independent variables $x_i$, $i = 1, ..., n$ and the dependent variable $y$, on average $y \mid x_i$ given by the linear regression model:

$$
\mu_{y \mid x_i} = b_0 + \sum_{i=1}^{n} b_{ixi}
$$

(1)

Thus, estimate the response obtained from the sample of the regression equation is

$$
y = \beta_0 + \sum_{i=1}^{n} b_{ixi}.
$$

(2)

Total relationship calculation was as follows

$$
tr = \sum_{i=1}^{n} \sum_{j=1}^{i} \beta_j
$$

(3)
Where $\beta_1 = \Pi j = 1 \beta j$ means the direct effect and $\Pi j = 2 \ldots n \beta j$ means the indirect effect. For the number of samples consisting of $k$ clusters that can be measured with $Y = \Sigma x_i$, $i = 1, \ldots, n$. To reduce the internal case consistency of constant sample behavioral user into generals, we use $\alpha$-Cronbach or

$$\alpha = \frac{k}{(k-1)}(1 - \Sigma \sigma^2 x_i / \sigma^2 Y)$$  

where $\sigma^2 Y$ is a variant of the total score observed while $\sigma^2 x_i$ is a variant of i-component for sample $x_i$. Variance is calculated using $\sigma^2 x_i = 1 / n \Sigma (x_i - x)$, $x$ is the average $x_i$.

4. Result and Discussion

Electronic-based customer behavior (e-customer behavior) in the digital age has brought a comprehensive change to the community [8]. This is seen in presenting business design electronically [9]. Metrics provide convenience about how users (customers) behave electronically and provide information that we can apply. The E-Metrics approach can be reviewed as follows:

- Stickiness
- Slipperiness
- Focus
- Velocity
- Seducible moments

From the description, a, b, c, d, and e, it explains that each business e-metrics presented is different based on customer life cycle and design to make it easier for us to better adjust existing needs.

$$(\text{Stickiness}) = (\text{Frequency} \times \text{Merchant} \times \text{Total Amount Transaction})$$  

where:

- Frequency $= \frac{\text{Acquisition of Total Customers in Time FT Period}}{\text{Number of VA User in FT}}$  
  and,
- Merchant $= \frac{\text{Total Amount of Customer in Transaction}}{\text{Number of VA User in FT}}$  
  and,
- Total Merchant $= \frac{\text{Number of Customer in Transaction}}{\text{Total Number of VA User in FT}}$
Table 3. Matching and observation of different data.

| Obs | Value transaction | Similarity | Resid | Std Resid |
|-----|------------------|------------|-------|-----------|
| 25  | 1,50000E+04      | 1,50000E+04| 0.000006 | 0.000133  | X         |
| 100 | 8,50000E+04      | 2,95710E+04| 5,54290E+04| 2,863172  | R         |
| 118 | 1,00000E+05      | 3,27713E+04| 6,72287E+04| 3,822056  | R         |
| 122 | 7,50000E+04      | 2,95710E+04| 4,54290E+04| 2,346624  | R         |
| 126 | 7,00000E+04      | 2,95710E+04| 4,04290E+04| 2,088350  | R         |
| 165 | 3000.000000     | 2999.999994| 0.000006  | 0.000108  | X         |
| 168 | 1,40000E+05      | 2,71694E+04| 1,12831E+05| 5,851783  | R         |
| 189 | 7,50000E+04      | 2,79687E+04| 4,70313E+04| 2,456029  | R         |
| 239 | 6,00000E+04      | 1,97500E+04| 4,02500E+04| 2,111985  | R         |
| 265 | 6,00000E+04      | 1,97500E+04| 4,02500E+04| 2,111985  | R         |
| 273 | 5500.000000     | 5499.999994| 0.000006  | 0.000108  | X         |
| 322 | 4200.000000     | 4199.999994| 0.000006  | 0.000107  | X         |
| 329 | 1,85000E+05      | 2,59032E+04| 1,59097E+05| 8,209327  | R         |
| 393 | 6500.000000     | 6499.999994| 0.000006  | 0.000142  | X         |
| 402 | 1,30000E+04      | 1,30000E+04| 0.000006  | 0.000142  | X         |
| 421 | 1,50000E+04      | 1,50000E+04| 0.000006  | 0.000142  | X         |
| 447 | 9,00000E+04      | 2,37340E+04| 6,62660E+04| 3,408107  | R         |
| 480 | 1,50000E+04      | 1,50000E+04| 0.000006  | 0.000142  | X         |

