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Modeling Pospay and Multi-Lane Free Flow Integration for Revenue Increase

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A B S T R A C T

The rise of e-commerce in Indonesia has made digital payment systems increasingly important. One such system is PT. Pos Indonesia's Pospay application. However, the app is not very popular among users as indicated by its low download numbers and ratings. To address this issue, the potential benefits of combining the Pospay application with Cantas to facilitate toll road transactions were examined. The aim was to increase public awareness of the Pospay application, which would lead to increased revenue. A dynamic system approach was used to develop an optimal strategy for improving Pospay services in the Public Transport sector and integrating it as a toll payment method in the MLFF (Multi-Lane Free Flow) system. The initial dynamic system modeling, using a Causal Loop Diagram (CLD), revealed that service innovation, customer satisfaction, and company revenue are interrelated variables that influence each other. The results of this research can be used as suggestions for companies in developing service innovation strategies.

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1. INTRODUCTION

The increase in internet users in Indonesia has led to a rise in B2C e-commerce apps and e-payments (Nurhuda & Irawan, 2023). Digital payment systems make transactions easier and can lower product prices, with options like digital banking, payment gateways, buy now pay later, and digital wallets. These systems come with numerous advantages. Digital wallets are now widely used for online transactions, including remittances, telecom top-ups, food delivery, ride-hailing, online shopping, utility payments, and investments. They are also increasingly used for offline transactions like dining, retail, groceries, and public transportation.

PT. Pos Indonesia (Persero) is a state-owned company that operates in three core businesses: courier, finance, and logistics. Unfortunately, the company's financial services sector experienced a decline in profits in 2021 due to a decrease in walk-in customers for payment and remittance services (Hadiwinata et al., 2023). To make matters worse, the company's digital application, Pospay, has received mixed reviews from users. Although the app has been downloaded over a million times, with 235 reviews on the Play Store and 1,476 on the App Store, many users remain dissatisfied with the service. As of August 2023, the application has a rating of 3.6 on the Google Play Store and 3.4 on the App Store, out of a maximum rating of

5.0. This causes the Pospay application to become less well-known, which may hinder its development. It is clear that PT. Pos Indonesia (Persero) needs to make improvements to both its financial services sector and its digital application to ensure customer satisfaction.

Digital wallets are becoming increasingly popular in Indonesia, with Gopay and OVO being the most widely used options according to recent surveys by Wellington Capital Advisory and Kedence International. Other popular digital wallets include DANA, ShopeePay, and LinkAja, with the latter being the newest addition to the top five. These digital wallets offer a range of features, including on-site dining payments, offline retail, telecom top-ups, utilities, public transport, and remittances. Companies that can quickly form partnerships with offline outlets may have an advantage in developing digital wallet features for offline B2C. However, it's worth noting that Pospay lacks key features such as offline groceries and public transportation payments, which are predicted to grow to $16.8 billion in 2025.

Table 1. Mapping use of digital wallet services in Indonesia

	GOPAY	OVO	LinkAja	Pospay
On-site Dining	●	●	●	●
Offline Retail	●	●	●	●
Offline Groceries	●	●	●	
Online Marketplace		●	●	
Food Delivery Services	●	●		
Ride-hailing Services (Car/Bike/Taxi)	●	●		
Telecom Top-ups	●	●	●	●
Utilities	●	●	●	●
Public Transport (Bus/Train/Toll Roads)	●	●	●	
Saving/Investment/Multifinance		●		
Remittance	●	●	●	●

Digital wallets like Gopay, OVO, DANA, and LinkAja are accepted for paying parking, KRL, MRT, TransJakarta, and DAMRI tickets. These options replace e-money cards for most transactions except toll payments. Bank Indonesia predicts a 30.84% growth to IDR 399.6 trillion in e-money transactions in 2022 and a 23.9% growth to IDR 459.2 trillion in 2023.

Pospay also needs to develop a public transport feature currently unavailable in Pospay services. Public transport features include access to top-up balances online to make payments offline using public transportation payment cards such as e-ticketing for payment of Transjakarta or Busway tickets, and e-toll for non-cash payments at all toll gates in Indonesia. In 2019, the number of Transjakarta Tap on Bus (TOB) e-ticketing users reached 980 thousand users per day. As for the e-toll payment system, Mandiri, which is the most sought-after e-toll brand, has 25 million users throughout 2021 (Sepulsa, 2022) out of a total of 75.13 million users, or 33%. Seeing a large number of current e-toll users, Pospay must participate in its development. Pospay has now introduced an e-money Top Up feature to add to Brizzi, Mandiri e-Money, and BNI TapCash card balances (Rizaty, 2021).

