

# Analysing the Effect of Product Quality, Service Quality, Customer Relationship Management, and Price on Customer Loyalty through Customer Satisfaction as an Intervening Variable Case Study: PT Mitsubishi Power Indonesia

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**Abstract:-** In the current era of globalization, business competition in every field of industries tends to be tighter. Therefore, it is important to maintain customer loyalty so that customers will not shift to the competitors. This case also applies for Mitsubishi Power Indonesia (MPI), as one of the biggest manufacturing companies that engaged in the power generation sector in Indonesia. In this study, we analyse the effect of four variables, i.e., product quality, service quality, customer relationship management (CRM), and price, on customer loyalty of MPI with and without using customer satisfaction as an intervening variable. This analysis was performed to have better understanding on the customers of MPI in terms of the factors that are important to maintain their loyalty. The results show that there is no significant effect of product quality, service quality, CRM, and price on customer loyalty with and without using customer satisfaction as an intervening variable. The significance is only found for the effect of customer satisfaction on customer loyalty. Here, customer satisfaction is shown to directly influence customer loyalty positively.

**Keywords:-** Product Quality; Service Quality; CRM; Customer Relationship Management; Price; Customer Satisfaction; Customer Loyalty; Mitsubishi Power Indonesia

## I. INTRODUCTION

The current era of globalization has resulted in increasingly fierce and dynamic business competition. In order to preserve the loyalty of customers, it is important for companies to maintain good long-term relationship with customer. The aim is to maintain the satisfaction and loyalty of customers so that they do not switch to other similar companies. This principle applies to all fields of industries, including manufacturing industries.

Mitsubishi Power<sup>1</sup> is a Japanese manufacturing company engaged in the power generation business. Mitsubishi Power provides several products for the power generation business, and also services to perform maintenance of their products.

Mitsubishi Power Indonesia<sup>2</sup> (MPI) is a branch of Mitsubishi Power in the Asia Pacific region that serves customers in Indonesia. MPI has cooperated with the national power plant company in Indonesia, i.e., the PLN (*Perusahaan Listrik Negara*) Group, over more than 50 years, and as of 2019, the total power generation capacity that has been delivered in Indonesia using the products of MPI has reached 12 GW [1]. Currently, MPI serves 15 power plant units in Indonesia that provide electricity for 85,636,198 users in December 2022 [2]. This shows that MPI has a large number of customers from the PLN (*Perusahaan Listrik Negara*) Group, and therefore, it is important for MPI to continue making innovation and improving service quality, so that the level of customer satisfaction and loyalty can be maintained.

The number of national electricity customers in Indonesia continues to experience a significant increase every year. This increase occurred in all types of customers, ranging from households, industry, business, social and other types of customers. The total number of national electricity users who use PLN group service in December 2022 (85,636,198 users) [2] has increased by 3.75% compared to December 2021. The high need of electricity indicates a good opportunity for MPI to expand its business through the collaboration with PLN Group. This can be performed only if the level of satisfaction and loyalty of existing PLN Group customers can be maintained properly.

Customer loyalty is a strong commitment to use a product or service again in the future although there are market influences or changes that may potentially cause the customers to switch [3]. Loyal customers not only serve as word-of-mouth advertisers, but will also continue to be loyal business partners for the company for years to come. Customer loyalty describes the level of satisfaction of customers with the products or services offered by the company. Therefore, maintaining customer loyalty is the main key in facing increasingly fierce and dynamic business competition.

<sup>1</sup> <https://power.mhi.com/>

<sup>2</sup> <https://power.mhi.com/regions/apac/id>

Customer satisfaction is one of important factors that determine customer loyalty to a company. Companies must focus more on retaining existing customers by minimizing the decrease of customer satisfaction. The decrease of customer satisfaction can have several negative impacts on the company, including causing negative attitudes towards the company, reduced repeat purchases, switching to other companies and repeated complaints. Therefore, companies must immediately follow up the indication of the decrease on customer satisfaction.

MPI experiences a decrease in the achievement of the company's annual revenue target in 2020. This situation needed to be investigated by immediately identifying the root causes of the decrease in revenue targets in that year. Companies need to identify whether the case is due to the Covid-19 pandemic or due to a decrease in customer satisfaction and loyalty. Therefore, a more comprehensive study and analysis needed to be carried out to find out how customers evaluate the business processes currently being carried out by MPI. This is the motivation to conduct this research.

In this study, we want to examine the influence of four factors, i.e., product quality, service quality, customer relationship management (CRM), and price, on customer loyalty at MPI with and without using customer satisfaction as an intervening variable. The justification of using these factors is based on the common factors used in the previous work and the results of our initial study (this is explained in more detail in section IV). Overall, this work has two purposes. First, we want to investigate whether the product quality, service quality, CRM, and price have significant effect on the customer loyalty in MPI. Second, we want to examine whether customer satisfaction can mediate the effect of product quality, service quality, CRM, and price towards the customer loyalty at MPI.

Several previous works have conducted studies on analyzing the influence of various factors affecting customer satisfaction and loyalty in various industrial sectors. They include textiles [4], B2B [5], fast-food [6], transportation [7], [8], bank [9], internet service provider [10], hotel [11], [12], supermarket [13], and cosmetic [14]. However, there has been no research that examines the influence of several factors on customer satisfaction and loyalty in the power generation industry sector. In addition, to the best of our knowledge, none of the previous work in any industrial sectors has analyzed the influence of product quality, service quality, CRM, and price factors on customer satisfaction and customer loyalty simultaneously in a study. So, this is the research gap that is fulfilled in this study, which becomes our contribution in this work.

The rest of this paper is structured as follows. Section II presents some previous work that are related to this study. Section III describes the research methodology. Section IV explains our initial study to determine the factors to be analyzed in this work. Section V and VI formulate our hypothesis and research variables, respectively. Section VII details the methods of data collection and analysis. Section

VIII and IX present the results as well as the conclusion of this study.

## II. RELATED WORK

### ➤ *Customer Loyalty*

Some researchers have given their perspectives on the definition of customer loyalty. According to Tjiptono [15], customer loyalty is a commitment of customer to a brand, store, supplier that is reflected in consistent repeat purchases. Next, according to Kotler & Armstrong [16], customer loyalty can be defined as repeat purchase, retention (resistance to the negative news of the company), and referrals (giving reference to others to use company's products/services). Further, according to Goodman [17], customer loyalty is a customer's long-term commitment that is implemented by being loyal to consume the company's products regularly and repeatedly, and therefore it will affect the existence of the company.

