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The Impact of Customer Complaint Resolution Time on The Number of Network Complaints at Pt XYZ: An Experimental Study on The Implementation of Complaint Handling Technology (SOC Platform)

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ABSTRACT

This study examines the influence of the Service Operation Center (SOC) Platform on customer complaint resolution time and network-related complaint volume at PT XYZ. Using a quasi-experimental study design and Difference-in-Differences (DID) analysis, data were collected from PT XYZ customer complaint system for one year. The study compares regions using the SOC Platform (treatment) with regions not using it (control) to measure the effect of quicker complaint resolution on complaint volume. The result mirrors that the application of the SOC Platform significantly improved complaint resolution times and reduced complaint volume. These findings show that the adoption of digital solutions, such as the SOC Platform, can enhance service quality, reduce operational inefficiencies, in order to raise customer satisfaction for the telecommunication sector.

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1. INTRODUCTION

Indonesia's telecommunication industry, with PT XYZ being one of its top players, is greatly challenged to ensure the quality of network services while there are increasingly high expectations from its customers. With over 150 million customers, PT XYZ aims to offer fast and responsive services in addressing customers' grievances. Even with such enhancements in its network quality, its company experienced a decline in its Net Promoter Score (NPS), or customer loyalty. It was conducted during the years 2022-2024, despite PT. XYZ launching many initiatives for the improvement of service quality (NielsenIQ, 2024). The most important factor driving NPS is the relatively long time to resolve customer complaints, impacting customer satisfaction and loyalty.

Inadequate good quality service, particularly customer complaint resolution, has often been the main cause of dissatisfaction, leading to customer churn. Complaints in the telecommunication industry are typically regarding issues related to the network such as weak signals, slow internet, and other network-related problems. Complaints, if not efficiently managed, can cause ill effects to the company's reputation and decreased customer loyalty [1]. As telecommunication customers have many service providers to choose from, companies must maintain minimal complaint handling times at all times to maintain customer satisfaction and loyalty. Another study by [2], [3] also proves that customer satisfaction rates in the telecommunication industry are very much related to customer loyalty and lowering churn rates.

To address these concerns, PT. XYZ has introduced a Service Operation Center (SOC) Platform as a solution to accelerate the handling of customer complaints. This technology enables the automatic identification and analysis of the root causes of network disturbances, thereby expediting and improving the efficiency of complaint handling. According to past studies, the use of technologies like the SOC Platform can reduce complaint handling time by over 50% [4]. The implementation of the SOC Platform within PT. XYZ will consolidate previously disparate systems in a way that complaint handling can be carried out more effectively and accurately.

Through customer service digitalization, the application of SOC Platform will improve service quality through reducing complaint handling time. As suggested by [5], applying an integrated information system reduces the number of incidents per month and shortens the time to handle incidents, thereby improving customer satisfaction. Speeding up complaint handling time is therefore critical in enhancing customer experience and creating more loyalty.

As increased digitalization, the aim of this study is to measure the impact of complaint handling time reduction on complaint volume received by PT. XYZ after the roll-out of the SOC Platform. This research is expected that the findings will be utilized by PT. XYZ to improve customers' experience and serve as a reference for other telecommunication players who want to automate their complaint handling with technology. The main problem in this research is whether the speeding up of complaint handling time through the implementation of the SOC Platform will reduce the level of customer complaints for network quality. Prior to the implementation of SOC, complaint handling in PT. XYZ was still utilizing various individual systems that caused the resolving process to become slower and and lacked precision. With SOC, the process is hoped to be sped up and streamlined.

This study strives to measure the impact of a decrease in complaint handling time on the number of network complaints received by PT. XYZ and assess the performance of SOC Platform implementation on improving customer service quality. This study is significant at an academic and practical level. From an academic perspective, this study contributes to literature on customer service digitalization and complaint handling in the telecommunications industry. In reality, the findings of this research can be applied by PT. XYZ in evaluating and optimizing the implementation of the SOC Platform to improve customer satisfaction and loyalty. Apart from that, the result of this research is also beneficial for other telecommunication companies interested in applying similar technology in order to improve their process in dealing with customer complaints.

2. LITERATURE REVIEW

2.1 *ServQual Model*

The ServQual model developed by [6] is used to measure the gap between customer expectations and their perceptions of the services received, and is an important reference in understanding customer satisfaction, especially in services such as telecommunications. This model includes five main dimensions: reliability, which reflects the consistency and accuracy of services such as network stability and the timeliness of resolving disruptions; responsiveness, which indicates the speed in responding to customer needs, including the use of technology such as a Service Operation Center (SOC) for quick and automated responses; assurance, which relates to a sense of security, staff competence, and system reliability; empathy as the ability to understand customers' personal needs; and tangibles, which include physical aspects of service such as infrastructure, technological devices, and the professional appearance of service channels. These five dimensions are important foundations for assessing service effectiveness and identifying potential triggers for complaints from the customer's perspective [6].