The government is currently exploring the possibility of replacing e-toll payments with more convenient and efficient contactless non-cash methods like Multi-Lane Free Flow (MLFF). This method allows toll road users to pay without stopping, reducing queue time to almost zero (Budiharjo & Margarani, 2019), thus optimizing vehicle traffic and increasing user comfort. The increased volume of vehicles on the road will lead to more payment transactions, which is why PT. Pos Indonesia (Persero) is actively studying the MLFF payment method and developing the Pospay

feature for public transport to support this payment method. With these advancements, toll road users can expect a more seamless and effortless. experience. The MLFF system requires an E-OBU and Electronic Route Ticket, allowing users to choose entry and exit points for one-time travel routes. The technology that will be used in MLFF is the Global Navigation Satellite System (GNSS), which allows satellites to read transactions made on applications on smartphones (Suprayitno et al., 2020). Cantas application will have a built-in OBU to streamline operations. PT. RITS has yet to decide on a payment scheme or instrument, but all payment methods in Indonesia can be integrated with the system. This is certainly an opportunity for PT. Pos Indonesia through the Pospay application to be integrated as a payment system in the Cantas application. Considering that if the MLFF system has been implemented 100% in Indonesia, Pospay will lose or reduce one of its financial services, namely the e-money card top-up, because later this card will no longer be used to pay tolls.

The Government is currently testing a new payment system for toll roads that uses RFID technology and the Let it Flo app, developed by PT. Jasa Marga Persero Tbk. The LinkAja e-wallet is the preferred method of payment at the moment. However, PT. Pos Indonesia (Persero) could benefit from integrating its Pospay app into the MLFF payment system, which would provide added convenience for users and potentially attract new customers. This innovation could lead to increased revenue and company profits, while also improving customer satisfaction. In order to evaluate the correlation between the number of users on the Pospay application and the profitability of a business, we can employ a systematic approach to identify the most effective strategies and policies that will maximize revenue and profits (Octabriyantiningtyas et al., 2019). It is important to note that customer satisfaction plays a crucial role in increasing the user base, and this is primarily driven by trust, which is one of the four key factors that influence the adoption of digital wallets (Daulay et al., 2020).

This study aims to utilize a system simulation model to enhance customer satisfaction by developing novel features and assessing their impact on company profitability. This study is structured with the following systematic writing: Section 1 shows the introduction; Section 2 presents a literature review; Section 3 shows the research method; Section 4 shows the results and discussion; and Section 6 shows the conclusion.

2. LITERATURE REVIEW

Pospay

Pospay is a digital platform launched in April 2021 through a partnership with PT. Pos Indonesia (Pesero). The platform aims to provide financial services to Giropos account holders by digitizing their transactions and offering them access to Giropos services and Pos Indonesia services through mobile devices. With the Pospay app, customers can easily perform financial transactions such as deposits, withdrawals, transfers, and payments for services offered by PT. Pos Indonesia (Persero) (PT Pos Indonesia, 2022). These services include telephone/cellphone bills, electricity bills, PDAM, internet and TV subscriptions, credit cards, loan payments, state revenue, virtual accounts, education, multibiller, motor vehicle tax, e-commerce, PGN gas, BPJS, land and building taxes, and e-money/e-wallet (Qorika et al., 2022). The app is available for download on both the App Store and Play Store, and has already been downloaded by over 1.5 million customers. In addition, Pospay provides a business opportunity for individuals to become Pospay agents, allowing them to open Pospay counters in their homes and connect to the online server of the post office. The development of Pospay agents will continue to be tailored according to the needs and expectations of the community and in partnership with PT. Pos Indonesia (Persero) (Triana & Anggeraini, 2022).

