



The effect of outage duration and outage frequency on customer satisfaction of PT PLN (persero) ULP Simpang Empat

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ABSTRACT

This research is motivated that customer satisfaction is part of one of PLN's missions, namely running the electricity business and other related fields, oriented to customer satisfaction, company members and shareholders. Customer satisfaction in the PLN ULP Simpang Empat area is the outermost unit of PLN West Sumatra needs to be measured to be a reference to the extent of the effectiveness of the budget spent by PLN to achieve the target of outage duration (SAIDI) and outage frequency (SAIFI) This study aims to determine the effect of 1) Outage Duration on Customer Satisfaction, 2) Outage Frequency on Customer Satisfaction. This type of research uses a quantitative approach with multiple linear regression methods. Data collection techniques with questionnaires. The respondents of this study were 100 PLN customers in the PLN ULP Simpang Empat work area. The sampling method uses the Proportional Stratified Random Sampling method. Hypothesis testing is calculated with the SmartPLS 3.0 program. From the results of this study it was found that: 1) The duration of the outage has a positive and significant influence on customer satisfaction. 2) The frequency of outages has a positive and significant influence on customer satisfaction.

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INTRODUCTION

One of the organizations engaged in public services is PT Perusahaan Listrik Negara (PLN) which is a Company Company (Persero) as a State-Owned Enterprise (BUMN) and as a Chargé d'Affaires Holder (PKUK) in charge of providing electricity for the public interest. Electrical energy is one of the basic needs that are very important in human life. Electricity is an important instrument in today's life, almost all sectors require electrical power. As a single company assigned by the state to supply electrical energy to all corners of Indonesia, one of which is in the Simpang Empat ULP working area. Customer satisfaction is part of one of PLN's missions, namely "Running electricity business and other related fields, oriented to customer satisfaction, company members and shareholders". Customer satisfaction according to Swan et al (1980) defines customer satisfaction as

a conscious evaluation or cognitive assessment concerning whether the performance of the product is relatively good or bad or whether the product is suitable or not suitable for its intended use. According to (Kotler, 2000) in the Principle of Marketing that Consumer Satisfaction is the result felt by buyers who experience the performance of a company in accordance with their expectations. Customers feel satisfied if their expectations are met and feel very happy if their expectations are exceeded.

Quality must start from consumer needs and end at consumer perception (Kotler, 2000). This means that the image of good quality is not seen from the perception of the service provider, but based on the perception of consumers. Consumer perception of service quality is a comprehensive assessment of the excellence of a service. Consumer satisfaction is the level of a person's feelings after comparing the performance or results he feels compared to Kotler's expectations (Kotler, 2000). If performance is below interests, consumers will feel disappointed, and if performance is in accordance with interests, consumers will be satisfied and if performance exceeds interests, consumers are very satisfied. To improve service quality, it is necessary to pay attention to the dimensions of service quality, while the dimensions of service quality according to (Freddy, 2006) include responsiveness, reliability, empathy, assurance, and tangibles. Therefore, the measurement of satisfaction with the services provided by PT. PLN (Persero) to the community must always be done to know and plan better strategies in the future and further improve the quality of its services in order to meet the wants and needs of consumers and to minimize problems. In this case, what customers feel most in PLN services is the Duration of Outages and the Frequency of Blackouts. Therefore, PLN includes Outage Duration (SAIDI) and Outage Frequency (SAIFI) in employee performance targets. For studies examining the effect of outage duration and outage frequency on customer satisfaction, no similar research has been found in this regard. Based on the above background, the author is interested in conducting a research entitled "The Effect of Outage Duration and Outage Frequency on Customer Satisfaction of PT PLN (Persero) ULP Simpang Empat".

