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Analysis Of Improving Service Quality At The Ssctelkom Surabaya Institute Of Technology Using The Lean Six Sigma Method

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Abstract: *Student Service Centre (SSC) is a center that provides services and information to active students at InstitutTeknologi Telkom Surabaya (ITTS). ITTS provides SSC with academic, student, and faculty services to support its students' academic and non-academic development. One of the main services provided by SSC is the Active Certificate. However, SSC users need help obtaining the letter. This study aims to measure the quality of Active Certificate services using the Lean Six Sigma method and provide recommendations for improvement. The results showed that the quality of SSC services still needs to be improved, with a DPMO value of 289686, a sigma value of 2.07, and the highest negative gap in the Responsiveness dimension. The total Non Value Added time was obtained at 10 hours 31 minutes, and the total Value Added time was 4 hours 8 minutes. Proposed improvements include the deployment of QR Codes to provide information on document requirements and using Value Stream Mapping (VSM) to reduce the time spent on non-value added. Lean Six Sigma method can reduce the total value-added time and improve the efficiency of SSC services.*

Keywords:*(Student service centre (SSC), Lean six sigma, value stream mapping (VSM), Qr Code)*

INTRODUCTION

The Telkom Surabaya Institute of Technology (ITTS) is an esteemed higher education institution associated with the Telkom Education Foundation. In order to facilitate the intellectual and personal growth of its students, ITTS offers a Student Service Center (SSC). The purpose of SSC is to offer a range of services to students, including academic, student, and faculty services. The primary objective of SSC is to address student needs and enhance the quality of student services at ITTS. The SSC is anticipated to facilitate the growth of ITTS students and provide assistance for their academic and extracurricular pursuits.

SSC offers a range of services to meet students' needs, such as academic services, PuTI services, student services, logistics services, financial services, language and library center services, information technology and business faculty services, and technology faculty services. Electronics and the intelligent industry. SSC offers various services to assist students in academic and non-academic pursuits.

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According to the acquired statistics and information, many students have utilized the services provided by the SSC at the Telkom Institute of Technology Surabaya campus. According to the pre-research survey data from September 2023, Diagram 1 displays several requests for SSC services.

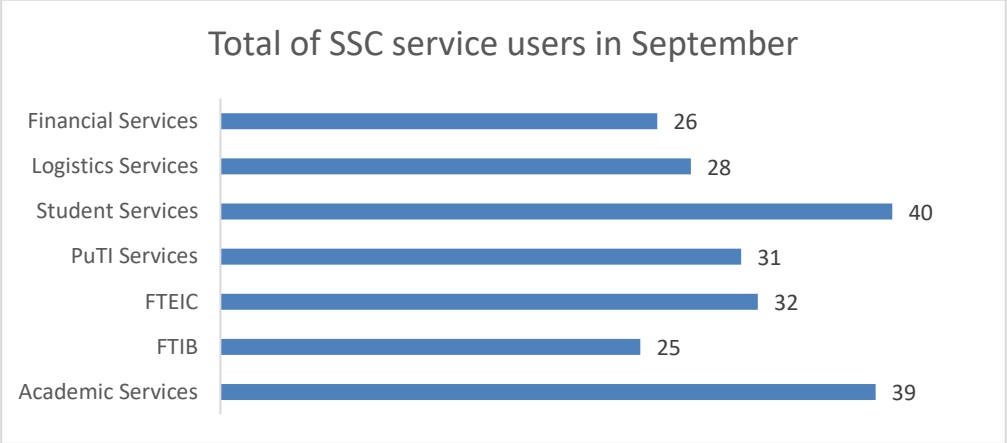

Diagram 1 Total of SSC Service Users
Source: Pre-Research Survey, 2023

SSC offers a range of services to meet students' needs, such as academic services, PuTI services, student services, logistics services, financial services, language and library center services, information technology and business faculty services, and technology faculty services. Electronics and the intelligent industry. SSC offers various services to assist students in academic and non-academic pursuits. According to the acquired statistics and information, many students have utilized the services provided by the SSC at the Telkom Institute of Technology Surabaya campus. According to the pre-research survey data from September 2023, Diagram 2 displays several requests for SSC services.

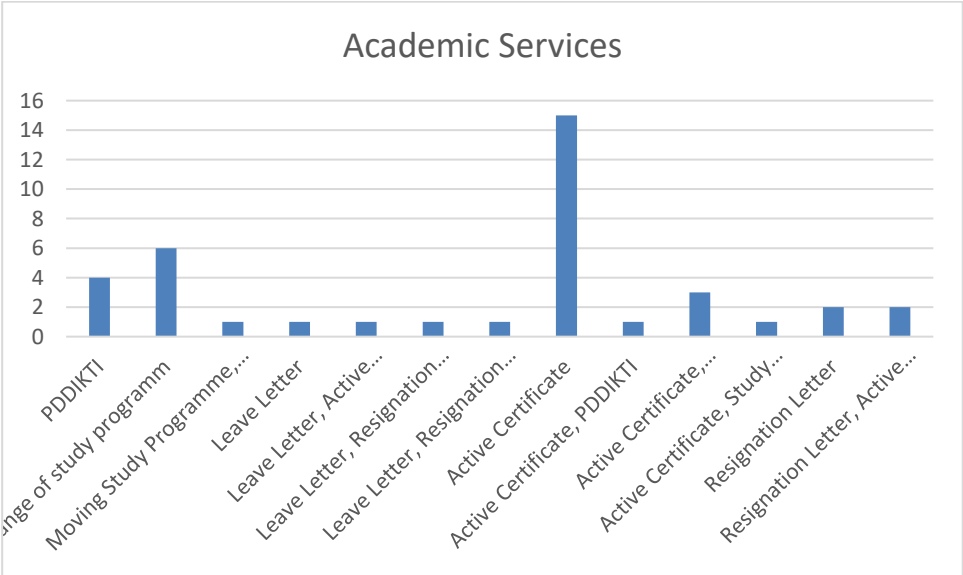

Diagram2 Academic Services
Pre-Research Survey Source, 2023

According to Diagram 2, the Active Certificate has the highest number of requests for academic services. The significance of prioritizing the quality of services offered is a direct response to the high volume of service demands, ensuring that they can effectively fulfill the requirements and anticipations of users. The paramount importance of ensuring student happiness, particularly in academic services, is

*name of corresponding author

in the quality of services given by SSC. Hence, it is crucial to assess the active mail request service to uphold and enhance SSC's services.

Several prior studies have examined service quality in various institutions using different methodologies. Prior studies have elucidated that Service Quality is important across diverse service sectors. Prior studies have elucidated the significance of service quality within a service. Service Quality is a useful tool for assessing and enhancing the quality of services offered by an organization (Maulidiyah, 2021; Bahiyyah&Wibowo, 2019; Astuti, 2001). Prior studies have also elucidated the significance of comprehending the requirements and anticipations of service recipients in order to enhance service quality and augment user contentment (Maulidiyah, 2021; Bahiyyah&Wibowo, 2019; Astuti, 2001).