Multi-Lane Free Folw (MLFF)

The Indonesian Ministry of Public Works and Public Housing (PUPR) is currently working on enhancing the toll road system's governance by introducing a Touchless Multi-Lane Free Flow (MLFF) payment system (Ramadhansyah Rangkuti, 2023). This technology is based on Multi-Lane Free Flow (MLFF), which allows for contactless transactions that are not only efficient but also safe and convenient for toll

payments in Indonesia. The BPJT Ministry of PUPR partnered with PT Roatex Indonesia Toll System (RITS) in March 2021 to implement this non-cash toll system. The MLFF System will be gradually rolled out on various toll roads in Indonesia in 2022, with full implementation expected by September 2023.

The MLFF system allows a vehicle to continue at high speed by identifying it and cutting off the electronic money balance on the cellphone application when it crosses the toll gate. There are several technologies available for Electronic Toll Collection (ETC), including Automatic License Plate Recognition (ANPR), Special Short Field Communication (DSRC), Radio Frequency Identification (RFID), and Global Navigation Satellite System (GNSS). ANPR requires access to a license plate database and is usually used in combination with other technologies, while DSRC and RFID require the purchase of an On Board Unit (OBU) or an RFID tag sticker for user identification. GNSS tracks the user's location and charges based on distance or time, but privacy issues may arise in some countries. The selection of a Contactless-Based Toll Transaction Technology takes into account reliability, investment costs, purchasing power of toll road users, and technological sustainability (Suprayitno et al., 2020). MLFF offers many benefits, such as faster and more efficient travel (Budiharjo & Margarani, 2019), no queues or delays, environmental friendliness, and faster delivery of goods and services.

Dynamic System

Dynamic system simulation is a method of continuous simulation that helps to understand complex large-scale problems, involving many qualitative and quantitative variables, as well as non-linear relationships. The systems dynamic approach considers the entire system as a whole. In a dynamic system, all variables influence one another. It's not just variable X that affects variable Y, there are times when variable Y affects variable X and so on, which is called a Close Loop. The relationship between variables and Close Loop is illustrated in a Causal Loop Diagram (CLD). CLD is arranged based on the linkages that have been identified. Hence, it can be understood how far the variables influence each other. The steps to perform a dynamic system simulation are as follows: (1) Problem identification, (2) System conceptualization, (3) Formulation, (4) Simulation, (5) Policy formulation and evaluation, and (6) Implementation (Octabriyantiningtyas et al., 2019).

3. RESEARCH METHOD

Innovation and service quality improvement are one of the factors that can increase customer satisfaction. Enhancing innovation and service quality is crucial for companies to drive customer satisfaction, profitability, and growth. To achieve this, businesses must take specific steps to improve their performance. By doing so, they can create a positive customer experience that translates into increased revenue and a stronger bottom line. This study aims to explore this relationship in order to find out its effect on company profitability.

The approach used in this study is dynamic systems modeling, which involves two steps: creating a causal loop diagram (CLD) and then applying it to stock and flow diagrams. However, due to limitations, this research only focuses on solving the CLD. The research step is carried out through the following steps shown in Figure 1.

1. Observation. Observation is a crucial step in conducting effective research. It involves collecting data through careful and systematic observation. This step provides detailed observations that are relevant to the research statement and objectives. Through observation, researchers can gain knowledge, identify problems, and find solutions to overcome them to achieve research objectives. In this research, observation begins with a literature review and continues with the collection of field data.
2. Literature review. A literature review is an academic sentence that demonstrates knowledge and understanding of a particular topic in context. It involves a critical evaluation of the existing material with the aim of obtaining a theoretical basis for research. The theory obtained serves as a foundation for researchers to better comprehend the problems being studied within the scientific framework. In this study, the literature review commences

with a review of the existing material, followed by the processing of previously collected field data.