RESEARCH METHOD

Data Types and Sources

This type of research uses quantitative methods (*quantitative approach*). Quantitative research methods are one type of research whose specifications are systematic, planned and clearly structured from the beginning to the making of the research design. According to Sugiyono (2011) Quantitative method is a research method based on the philosophy of positivism, used to examine certain populations or samples, data collection using research instruments, quantitative / statistical data analysis, with the aim of testing hypotheses that have been set. This study tested and analyzed the effect of outage duration (SAIDI) and frequency of power outages (SAIFI) on customer satisfaction of PT PLN (Persero) ULP Simpang Empat. The sampling technique that the author used in this study is Non Probability Sampling with a Purposive Sampling approach. Non Probability Sampling according to Sugiyono (2015: 84) is: A technique that does not provide equal opportunities for every element or member of the population to be selected as a sample. Purposive Sampling according to Sugiyono (2015: 84) is: Sampling techniques with certain considerations. The reason for selecting samples using the Purposive Sampling Technique is because not all samples have criteria in accordance with what the author has determined, therefore the author chooses the Purposive Sampling Technique by setting certain considerations or criteria that must be met by the sample used in this study. The sample in this study amounted to 100 people using the *Margin of error* formula according to Arikunto (2014: 75).

$$n = \frac{Z^2}{4(moe)^2} = \frac{(1,96)^2}{4(0,1)^2} = \frac{3,8416}{0,04} = 96,54 = 100$$

Information:

n : number of samples

Z : The level of confidence required in sampling is 96% so that the value is 1.96
 Moe : margin of error, i.e. the maximum tolerable error rate, and deep this study used Moe 10%

Analysis Method

Data analysis is an activity after data from all 45 respondents or data sources are collected. Data analysis activities are grouping data based on variables from all respondents, presenting data from each variable studied, doing calculations to answer problem formulations and doing calculations to test hypotheses that have been proposed (Sugiyono, 2017). Partial Least Square (PLS) analysis aims to help researchers to obtain latent variables for prediction purposes (Ghozali, Imam, 2015).

Measurement Model (Outer Model)

Evaluation of the measurement model or outer model is carried out to assess the validity or reliability of the model. Outer models with reflexive indicators are evaluated through convergent and discriminant validity of latent construct-forming indicators and composite reliability and cronbach alpha for the indicator block (Ghozali, Imam, 2015). The tests carried out on the outer model are: (a). Convergent Validity = The convergent validity value can be seen from the correlation between score items or indicators and their constructs. Indicators are considered reliable if they have a correlation value above 0.7, however, at the scale development stage research, the loading factor value of 0.5 – 0.6 is still acceptable (Ghozali, Imam, 2015), (b). Discriminant Validity=This value is a cross loading factor value that is useful for knowing whether the construct has adequate discrimination, namely by comparing the loading value on the intended construct must be greater than the loading value with other constructs (Ghozali, 2015: 39). In addition to the cross loading method, the Fornell and lacker methods are also used where the model with a good discriminant if the AVE root of the variable is greater than the correlation between variables, (c). Average Extracted Variance (AVE): The expected AVE value > 0.5 (Ghozali, 2015: 76), (d). Composite Reliability=The compsite reliability value should be > 0.7 for confirmatory research and 0.6 – 0.7 is still acceptable for exploratory research (Ghozali, Imam, 2015), (f). Cronbachs Alpha =The expected value > 0.7 for all constructs, but for exploratory research > 0.6 is still acceptable (Ghozali, Imam, 2015)

Inner Model Analysis

Inner model analysis is also known as structural model analysis, which aims to predict relationships between latent variables (Ghozali, Imam, 2015). The evaluation of the inner model can be seen from several indicators which include: (a). Coefficient of Determination (R²) = Used to find out how much the influence of exogenous variables affects the dependent variable. The R² value of 0.75 is high, 0.50 is moderate, while 0.25 is weak (Ghozali, Imam, 2015), (b). Goodness of Fit (GoF) Assessment = Goodness of fit (GoF) was developed by Tenenhaus et al, to evaluate measurement models and structural models, while providing simple measurements for the entirety of the model's predictions. If the value obtained 0.1 is considered small, 0.25 is considered simple and 0.36 is considered large. For this reason the GoF index is calculated from the square root of the AVE and the square root of the R-square(Ghozali, Imam, 2015).