Prior studies have employed the Six Sigma method to demonstrate its efficacy in enhancing the quality of services offered by institutions (Astuti, 2001; Wulandari&Sauddin, 2017; Ibnas et.al., 2019; Masruroh, 2023; Dinnia&Nasrudin, 2021). Prior studies have indicated that Six Sigma is applicable for assessing and analyzing service quality levels and identifying areas for enhancement. Implementing Six Sigma can enhance an organization's ability to deliver superior services to its users and elevate overall satisfaction levels (Astuti, 2001; Wulandari&Sauddin, 2017; Ibnas et.al., 2019; Masruroh, 2023; Dinnia&Nasrudin, 2021). In addition, previous studies have utilized the Lean Six Sigma approach. Prior studies have elucidated that Lean Six Sigma is a methodology employed to enhance the quality of services rendered by an institution (Wulandari&Sauddin, 2017; Masruroh, 2023; Dinnia&Nasrudin, 2021). Lean Six Sigma is a valuable methodology for reducing waste and improving the efficiency of service delivery (Wulandari&Sauddin, 2017; Masruroh, 2023; Dinnia&Nasrudin, 2021). Utilizing Lean Six Sigma can assist in identifying areas for improvement in service quality and prioritizing necessary actions to address these areas (Wulandari&Sauddin, 2017; Masruroh, 2023; Dinnia&Nasrudin, 2021) Utilizing Lean Six Sigma can assist an institution in enhancing user satisfaction by delivering the expected services (Wulandari&Sauddin, 2017; Masruroh, 2023; Dinnia&Nasrudin, 2021).

Based on the previous explanation, the Lean Six Sigma method is essential for identifying inefficiencies and issues within the SSC service process. Implementing Lean Sigma methods results in improved efficiency, cost reduction, and enhanced speed in delivering services. In addition, this method aids in measuring process performance using clear quality indicators. It enables organizations to evaluate service quality and objectively make ongoing improvements.

LITERATUREREVIEW

Student Service Center (SSC)

The Student Service Center (SSC) is a dedicated building designed to offer information and services to currently enrolled students at the Telkom Surabaya Institute of Technology (Ittelkom-sby,2023). During the EPIC event, SSC, situated on the second level of the leading IT Telkom Surabaya building, was officially opened on February 24, 2023. This occasion served as the initial exposure of SSC to the Chancellor and all IT Telkom Surabaya staff (Ittelkom-sby,2023). The SSC is a resource for students seeking support navigating the campus environment and obtaining information and services. The management of SSC is conducted by two groups of highly engaged IT Telkom Surabaya students, specifically the development team and the service team. The development team is responsible for creating websites and applications, while the service team is in charge of providing information and resolving issues encountered by students. The motto of the SSC is "arrive, obtain a ticket, proceed" (Ittelkom-sby,2023).

SSC offers various services, such as academic services, PuTI (information technology centre), student services, logistics services, financial services, language centre and library services, information technology and business faculty services, and electrical technology and intelligent industry faculty services. SSC is a viable option for students with challenges accessing information and services on campus. The SSC offers various services to assist students in fulfilling their academic and non-academic requirements. The management of SSC is conducted by highly engaged IT Telkom Surabaya students who are organized into two distinct teams: the development team and the service team. The development team is responsible for creating websites and applications, whilst the service team is

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responsible for delivering information-related services to students and addressing student-related issues.SSC offers both offline and online services. The official SSC website provides access to online services through the link https://ssc.ittelkom-sby.ac.id/. Figure 1 depicts the primary interface shown on the SSC website.

Figure 1 Dashboard Website SSC

The SSC website provides accessible information, including comprehensive instructions on how to apply for both online and offline services. It also provides information on various service categories, including academic services, PuTI (Information Technology Center), student services, logistics services, financial services, language centre and library services, information and business technology faculty services, electrical technology faculty services, and smart industry services.

Lean

Lean is a management methodology focused on minimizing waste and maximizing efficiency in all manufacturing or service operations areas. Its core premise is to optimize value creation by minimizing waste and superfluous expenses with utmost efficiency. Utilizing lean principles in academic services seeks to discover and eradicate inefficiencies in academic administration procedures, hence enhancing efficiency and service quality(Anggraini,et al., 2020).

The Lean stage in academic services has multiple stages, precisely(Anggraini,et al., 2020)determine the worth or importance of a product or service from the customer's viewpoint, utilizing value stream mapping to uncover inefficiencies in the academic administration process, establish an efficient and environmentally friendly system to minimize delays and expedite academic administrative procedures, deploy a pull system to prevent excessive production and enhance resource use, strive for perfection by consistently enhancing the academic administration process.

Implementing lean principles in academic services can yield numerous advantages, including enhanced operational efficiency and improved service quality. The successful implementation of lean principles in academic services, it is imperative to have the backing of university management and the active participation of staff members in the academic administration process. Furthermore, it is essential to consistently assess and enhance the academic administration process to guarantee that the integration of lean principles may yield maximum advantages for universities and their stakeholders.

Six Sigma

Six Sigma is a systematic approach to enhancing and regulating the quality of organizational activities. This strategy utilizes data to effectively minimize flaws and errors in a process, resulting in enhanced customer happiness and profitability. Six Sigma is a methodology based on the statistical concept of "sigma," which measures the variability or dispersion of a process. As the sigma level increases, the likelihood of defects occurring in a process decreases.

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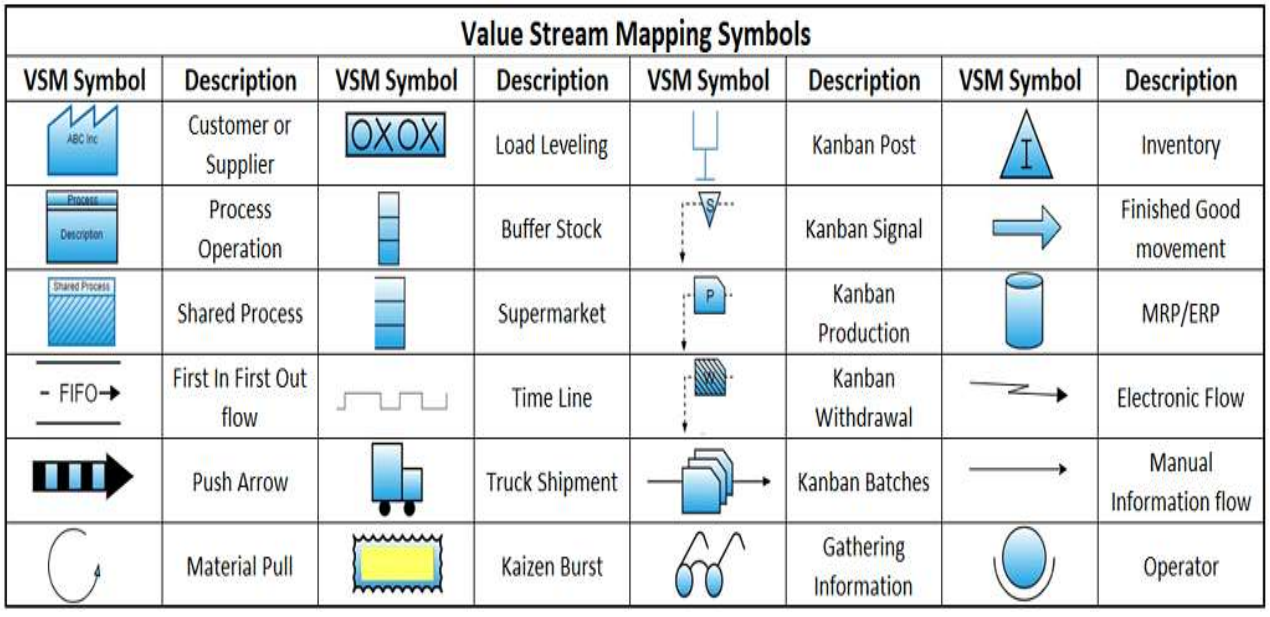
The Six Sigma process adheres to a structured paradigm known as DMAIC, an acronym for Define, Measure, Analyze, Improve, and Control. This model is utilized to identify and resolve issues inside a process. It encompasses various steps, such as problem definition, process measurement, data analysis, process improvement, and process control, to sustain the achieved enhancements (Haryanto and Ichtiarto, 2020). The DMAIC phases from the Six Sigma Methodology (Haryanto and Ichtiarto, 2020) are as follows: define, this stage commences by recognizing the problem or potential for enhancement. Six Sigma includes identifying problems, consumers, processes, and goals.Measure, this phase entails assessing the present performance of the process and gathering data. Six Sigma gathers data to assess the severity of the problem and its magnitude of influence on the process.Analyze, this stage entails scrutinizing facts to ascertain the problem's underlying source. Six Sigma utilizes data analysis to identify the components that impact problems and ascertain the correlations between these aspects.Improve, this phase entails creating and executing a resolution to tackle the issue at hand effectively. Six Sigma methodology focuses on developing and testing solutions to enhance processes and minimize or eliminate issues.Control, this phase entails controlling the process to sustain the achieved improvement. Six Sigma ensures processes' sustained performance and prevents problems' recurrence.