3. Problem articulation. In order to identify problems and user needs, field studies are conducted as a preliminary step. The government is currently developing the MLFF system as a future toll payment option. For PT. Pos Indonesia (Persero), it is important to recognize these opportunities and potential business prospects. However, before investing in this area, it is necessary for companies to model the expected phenomena. The problems addressed in this study were identified through literature research and interviews with users, ensuring that the outcomes of the research can have a positive impact in the future.
4. Dynamic hypothesis. In order to improve the model built using the system dynamic approach, it may be necessary to re-evaluate the initial problem identification and hypothesis as forming CLD. It may also be helpful to gather additional data and reassess any assumptions made during the modeling process. Continuously refining the model can become a more accurate representation of the system being studied.
5. System conceptualization. At this stage, data collection is carried out in the form of variables/factors related to the hypothesis. Data collection was carried out through literature studies in journals or articles related to the topic, and brainstorming with PT users. Pos Indonesia (Persero) which developed Pospay. To get a conceptual model to be studied. The process of developing a model involves several stages of elaboration. The primary model is derived from the sub-models, which include the innovation service, customer satisfaction, and loyalty sub-models. The main model embodies the collective relationship between these sub-models and their impact on the company's revenue and profitability. During this stage, the analysis of both exogenous and endogenous factors that affect the system is conducted, along with identifying reinforcing and balancing loops.

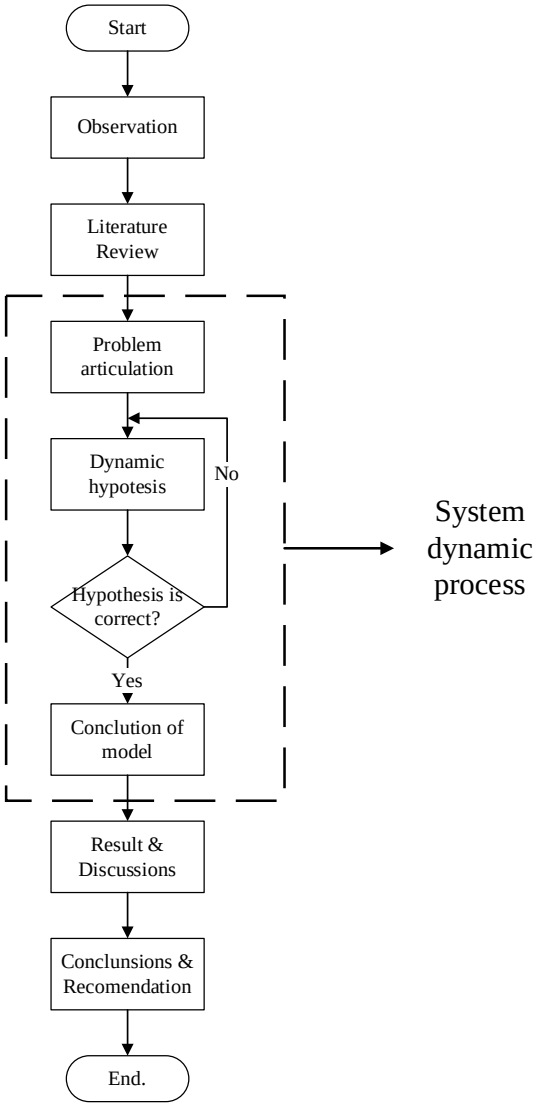

Figure 1. Research method

6. Validation structure. One way to improve the system dynamics model is to ensure that all relevant factors are taken into account. This can be done by conducting thorough research and referencing relevant literature. To ensure the accuracy of the system dynamics model, it is important to thoroughly test its limits and incorporate key concepts and structures that can effectively address policy issues. It is essential to validate the model by referencing relevant literature to ensure its adequacy.
7. Conclusion of model. This stage concludes and answers the hypothesis based on the conceptual model that has been built.
8. Result and discussion. The results and discussions stage of the research

methodology involves collecting and analyzing data to draw conclusions. This step requires a thorough analysis of the data collected during the research and presenting the findings in a clear and concise manner. The aim is to interpret the data and provide useful insights and conclusions. By effectively presenting and analyzing the results, researchers can contribute to the understanding of the research topic and provide valuable insights for the scientific community. In this research, discussions are carried out based on the processed data to achieve more optimal and effective results.

9. Conclusions. The conclusions and recommendations step in research methodology is a crucial process where the researcher presents the findings of the study, and provides suggestions for future actions or areas of further investigation. This step serves important purposes, such as summarizing key findings, validating the research study, addressing limitations, and offering valuable recommendations based on the research data. The conclusion of a study should include a summary of the findings, a discussion of the research objectives and hypotheses, an interpretation of the results, acknowledgment of limitations, and a concluding statement that emphasizes the significance of the study. In this research, the conclusion is presented through the results of the model created using dynamic system design. The study's recommendations are intended for PT Pos Indonesia and for any researchers interested in related areas of research.