Hypothesis Testing

After conducting various evaluations, both outer model and inner model, the next step is to test the hypothesis. Hypothesis tests are used to explain the direction of the relationship between endogenous variables and exogenous variables. Hypothesis testing is done by looking at the probability value and its t- statistics. For probability values, the p-value with an alpha of 5% is < 0.05. The t-Table value for 5% alpha is 1.96. So the acceptance criterion of the Hypothesis is when t- statistics > t-Table. A hypothesis can be accepted or must be rejected statistically can be calculated by its level of significance. The level of significance used in this study was 5%. If the significance

level chosen is 5%, then the significance level or confidence level is 0.05 to reject a hypothesis. In this study there was a 5% chance of taking the wrong decision and a 95% chance of taking the right decision. Based on previous results and rationalization of the relationship between variables in this study, the hypotheses proposed in the study are as follows:

Direct positive effect of outage duration/SAIDI (X1) on customer satisfaction (Y).

Specifying H_0 and H_a : H_0 : Directly, there is no positive and significant effect of outage duration (SAIDI) on customer satisfaction, H_a : Directly, there is a positive and significant effect of the duration of the blackout (SAIDI) on Customer satisfaction

Direct positive effect of outage frequency/SAIFI (X2) on customer satisfaction (Y) Determining H_0 and H_a :

H_0 : Directly, there is no positive and significant effect of outage frequency (SAIFI) on customer satisfaction, H_a : Directly, there is a positive and significant influence of the frequency of outages (SAIFI) on customer satisfaction.

RESULTS AND DISCUSSIONS

Measurement Model Evaluation

The measurement model in this study consists of a reflective measurement model. In Ghazali et al (2015), the evaluation of the reflective measurement model consists of loading factor ≥ 0.70 composite reliability ≥ 0.70 , Cronbach's alpha, and average variance extracted ($AVE \geq 0.50$) as well as evaluation of discriminant validity, namely the highest value of fornell and lacker.

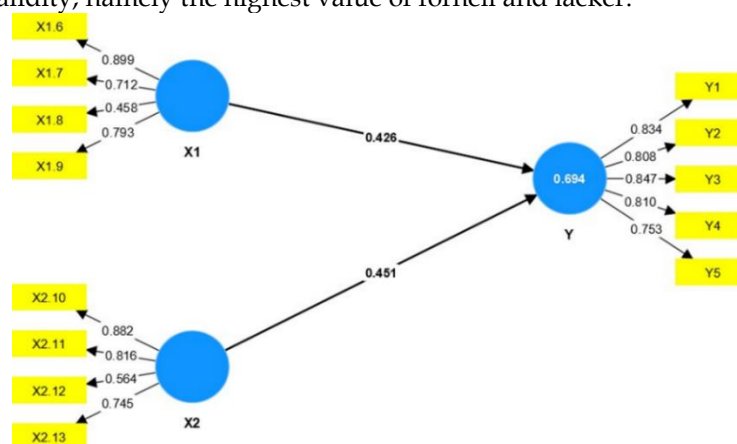


Figure 1. Initial outer loading diagram of research

Source : Data processed using Smart PLS, 2023

Table 1. Initial outer loading

Variable	Items	Loading Factor	Information
Customer satisfaction	Y1	0.834	Valid
	Y2	0.808	Valid
	Y3	0.847	Valid
	Y4	0.810	Valid
	Y5	0.753	Valid
Outage Duration	X1.6	0.899	Valid
	X1.7	0.712	Valid
	X1.8	0.458	Invalid
	X1.9	0.793	Valid
Outage Frequency	X2.10	0.882	Valid
	X2.11	0.816	Valid

X2.12	0.564	Invalid
X2.13	0.745	Valid

Source : Data processed using Smart PLS, 2023

From table 1 there are 11 valid items and 2 invalid items. The valid items are Y1, Y2, Y3, Y4, Y5, X1.6, X1.7, X1.9, X2.10, X2.11, and X2.13. Its invalid because the outer loading is less than 0.60 (Chin 1998). The invalid items are (PLN provides an opportunity to provide suggestions, opinions and complaints about the duration of the outage) and X12 (PLN provides an opportunity to provide suggestions, opinions and complaints about the frequency of outages). Invalid items (X1.8 and X2.12) are omitted from the model. Furthermore, Likert scale improvements and reestimates were carried out in Smart PLS.