2.2 *Service Management (Service Management)*

According to Grönroos (1990), service management is a strategic approach to managing interactions between customers and service providers in order to create sustainable value. Services have unique characteristics such as intangibility, inseparability, perishability, lack of ownership, and variability [6], which distinguish them from physical products. The service system itself is divided into two main components, namely the front office, which includes direct interactions with customers, and the back office, which supports behind-the-scenes operations. [7] emphasize that services should be viewed as integrated systems, where success depends on the synergy between people, technology, and procedures. An effective service system also requires a feedback loop to capture complaints and support continuous improvement. In the context of digitalization, service efficiency and effectiveness are direct results of the implementation of a fully automated and integrated system.

2.3 *Customer Complaints*

Customer complaints are expressions of dissatisfaction with services that do not meet expectations [8], and in the context of the telecommunications sector, these complaints are generally related to network quality [9]. [1] Exit, Voice, and Loyalty theory explains that dissatisfied customers may respond by voicing their complaints (voice), stopping using the service (exit), or remaining loyal depending on how the company handles the complaints. Complaints can be channeled through various means, such as directly to the company, through third parties such as regulators, or openly through social media. A study conducted by [10] shows that technical incidents such as signal loss and slow connections have a positive correlation with an increase in complaints, emphasizing the importance of quick and responsive technical handling in maintaining customer satisfaction.

2.4 *Service Quality as a Trigger for Complaints*

Poor service quality is the main cause of customer complaints, with [11] stating that complaints arise when expectations are not met by actual experiences. In the telecommunications industry, technical disruptions, slow problem resolution, and poor communication are the main factors contributing to customer dissatisfaction [12]. [13] distinguishes between technical quality, which refers to the final outcome of the service, and functional quality, which refers to how the service is delivered—both must align to avoid triggering complaints. Hui et al. (2004) also emphasize that uncertainty in estimated completion times can increase the potential for complaints. Furthermore, [14] and [15] highlight the importance of service innovation and organizational adaptation to market dynamics, as the inability to adapt can widen the service gap. Additionally, poor service interactions, such as lack of staff empathy or low technical competence [16], further worsen customers' perceptions of the quality of service received.

2.5 *Customer Complaint Handling*

Complaint handling is an important part of service recovery strategies to restore customer satisfaction [17], where the success of this process is greatly influenced by two-way communication, empathy, and a sense of fairness. [9] identified three dimensions of fairness in complaint handling: procedural fairness (fair and transparent procedures), interactional fairness (polite and respectful treatment of customers), and distributive fairness (a resolution outcome perceived as fair). [18] added that speed, clarity, and empathy are key elements in this process, while [16] showed that customers often value a good resolution process more than the final outcome, known as the service recovery paradox, a condition in which customers become more loyal after experiencing and receiving a satisfactory complaint resolution. With technological advancements, Kuo (2011) and [19] emphasize the importance of implementing digital systems and automation in complaint handling, enabling accurate ticket tracking, real-time notifications, and automatic escalation—all of which contribute to improved speed, transparency, and effectiveness of service.

2.6 *Digital Transformation*

Digital transformation is the process of integrating digital technology into all aspects of an organization's operations and business strategies to create added value, efficiency, and a better customer experience (Westerman et al., 2011). In the context of customer service, digital transformation includes the implementation of automation systems, big data, artificial intelligence, and integrated digital platforms that can optimize service processes, including complaint handling. Research by Sebastian et al. (2017) emphasizes that digital transformation is not merely the adoption of technology, but a paradigm shift in how organizations respond to customer needs. In the telecommunications industry, the success of digital transformation depends heavily on the ability of systems to provide real-time services, accelerate decision-making, and improve responsiveness to disruptions or customer complaints.

2.7 *Conceptual Framework*

The conceptual framework illustrates the relationships between variables in a study to facilitate understanding of the phenomenon being studied [20]. In the context of customer complaint management, the ServQual model serves as the primary framework, with the dimensions of Responsiveness and Empathy playing a role in enhancing customer satisfaction and loyalty through quick responses and attention to complaints [6], [21]. Effective complaint handling also contributes to operational efficiency and prevents customer loss due to dissatisfaction (Stone, 2013; Homburg et al., 2005). Furthermore, in the concept of service management, an integrated service system is required that can design and improve processes continuously [22]. One solution supporting this is the SOC Platform, a digital system enabling automatic detection, analysis, and resolution of complaints, thereby enhancing service effectiveness and the quality of managerial decisions proactively (Chong et al., 2024).