4. RESULT AND DISCUSSION

Problem Articulation

Innovations in toll payment systems have eliminated the need for e-toll cards and transitioned towards cashless payments with the MLFF system. This has prompted existing digital wallets to support the integration of their payment systems. A trial of non-cash toll payments has been conducted by PT. Jasa Marga Tbk uses RFID technology, which has been integrated with the Let it Flo application. LinkAja, a digital financial service from Telkomsel and a member of Badan Usaha Milik Negara (BUMN) in the form of electronic money, has collaborated with the system. Customers are required to pay an administration fee of IDR 1,500 when purchasing a non-cash toll payment package. As the MLFF system becomes commercialized, other digital wallets such as Pospay will have the opportunity to participate. There are currently over 13,000 toll users recorded in JABODETABEK alone, with a daily volume of 3,770 vehicles accessing the toll road.

At present, Pospay provides e-money and e-wallet top-up services. If Pospay chooses to adopt the MLFF system with the current technology, customers can conveniently top-up their LinkAja accounts through Pospay with an administration fee of IDR 500. By using the Let it Flo application, customers can then purchase balance packages using the LinkAja payment method for a fee of IDR 1,500. This means that Pospay customers would need to pay IDR 2,500 to top-up their MLFF balance using RFID technology. However, if Pospay collaborates with PT. Jasa Marga Tbk for payment method, the fees charged to Pospay users would be lower as shown in Figure 2.

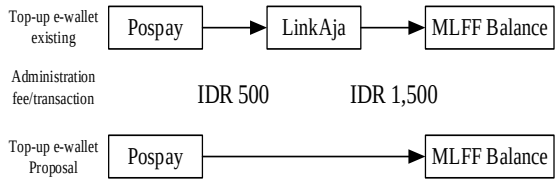

Figure 2. MLFF payment system

When Pospay plans to innovate its services by adding new features. However, it is important to consider the potential trade-off between profit and liability that may arise. To understand the long-term impact of this innovation, it is necessary to model the impact on companies, especially PT. Pos Indonesia (Persero) Tbk.

Dynamic Hypothesis

The development of the Pospay feature on the public transport aspect can be referred to as a service innovation effort. Service innovation goes hand in hand with service quality, the better the service provided, the better customer quality will be (Chen et al., 2015). Satisfied customers will repeat transactions and will even recommend services to other people so that they can attract new customers (Silalahi & Kaunang, 2022). This will certainly affect the company's

revenue and profits (Hallowell, 1996). So there are two hypotheses to be tested in this study, namely

H_0 : There is no relationship between product/service innovation and an increase in revenue company.

H_1 : There is a relationship between product/service innovation and an increase in company revenue.

The Causal Loop Diagram (CLD) is a helpful tool that can easily depict the interdependent structure of the system (Octabriyantiningtyas et al., 2019). To test the hypothesis, it is essential to analyze the key variables, such as service innovation, customer satisfaction, loyalty, and profit (Hallowell, 1996).

The Innovation Service Sub-model

Product innovation and service innovation are two crucial concepts that play a significant role in meeting customer needs, enhancing customer satisfaction, and driving organizational competitiveness (Silalahi & Kaunang, 2022). Product innovation involves the creation and development of new or improved products by introducing new features, technologies, or designs (Chen et al., 2015). On the other hand, service innovation focuses on enhancing the quality, design, and delivery of services to meet customer expectations. Understanding the relationship between product innovation, service innovation, and customer satisfaction requires a comprehensive analysis of relevant variables and research.

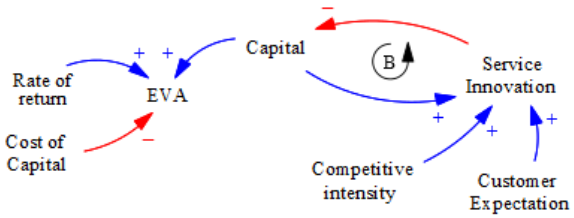

Figure 3. The innovation service sub-model

At Figure 3 is shown service innovation has a significant impact on customer satisfaction (Nwachukwu & Vu, 2022) and profitability (Amalia & Rosyid, 2022). This relationship is further strengthened by the level of competition in the market and the expectations of consumers towards services. When competition is high, service innovation and customer satisfaction tend to go hand in hand. However, implementing service innovation requires careful analysis of capital procurement to ensure that it adds economic value to the company (Sahar et al., 2020). To achieve this, it is essential to consider the rate of return, cost of capital, and capital in financial performance analysis (Handoko W & Ummah, 2009).