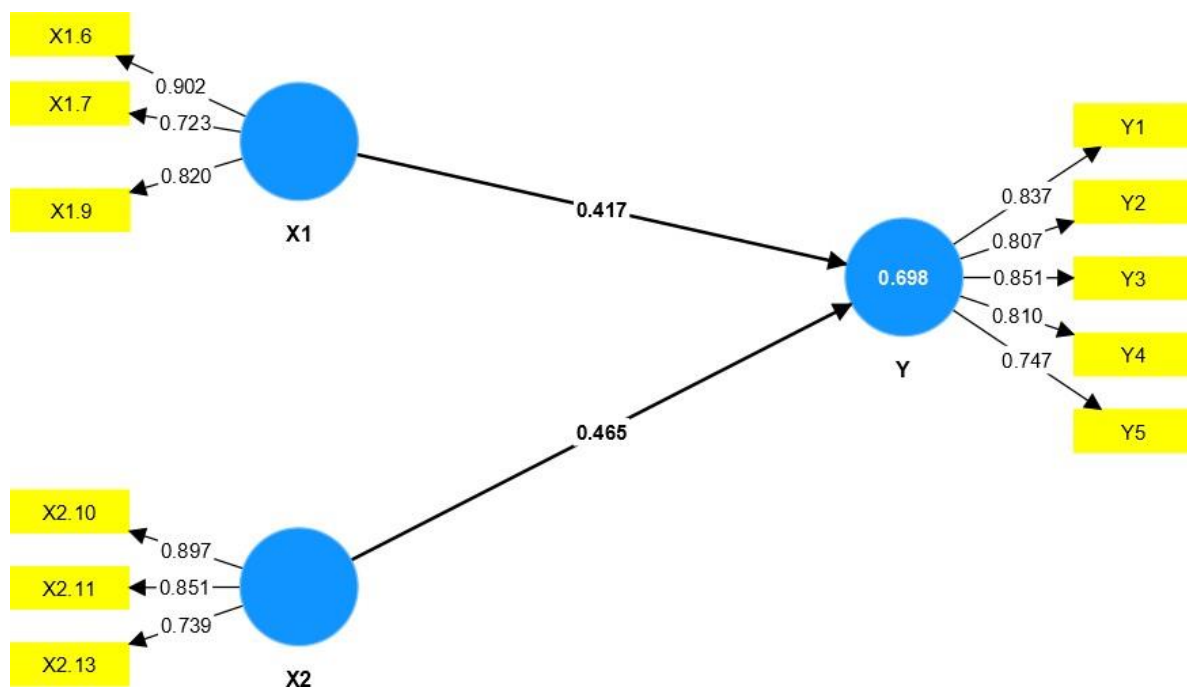


Figure 2. Research outer loading diagram after repair

Source : Data processed using Smart PLS, 2023

Table 2. Outer loading after repair

Variable	Items	Loading Factor	Information
Customer satisfaction	Y1	0.834	Valid
	Y2	0.808	Valid
	Y3	0.847	Valid
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	Y5	0.753	Valid
Outage Duration	X1.6	0.899	Valid
	X1.7	0.712	Valid
	X1.9	0.793	Valid
Outage Frequency	X2.10	0.882	Valid
	X2.11	0.816	Valid
	X2.13	0.745	Valid

Source : Data processed using Smart PLS, 2023

The customer satisfaction variable is measured by 5 (five) valid items where the outer loading value lies between 0.747-0.851 which shows that the five measurement items are strongly

correlated in explaining customer satisfaction. The level of reliability of customer satisfaction variables can be accepted with a *composite reliability* value of 0.858 above 0.70 and *convergent validity* shown by AVE 0.670 > 0.50. Among the five valid measurement items, customer satisfaction was more strongly reflected by Y4 (LF=0.851) and Y1 (LF=0.837). The Outage Duration variable is measured by 3 (three) valid items where the outer loading value lies between 0.902–0.723 which shows that the three measurement items are strongly correlated in explaining the duration of the outage. The variable reliability level of outage duration is acceptable with a *composite reliability* value of 0.870 above 0.70 and *convergent validity* shown by AVE 0.691 > 0.50. Among the three valid measurement items, outage duration was more strongly reflected by X6 (LF=0.902) and X9 (LF=0.820). The variable frequency of the outage is measured by 3 (three) valid items where the outer loading value lies between 0.897–0.739 which shows that the three measurement items are strongly correlated in explaining the frequency of the outage. The variable reliability level of the outage frequency can be accepted with a *composite reliability* value of 0.906 above 0.70 and *convergent validity* shown by AVE 0.658 > 0.50. Among the three valid measurement items, the blackout frequency was more strongly reflected by X2.10 (LF=0.897) and X2.11 (LF=0.851).