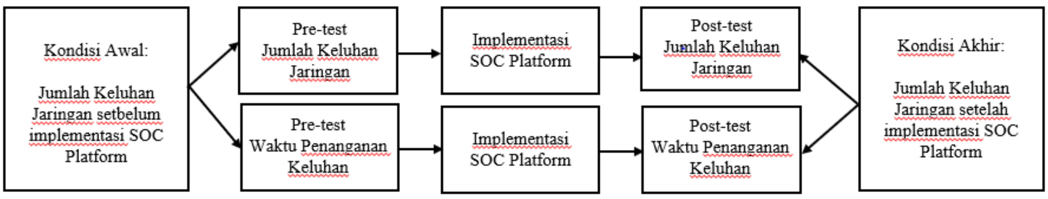

Figure 2.2 Conceptual Framework
Compiled by the researcher, 2025

The following are the hypotheses in this study:

a. Hypothesis 1

Before the implementation of the SOC Platform, Telkomsel's complaint handling system was fragmented, where agents had to access various standalone systems to resolve a single complaint, resulting in a long and inefficient handling time, averaging 45 minutes per complaint (Telkomsel Data, 2024). According to Service Management theory (Grönroos, 1990) and the ServQual model (Parasuraman et al., 1988), lengthy handling times have a negative impact on customer perception, as the "responsiveness" dimension is a key indicator in assessing service quality. In this context, long handling times can trigger an accumulation of complaints, either because issues remain unresolved or due to customer frustration with the slow process, as emphasized by Johnston and Mehra (2002) that manual and unresponsive systems increase complaint recurrence. Therefore, even though SOC technology has not yet been implemented, variations in handling speed across regions or staff members still have the potential to influence the number of complaints, making it important to test whether such a relationship already exists even before technological interventions are implemented.

H_0: There is no significant effect of complaint handling time on the number of complaints before the implementation of the SOC Platform.

H_1: There is a significant effect of complaint handling time on the number of complaints before the implementation of the SOC Platform.

b. **Hypothesis 2**

After the SOC Platform was implemented, there was a fundamental change in the work system, whereby SOC integrated monitoring, alarm, and incident handling systems into a single digital platform equipped with automation, root cause analysis, and real-time service quality visualization features. This resulted in a drastic reduction in handling time, while also making the process more accurate and consistent. Within the framework of the Service Recovery Theory and Technology Acceptance Model (TAM), the use of technology that accelerates response times has been proven to improve problem-solving efficiency and reduce customer complaints (Chui & Francisco, 2017; Chong et al., 2024). Previous research also shows that integrated digital systems can reduce complaints by up to 50% (Smith & Brown, 2021) and reduce the risk of churn due to unresolved complaints (Michel, 2001). With the presence of SOC, reducing handling time is no longer just an operational target, but a key factor in changing customer complaint dynamics. Therefore, Hypothesis H2 is proposed to test whether, in the context of digital transformation, faster handling time significantly impacts the reduction in the number of network complaints.

H_0: There is no significant effect of complaint handling time on the number of complaints after the implementation of the SOC Platform.

H_1: There is a significant effect of complaint handling time on the number of complaints after the implementation of the SOC Platform.

3. RESEARCH METHODS

3.1 Research Design

This study uses a quantitative approach with a causal explanatory method. This design was chosen to test the effect of handling time on the number of network complaints using the Difference-in-Differences (DID) approach. DID is used to compare changes that occurred before and after the implementation of the SOC Platform, as well as to isolate the effect of the intervention on the dependent variable.

The focus of this study is to measure the difference in the average number of complaints and complaint handling time in two conditions, namely before and after the implementation of SOC, such as [23] and [24]. Parallel if no treatment is given (Bertrand et al., 2004). To make the estimates more accurate and avoid bias, the DID model is equipped with fixed effects for area and time (Imbens & Wooldridge, 2009).

3.2 *Sample and Data Collection*

The unit of analysis in this study is the area or cluster that reports network complaints. The sample used is purposive and limited to XYZ operational data relevant to the observation period. Data were collected from XYZ internal reports, covering 60 data points for the period before SOC and 60 data points for the period after SOC, resulting in a total of 120 observations. Data collection was carried out through digital archive documentation provided by XYZ Service Operation Center (SOC).

3.3 *Measures*

This study uses four main variables that are operationalized based on secondary data from PT XYZ internal system. The first variable is **Complaint Handling Time**, which is conceptually defined as the average duration of customer complaint resolution by the technical team. Operationally, this variable is measured based on the average response time (in minutes) per region per month, using a ratio measurement scale. Data was obtained from XYZ customer complaint reporting system for the year 2024. The second variable is the **Number of Network Complaints**, which refers to the total number of customer complaints recorded in the network service-related system. Operationally, this variable is calculated based on the total number of complaints recorded per region each month, also on a ratio scale, sourced from the same system.

For the purposes of *Difference-in-Differences (DID)* analysis, this study also involves two dummy variables. First, the **Period** variable, which is a time indicator showing the status before or after the implementation of the SOC Platform. This variable is operationalized as a dummy variable with a value of 0 for the period before implementation and 1 for afterward, on a nominal scale, based on the SOC implementation schedule from 2022 data. Second, the **Region Group** variable, which indicates the classification of regions based on the implementation of SOC interventions. Regions that received the intervention are coded as 1 (experimental group), while regions that did not receive the intervention are coded as 0 (control group). This variable is also nominal and refers to the SOC rollout planning document from XYZ in 2022.

3.4 *Data Analysis*

Data analysis was conducted using the Difference-in-Differences (DID) approach, a quantitative technique that allows researchers to measure the causal impact of an intervention (SOC Platform) on a specific variable (number of network complaints). DID compares the average change between groups before and after the intervention. In its implementation, data was processed using SPSS and Excel software to present descriptive statistics and test the significance of differences using the paired t-test and simple regression. This analysis aims to identify whether the reduction in handling time after SOC implementation has a significant impact on the reduction in the number of network complaints.