Based on some definitions above, it can be concluded that customer loyalty is a strong commitment to use a product or service on a regular basis and to continue using it even though there are some situations that potentially cause a shift in behavior. Loyal customers are very satisfied with a product or service and also enthusiast to promote it to others. Customer loyalty is very important for the company in order to maintain the continuity of its business. Therefore, customer loyalty is a long-term asset that is important for a company.

Hill & Alexander [18] explains there are five factors that must be considered to maintain customer loyalty, including product quality, service quality, price, fees, and emotion. According to their study, customers are satisfied when they receive high-quality products, good service, & competitive price; when they do not need to pay additional costs; and when other people are amazed if they use that brand of products. In another perspective, Rai & Srivastava [19] pointed out six elements that may influence customer loyalty. Two of them are similar to the factors mentioned by Hill & Alexander [18], i.e., service quality and price. Then, four other factors are brand image, convenience of obtaining products or services, customer satisfaction, and warranty.

In this study, we want to analyse whether the loyalty of customer at MPI is significantly affected directly by product quality, service quality, CRM, and price factors. Further, we are also interested to investigate whether customer satisfaction can be an intervening variable of product quality, service quality, CRM, and price factors on customer loyalty. The next subsection elaborates the theoretical information on customer satisfaction.

### ➤ *Customer Satisfaction*

According to Kotler & Armstrong [16], satisfaction is a person's feelings of pleasure or disappointment that is resulted by comparing the perceived performance of a product and his expectations. Meanwhile, according to Goodman [17], customer satisfaction is the feeling of pleasure felt by customers because they obtain their rights properly and tend to be comfortable. Based on these definitions, it can be

concluded that companies must be able to understand and study well all the needs, desires and expectations of customers so that companies can increase customer satisfaction.

Hill & Alexander [18] described that the evaluation of consumer satisfaction on certain products or services generally refers to various factors or dimensions. They highlighted some factors that are often used in evaluating customer satisfaction with a manufactured product include responsiveness of service, speed of transaction, availability of service, professionalism, and overall satisfaction. Hansen et al. [3] pointed out four methods to measure customer satisfaction. The first method is complaint and suggestion system. All companies need to provide easy and convenient opportunities for its customers to convey their suggestions and complaints. The second method is ghost shopping (mystery shopping). The idea is to use several people as ghost shoppers who are asked to use the company's and competitors' products or services. They would be asked to report their findings regarding the strengths and weaknesses of the products of company and those of competitors. The third method is the lost customer analysis. Companies that have lost customers try to contact these customers and investigate why they stopped or moved to other products. Finally, the last method is customer satisfaction survey using interview, email, or questionnaires.

#### ➤ *Factors of Customer Satisfaction and Loyalty*

Some previous works have analyzed the effect of service quality on customer satisfaction and/or customer loyalty. Liu et al. [6] studied the interrelationship among service quality, customer satisfaction, and customer loyalty in a fast-food industry. They found that service quality significantly affects the customer satisfaction; and service quality significantly affects the customer loyalty through customer satisfaction as an intervening variable. Bismo et al. [7] examined the effect of service quality and customer satisfaction on customer loyalty in transportation services in Indonesia. They found that service quality significantly affects the customer satisfaction, but does not significantly affect the customer loyalty.

Darmawan et al. [9] investigated the effect of service quality, customer satisfaction, and corporate image on customer loyalty in the bank company in Indonesia. They found that service quality has a significant effect on customer satisfaction, corporate image, and customer loyalty; and customer satisfaction and corporate image have significant effect on customer loyalty. Joudeh and Dandis [10] explored the relationship between service quality, customer satisfaction, and customer loyalty in internet service provider. They found that internet service quality has a significant effect on customer satisfaction that can further affect the customer loyalty.

Huang et al. [5] studied the effect of service quality on customer satisfaction in B2B technology company. They found that service quality has a significant effect on customer satisfaction. Then, customer satisfaction has a significant effect on customer loyalty. Jannah et al. [20] analyzed the effect of product quality & promotion on customer

satisfaction and customer loyalty in a health and cosmetic distribution company. Their results show that the product quality and the promotion significantly influence customer satisfaction. The product quality is not shown to have a significant effect on the customer loyalty directly, but it does through customer satisfaction.

Lie et al. [21] studied whether consumer satisfaction can be an intervening variable on the effect of service quality, price, and consumer trust on consumer loyalty. Their results show that the price and consumer trust variables have a positive effect on consumer loyalty. Priyo et al. [11] examined the effect of service quality and customer satisfaction on customer loyalty in hotel industry. The results reveal that service quality has positive effect on customer satisfaction and loyalty. A positive effect is also shown from customers satisfaction on customer loyalty. Significant mediating effect of customer satisfaction was found on the relationship between service quality and customer loyalty. Mokhtar & Sjahrudin [12] examined the relationship between customer relationship management (CRM) quality, service quality, customer satisfaction and customer loyalty in hotel industry. The results show that customers satisfaction plays a mediating role in the influence of CRM quality and service quality on customer loyalty. Fitrajaya & Nurmahdi [22] studied the effect of product quality, service quality, and brand image on customer loyalty. They found that product quality has a significant positive effect on customer loyalty, but the service quality and the brand image do not have significant effect on customer loyalty.

Cahaya & Siswanti [23] investigated internet banking service quality in Indonesia and its impact on e-customer satisfaction and e-customer loyalty. They found that internet banking service quality has a positive effect on e-customer satisfaction as well as e-customer loyalty; and e-customer satisfaction has a positive effect on e-customer loyalty. Khan et al. [24] studied the effect of CRM and company reputation on customer loyalty. The results show that CRM and company reputation significantly affect the customer loyalty positively. In addition, customer satisfaction partially mediates the relationship between CRM, company reputation and customer loyalty. Lubis et al. [25] studied the influence of CRM indicators on customer loyalty of Sharia-based banking system. They found that partially, complaint resolution, customer orientation, customer empowerment and customer knowledge significantly affect the customer loyalty in Islamic banking.

Nguyen et al. [26] studied the effect of service quality, customer satisfaction and switching costs on customer loyalty. The results show that the five service quality factors in e-banking - reliability, responsiveness, service capacity, empathy and tangibles - have a positive correlation with customer satisfaction. Surahman [27] studied the effect of service quality on customer loyalty using customer satisfaction as a mediating variable in tourism villages in Badung regency. They found insignificant direct effect of service quality on customer loyalty. Slack & Singh [13] examined the effect of service quality on customer satisfaction and loyalty in supermarkets in Fiji. Their findings

show that service quality significantly affects the customer satisfaction and loyalty, and customer satisfaction partially mediates the relationship between service quality and customer loyalty. Nandya & Permana [14] analyzed the effect of e-CRM and brand trust on customer satisfaction and loyalty in Pixy cosmetic products. The results showed that the e-CRM significantly has a positive effect on customer satisfaction, and customer satisfaction significantly has a positive effect on customer loyalty.