Value Stream Mapping (VSM)

Value Stream Mapping (VSM) is a methodology that may be employed to reduce inefficiencies in a process (Tambunan et al.,2017). The objective of VSM is to facilitate the visualization and enhancement of the entire process, discerning and differentiating between processes that contribute value and those that are wasteful. The icon representing Value Stream Mapping (VSM) can be observed in mapping 1.

Mapping 1 Icon symbol in Value Stream Mapping



METHOD

Design of the Research

Analyzing service quality at SSC involves multiple stages and steps, which are carried out using the Lean Six Sigma methodology. The research method was conducted sequentially, following the actions shown in Mapping 2.

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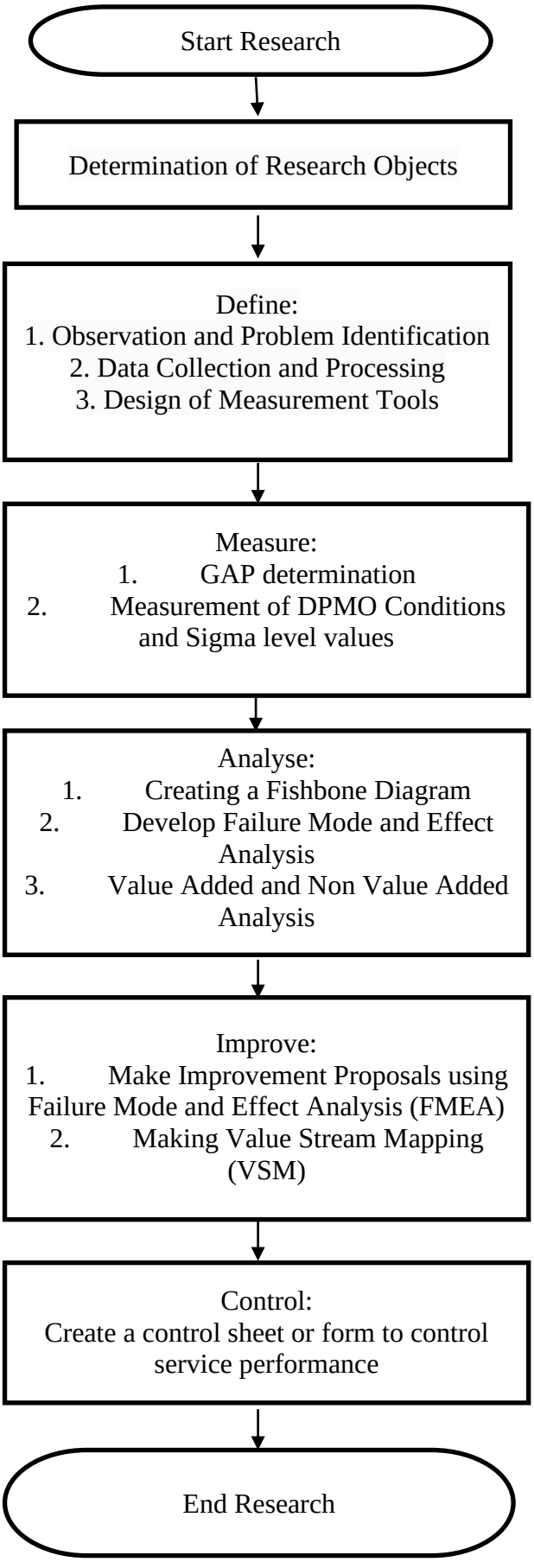

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Define Design

This phase's purpose is to identify the issues that arise during the research process and ascertain the recurring themes that will be examined in a Lean Six Sigma study.

1. Observation and Problem Identification

Identification of the problem is an essential phase of the research procedure. The issue can be identified by observing the situation, consulting pertinent literature, or conducting a preliminary survey. At this juncture, it will be linked to the identified challenges to offer resolutions for said challenges. Students enrolled at the Telkom Surabaya Institute of Technology have completed a questionnaire that has been utilized to collect the data.

2. Data Collection and Data Analysis

The gathering and analysis of data constitute a critical phase within the research endeavour. The initial phase in the data collection process is identifying opportunities for data collection in accordance with the research objectives. The research was conducted through the administration of questionnaires. After collecting the data, it is organized in preparation for analysis. Following the interpretation of the analyzed data, conclusions and recommendations are generated. After that, the researcher uses tables, graphs, and charts to present the research findings clearly and concisely.

3 Instrument

The Service Quality Method is a technique utilized to assess service quality. It comprises five distinct dimensions of service quality. The criteria comprise five distinct quality dimensions: tangible physical evidence, responsiveness, dependability, assurance, and emphasis on attention. The service grade method may be applied to SSC services to assess the service grade. Utilizing these dimensions can assess and identify the caliber of services rendered. The explication of the five dimensions of service quality (Layanan, 2021) is as follows:

a) Physical Evidence (Tangible) comprises information, consultation services, and visible elements of the SSC's physical facilities, including buildings and chambers.
b) Reliability encompasses the capacity to consistently and accurately deliver services as promised, including administrative services and providing accurate information.
c) Responsiveness encompasses the capacity to deliver services in a timely and dependable fashion, as promised.
d) Assurance encompasses the aptitude of SSC officers to possess pertinent expertise, deliver high-quality services, effectively communicate information, and establish customer confidence in SSC.
e) Attention (Emphasis) encompasses the employees' empathetic demeanour towards the services provided by SSC, which consists of a cordial demeanour towards patrons and the capacity to consider their grievances attentively.

The data collection methodology employed at the Telkom Surabaya Institute of Technology involved distributing questionnaires to the participants. A questionnaire is a method of gathering data in which respondents are presented with written or electronic inquiries regarding the services offered. The questionnaire aims to assess the degree of significance and effectiveness perceived by service consumers concerning the service standards the SSC ought to deliver. The data gathered from the distribution of questionnaires is subsequently utilized to ascertain the range of services SSC offers.

The data utilized in this study were acquired directly from primary sources. This primary data was collected through the distribution of questionnaires to service users. The variables utilized are dimensions of quality. The survey was administered utilizing a Likert scale. On a Likert scale, responses to each instrument item varied from positive to negative. The subsequent values pertain to each scale:

a) Expectation Scale: The expectation level indicates the user's optimism regarding the SSC service.
b) Satisfaction Scale: The Satisfaction Level quantify the user's contentment with the Active Certificate service according to the service attributes of the SSC.

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Table 1 Likert Scale Level of Measurement of SSC Service Quality

Value	Expectation Scale	Satisfaction Scale
1	Very unimportant	Strongly Disagree
2	Not important	Disagree
3	Enough	Enough
4	Important	Agree
5	Very important	Strongly agree

The measurements for the optimism scale and evaluation scale utilized in the questionnaire are presented in Table 1. The rating scale for this research questionnaire is five points. The hope questionnaire employs the following rating scale: (1) Very Unimportant; (2) Not Important; (3) Fair; and (4) Not Important;(5) Very Important. The satisfaction survey employs the following rating scale: (1) Strongly Disagree; (2) Disagree; (3) Enough; and (4) Agree; (5) Strongly Agree. [23].