4. RESULTS AND DISCUSSION

4.1 *Data Presentation*

During the period from June 2023 to July 2024, there were 309,780 customer complaints related to the PT. XYZ network, with three main regions contributing to the complaints: Jabotabek Outer, Sumbagut, and Sumbagteng. To improve the accuracy of identifying issues and expedite their resolution, PT. XYZ has implemented a SOC platform that automates the process of determining the root cause of issues and distributing complaint tickets to the relevant personnel, in accordance with the Incident Handling Process workflow.

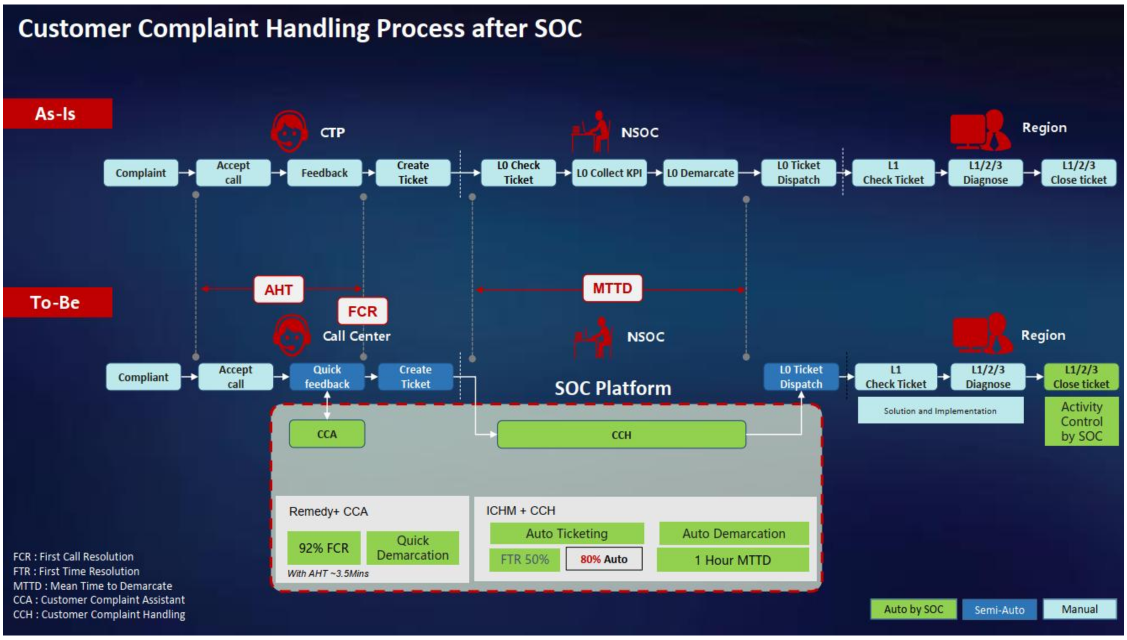

Figure 1. Comparison of Incident Handling Processes Before and After the SOC Platform
Source: Company's data (PT. XYZ), 2025

Given the complexity of developing and integrating the SOC platform with PT. XYZ existing systems, the implementation strategy for the SOC platform is divided into three phases, namely:

Table 2. Implementation Phases of the SOC Platform

Category	Period	Regional Implementation
Phase-1	Jan 1, 2023 – Aug 31, 2023	Central Java, Jabo Inner, Jabo Outer, West Java
Phase-2	Jun 1, 2023 – Dec 31, 2023	Sumbagut, Sumbagsel, Sumbagteng, East Java
Phase-3	Jan 1, 2024 – Jul 31, 2024	Kalimantan, Puma, Sulawesi, Balinusra

Source: Author's data, 2025

The division of implementation into these three phases is based on the need to transfer network data across all regions to the SOC Platform. With this implementation process, it is possible to use the SOC Platform in the automation process more stable than with direct national implementation.

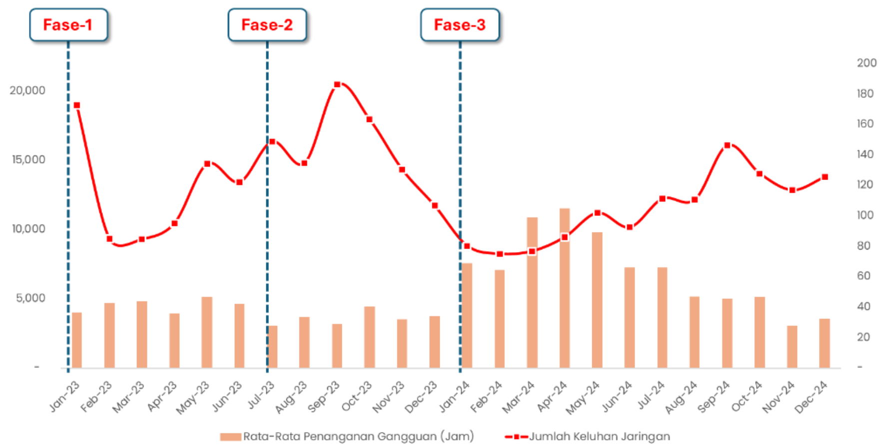

Figure 2. Graph of Customer Complaints, Complaint Handling Time, and Implementation Phase of the SOC Platform
Source: Company's data (PT. XYZ), 2024

From historical customer complaint data after the implementation of the SOC Platform in phase 1, there was a decrease in complaints up to phase 3. However, this data was influenced by an increase in the number of customers, network expansion, and the implementation of new technology that required continuous iteration in analyzing the root cause of each complaint. Therefore, it is recommended that future research be conducted over a longer time span to capture more stable trends and minimize short-term fluctuations.