### III. RESEARCH METHODOLOGY

The research design used in this study is causality research with a quantitative approach. In general, the

flowchart of this research can be seen in Figure 1. This study starts with identifying the problem occurs in MPI, which is related with the decrease in the company's annual revenue target in 2020. Here, we want to investigate whether the case is due to the Covid-19 pandemic or due to a decrease in customer satisfaction and loyalty. In this case, we first need to better understand the satisfaction and loyalty of customers, and what aspects that may affect them. An extensive literature review is then performed to explore the factors that may influence the customer satisfaction and loyalty from the results of previous work. By conducting this step, we also want to understand common methods used in previous work to perform this kind of analysis.

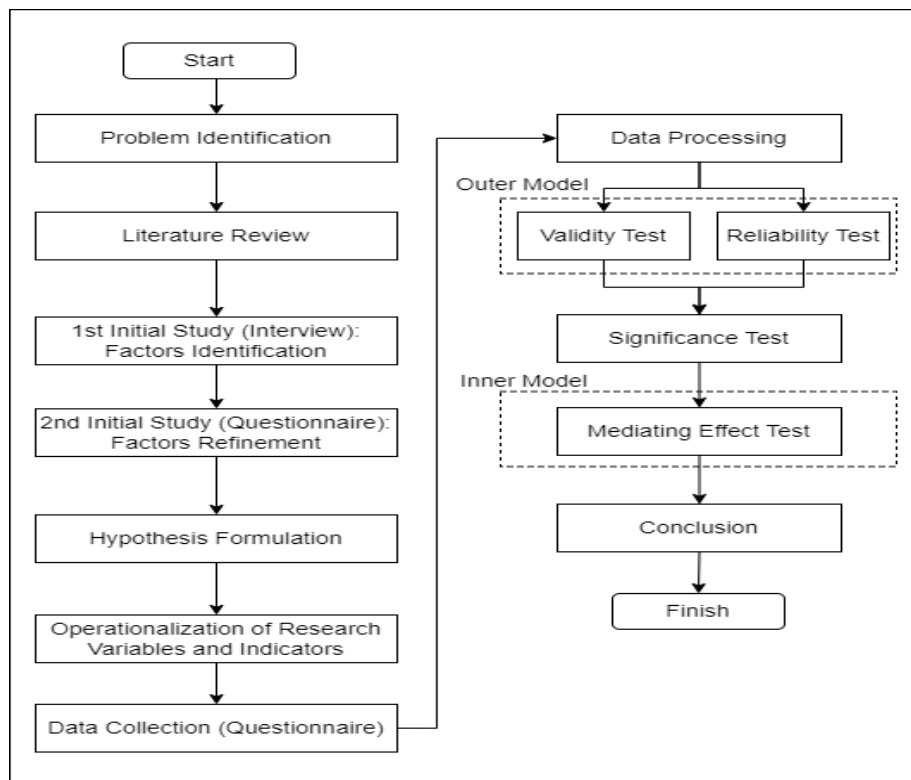


Fig 1 Research Flow

The first initial study is conducted to obtain general knowledge on the factors that are considered as important by customers, and therefore may influence customer satisfaction and loyalty. The second initial study is further performed to refine or select the factors to be analyzed in this work. This step is performed so that we can focus more on the most important factors that may influence customer satisfaction and loyalty. The first and second initial studies are detailed in section IV.

After determining the factors to be analyzed in this study, we formulate hypotheses to test the effect of these factors. There are nine hypotheses in total, explained in more detail in section V (Hypothesis Formulation). Before starting to collect data for the main study, we need to operationalize all variables and all indicators for each of the variables. This step is explained in detail in Section VI (Operationalization of Research Variable). The next step is data collection. We collect the primary data for main study using questionnaires.

The collected data are then processed or analyzed using some statistical methods. Data collection and analysis are described in Section VII (Methods). Finally, conclusion is withdrawn based on the results of our data analysis using hypothesis testing.

### IV. INITIAL STUDY

The first initial study was conducted to obtain general knowledge on the factors that are considered important by customers to maintain their satisfaction and loyalty to MPI. This study was performed by interviewing four customers of MPI who work at managerial levels. They include Deputy General Manager (1 person), General Manager (1 person), and Manager (2 persons). These persons have worked in power units that use products from MPI for more than 15 years. Therefore, the results of the interview are expected to provide all the important information needed to conduct further initial study by the authors. The results of this

interview highlight six important factors that may influence customer satisfaction: Product Quality, Price, Service Quality, Customer Relationship Management (CRM), Promotion, and Brand Image.

We choose four most important factors (out of the six resulting factors from initial study) to limit the scope of the independent variables and the hypothesis addressed in this work. For this selection, we perform the second initial study

by distributing questionnaires to a total of 40 customers of MPI. These customers are key person from each of the power plant unit who often interact with the technical and commercial teams from MPI. In addition, all of these respondents have a great influence on the top management policies of each power plant unit, especially those related to the repair work or the new parts purchasing from MPI. The statistics of our respondents are described in Table 1.

Table 1 The Statistics of our Respondents

No	Variable	Description	Frequency
1	Gender	Man	38
		Woman	2
		<b>Total</b>	40
2	Age	>20 - 30 years	6
		>31 – 40 years	10
		>41 – 55 years	24
		<b>Total</b>	40
3	Position	Supervisor	4
		Senior Supervisor	12
		Manager	20
		Deputy Manager	2
		General Manager	2
		<b>Total</b>	40

In this second initial study, we use survey method using questionnaires. We ask the respondents to rate the importance of each of the six resulting factors from the first initial study using a 5-scale Likert scale (5: Very unimportant and 1: Very important). Figure 2 shows the results of the second initial study.