The data utilized in this study was collected by distributing a questionnaire to service consumers residing in Dukuh Menanggal Village. The Slovin formula was utilized for research sampling. The Slovin formula is frequently applied to studies involving a sizable population and a specific object. In this research, the Slovin formula was applied (Novitaningsih, 2019).

RESULT

The data collection phase of this study spanned one month, specifically until December 2023. The data was gathered through the distribution of questionnaires that inquired about the perceptions and actual experiences of the Telkom Surabaya Institute of Technology regarding SSC services. The researchers collected data from a sample of 106 respondents. Students enrolled at the Telkom Surabaya Institute of Technology constituted the respondents of this study, as evidenced by the successful completion of their academic programs and courses and the utilization of SSC services. The information presented below pertains to respondents who have completed the customer satisfaction questionnaire regarding SSC services:

Diagram 1 Study Program Data

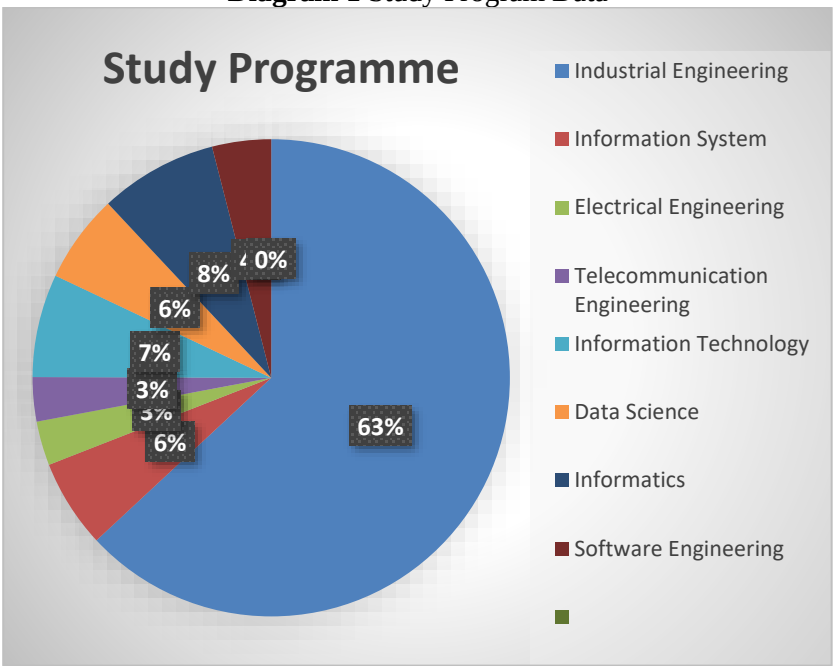

Diagram 2 is the results obtained by respondents based on the student class of the Telkom Surabaya Institute of Technology.

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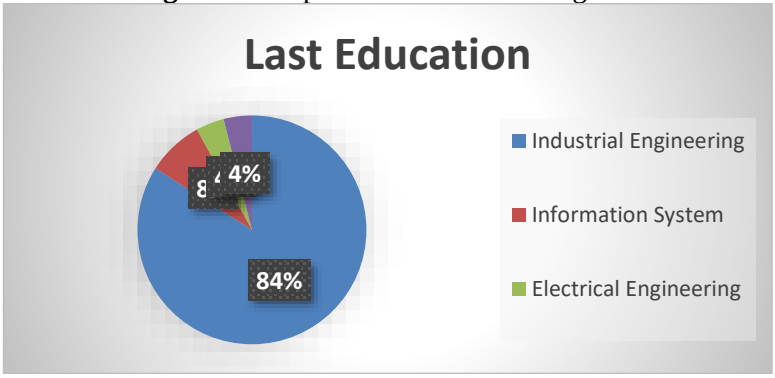
Diagram 2 Respondent data based on generation



36.8% of the 106 respondents are from the class of 2020, 18.9% are from the class of 2021, 33% are from the class of 2022, and 11.3% are from the class of 2023, as shown in Figure 4.2. At 36.8%, respondents' data regarding the completion of the research questionnaire was dominated by the 2020 class. Lean Six Sigma (Define, Measure, Analyze, Improve, and Control) is the data processing methodology utilized for the SSC service process at the Telkom Surabaya Institute of Technology.

Measure Stage

Utilized techniques during the Measure phase are Servqual and Lean Six Sigma. Evaluation of the level of reality and user expectations with respect to service quality constitutes Servqual (Maulidiyah,2021). The servqual value is computed by identifying the GAP between the service quality received by service consumers. In order to ascertain that the data collected are consistent with the real-world circumstances of the subject under investigation, the validity test is employed (Astuti,2021). Validity and Reliability Testing is the procedure by which the items of a questionnaire are examined.Table 2 is the result of the questionnaire data processing validity test related to service quality analysis at SSC Telkom Institute of Technology Surabaya.

Tabel 2 Results of the Respondent Data Validity Test

Validity Test							
Dimension	*Indicator*	*Sig.*	*Status*	*Dimension*	*Indicator*	*Sig.*	*Status*
TH	TH1	< 0.005	Valid	TR	TR1	< 0.005	Valid
	TH2	< 0.005	Valid		TR2	< 0.005	Valid
	TH3	< 0.005	Valid		TR3	< 0.005	Valid
KH	KH1	< 0.005	Valid	KR	KR1	< 0.005	Valid
	KH2	< 0.005	Valid		KR2	< 0.005	Valid
	KH3	< 0.005	Valid		KR3	< 0.005	Valid
RH	RH1	< 0.005	Valid	RR	DR1	< 0.005	Valid
	RH2	< 0.005	Valid		RR2	< 0.005	Valid
	RH3	< 0.005	Valid		RR3	< 0.005	Valid
AH	AH1	< 0.005	Valid	AR	AR1	< 0.005	Valid
	AH2	< 0.005	Valid		AR2	< 0.005	Valid
	AH3	< 0.005	Valid		AR3	< 0.005	Valid
EH	EH1	< 0.005	Valid	ER	ER1	< 0.005	Valid
	EH2	< 0.005	Valid		ER2	< 0.005	Valid
	EH3	< 0.005	Valid		ER3	< 0.005	Valid

According to the validity test findings in Table 2 above, it is evident that the data for all dimensional qualities about the expectations and reality of respondents in the questionnaire meet the standards, thereby confirming their validity. Reliability testing determines the accuracy and consistency of the research tool's measurements. This test employs the Cronbach's Alpha technique. Table 4.2 displays the outcomes of the reliability test conducted on the questionnaire data processing to examine service quality at SSC Telkom Institute of Technology Surabaya.

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Tabel 3 Reliability Test Results of Respondent Data

Reliability Test Result					
Dimension	*Cronbach's Alpha*	*Status*	*Dimension*	*Cronbach's Alpha*	*Status*
TH	> 0.6 (0.914)	Reliable	TR	> 0.6 (0.906)	Reliable
KH	> 0.6 (0.911)	Reliable	KR	> 0.6 (0.907)	Reliable
RH	> 0.6 (0.902)	Reliable	RR	> 0.6 (0.922)	Reliable
AH	> 0.6 (0.905)	Reliable	AR	> 0.6 (0.903)	Reliable
EH	> 0.6 (0.904)	Reliable	ER	> 0.6 (0.908)	Reliable

Table 3 demonstrates that the data for the questionnaire as a whole is deemed credible for each attribute. The alpha values are presented in the table above. The Cronbach's Alpha value exceeds the threshold of 0.6, as required for the reliability test. The significance level is modified to reflect the mean of the study by incorporating a 10% margin of error. Both the Reliability Test and the Validity Test employ decision-making and hypotheses.