4.2 *Classical Assumption Test*

a. Normality Test

Normality testing was performed on the regression residuals between the average complaint handling time and the number of network complaints using the Normal P-P Plot method. The distribution is said to be normal if the data points are scattered around the diagonal line and follow the direction of the line consistently.

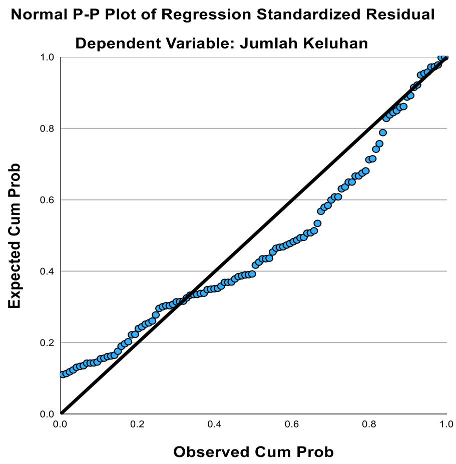

Figure 3. P-Plot Normality Test
Source: Author's Data Analysis (2025)

The visualization results of the P-P Plot and residual histogram in Figure 3 show that the data points on the Normal P–P Plot are consistently scattered around the diagonal line, indicating that the residual distribution follows a normal pattern. The agreement between the observed cumulative probability values and the expected values indicates no significant deviation in the low or high quantiles, so the assumption of residual normality is satisfied and the linear regression model can be used without violating the distributional assumptions.

b. Validity Test

Data validity was tested to measure the relationship between the independent variable, Average Complaint Handling Time, and the dependent variable, Number of Network Complaints, using Pearson's correlation because the data were normally distributed. According to Ghozali (2018), data are considered empirically valid if there is a statistically significant relationship between the variables being tested.

Table 3. Validity Test

Correlations

		Rata-rata Waktu Penanganan	Jumlah Keluhan
Rata-rata Waktu Penanganan	Pearson Correlation	1	-.166
	Sig. (2-tailed)		.080
	N	112	112
Jumlah Keluhan	Pearson Correlation	-.166	1
	Sig. (2-tailed)	.080	
	N	112	112

Source: Author's Data Analysis (2025)

The test results show a correlation value of -0.166 with a significance of 0.080, indicating that although faster handling times tend to reduce the number of complaints, this relationship is not statistically significant at the 5% level (p > 0.05). Although the Pearson correlation is not significant, this variable is retained in further testing. This is because the quasi-experimental approach used in this study, such as Difference-in-Differences (DID), focuses on testing causal effects, not merely correlational relationships. Additionally, complaint handling time is a strategic performance indicator set by the company in its SOC Platform implementation policy.

c. **Heteroscedasticity Test**

A heteroscedasticity test was conducted to identify inconsistencies in the residual variance between observations in the regression model, one of which used a scatter plot between the standardized predicted values (ZPRED) and standardized residuals (SRESID). If the points on the scatter plot are evenly distributed without a specific pattern above and below the zero line on the Y-axis, it can be concluded that the model does not exhibit heteroscedasticity.

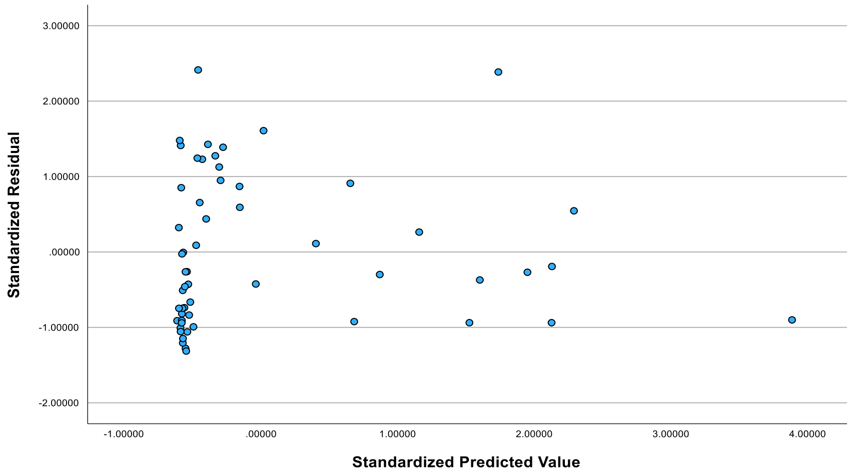

Figure 4. Heteroscedasticity Test
Source: Author's Data Analysis (2025)