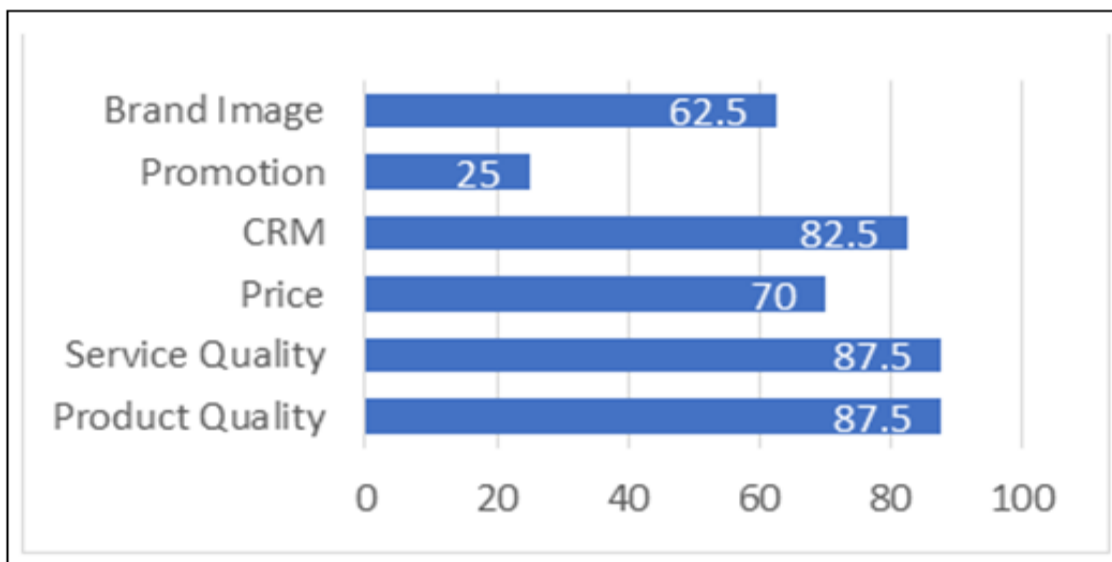


Fig 2 The Percentage of Respondents who Chose Very Important for Each of the Factor

The results of this questionnaire show that the four factors that are considered as the most important factors by MPI customers are product quality, service quality, CRM, and price. The percentage of respondents who rate the Product Quality, Service Quality, CRM, and Price factors as "Very Important" factors respectively are 87.5%, 87.5%, 82.5%, and 70%. Based on this result, we then use these four factors to be examined in the main study related to their direct effect on customer loyalty, and their effect on customer loyalty when mediated by the customer satisfaction.

**V. HYPOTHESIS FORMULATION**

This study uses four independent variables, one dependent variable, and one intervening variable. The independent variable is the cause of the change of the dependent variable. The dependent variable is affected or is the result of the independent variable. Intervening variables influence the relationship between the independent and dependent variables to become an indirect relationship. In this work, the independent variables are the important factors



resulted from our initial studies: product quality, service quality, CRM (customer relationship management), and price; while the dependent variable is customer loyalty. Then,

the intervening variable is customer satisfaction. Using our variables, we formulate nine hypotheses to be tested in this study, described in Table 2.

Table 2 List of Our Hypothesis

No	Hypothesis	Related work
H1	Product quality has a positive and significant effect on customer loyalty.	[22], [28]
H2	Service quality has a positive and significant effect on customer loyalty.	[6], [9]–[13], [23], [27], [29]
H3	CRM has a positive and significant effect on customer loyalty.	[12], [24], [25], [30]
H4	Price has a positive and significant effect on customer loyalty.	[21]
H5	Customer satisfaction has a positive and significant effect on customer loyalty.	[5], [9], [11], [12], [14], [20], [21], [23], [26], [30], [31]
H6	Product quality has a positive influence on customer loyalty through customer satisfaction.	[20], [28]
H7	Service quality has a positive influence on customer loyalty through customer satisfaction.	[6], [10]–[13], [21], [27], [29], [31]
H8	CRM has a positive influence on customer loyalty through customer satisfaction.	[12], [24]
H9	Price perception has a positive influence on customer loyalty through customer satisfaction.	[31]

These hypotheses have also been explored and are shown to have direct or indirect significant effect on customer loyalty in some previous work on different field of industries. These related works are displayed in the third column of the table.

Figure 3 illustrates the conceptual framework of this study which describes the relationship between independent, dependent, and intervening variables in our hypothesis. Symbols X1, X2, X3, and X4 denote independent variable, while symbols Y and Z respectively denote dependent and intervening variables. In hypotheses H1 until H4, we analyse the **direct** causal relationship between each of our independent variables and the dependent variable. In hypothesis H5, we consider Customer Satisfaction as an independent variable and examine its direct causal relationship towards the dependent variable. In hypothesis H6 until H9, we analyse **indirect** causal relationship between each of our independent variables and the dependent variable through intervening variable.

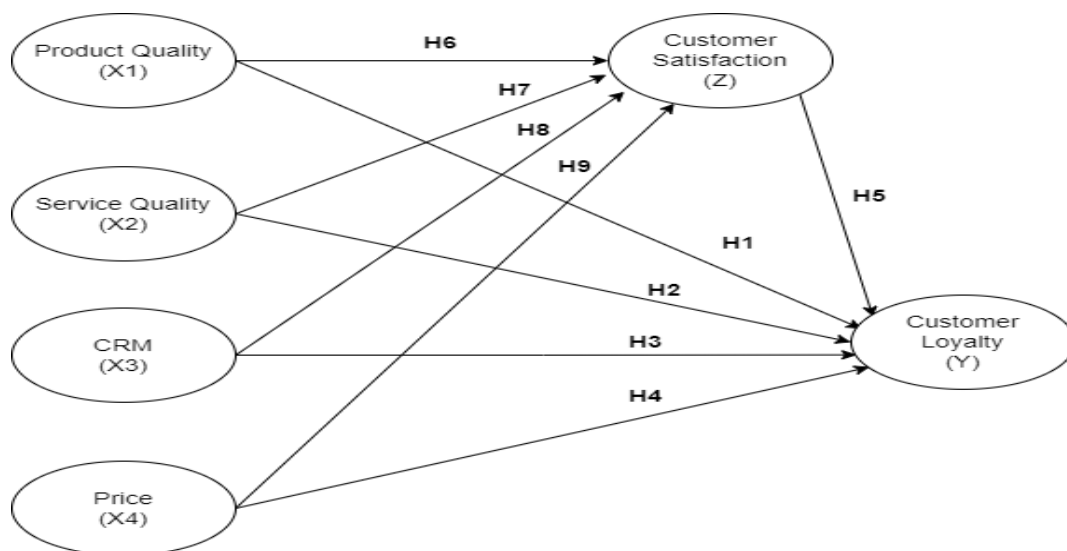


Fig 3 Conceptual Framework

## VI. OPERATIONALIZATION OF RESEARCH VARIABLES

Based on the theoretical studies that have been conducted, the research variables, dimensions and indicators used in this study are described in Table 3. Each variable has some dimensions to measure, and each dimension has an indicator to determine the criteria of the fulfillment of that dimension. In total, there are 6 variables, 30 dimensions, and 30 indicators used in this study. In the data collection process, we will ask MPI customers to rate the level of fulfillment of each of these indicators by MPI in the perspective of customers using a 5-level Likert scale (1:Strongly Disagree and 5:Strongly Agree). Here, the indicators become the questions that compose our questionnaires. More detailed explanation about data collection process is described in the next section.