Once the results of the validity and reliability tests have been obtained, the gap value (GAP) must be computed. It will be possible to determine whether or not the services provided by SSC Telkom Institute of Technology Surabaya meet the expectations of their customers based on the outcomes of this GAP calculation. The calculation of the GAP value involves the subtraction of the actual score from the anticipated score. The next stage, after the GAP value has been determined, is to conclude. A negative satisfaction value below zero (<0) signifies that the service recipient's expectations do not align with the experience. A negative Gap value signifies that the attribute has failed to satisfy the expectations of the customers. On the contrary, a positive satisfaction value exceeding zero (>0) signifies that the grade of service rendered to the customer has surpassed their initial expectations. The outcome of the service quality GAP calculation at SSC Telkom Institute of Technology Surabaya is presented in Table 2.

Table 4 Results of GAP Tests

Indicators	**Reality (X)**	**Hope (Y)**	**GAP (X-Y)**	**Sig.Indicators**	**Description**	**GAP for each dimension**	**Service Quality (Q)**	**Service Quality for Each Dimension**
***Tangible* (Bukti Fisik)**								
T1	4,066	4,642	-0,575	0,000	H0 Ditolak	-0,550	0,876	0,876
T2	3,481	4,358	-0,877	0,000	H0 Ditolak		0,799	
T3	3,915	4,113	-0,198	0,000	H0 Ditolak		0,952	
***Reliability* (Kehandalan)**								
K1	3,726	4,349	-0,623	0,000	H0 Ditolak	-0,833	0,857	0,801
K2	3,264	4,189	-0,925	0,000	H0 Ditolak		0,779	
K3	3,160	4,113	-0,953	0,000	H0 Ditolak		0,768	
***Responsiveness* (Daya Tanggap)**								

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Indicators	Reality (X)	Hope (Y)	GAP (X-Y)	Sig.Indicators	Description	GAP for each dimension	Service Quality (Q)	Service Quality for Each Dimension
R1	2,528	4,179	-1,651	0,000	H0 Ditolak	-1,201	0,605	0,710
R2	3,094	4,094	-1,000	0,000	H0 Ditolak		0,756	
R3	3,170	4,123	-0,953	0,000	H0 Ditolak		0,769	
***Assurance* (Jaminan)**								
A1	3,896	4,764	-0,868	0,000	H0 Ditolak	-0,632	0,818	0,866
A2	3,915	4,047	-0,132	0,004	H0 Ditolak		0,967	
A3	3,887	4,783	-0,896	0,000	H0 Ditolak		0,813	
***Empathy* (Empati)**								
E1	3,915	4,009	-0,094	0,047	H0 Diterima	-0,701	0,976	0,847
E2	3,792	4,736	-0,943	0,000	H0 Ditolak		0,801	
E3	3,462	4,528	-1,066	0,000	H0 Ditolak		0,765	

The data presented in Table 4 indicates that the mean anticipated score for every attribute surpasses the mean actual score. Each calculation yields a negative GAP. The dimension exhibiting the most pronounced negative disparity is Responsiveness, measuring -1.201. The dimensions are as follows, in the order of their highest negative Gap values: Responsiveness, reliability, empathy, assurance, and tangible. The negative satisfaction indicated by these results suggests that service consumers' expectations need to align with the experience. Therefore, the intention of service consumers is for SSC Telkom Institute of Technology Surabaya to enhance its service quality performance in order to meet their expectations more closely.

Defects, as defined by the Six Sigma Method, are errors or blunders that customers or service users encounter. The Six Sigma approach modifies the quality performance metric from "defect per million opportunity" to "defect rate per million opportunity." The Six Sigma methodology comprises a sequence of phases, commencing with Define, followed by Measure, Analyze, and Improve. The stage that will be implemented in this study is Control.Subsequently, the significance of the grade of services presently rendered must be assessed. The average level of reality, average level of expectations, GAP value, Defect Per Million Opportunity (DPMO), and sigma value level are all components of the measurement process. The intended level of satisfaction in this study is a score of five, denoting exceptionally contented quality. It is in accordance with the responses provided by the participants on a Likert scale ranging from 5 (indicating high satisfaction) to 1 (indicating low satisfaction). The service quality sigma values and DPMO calculations obtained from SSC Telkom Institute of Technology Surabaya are presented in Table 3.

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Table 5 Sigma values and DPMO measurements

Attribute	Average Expected level	Average Reality level	GAP	Target satisfaction	Satisfaction level	DPMO	Sigma Value
T1	4,642	4,066	-0,575	5	81,32%	186792,5	2,39
T2	4,358	3,481	-0,877	5	69,62%	303773,6	2,01
T3	4,113	3,915	-0,198	5	78,30%	216981,1	2,28
K1	4,349	3,726	-0,623	5	74,53%	254717	2,16
K2	4,189	3,264	-0,925	5	65,28%	347169,8	1,89
K3	4,113	3,160	-0,953	5	63,21%	367924,5	1,84
R1	4,179	2,528	-1,651	5	50,57%	494339,6	1,51
R2	4,094	3,094	-1,000	5	61,89%	381132,1	1,80
R3	4,123	3,170	-0,953	5	63,40%	366037,7	1,84
A1	4,764	3,896	-0,868	5	77,92%	220754,7	2,27
A2	4,047	3,915	-0,132	5	78,30%	216981,1	2,28
A3	4,783	3,887	-0,896	5	77,74%	222641,5	2,26
E1	4,009	3,915	-0,094	5	78,30%	216981,1	2,28
E2	4,736	3,792	-0,943	5	75,85%	241509,4	2,20
E3	4,528	3,462	-1,066	5	69,25%	307547,2	2,00
Average	**4,335**	**3,552**	**-0,784**		**71,03%**	**289686**	**2,07**

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Table 5examines the current performance of 15 service quality dimension attributes at SSC Telkom Institute of Technology Surabaya to be 2.07 sigma, with a DPMO value of 289,686. This finding suggests that out of a total of one million services rendered, approximately 289,686 deviated from established procedures, potentially resulting in client dissatisfaction.Additionally, the sigma value of 1.83, which is nearly equivalent to the average value for the Indonesian industry, deems the service performance of SSC Telkom Institute of Technology Surabaya to be satisfactory. Nevertheless, this value remains significantly below the intended target of 6.00 sigma, as indicated by the opportunity value of defects per million at 4.3.