Figure 4 shows a scatter plot of the regression model on the combined customer network complaint data, where the residual points are randomly scattered without a specific pattern. Based on this visualization, it can be concluded that there is no systematic pattern in the distribution of residuals against the predicted values, so the regression model does not experience heteroscedasticity and meets the homoscedasticity assumption.

d. Autocorrelation Test

The autocorrelation test is conducted to determine the correlation between the residuals of one period and the previous period, which is important in regression analysis, especially for time-series or panel data. This test uses the Durbin-Watson (DW) method, with values ranging from 0 to 4. A DW value close to 2 indicates no autocorrelation; below 2 indicates positive autocorrelation, and above 2 indicates negative autocorrelation. A more accurate interpretation is obtained by comparing the DW value with the lower limit (dL) and upper limit (dU) from the Durbin-Watson table.

Nilai dL	Nilai dU	Nilai DW	4 – dU	4 – dL
1.50	1.65	2.430	2.35	2.50

Figure 5. Autocorrelation Test
Source: Author's Analysis (2025)

The test results show a DW value of 2.430, which is between 4 – dU (2.35) and 4 – dL (2.50), indicating an inconclusive zone according to [25] criteria. This means the model does not exhibit positive autocorrelation, and negative autocorrelation is not statistically significant, so the classical assumption of autocorrelation can be considered satisfied. However, this gray zone should be noted, as violations of classical assumptions often occur in time-series or panel data analysis, especially if the model does not fully capture system dynamics or there are unobserved variables [26].

4.3 Hypothesis Testing Procedure

a. Parallel Trend Test

The test was conducted by including the interaction variable between groups (experimental vs. control) and time before SOC implementation into the regression model to verify the parallel trend assumption in the Difference-in-Differences approach. This assumption states that before the intervention, the trends in the number of complaints between the experimental and control groups must be parallel. The test results show a coefficient of -47.199 with a significance level of p=0.058, which is greater than the threshold of 0.05, indicating that the trends are parallel before treatment, thus fulfilling the parallel trend assumption.

Table 4. Parallel Trend Test

Interaction Variable	Coefficient	Sig. (p-value)
Group × TimeToTreatment	-47,199	0,058

Source: Author's Data Analysis (2025)

In addition to statistical tests, this analysis also includes visual graphs of complaint trends between groups before treatment. Figure 6 shows that complaint trends in the experimental and control groups moved in parallel, supporting the assumption of parallel trends being visually fulfilled.

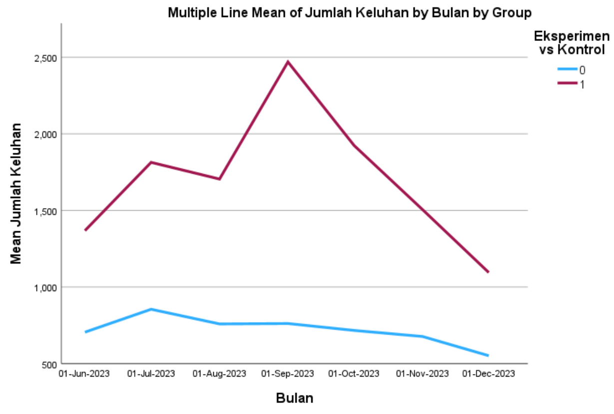

Figure 6. Parallel trends test
Source: Author's data analysis (2025)

b. Difference-in-difference analysis

Difference-in-differences (DID) analysis is used to evaluate the effect of SOC Platform implementation on the number of network complaints by comparing the average changes before and after the intervention between the experimental and control groups. The DID regression model includes four main independent variables: (1) average complaint handling time, (2) dummy variables for groups (control vs. experimental), (3) dummy variables for time periods (before vs. after implementation), and (4) interaction variables between groups and time periods.

Table 5. DID Regression Coefficients

No	Variable	Coefficient (B)	p-value
1	Interaction (Group × Post_SOC)	-126.579	0.001
2	Group	-36.509	0.253
3	Post_SOC	147.229	<0.001
4	Average Handling Time	0.026	0.17

Source: Author's Data Analysis (2025)

The test results show that the interaction variable between Group and Post_SOC has a coefficient of -126.579 with a p-value of 0.001, indicating a significant decrease in the number of complaints in the experimental group after the implementation of the SOC Platform compared to the control group. The decrease of 126.579 units in the experimental group after the implementation of SOC reflects the success of the SOC intervention in substantially reducing network complaints.

c. Paired Sample T-Test

The Paired Sample T-Test was conducted to evaluate whether there was a significant difference between the number of network complaints before and after the implementation of the SOC Platform, with the aim of assessing the effectiveness of the platform implementation in reducing complaint volume.