Table 3 Variables, Dimensions and Indicators

Variable	Dimension	Indicator
Product Quality (X1) [15]	Performance	The products of Mitsubishi Power have good performance (X1.1)
	Features	The products of Mitsubishi Power have features that suit customer needs (X1.2)
	Reliability	The products of Mitsubishi Power have good reliability (X1.3)
	Conformance to Specifications	The products of Mitsubishi Power comply with the technical specifications from customer (X1.4)
	Durability	The products of Mitsubishi Power have good durability (X1.5)
	Serviceability	The products of Mitsubishi Power are easy to identify, inspect and repair (X1.6)
	Design	The products of Mitsubishi Power are in accordance with the design drawings from customer (X1.7)
	Perceived quality	The products of Mitsubishi Power have good quality (X1.8)
Service Quality (X2) [16]	Reliability	Mitsubishi Power provides reliability guarantees for its products or services to customers (X2.1)
	Assurance	Mitsubishi Power provides warranty or after-sales service for its products or services to customers (X2.2)
	Tangible	Mitsubishi Power provides real service quality to customers (X2.3)
	Empathy	Mitsubishi Power always helps to solve problems experienced by customers (X2.4)
	Responsiveness	Mitsubishi Power provides are responsive to the needs of customers (X2.5)
CRM (X3) [32]	People	Mitsubishi Power has good employee, e.g., Sales & Engineers (X3.1)
	Process	Mitsubishi Power has a good business transaction process mechanism (X3.2)
	Technology	Mitsubishi Power use good technology to interact with customers, e.g., Customer Portal, O&M Seminars, and Communication Sheets. (X3.3)
Price (X4) [18]	Affordable	The prices for products or services of Mitsubishi Power are still affordable for customers (X4.1)
	Conformance to quality	The prices for products or services of Mitsubishi Power are in accordance with their quality (X4.2)
	Competitive price	The prices for products or services of Mitsubishi Power can compete with existing competitors (X4.3)
	Conformance to portion	The prices for products or services of Mitsubishi Power are in accordance with their portion (X4.4)
Customer Satisfaction (Z) [17]	Responsiveness of Service	Mitsubishi Power provides fast and responsive service to customers (Z.1)
	Speed of Transaction	Mitsubishi Power provides fast and responsive business transaction system (Z.2)
	Availability of Service	Mitsubishi Power always standby to provide services to customers who need assistance (Z.3)
	Complain System	Mitsubishi Power has a good customer complaint system (Z.4)
	Professionalism	Mitsubishi Power has high professionalism (Z.5)
	Overall Satisfaction	Customers are satisfied with the quality of service offered by Mitsubishi Power as a whole (Z.6)
Customer Loyalty (Y) [16]	Regular buying	Customers will continue to use products or services from Mitsubishi Power (Y.1)
	Buying outside the line of products and services	Customers will buy other products or services of Mitsubishi Power that have never been purchased before (Y.2)
	Recommend products to others	Customers will recommend products or services of Mitsubishi Power to others (Y.3)
	Persist not to use competitors' products	Customers will still choose to use the products or services offered by Mitsubishi Power (Y.4)

## VII. METHODS

### ➤ Data Collection

The population in this study are employees who work at power plants in Indonesia that uses products and services from MPI. The sampling method was carried out using purposive sampling method. Our samples are employees who work at power plants that use products from MPI and are directly involved in the operational activities of power plants. They have worked for more than 2 years, spread throughout Indonesia. We took 40 customers from the population as our samples to be the respondents in this main study. Our respondents in this main study are basically similar to those in the second initial study. So, the statistics of our respondents in this main study can be seen from Table 1 presented earlier.

We use survey method using questionnaire to collect data from our respondents. In the questionnaires, we ask the respondents to judge the level of fulfillment of the indicators described in Table 3 by the MPI based on their perspectives. The scale used in this study is a 5-level Likert scale (1: Strongly Disagree and 5: Strongly Agree). For example, if a customer strongly agree that the products of Mitsubishi have good performance, then he will rate 5 (Strongly Agree) to the indicator X1.1 for variable "Product Quality". Otherwise, he will rate 1 (Strongly Disagree) for that indicator, if he thinks that such indicator is not fulfilled at all by the MPI.

### ➤ Data Analysis

Multivariate analysis is used to analyse the resulting data from our questionnaires. Multivariate analysis is a statistical approach that can be used to analyse data that has more than two variables. In this study, a multivariate analysis is conducted using Structural Equation Model (SEM). SEM has helped many researchers in solving problems related to aspects of the measurement and structural models. The measurement model is used to test validity and reliability. The structural model is used to test causality by testing hypotheses using predictive models.

We use SEM with instrument testing using the Partial Least Square (PLS) method. PLS method is a variance-based SEM that can simultaneously test the measurement model and the structural model. PLS analysis is a multivariate statistical technique that makes comparisons between multiple dependent variables and multiple independent variables. The algorithm in PLS is not limited to the relationship between indicators and latent constructs. The main purpose of PLS is to explain the relationships between constructs and emphasize the notion of the value of these relationships. PLS can be used for very complex models (consisting of many latent variables) and can predict the model path with a small sample. We use SmartPLS software version 3.2.9 to apply PLS analysis.

- The following are some of the reasons why PLS was used for this study, including:

- ✓ PLS can be used with a relatively small number of samples (under 100 samples).
- ✓ PLS can be used for theoretical analysis which is still said to be weak. This is because PLS can be used to provide predictions.
- ✓ PLS can assume that all variance measures can be used to explain research variables.

- The following are the steps in the analysis with PLS:

- ✓ Evaluation of the Measurement Model (Outer Model).

This step is performed to evaluate the relationship between the construct and its indicators which are divided into two processes:

- *Validity Test*

Using the PLS method, testing the validity of reflexive indicators is carried out in two stages: convergent validity and discriminant validity. The convergent validity test is based on the loading factor value of each construct. This test is used to identify if the unobserved variable can be measured using each observed variable construct through factor analysis. Another convergent validity test can be conducted based on Average Variance Extracted (AVE).