Structural Model Evaluation

Structural model evaluation is concerned with testing the hypothesis of influence between research variables. The structural model evaluation examination is carried out in three stages, namely first checking the absence of multicollination between variables with the *size of the Inner VIF* (*Variance Inflated Factor*). The value of Inner VIF below 5 shows that there is no multicollination between variables, Ghazali et al (2015). The second is testing the hypothesis between variables by looking at the statistical t value or p-value. If the statistical t of the calculation result is greater than 1.96 (t table) or the p-value of the test result is smaller than 0.05 then there is a significant influence between the variables. . Next is the value of f square, which is the influence of variables at the structural level with criteria (*f square* 0.02 low, 0.15 moderate and 0.35 high). Ghazali et al (2015).

Table 4.Data inner VIF

	Y
X1	2.693
X2	2.693

Source : Data processed using Smart PLS,2023

Before testing the structural model hypothesis, it is necessary to see whether there is a multicollination between variables, namely with the statistical measure of inner VIF. The estimation results show an inner VIF value of < 5, so the multicollinary level between variables is low. This result corroborates the results of parameter estimation in SEM PLS is robust (unbiased).

Model Goodness and Fit Evaluation

PLS is a variance-based SEM analysis with the aim of testing model theory that focuses on prediction studies. Therefore, several measures were developed to declare the proposed model acceptable such as *R square*, SRMR, and *Goodness of Fit Index (GoF Index)*, Sarstedt and Henseler (2013).

Table 5. Data R square

	R- square	R- square adjusted
Y	0.698	0.692

Source : Data processed using Smart PLS,2023

The statistical size of the R square describes the magnitude of variation in endogenous variables that can be explained by other exogenous variables in the model. According to Chin (1998) the qualitative value of R square interpretation is 0.19 (low influence), 0.33 (moderate influence), and 0.66 (high influence). Based on the results of the processing above, it can be said that the magnitude

of the joint influence of the duration of the outage and the frequency of the outage on customer satisfaction is 69.8% (high influence).

Table 6. SRMR Data

Model Estimation	
SRMR	0,089

Source : Data processed using Smart PLS, 2023

SRMR is Standardized Root Mean Square Residual. In Yamin (2022), this value is a measure of model fit, namely the difference between the data correlation matrix and the model estimate correlation matrix. In Ghazali et al (2015), SRMR values below 0.08 indicate a fit model. However, in Karin Schmelleh et al (2003), SRMR values between 0.08 – 0.10 indicate an acceptable fit model. The estimated result of the model is 0.089 which means that the model has an acfast-fit fit. Empirical data can explain the influence between variables in the model.