Table 6. Summary of Paired T-Tests

No	Variable	Mean	N	Std. Deviation	Category
1	Number of Complaints Before SOC (Pre)	8451.75	8	4659.32	High
2	Number of Complaints After SOC (Post)	5149.13	8	2292.72	Decreased (Good)

Source: Author's Data Analysis (2025)

The table above presents a summary of the average number of customer complaints before and after the implementation of the SOC Platform in the experimental group. Before the implementation of the SOC, the average number of complaints was 8,451.75 with a standard deviation of 4,659.32 (high), while after implementation, the average decreased to 5,149.13 with a standard deviation of 2,292.72 (decreased). The analysis was conducted on 8 entities under two different time conditions. This reduction of over 3,300 complaints indicates the initial positive impact of SOC on complaint handling efficiency, which is further supported by the paired t-test and effect size.

Table 7. Paired Samples Correlation

No	Statistic	Value	Interpretation
1	Correlation Coefficient (r)	0.862	Strong relationship between pre and post values
2	Significance (p-value)	0.006	Significant (< 0.05), supports paired t-test

Source: Author's Data Analysis (2025)

This table 7 shows the correlation (linear relationship) between the values before and after the implementation of SOC. The correlation value r = 0.862 indicates that there is a very strong relationship between the two conditions. The significant p-value of 0.006 reinforces that the pre- and post-data are well correlated.

Table 8. Paired T-test

No	Statistic	Value	Interpretation
1	Mean Difference (Pre - Post)	3302.63	Average decrease in complaints
2	t-statistic	3.197	Paired t-test statistic
3	df	7.0	Degrees of freedom
4	Sig. (2-tailed)	0.015	Significant (< 0.05)

Source: Author's Data Analysis (2025)

Statistical analysis shows that the average difference is statistically significant, with a t-value of 3.197, df = 7, and p-value = 0.015 (Sig. 2-tailed < 0.05). Therefore, it can be concluded that there is a significant difference between the number of complaints before and after the implementation of the SOC Platform.

Table 9. Effect Size

No	Effect Size	Value	Interpretation
1	Cohen's d	1.13	Large effect (d > 0.8), strong statistically and practically
2	Hedges' g	1.004	Corrected for small N, still shows large effect

Source: Author's Data Analysis (2025)

Cohen's d value = 1.130 indicates that the effect of SOC implementation on the reduction in the number of complaints is large, with a statistically and practically significant impact on customer complaint management. This reduction in the number of complaints reflects an improvement in the efficiency or effectiveness of the complaint handling process that is not coincidental.

d. Linear Regression Test

A simple linear regression analysis was conducted to determine the effect of the average complaint handling time on the number of customer complaints both before and after the implementation of the SOC Platform.

Table 10. Comparison of Linear Regression Results

Time	Coefficient (B)	p-value	R	R^2
Before SOC	-8.301	0.156	0.192	0.037
After SOC	-0.243	0.464	0.100	0.010

Source: Author's Data Analysis (2025)

Simple linear regression before the implementation of the SOC Platform showed a regression coefficient of -8.301 with a significance value (p-value) of 0.156.

The correlation coefficient (R) is 0.192, and the coefficient of determination (R Square) is 0.037, meaning that only 3.7% of the variation in the number of complaints can be explained by handling time. After the SOC Platform was implemented, the linear regression results showed a coefficient value of -0.243 with a significance value (p-value) of 0.464. The R value is 0.100 and the R Square value is 0.010, indicating that only 1.0% of the variation in the number of complaints can be explained by the handling time after the intervention was implemented. The interpretation of these results indicates that although the direction of the relationship between handling time and the number of complaints is negative (faster handling results in fewer complaints), the relationship is not statistically significant.

4.4 Discussion

Digital transformation through the implementation of the SOC Platform is a key component in improving the efficiency of complaint handling. SOC is not only an operational tool, but also a symbol of a digital-based work model that integrates data, monitoring systems, and analytics in real time. This aligns with digital transformation theory, which states that technology adoption must be accompanied by process improvements and data-driven decision-making (Westerman et al., 2011). The reduction in complaint handling time post-SOC implementation indicates that digitalization not only enhances internal efficiency but also improves customer experience. However, since this study has not directly evaluated customer perceptions, the potential impact of digital transformation on customer loyalty (such as NPS) remains an area for further exploration.

a. Prior to SOC Platform Implementation

Testing of Hypothesis 1 aims to evaluate the relationship between complaint handling time and the number of customer complaints prior to the implementation of the Service Operation Center (SOC) Platform. The results of simple linear regression show that the regression coefficient is negative at -8.301, with a p-value of 0.156 and R^2 of only 0.037. This indicates that although there is a tendency for faster complaint handling to result in fewer complaints, the relationship is not statistically significant. Thus, only a small portion of the variability in the number of complaints can be explained by complaint handling duration during this period. The limitations of the manual system, which is still fragmented, explain the low influence of handling time on complaint reduction. The handling process during this period still involved separate systems and slow manual verification procedures, so that response time was not yet able to reflect the overall effectiveness of problem resolution.