The second stage is discriminant validity test, which is validity testing based on comparison. This test is carried out based on the value of the Cross Loading Factor (CLF) measurement with the construct and the Average Variance Extracted (AVE) value. The CLF score must be greater than the correlation between indicators and other latent variables. Other discriminant validity tests include Fornell & Larcker Criterion and Heterotrait-Monotrait (HTMT) Ratio.

- *Reliability Test*

This test aims to see the construct reliability of latent variables as measured by two kinds of measures, namely Composite Reliability and Cronbach Alpha from the indicator block that measures constructs. In the first stage, the construct is considered to be reliable if it has Composite Reliability and Cronbach's Alpha values above 0.70.

- ✓ Evaluation of the Structural Model (Inner Model)

An assessment of the structural model can be performed by examining the coefficient of determination ( $R^2$ ) value, the cross-validated redundancy ( $Q^2$ ) value, the Goodness of Fit (GoF) index, the effect size ( $f^2$ ), and then looking at the significance between constructs shown by the path coefficient. The  $R^2$  value for each endogenous latent variable is used to measure the predictive power or predictive accuracy of the structural model. The  $Q^2$  can be used to evaluate the predictive relevance of inner models. If the  $Q^2$  value  $> 0$ , then it indicates that the model has good predictive relevance.



The GoF index is a measure to validate the structural model globally, to see whether there are discrepancy between observed values and expected values [33]. It can be used to determine the overall prediction power of the model, by taking into account the combined performance of measurement and structural models. It can be computed as the square root of the multiplication between AVE and R<sup>2</sup> values [33], [34]. The GoF index can be classified as small ( $\geq 0.1$ ), moderate ( $\geq 0.25$ ), and large ( $\geq 0.36$ ) [34].

Next, the effect size analysis can be conducted to measure how much the exogenous latent variables influence the endogenous latent variables. Here, we examine if removal an independent variable from the model can have a substantial impact on the dependent variable. Based on the f<sup>2</sup> values, the effect size of the omitted variable for a particular endogenous construct can be classified as small, medium, and large effects when the scores are respectively  $\geq 0.02$ ,  $\geq 0.15$ , and  $\geq 0.35$  [35].

After the above test are conducted, the hypotheses in this study are tested by examining the path coefficients and the significance value of the t-statistic. The limit for rejecting and accepting the proposed hypothesis is using a probability of 0.05.

**VIII. RESULTS**

➤ *Convergent Validity: Factor Loadings*

Table 4 describes the factor loadings results for all indicators used in this study. The definitions of indicator symbols displayed in this table refer to the definitions displayed in Table 3 earlier. We can see that the factor loadings for all variable indicators are greater than 0.7, indicating that convergent validity is achieved [36]. This result shows that the indicators for these variables work well with the measurement model because the indicators correlate well with the underlying factor. The higher the factor loading values indicate the higher the correlation of indicators with the underlying factor.

Table 4 The Results of Factor Loadings Evaluation

Constructs	Indicators	Factor Loadings
Product Quality (X1)	X1.1	0.761
	X1.2	0.746
	X1.3	0.931
	X1.4	0.893
	X1.5	0.844
	X1.6	0.848
	X1.7	0.887
	X1.8	0.879
Service Quality (X2)	X2.1	0.878
	X2.2	0.841
	X2.3	0.838
	X2.4	0.852
	X2.5	0.838
CRM (X3)	X3.1	0.836
	X3.2	0.745
	X3.3	0.927
Price (X4)	X3.4	0.910
	X3.5	0.884
	X3.6	0.742
	X3.7	0.786
Customer Satisfaction (Z)	Z.1	0.826
	Z.2	0.847
	Z.3	0.859
	Z.4	0.886
	Z.5	0.848
	Z.6	0.840
Customer Loyalty (Y)	Y.1	0.881
	Y.2	0.791
	Y.3	0.860
	Y.4	0.856

➤ *Convergent Validity: Average Variance Extracted*

This test measures the degree to which two or more measures of the same thing covary. Table 5 displays the results of AVE (Average Variance Extracted) statistics for all constructs in this study. All constructs have AVE values greater than 0.5, which indicates that convergent validity for all constructs is established [37].

Table 5 The Results of Construct Convergent Validity Test

Constructs	AVE
X1	0.724
X2	0.722
X3	0.704
X4	0.695
Z	0.725
Y	0.719

➤ *Discriminant Validity : Fornell & Larcker Criterion*

Based on Fornell and Larcker [37], when the square root of AVE for a construct is greater than its correlation with all other construct, then discriminant validity is established. We can see from Table 6 that the square root of AVE for each construct (in bold) is shown to be greater than its correlation with other constructs. This supports the claim that discriminant validity of our constructs is established according to the Fornell & Larcker Criterion.

Table 6 The Results of Fornell & Larcker Criterion Test

	X1	X2	X3	X4	Z	Y
X1	<b>0,851</b>					
X2	0,380	<b>0,849</b>				
X3	0,165	0,268	<b>0,839</b>			
X4	0,326	0,239	0,244	<b>0,834</b>		
Z	0,218	0,300	0,228	0,151	<b>0,851</b>	
Y	0,154	0,342	0,183	0,165	0,612	<b>0,848</b>

➤ *Discriminant Validity: Heterotrait-Monotrait Ratio*

Heterotrait-Monotrait (HTMT) ratio measures the correlation between constructs to determine whether discriminant validity is established or not. According to Kline [38], the threshold for HTMT ratio is 0.85 or less to conclude that the data satisfies discriminant validity. It is clear from Table 7 that all HTMT ratio is less than 0.85. Therefore, discriminant validity is established according to the HTMT ratio test.

Table 7 The Results of Htmt Values

	X1	X2	X3	X4	Z	Y
X1						
X2	0,381					
X3	0,190	0,287				
X4	0,358	0,276	0,356			
Z	0,205	0,319	0,238	0,146		
Y	0,171	0,383	0,224	0,182	0,669	

➤ *Discriminant validity : Cross Loadings*

Table 8 describes the results of cross loadings evaluation in this study. Cross loadings evaluation analyzes if an indicator in a particular construct loads strongly onto its own construct instead of other constructs. It appears from the table that the factor loading of each indicator on its construct (shown in the grey cells) is stronger than those in other constructs, indicating that the discriminant validity is established based on cross loading analysis [39].