Table 3 shows that from the user behavior, the merchants with great demands are “SATE BANG JON LK”, by looking at the 30 users behavior, so like merchants “STORE SAVE THREE”, “RUJAK JAELANI”, “BURGER BU NENG LK”. The number of user behavior in merchant 1 - 25 varied greatly to the competitiveness of each merchant. User transactions with merchants also differ from the level of sales items. So there needs to be the anticipation to avoid disruption by increasing the number of very diverse competitors. This requires the existence of a standard model for managing diverse user behavior. To anticipate sustainable business and its challenges to the development of digital business.

5. Conclusion and Future Work
The metric optimization of the acquisition of 1300 users and the distribution 33 municipal districts with an area of 224 merchant transactions in the province of North Sumatra that the data acquisition. In the future, it is necessary to have a variety of models for approval in businesses that are supported in other regions, especially in North Sumatra Province. This paper can be continued by finding a model to anticipate the uncertainty of sustainable business competition.

References
[1] Peraturan Bank Indonesia (PBI) Nomor 19/12/PBI/2017 “Tentang Penyelenggaraan Teknologi Financial”, Jakarta, 30 November 2017.
[2] Mahyuddin K. M. Nasution, “Social Network Mining (SNM): A Definition of Relation between the Resources and SNA,” International Journal on Advanced Science, Engineering and Information Technology, vol. 6, no. 6, pp. 975-981, 2016. [Online]. Available: http://dx.doi.org/10.18517/ijaseit.6.6.1390.
[3] Nasution, M. K. M., Elveny, M., Syah, R., and Noah, S. A.: Behavior of the resources in the growth of social network. Proceedings of the 5th International Conference on Electrical Engineering and Informatics (ICEII), 551-554, IEEE (2015).
[4] G-W Weber, I. Batmaz, G. Koksal, P.Taylon, and F.Yerlikaya. CMARS: A New Contribution to nonparametric regression with Multivariate Adaptive Regression Splines Support by Continuous Optimization, Inverse Problem and Science and Enggeering, 2011. DOI:10.1080/17415977.2011.624770.
[5] B Kjamili & G-W Weber (2017). The Role of LiBerated Social Entrepreneur in Developing Countries: A mid-way, in Societal Complexity, Data Mining and Gaming: State-of-the-Art 2017, Greenhill & Waterfront, Europe: Amsterdam, The Netherlands; Guilford, UK North-America: Montreal, Canada, 2017. ISBN /EAN 978-90-77171-54-7.

[6] G-W Weber, B Kjamili, D. Czerkawski, 2019. LiBerated Social Entrepreneur. Using Business Metrics: Migport Refugee Big Data Analytics. With a Note on Ability and Disability. Engineering Science and Technology, an International Journal, JESTECH (Elsevier Inc., 2019).

[7] Kim, Y. & Lee, Y. A Study on the Consumers’ Perceptions and Behavioral Characteristics toward Fashion Products in Omni-channel Retailing. Journal of the Korean Society of Clothing and Textiles 41, 170–183 (2017).

[8] C. Tat Huei, L. Suet Cheng, L. Chee Seong, A. Aye Khin, R. Ling Leh Bin, Preliminary Study on Consumer Attitude towards FinTech Products and Services in Malaysia. International Journal of Engineering & Technology. 7, 166 (2018).

[9] M. Steketee, A. Miyaoka, M. Spiegelman, in International Encyclopedia of the Social & Behavioral Sciences: Second Edition (Elsevier Inc., 2015), pp. 461–467.

[10] E. Ferrara, in Encyclopedia of Social Network Analysis and Mining (Springer New York, 2018), pp. 1297–1300.

[11] S. T. Asah, A. D. Guerry, D. J. Blahna, J. J. Lawler, Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications. Ecosystem Services. 10, 180–186 (2014).

[12] D. Pal, V. Vanijja, B. Paprasratorn, in Procedia Computer Science (Elsevier B.V., 2015), vol. 69, pp. 13–25.