Tabel 7. Indeks GoF Data

Rerata Commuality	Rerata R square	GoF Index
0,670	0,698	0,684

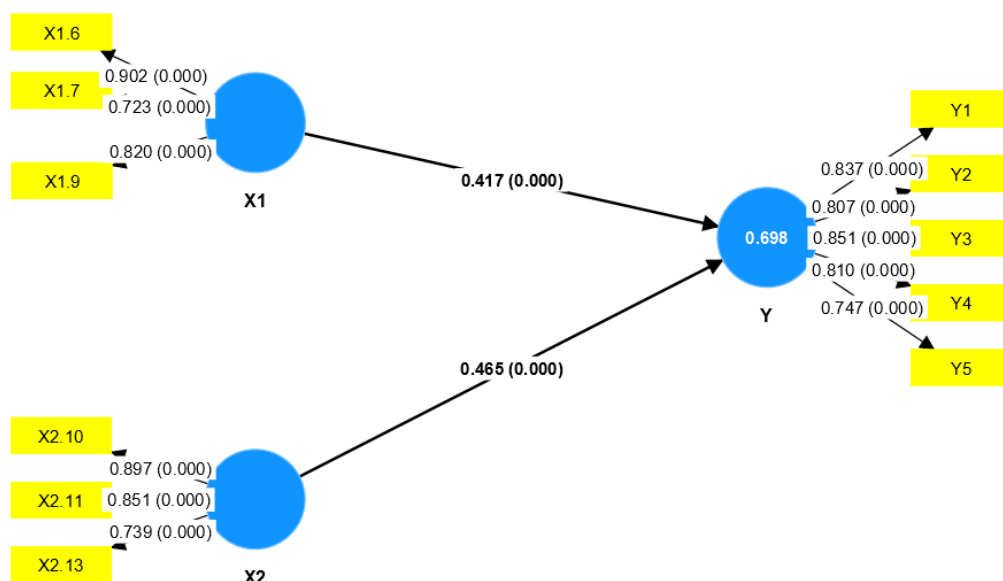
Source : Data processed using Smart PLS, 2023

Goodness of Fit Index (GoF Index) is an evaluation of the entire model which is an evaluation of measurement models and structural models. GoF this index can only be calculated from reflective measurement models, that is, the root of geometric multiplication of the mean communality by the mean R square. According to Wetzels et al (2009) in Yamin (2022), the interpretation of GoF index values is 0.1 (low GoF), 0.25 (medium GoF) and 0.36 (high GoF). The calculation results show that the model's GoF value is 0.684 including the high GoF category. Empirical data are able to explain measurement models and measurement models with a high match rate.

Table 8. Hypothesis testing

Hypothesis	Path Coefficient	p-value	f square
H ₁ . Outage Duration --> Customer Satisfaction	0,417	0.000	0,214
H ₂ . Outage Frequency --> Customer satisfaction	0.465	0.000	0,266

Source : Data processed using Smart PLS, 2023



Source : Data processed using Smart PLS, 2023

Based on the results of the above hypothesis testing, it is known as follows: (a). The first hypothesis (H_1) is **accepted** that there is a significant effect of Outage Duration on increasing Customer Satisfaction with path coefficient (0.417) and p -value ($0.000 < 0.05$). Any change to the Outage Duration will increase Customer Satisfaction. However, the existence of Outage Duration in improving Customer Satisfaction has a moderate influence at the structural level (f square = 0.214). The need for programs related to reducing the Duration of Outages, especially for respondents who feel a long Duration of Blackouts (the end area of PLN Simpang Empat operations) is considered very important where when the PLN Simpang Empat policy in decreasing the Outage Duration will increase Customer Satisfaction. (b). The second hypothesis (H_2) is **accepted** that there is a significant effect of Outage Frequency on increasing Customer Satisfaction with path coefficient (0.465) and p -value ($0.000 < 0.05$). Any change in Outage Frequency will increase Customer Satisfaction. However, the presence of Outage Frequency in increasing Customer Satisfaction has a moderate influence at the structural level (f square = 0.266). The need for programs related to reducing the Blackout Frequency, especially for respondents who feel the long Outage Frequency (the end area of PLN Simpang Empat operations) is considered very important where when there is a PLN Simpang Empat policy in a decrease in Outage Frequency will increase Customer Satisfaction.

CONCLUSION

Based on the results of data analysis and discussion, the author obtained conclusions that can be drawn from research on the Effect of Outage Duration (SAIDI) and Frequency of Electricity Outages (SAIFI) on Customer Satisfaction of PT PLN (Persero) ULP Simpang Empat as follows: 1). The duration of the outage has a direct influence on customer satisfaction by having significant significance on customer satisfaction and has an influence of 0.417 with a moderate level of influence in the level structural (F square = 0.214). 2). The frequency of outages has a direct effect on customer satisfaction by having significant significance on customer satisfaction and has an influence of 0.465 with a moderate level of influence at the structural level (f square = 0.266). Based on the results of research findings and conclusions obtained in this study, the suggestions that the author can give to increase customer satisfaction are as follows: 1). increased the values of outage duration (SAIDI) and outage frequency (SAIFI). 2) improve the reliability of PLN's electricity network, especially in the end of operation area 2 (Silaping, Sitabu, Maligi, Sikabau, Andilan and Mandiangan) to increase customer satisfaction.