Table 8 The Results of Cross Loadings Evaluation

	X1	X2	X3	X4	Z	Y
X1.1	0,761	0,191	0,243	0,149	0,048	-0,006
X1.2	0,746	0,235	0,051	0,043	-0,001	-0,007
X1.3	0,931	0,270	0,060	0,224	0,143	0,078
X1.4	0,893	0,355	0,135	0,371	0,192	0,154
X1.5	0,844	0,296	0,135	0,130	0,121	0,105
X1.6	0,848	0,338	0,237	0,451	0,191	0,014
X1.7	0,887	0,317	0,108	0,294	0,270	0,223
X1.8	0,879	0,428	0,198	0,235	0,172	0,149
X2.1	0,398	0,878	0,315	0,169	0,267	0,290
X2.2	0,361	0,841	0,186	0,260	0,158	0,268
X2.3	0,213	0,838	0,160	0,211	0,241	0,287
X2.4	0,322	0,852	0,270	0,235	0,324	0,290
X2.5	0,324	0,838	0,192	0,152	0,254	0,312

X3.1	0,119	0,286	0,836	0,256	0,192	0,073
X3.2	0,058	0,147	0,745	0,266	0,139	-0,090
X3.3	0,174	0,220	0,927	0,182	0,215	0,254
X4.1	0,233	0,242	0,211	0,910	0,138	0,188
X4.2	0,304	0,190	0,173	0,884	0,189	0,134
X4.3	0,393	0,238	0,253	0,742	0,025	0,038
X4.4	0,301	0,151	0,288	0,786	0,028	0,105
Z1.1	0,239	0,373	0,332	0,031	0,826	0,458
Z1.2	0,269	0,244	0,053	0,156	0,847	0,547
Z1.3	0,100	0,234	0,342	0,245	0,859	0,578
Z1.4	0,181	0,239	0,248	0,123	0,886	0,464
Z1.5	0,144	0,232	0,159	0,131	0,848	0,563
Z1.6	0,186	0,201	-0,011	0,067	0,840	0,503
Y1.1	0,186	0,339	0,206	0,239	0,596	0,881
Y1.2	0,103	0,291	0,210	0,157	0,386	0,791
Y1.3	0,260	0,307	0,067	0,023	0,546	0,860
Y1.4	-0,044	0,220	0,145	0,131	0,516	0,856

➤ Reliability Analysis

The results of reliability test for all constructs (variables) in this study are displayed in Table 9. The Cronbach’s Alpha ranged from 0.831 to 0.951, whereas the Composite Reliability ranged from 0.876 to 0.954. It is shown that the Cronbach’s Alpha and the Composite Reliability values for all constructs are greater than 0.7, indicating that the construct used in this study are reliable [36].

Table 9 The Results of Reliability Test

Constructs	Cronbach’s Alpha	Composite Reliability
X1	0.951	0.954
X2	0.904	0.928
X3	0.831	0.876
X4	0.871	0.901
Z	0.924	0.940
Y	0.870	0.911

➤ Model’s Predictive Capability: R<sup>2</sup>, Q<sup>2</sup>, and GoF Index

Table 10 presents the results of the coefficient of determination (R<sup>2</sup>), the cross-validated redundancy (Q<sup>2</sup>), and the Goodness of Fit (GoF) values for dependent variable Y (customer loyalty) as well as for intervening variable Z (customer satisfaction). The R<sup>2</sup> value for dependent variable Y is 0.406, which means that 40.6% change in Y can be explained by X1, X2, X3, X4, and Z. Then, the R<sup>2</sup> value for intervening variable Z is 0.124, which means that 12.4% change in Z can be explained by X1, X2, X3, and X4.

Table 10 The R<sup>2</sup> and Q<sup>2</sup> Values of the Inner Models

	R <sup>2</sup>	Q <sup>2</sup>
Y (dependent variable)	0.406	0.242
Z (intervening variable)	0.124	0.067

The R<sup>2</sup> values for both dependent and intervening variables are greater than 0.1. Therefore, according to Falk & Miller [40], the variance explained of both inner models Y and Z are adequate. According to Cohen [35], the predictive power of Y belongs to substantial (≥ 0.26), while the predictive power of Z belongs to weak (≥ 0.02). Then, according to Chin [41], the predictive power of Y belongs to moderate (≥ 0.33), while the predictive power of Z belongs to very weak (< 0.19). At last, according to Hair et al. [36], the predictive power of Y belongs to weak (≥ 0.25), while the predictive power of Z belongs to very weak (< 0.25).

The Q<sup>2</sup> scores for both dependent and intervening variables are greater than 0. This demonstrate that both inner models Y and Z have predictive relevance of the endogenous

constructs [36]. Next, our calculation reveals that the GoF index for our model globally is 0.435. According to Wetzels et al. [34], this belongs to large GoF index. It means that the level of goodness of fit of the model globally is high. Therefore, the discrepancy between the observed values and expected values are low, and so our model globally is validated.

➤ Effect Size: f<sup>2</sup>

Table 11 presents the effect size statistics. It is shown from the table that referring to the Cohen’s guideline [35], removing Z (customer satisfaction) will have a large effect on Y (customer loyalty) since the f<sup>2</sup> ≥ 0.35, while removing X2 (service quality) will only have a low effect since the 0.02 ≤ f<sup>2</sup> < 0.15. On the other hand, removing X1, X3, and X4

can be considered as resulting in no effect on Y, because the  $f^2$  values for these variables towards Y are less than 0.02 [35]

Table 11 The Effect Size of the Inner Models

	Y (dependent variable)	Z (intervening variable)
X1	0.004	0.009
X2	0.043	0.042
X3	0,000	0.022
X4	0,004	0.001
Z	<b>0.464</b>	

Next, removing X2 is also shown to have low effect on Z since the  $0.02 \leq f^2 < 0.15$ . In addition, removing X1, X3, and X4 also does not have any effect on Z because the  $f^2$  values for these constructs are less than 0.02 [35].

➤ *Hypothesis Testing*

Table 12 reports the results of direct effect that specifically deals with hypotheses H1 to H5. Based on the results of path coefficients displayed in the table, we can see that service quality (X2), CRM (X3), and price (X4) give slightly direct positive effect on customer loyalty (Y); while product quality (X1) has slightly direct negative effect on customer loyalty (Y); but all of these effects are not significant. The significance test reveals that hypotheses H1, H2, H3, and H4 are rejected because the  $p$ -values for these hypotheses  $\geq 0.05$ . Only hypothesis H5 is accepted because the  $p$ -value for this hypothesis  $< 0.05$ . It shows that customer satisfaction (Z) significantly influences customer loyalty positively.