These findings are consistent with service mangement theory from [13] and [7], which emphasize the importance of integrating service elements—technology, people, and procedures—to create an effective service system. Without a coordinated system, operational speed does not necessarily improve customer satisfaction. In the perspective of the ServQual model [6], the dimensions of responsiveness and reliability were not optimal in the period before the intervention, so that customer expectations regarding complaint resolution were not consistently met. Speed in responding to complaints, if not accompanied by system reliability in resolving complaints thoroughly, will fail to build long-term satisfaction [27]. Therefore, the first hypothesis is not empirically supported, reinforcing the urgency to adopt a more integrated service system such as the SOC Platform.

b. After SOC Platform Implementation

Hypothesis 2 tests the effect of complaint handling time on the number of customer complaints after SOC Platform implementation. Simple linear regression shows a regression coefficient of -0.243 with a p-value of 0.464 and R^2 of 0.010, indicating that the relationship between the two variables remains negative but is not statistically significant. These results indicate that after the SOC system was implemented, handling time is no longer the sole determinant of the number of complaints, as the effectiveness of handling is also determined by the quality of the system and the integrative capabilities of the technology.

However, the results of the paired sample t-test analysis show that there was a significant decrease in the average number of complaints, from 8,451.75 before SOC to 5,149.13 after SOC, with a p-value of 0.015 and an effect size (Cohen's d) of 1.130—indicating a large and practically relevant impact. Furthermore, the Difference-in-Differences (DID) analysis revealed that the interaction variable between the group and time had a coefficient of -126.579 with a p-value of 0.001, indicating that the group that received the SOC intervention experienced a significantly greater reduction in complaints compared to the control group.

This shows that the implementation of SOC has a causal and substantial effect on complaint handling efficiency. Theoretically, these findings reinforce the ServQual model, particularly in the dimensions of responsiveness and reliability [27], where the SOC Platform has improved both the speed and accuracy of complaint resolution. SOC features such as automatic root cause analysis and smart escalation enable the service process to run more horizontally and standardized in line with the principles of service management by [7]. The decrease in the number of complaints also reflects the realization of a more proactive, precise, and customer-centric service process.

Thus, although simple linear regression did not find a significant direct relationship between handling duration and the number of complaints, the other two methods—t-test and DID—provide strong evidence that SOC implementation has a significant positive impact on reducing customer complaints. Therefore, the null hypothesis (H_0) can be rejected, and the alternative hypothesis (H_1) is accepted: there is a significant influence of SOC implementation on the reduction in the number of customer complaints in the context of telecommunications services.

5. CONCLUSION

This study concludes that accelerating the handling time of new complaints will have a significant impact on reducing the number of customer complaints when supported by an integrated and digital-based service system such as the SOC Platform. Before the implementation of SOC, handling time efficiency did not contribute significantly to reducing complaints due to the limitations of the manual system. However, after SOC was implemented, a comprehensive service transformation occurred, with a decrease in the number of complaints driven by process automation, data-driven root cause analysis, and more effective escalation management. This confirms that the quality of the service management system plays a more decisive role than mere operational acceleration, and that customer service digitalization is an important pillar in improving customer experience and company competitiveness in the telecommunications sector.

5.1 *Recommendations for PT. XYZ*

PT. XYZ is advised to develop the SOC Platform not only as a technical acceleration tool, but also as part of an integrated customer experience management system. One strategic step is to link SOC operational performance—such as complaint resolution duration and first-touch resolution rate—to customer loyalty indicators such as Net Promoter Score (NPS). A regional dashboard-based approach that records the correlation between system performance and changes in customer loyalty will provide a more comprehensive and long-term view. In addition, PT. XYZ needs to strengthen the readiness of human resources handling SOC output through cross-functional training that covers technology mastery, SLA understanding, analytical skills, and cross-divisional coordination. Real-time SLA monitoring should also be optimized to ensure that the speed and accuracy of responses in the field are aligned with system performance. Thus, the SOC Platform will function not only as a digital tool but also as a catalyst for a collaborative, responsive, and data-driven work culture transformation.

5.2 *Recommendations for Further Research*

Further research is recommended to integrate customer loyalty variables such as NPS, churn rate, and repeat complaint rates into the analysis framework to more comprehensively assess the impact of SOC on customer experience and retention. In addition, a mixed-method approach would be highly relevant, combining quantitative data with qualitative insights from in-depth interviews or observations of SOC users, technicians, regional managers, and customers. This approach allows for a more contextual understanding of organizational dynamics and non-technical factors that influence the effectiveness of SOC implementation. Future research should also use a longitudinal design to evaluate the sustainability of SOC's impact in the long term. This is important given the potential for a diminishing effect or post-implementation drift that could reduce the effectiveness of the system if not followed up with innovation and periodic evaluation. Thus, further research is expected to not only evaluate the initial impact but also formulate adaptive strategies to maintain the performance of digital service systems so that they remain relevant and optimal on an ongoing basis.

5.3 *Research Limitations*

This study has limitations in terms of the scope of analysis, which is still limited to systemic data without assessing individual customers who file complaints. In addition, the study has not directly linked the impact of complaint handling acceleration to customer loyalty indicators such as Net Promoter Score (NPS), so it does not fully describe the implications for customer retention. Furthermore, the study only covers period after the SOC Platform implementation, which may not be sufficient to capture long-term behavioral changes or the sustainability of improvements in complaint handling performance.

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