Loyalty Sub-models

The satisfaction and loyalty of customers are strongly connected and can influence each other (Hallowell, 1996). When customers are satisfied, they tend to stick around and spread positive feedback about the service to others, which can bring in new customers (Octabriyantiningtyas et al., 2019) and increase the frequency of transactions. Moreover, high service quality also has an impact on attracting more customers (Qorika et al., 2022; Triana & Anggeraini, 2022). The relationship between these factors is illustrated in Figure 4.

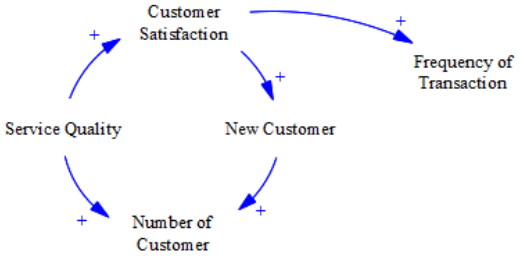

Figure 4. Loyalty sub-models

Customer satisfaction sub-models

Based on its sub-models, it is evident that customer satisfaction is impacted by service innovation and loyalty. When customers are loyal, they tend to make continuous transactions, leading to an increase in the number of transactions (Octabriyantiningtyas et al., 2019). While this increase benefits Pospay, it also brings about certain obligations (Handoko W & Ummah, 2009), such as fixed costs, variable costs, and taxes, which are directly proportional to the level of income.

The diagram presented in Figure 5 effectively displays the relationship between loyalty and recurring transactions, as well as the impact of transaction frequency on overall loyalty. Additionally, it highlights how an increase in recurring transactions can lead to a boost in overall transaction volume. However, it may be

beneficial to provide more detailed explanations or examples to further clarify these relationships.

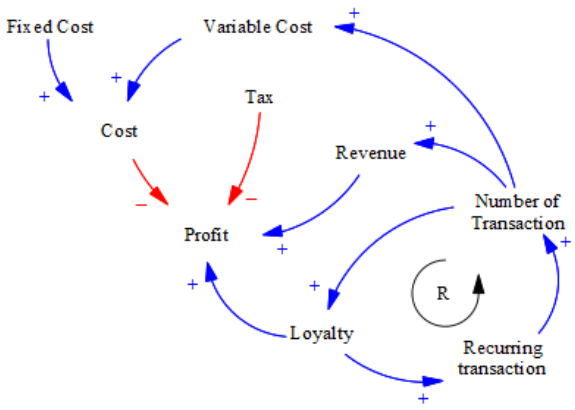

Figure 5. Customer satisfaction sub-models

Main Model

The cause and effect diagram shown in Figure 6 shows a clear correlation between service innovation, customer satisfaction, loyalty, and profits. All the variables involved are described in detail. This conceptual model could be useful for Pospay if they plan to improve their services by introducing features in the public transport sector and becoming a payment option for MLFF. By analyzing this model, companies can make informed decisions about how to improve their services and increase customer satisfaction and loyalty, ultimately leading to higher profits.

Validation structure

In order to create an effective model, it is crucial to have a clear understanding of the problem it is intended to solve (Octabriyantiningtyas et al., 2019). If the goal is not properly defined, even the most accurate model may lead to the wrong outcome and be ultimately misleading. To ensure the validity of a model, structural validation is essential. This may involve conducting boundary adequacy and structural verification tests, among other measures. While these tests may not be exhaustive, they are essential for verifying the accuracy and reliability of a dynamic system-type simulation model.

In Table 2, the results of boundary adequacy and structure verification tests are presented, which are a part of the structural validation process (Qudrat-Ullah, 2008). These tests in volve examining the endogenous and exogenous variables in the model developed to test three structural concepts: creating service innovation, increasing customer satisfaction, and increasing loyalty. Each concept has its own set of endogenous and exogenous variables. The endogenous variables include capital, EVA, cost, revenue, and service quality, while exogenous variables include competitive intensity, customer expectation, tax, number of customers, frequency of transactions, number of transactions, and recurring transactions. All of these variables have references that can be used for structure verification.