Table 12 The Results of Direct Effect

Hypothesis	path coeffi-cient	STDEV	T Statistics	p-value	Significance
H1: X1->Y	-0,055	0,151	0.950	0,715	Not significant
H2: X2->Y	0,181	0,176	0.443	0,302	Not significant
H3: X3->Y	0,003	0,239	0,012	0,991	Not significant
H4: X4->Y	0,054	0,163	0,330	0,742	Not significant
H5: Z->Y	0,561	0,150	3,748	0,000	<b>Significant</b>

Table 13 presents the results of indirect effect of independent variables through customer satisfaction as an intervening variable. It specifically deals with hypotheses H6 to H9. It appears from the results of path coefficients displayed in the table that all independent variables (product quality, service quality, CRM, and price) have a slightly positive effect on customer loyalty through customer satisfaction. However, the significance test indicates that none of these effects are significant because all the  $p$ -values are  $< 0.05$ . Therefore, hypotheses H6 to H9 are rejected.

Table 13 The Results of Indirect Effect

Hypothesis	path coeffi-cient	STDEV	T Statistics	p-value	Significance
H6: X1->Z->Y	0,057	0,117	0.490	0,625	Not significant
H7: X2->Z->Y	0,120	0,122	0.984	0,325	Not significant
H8: X3->Z->Y	0,082	0,105	0,778	0,437	Not significant
H9: X4->Z->Y	0,017	0,116	0,150	0,881	Not significant

Figure 4 illustrates the structural model from this study that is outputted by SmartPLS software. It depicts the relationship between variables, as well as the relationship between variables and indicators. The values on the edges connecting variables (or constructs) and indicators denote the factor loadings for each indicator. Then, the values on the edges connecting between two variables denotes the path coefficients, indicating the relationship or the effect (whether positive or negative) between those variables.

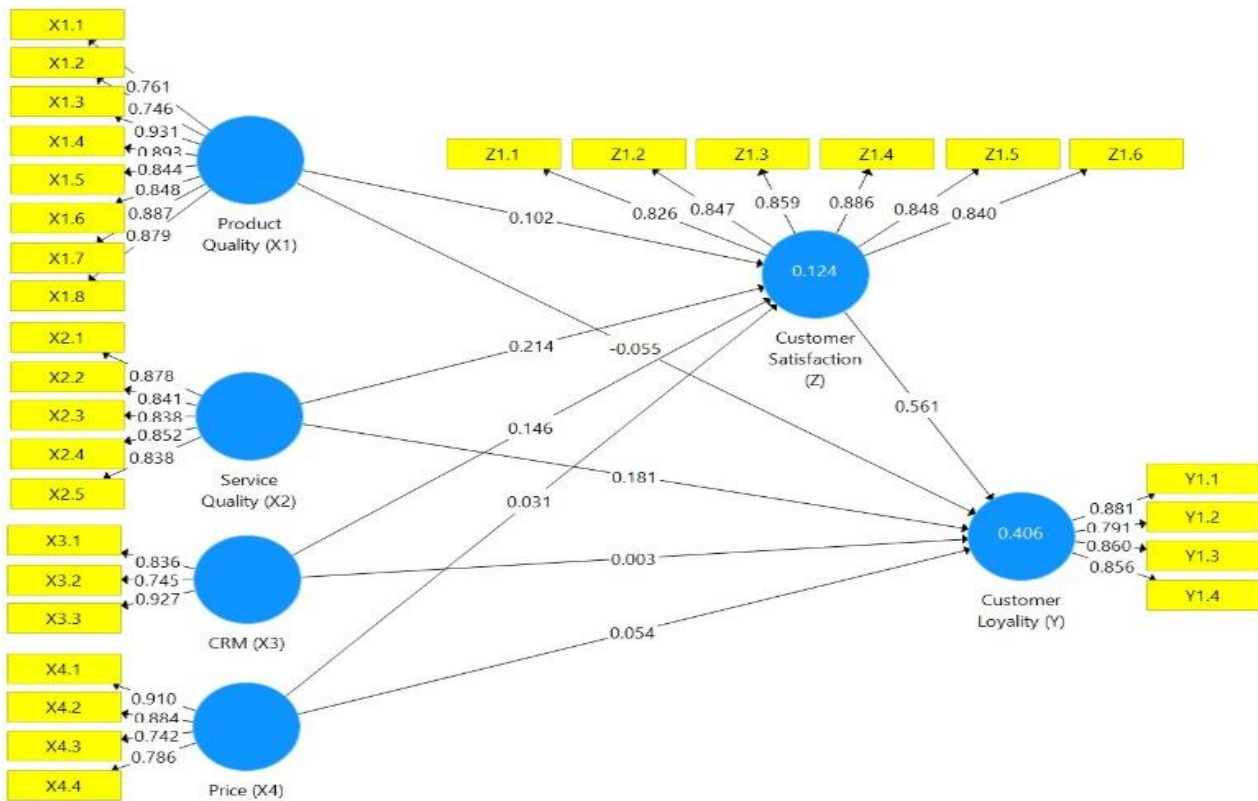


Fig 4 Structural Model

**IX. CONCLUSION AND SUGGESTIONS**

➤ *Conclusion*

In this study, we analyse the effect of product quality, service quality, CRM, and price on customer loyalty at Mitsubishi Power Indonesia (MPI) with and without using customer satisfaction as an intervening variable. Analysis was conducted using Structural Equation Model (SEM) with instrument testing using the Partial Least Square (PLS) method. In this study, there is only one hypothesis that was found to be significant: “Customer satisfaction has a positive and significant effect on customer loyalty”. On the other hand, all other hypotheses that deal with the effect of product quality, service quality, CRM, and price on customer loyalty with and without using customer satisfaction as an intervening variable are found to be not significant.

➤ *Suggestions*

Based on the results of this study, the main suggestion for MPI is to increase the customer satisfaction as it is shown from the results of our study that it positively and significantly influences customer loyalty. In addition, although significance is not found for the effect of product quality, service quality, CRM, and price on customer loyalty, the slightly positive effect found for the effect of service quality, CRM, and price on customer loyalty may worth taking into consideration by the MPI company. Here, MPI may need to do the followings to improve customer loyalty: (i) continue improving the service quality both from a technical and commercial perspective; (ii) conduct more comprehensive studies so that the prices offered to customers can be more competitive; and (iii) continue improving CRM with all customers so that customer loyalty can get better.

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