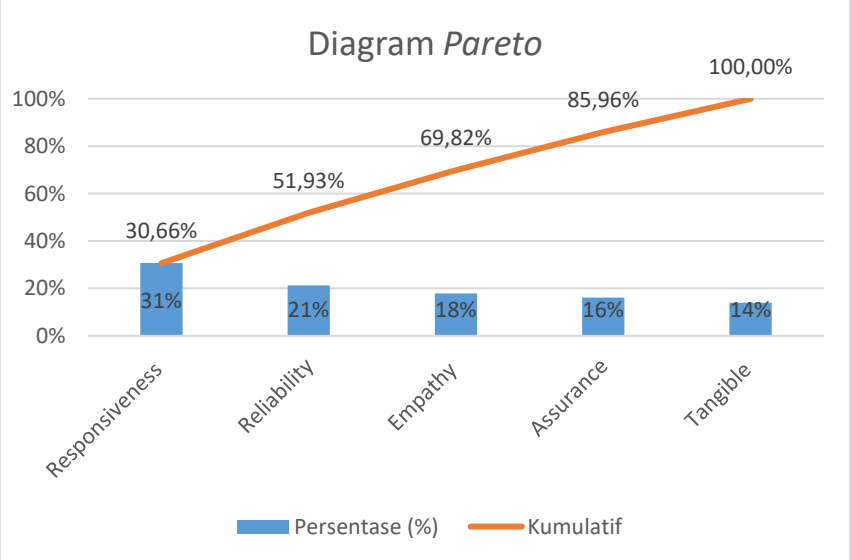
Analyze Stage

The analysis stage follows the execution of the measure stage. During this phase, an examination is conducted to ascertain the components that contribute to malfunctions or flaws. Process activity mapping (PAM), Pareto diagrams, and Fishbone diagrams are utilized in this analysis. The outcomes of the Pareto diagram analysis for each dimension are presented in Table 6 and Diagram 3, which follow:

Table 6. Dimension Grouping for Pareto Diagrams

Dimensions	GAP Value	Percentage	Cumulative
Responsiveness	-1,201	31%	30,66%
Reliability	-0,833	21%	51,93%
Empathy	-0,701	18%	69,82%
Assurance	-0,632	16%	85,96%
Tangible	-0,550	14%	100,00%
Average	-3,917		

Diagram 3 Pareto diagram



Subsequently, the causal factor that is postulated to be the source of the issue will be examined through the application of the Fishbone diagram analysis tool (cause-and-effect). The fishbone diagram facilitates the identification of issues, subsequently enabling the implementation of corrective measures. This study employs the responsiveness dimension due to the fact that it presents the most challenges. The explication of the attributes that will be examined utilizing the Fishbone diagram is provided below.

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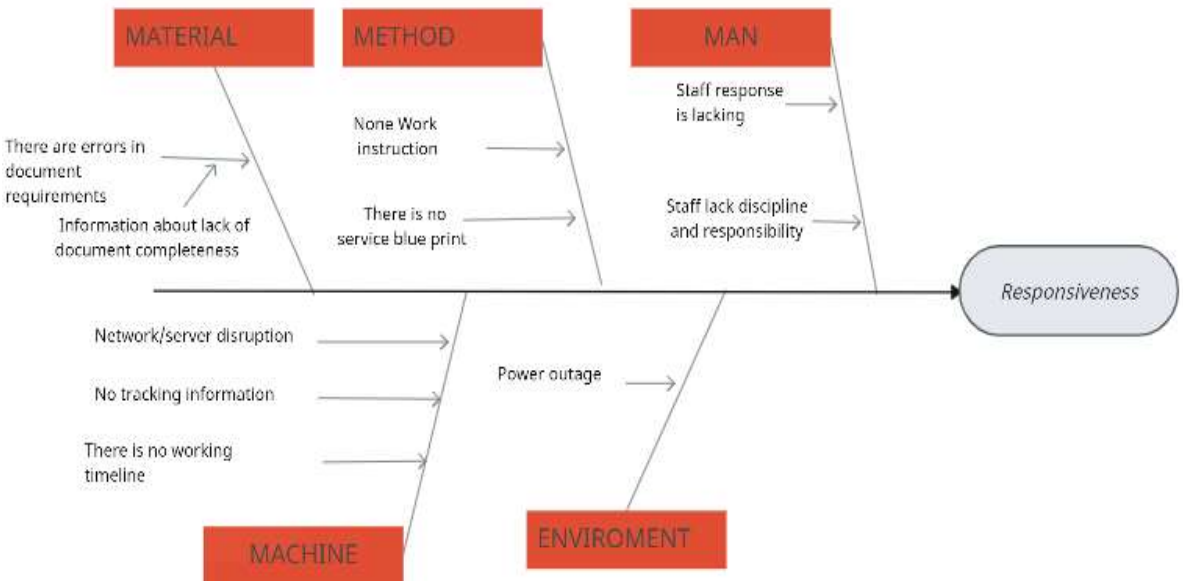
Diagram 4 Fishbone diagram



The preceding Fishbone (cause-and-effect) diagram elucidates the variables that may exert an impact on the service quality delivered by SCC Telkom Institute of Technology Surabaya. Following a comprehensive evaluation encompassing human, method, material, machine, and environmental factors, the subsequent course of action is to employ the Future Mode and Effect Analysis (FMEA) technique in order to propose enhancements to the service quality at SSC Telkom Institute of Technology Surabaya.

The highest Risk Priority Number (RPN) value is utilized in improvement planning in order to concentrate efforts on issues with the highest priority. Future Mode and Effect Analysis (FMEA) is then applied to SOD (Severity, Occurrence, and Detection) criteria in order to identify potential failures. A table of recommendations derived from the Future Mode and Effect Analysis (FMEA) technique.

The greatest RPN value, as determined by the FMEA method's recommendation table, pertains to the absence of information regarding document completeness (210). Following the completion of the RPN calculation, the RPN outcomes are ranked according to their risk level. Following that, offer recommendations for enhancements to failures that have been prioritized. The objective is to enhance the service quality at SSC Telkom Institute of Technology Surabaya.

Utilizing the process activity mapping (PAM) technique, which seeks to identify and eliminate waste while also increasing the process's overall efficiency and effectiveness, is the following step. Process activity mapping (PAM) is a method for systematically analyzing and mapping every stage of an enterprise process. The service process activity mapping (PAM) table at SSC Telkom Institute of Technology Surabaya is presented in Table 5.

Table 5 Process Activity Mapping (PAM)

No	Activity	Minutes	Jenis Aktivitas					Kategori		
			Operasi	Delay	Transport	Storage	Inspect	VA	NVA	NNVA
1	Look for information regarding terms of service									
2	Take a Service Ticket	3	2	1	1			1	1	1
	Waiting Queue	1		□				□	□	
	Taking Numbers	1	□					□		
	Submit Number	1	□		□					□

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No	Activity	Minutes	Jenis Aktivitas					Kategori		
			Operasi	Delay	Transport	Storage	Inspect	VA	NVA	NNVA
2	Service Submission	1	1					1		
	Select the service type	1	□					□		
3	File and service verification process	16	7			2	1	1	2	3
	Enter number and email	2	□							□
	Consultation	3	□					□	□	
	Submission of files	3	□					□		
	Checking files	1	□				□		□	□
	File verification	4	□				□		□	□
	Process of inputting data into the SSC database	2	□			□				□
	Ticket Number Creation	1	□			□				□
4	SSC sends the ticket to the destination unit	360	3		1			2	1	
	Writing letters	120	□					□		
	Letter printing process	60	□					□		
	Mail delivery	180	□		□				□	
5	Academic units receive letters from SSC	60	1	1			1		1	
	Mail verification	60	□	□			□		□	
6	Legalization Process	340	4	4	1	1	1		5	1
	Waiting for related positions to become available	60							□	
	Sign the letter	10	□	□					□	
	Mail verification	30	□	□			□		□	
	Creation of letter numbers	60	□							□
	Mail Storage	60		□		□			□	
	Send a letter to ssc	120	□	□	□				□	
7	Handover Process	60	3	1	3	1			2	1
	Academic handover to SSC	30	□	□	□				□	
	Submission of identity and signing of documents by students	20	□		□	□				□
	Retrieval of documents by students	10	□		□				□	

The procedure that took place at SSC Telkom Institute of Technology Surabaya is detailed in Table 5. By utilizing process activity mapping (PAM), it is possible to classify and identify the nature of each occurring process. Furthermore, Value Stream Mapping (VSM) can be generated utilizing the outcomes of process activity mapping (PAM). The purpose of Value Stream Mapping (VSM) is to reduce process waste (Tambunan,et al., 2017).