Table 2. Summary of the boundary of service innovation, customer satisfaction, and loyalty to revenue

Structure Concept	Endogen	Reference	Exogen	Reference	Remarks
Creating service innovation	Capital EVA Profit Cost Revenue	(Hallowell, 1996; Handoko W & Ummah, 2009; Octabriyantiningtyas et al., 2019; Sahar et al., 2020)	Competitive Intencity Customer Expectation Tax	(Nwachukwu & Vu, 2022)	Structural formulation was adopted
Increase customer satisfying	Service quality	(Qorika et al., 2022; Silalahi & Kaunang, 2022; Triana & Anggeraini, 2022)	Number of customer Frequency of transaction	(Octabriyantiningtyas et al., 2019; Silalahi & Kaunang, 2022)	Causal structure was adopted
Increase loyalty	-		Number of transaction Recurring transaction	(Octabriyantiningtyas et al., 2019)	Causal structure was adopted

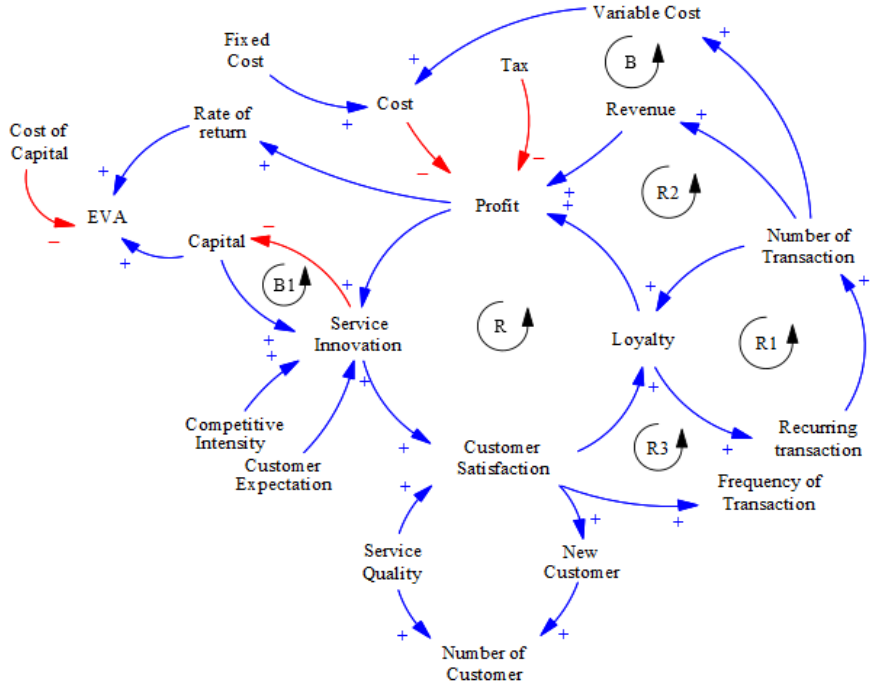

Figure 6. Main conceptual model

5. CONCLUSION

A model created through dynamic system design can help us better understand how real systems behave and allow us to simulate experiments before implementing policies. However, the model discussed in this study is still in progress until a Causal Loop Diagram (CLD) is formed. By following the stages in the system dynamics methodology, the process of understanding and modeling the system becomes easier. This starts with the upper level, the subsystem diagram then moves to the middle level, the causal loop diagram, and finally to the lower level, which provides more detail in the stock and flow diagram.

This study examines the impact of integrating Pospay as a payment method for the MLFF system on companies. The study models various behaviors and variables to test hypotheses related to constraints and modeling variables. The main model shows a relationship between service innovation, customer satisfaction, loyalty, and company profits. Service innovation leads to increased customer satisfaction, which in turn increases company loyalty and revenue. The results suggest that the model can be used as a policy-making proposal by companies. However, some variables related to technology cannot be included in the behavior of creating Pospay service innovations. Future research should consider variables related to planning a business model and accompanying costs. This study is limited to a conceptual model using a Causal Loop Diagram, and further research is expected to interpret the model on stock and flow to obtain more reliable results.

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