References

- Afandi, P. (2018). *Manajemen Sumber Daya Manusia, Teori, Konsep dan Indikator*. Zanafra Publishing.
- Busro, M. (2018). *Teori-Teori Manajemen Sumber Daya Manusia*. Prenadamedia Group.
- Fandi, T. (2014). *Service, Quality & Satisfaction*. Andi.
- Freddy, R. (2006). *Teknik Mengukur dan Strategi Meningkatkan Kepuasan Pelanggan*. PT Gramedia Pustaka Utama.
- Ghozali, Imam, H. L. (2015). *Konsep, Teknik, Aplikasi Menggunakan Smart PLS 3.0 Untuk Penelitian Empiris*. BP UNDIP
- Hamali, A. Y. (2018). *Pemahaman Manajemen Sumber Daya Manusia*. Bandung. CAPS.
- Hasibuan, M. (2018). *Manajemen Sumber Daya Manusia*. Bumi Aksara.
- Jogiyanto. (2015). *Metodologi Penelitian dengan Pendekatan Deskriptif*. BPFE.
- Kotler, P. (2000). *Prinsip – Prinsip Pemasaran Manajemen*. Prenhalindo.
- Luthan, F. (2018). *Perilaku Organisasi (Organizational Behavior) Edisi ke-10*. Andi.
- Mangkunegara, A. A. A. P. (2003). *Manajemen Sumber Daya Manusia Perusahaan*. Remaja Rosdakarya.
- Mangkunegara, A. A. A. P. (2016). *Manajemen personalia dan Sumber Daya Manusia*. BPFE.
- Moehariono. (2012). *Pengukuran Kinerja Berbasis Kompetensi*. Raja Grafindo Persada.
- Nardo, R. (2022). *Human Capital Management*. Media Sains Indonesia.
- Riduwan. (2012). *Metode & Teknik Menyusun Proposal Penulisan*. Alfabeta.
- Rivai, V. (2014). *Kepemimpinan dan Perilaku*. Prenhalindo.
- Sedarmayanti. (2013). *Pengembangan Sumber Daya Manusia*. Remaja Rosda Karya.

- Sekaran, U. (2016). *Research Methodes for Business*. Remaja Rosda Karya.
- Stephen P. Robbins. (2014). *Organizational Behavior*. Salemba Empat.
- Sugiyono. (2017). *Metodologi Penelitian Kuantitatif, Kualitatif, dan R&D*. CV.Afabeta.
- Wang, P., & Rode, J. C. (2010). Transformational leadership and follower creativity: The moderating effects of identification with leader and organizational climate. *Human Relations*, 63(8), 1105–1128. <https://doi.org/10.1177/0018726709354132>
- Wibowo. (2018). *Manajemen Kinerja*. Raja Grafindo Persada.
- Winardi, J. (2004). *Pemimpin dan Kepemimpinan dalam Management*. Prenada Media.
- Xerri, M. (2013). Workplace relationships and the innovative behaviour of nursing employees: A social exchange perspective. *Asia Pacific Journal of Human Resources*, 51(1), 103–123. <https://doi.org/10.1111/j.1744-7941.2012.00031.x>
- Xerri, M. J. (2012). *Workplace Relationships and The Innovative Behaviour of Nursing Employees*. Asia Pacific Journal of Human Resourcesvol.
- Yidong, T., & Xinxin, L. (2013). How Ethical Leadership Influence Employees' Innovative Work Behavior: A Perspective of Intrinsic Motivation. *Journal of Business Ethics*, 116(2), 441–455. <https://doi.org/10.1007/s10551-012-1455-7>
- Yuan, F., & Woodman, R. W. (2010). Innovative behavior in the workplace: The role of performance and image outcome expectations. *Academy of Management Journal*, 53(2), 323–342. <https://doi.org/10.5465/amj.2010.49388995>