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Improve Stage

The improvement stage involves providing a design solution to analyze the quality of service at SSC Telkom Institute of Technology Surabaya. This design aims to enhance the overall service quality. By analyzing service non-conformities using a Fishbone diagram and process activity mapping (PAM), subsequent RPN calculations are performed to determine the priority order of suggested improvements for failures. Table 7 displays the outcome of FMEA suggestions aimed at enhancing service quality at SSC Telkom Institute of Technology Surabaya.

Table 7 Recommendations for FMEA Improvements

Dimensions	Highest RPN	RPN	Improvement Recommendations
RESPONSIVINESS	Information about completeness of documents is lacking	210	Distributing QR Codes in strategic places
	There is no service blueprint	168	Create a service blueprint
	No Tracking information	150	Create a document tracking system
	There is no work timestamp	144	Create work timestamps for each process
	There are no work instructions	120	Provide training to staff
	There are errors in the document requirements	100	Create information regarding the necessary requirements
	Network/server disruption	96	Provide training to staff so they can anticipate disruptions that occur
	Power outage	80	Provide a generator if there is a possibility of a power outage
	Staff lack discipline and responsibility	60	Give warning
	Staff response is lacking	48	Make criticism and suggestions after receiving service, then evaluate staff performance

Based on the analysis of Table 6, the RPN score has the highest value. As indicated by an RPN score of 210, more information needs to be provided regarding the completeness of the document. Suggested improvements could involve the distribution of QR Codes in strategic locations. These QR Codes would provide information about the necessary document requirements for the service process at the SSC Institute, Telkom Technology Surabaya. By implementing the suggested improvements, there is an expectation of enhanced service quality at SSC Telkom Institute of Technology Surabaya.Move on to the next stage, which involves utilizing Value Stream Mapping (VSM). The objective of VSM is to aid in visualizing and enhancing the entire process, discerning and differentiating between steps that contribute value and those that result in waste. Attachments 3 and 4 include images of Value Stream Mapping (VSM), with attachment 3 showing an unrepaired VSM image and attachment 4 showing a repaired VSM image.

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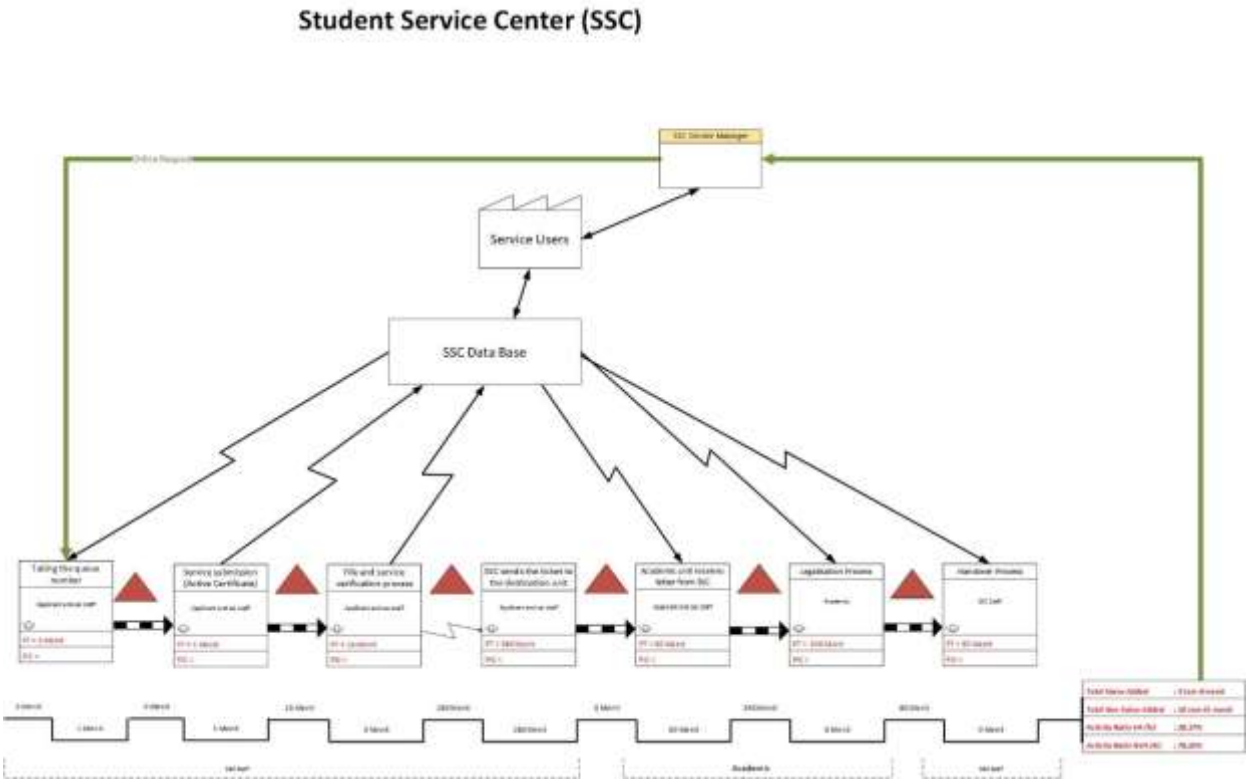
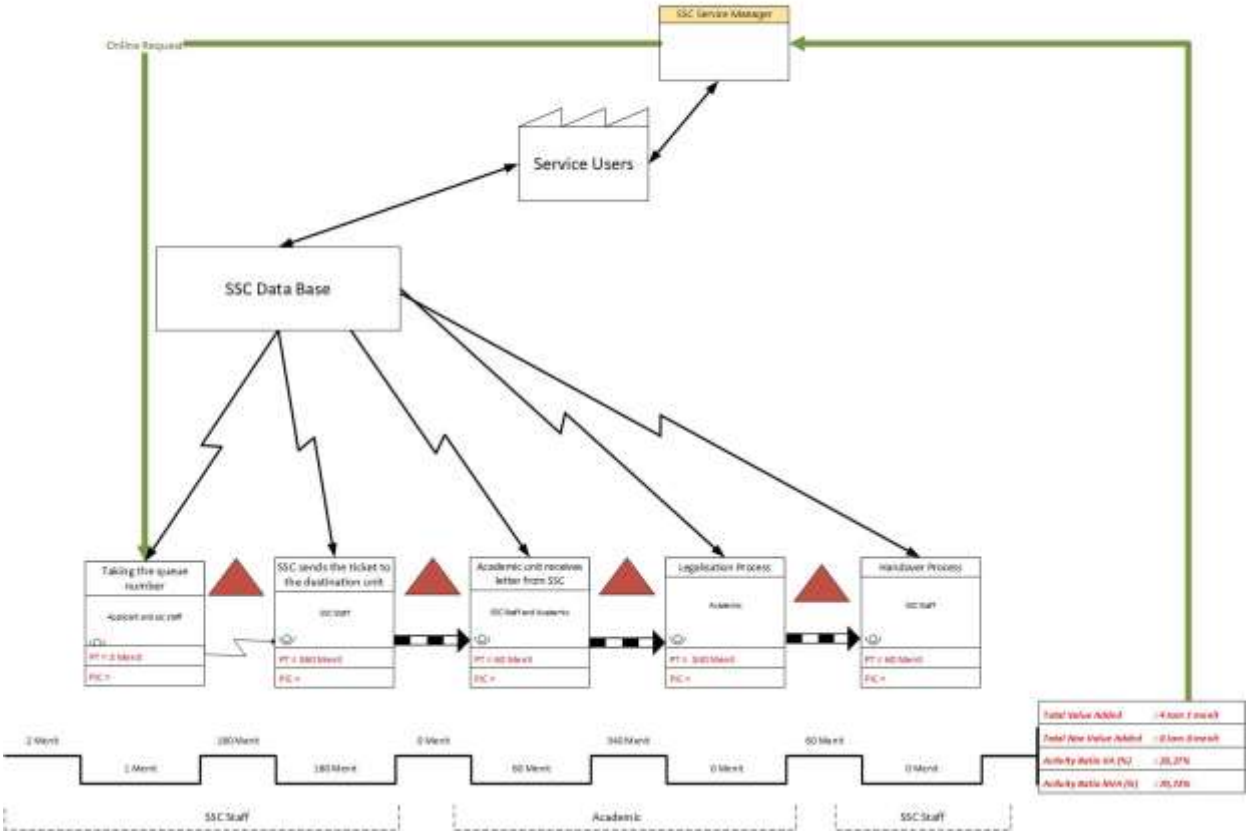


Student Service Center (SSC)



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Control Stage

During this stage of control, the suggestions for improvement are carefully reviewed and supervised. With the enhancements implemented, the aim is to achieve a customer satisfaction level of 6 sigma, ensuring high levels of quality. SSC Telkom Surabaya Institute of Technology plans to survey service users regularly to gauge their satisfaction levels. It marks the initial stage of enhancing and elevating the quality of services offered thus far. In addition, SSC Telkom Institute of Technology Surabaya ensures the maintenance and enhancement of services by strictly adhering to service SOPs. It is achieved through the implementation of checklist methods and continuous staff training, all aimed at enhancing the quality of services provided at SSC Telkom Institute of Technology Surabaya.

Managerial Implications

Managerial implications are the outcomes arising from managerial decisions or actions taken by organisational leaders. Managerial implications cover various aspects including the impact on service performance, service efficiency, finance, and human resources. Based on the results of this study, the following are managerial steps that need to be taken by SSC Telkom Institute of Technology Surabaya.

The first managerial implication is to make service improvements based on the findings in the research. By using the research results to identify areas where SSC services can be improved. For example, if the findings show that there are complaints about long waiting times for files, management can take steps to improve efficiency in the file submission service process.

SSC conducts surveys to SSC service users. Conducting surveys to service users on a regular basis can help to continuously monitor and improve the quality of services provided. SSC management needs to establish an effective mechanism to collect, analyse and respond to surveys from students and staff.
SSC conducts continuous evaluation of the implementation of improvement efforts that have been made. Management needs to continuously monitor the performance of SSC services and make adjustments to ensure long-term success. By implementing these managerial efforts, SSC Institut Teknologi Telkom Surabaya can improve their service quality and better fulfil the needs of students. Based on previous literature, continuous evaluation can be done with 2 periods for 1 year in order to get optimal results.

DISCUSSION

This study employs the Lean Six Sigma methodology to address the issues encountered in SSC by implementing the DMAIC technique. The DMAIC technique reveals the presence of a discrepancy, with the highest discrepancy being in Responsiveness, having a discrepancy value of -1.201. The measuring method encompasses the average level of actuality, average level of anticipation, GAP value, Defect Per Million Opportunity (DPMO), and sigma value level. The objective of this study is to attain a satisfaction score of 5, which signifies a high level of contentment with the quality. The respondents' answers were collected using a Likert scale ranging from 1 (indicating dissatisfaction) to 5 (indicating high satisfaction).

During the measurement stage for 15 attributes of service quality dimensions at the SSC Telkom Institute of Technology Surabaya, it was found that the current performance is expected to be at a level of 2.07 sigma, with a DPMO value of 289,686. Out of 1,000,000 services given, about 289,686 were found to be non-compliant with processes. It has the potential to result in discontent among service users. The subsequent phase involves scrutinizing the underlying source of the issue, which is believed to be the primary element, utilizing the Fishbone diagram analysis tool (cause-effect). The purpose of this fishbone diagram is to facilitate the identification of a problem, which will then inform the implementation of appropriate corrective measures. According to the FMEA technique, the suggestion table shows that the highest Risk Priority Number (RPN) value is 210, indicating a need for more information regarding document completeness. Once the RPN computation is completed, the resulting RPN values are rated according to their respective risk levels. Next, it is necessary to propose recommendations for enhancing the identified failures, which have been prioritized.

The improvement stage involves delivering a design solution to examine and enhance the quality of service at SSC Telkom Institute of Technology Surabaya. The reasons for service non-conformities are thoroughly examined using a Fishbone diagram and process activity mapping (PAM). The Risk

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Priority Number (RPN) is then produced to determine the failures' severity and prioritize improvement areas. The RPN score of 210 indicates that there is a deficiency in the completeness of the document. Suggested enhancements include the strategic distribution of QR Codes to convey information about the necessary document requirements during the SSC Telkom Institute of Technology Surabaya service process. Subsequently, the subsequent step involves the utilization of Value Stream Mapping (VSM). VSM aims to facilitate the visualization and enhancement of the entire process, discerning and differentiating between processes that contribute value and those that result in inefficiency.

CONCLUSION

According to the research findings, the quality of service provided by SSC Telkom Institute of Technology Surabaya has yet to be optimal. This conclusion is based on the results obtained from the collection, data processing, and discussion analysis stages. An evaluation was conducted to enhance service performance, utilizing the Servqual dimensions and the Lean Six Sigma method, with active involvement from service users. Based on an average of 15 DPMO value attributes, the level value is DPMO 289,686. It indicates that there are approximately 289,686 defects in every one million opportunities. With a sigma value of 2.07 sigma, it is evident that there are around 2.07 standard deviations between the process average value and the specification limit in the production process.Nevertheless, the results indicate that the DPMO value and sigma value have yet to reach the desired target of 6 Sigma. The largest negative gap is identified in the Responsiveness dimension, with a Gap value of -1.201. It suggests that there needs to be more clarity between the expectations of service users and the actual service provided. Therefore, it is crucial to enhance service performance in order to meet the expectations of service users. The Fishbone diagram identifies various factors that can contribute to defects, including human, method, machine, material, and environmental factors. One of the reasons for the high defect levels is the need for proper documentation regarding the materials used in the process. One possible solution to minimize these defects is to strategically place QR Codes that provide information about the necessary document requirements for the service process at SSC Telkom Institute of Technology Surabaya.

Through the utilization of process activity mapping (PAM), one can effectively determine the duration, nature, and classification of each process, resulting in a total time of 840 minutes. So that PAM can be utilized for Value Stream Mapping (VSM). Results from Value Stream Mapping (VSM) were obtained both before and after improvements were implemented. Prior to the repairs, the cumulative Non Value Added time amounted to 10 hours and 31 minutes, while the cumulative Value Added time stood at 4 hours and 8 minutes. Following the enhancements, the overall time spent on non-value-added tasks amounted to 10 hours and 10 minutes, while the time dedicated to value-added activities was 4 hours and 1 minute. Having successfully decreased the Non Value Added ratio by 0.10% and the Value Added ratio by 0.10%. One of the factors contributing to the high number of Value Added and Non Value Added in the file and service verification process.

Through the application of the Lean Six Sigma method, it is evident that enhancements are necessary to effectively communicate the document requirements for the service process at SSC Telkom Institute of Technology Surabaya. One potential solution is the strategic placement of QR Codes in key locations. QR Codes are strategically placed to offer information on the necessary document requirements for service processes at SSC Telkom Institute of Technology Surabaya. This implementation has the potential to significantly decrease the total Non Value Added time by 21 minutes and the total Value Added time by 7 minutes. Additionally, it can lead to a reduction of 0.10% in the Non Value Added ratio and a 0.10% decrease in the Value Added ratio.

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