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Key success factors for lean six sigma implementation on Light Rail Transit Station construction project

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ABSTRACT

Transportation is essentially designed to meet the requirements of the movement or movement of a person or an item from one place to another. Transportation has an important role and strategy in achieving goals, including recognizing that transportation is a method of facilitating the wheels of the economy and strengthening unity and integrity in national development. Transportation has an important role and strategy in achieving goals, including recognizing that transportation is a method of facilitating the wheels of the economy and strengthening unity and integrity in national development. In the implementation of the LRT Station construction project, good the timeliness, cost, and quality of a project's overall completion are all influenced by scheduling and quality control. Project delays are common in the process of implementing construction projects. This as a result, the quality is low and does not meet technical criteria. At long last, it caused a project's failure. This study analyzes the key success factor for lean six sigma implementation on Light Rail Transit Station Construction Project. The conclusion of this study is that there is a significant key success factor for lean six sigma implementation on Light Rail Transit Station Construction Project. Based on the outcomes, of the study, ten (10) factors that affect cost performance using Lean Six Sigma include: cost reduction, evaluating quality, ceiling, productivity, waste management, lack of leadership understanding of the project, drawing, design changes, defect rate in work process, variability reduction. The control phase is carried out by the coordinator each division to reduce or eliminate errors in construction application. Control work is carried out regularly and in an organized manner.

ABSTRAK

Transportasi pada hakikatnya dimaksudkan untuk memenuhi kebutuhan memindahkan atau memindahkan seseorang atau benda dari satu tempat ke tempat lain. Transportasi memiliki peran dan strategi penting untuk mencapai tujuan, termasuk dalam pembangunan negara. Dalam pelaksanaan proyek pembangunan Stasiun LRT, baik ketepatan waktu, biaya, dan kualitas penyelesaian suatu proyek secara keseluruhan dipengaruhi oleh penjadwalan dan pengendalian mutu. Keterlambatan proyek sering terjadi dalam proses pelaksanaan proyek konstruksi. Akibatnya, kualitasnya rendah dan tidak memenuhi kriteria teknis. Akhirnya, itu menyebabkan kerugian proyek. Studi ini menganalisis faktor kunci sukses dalam proyek Lean Six Sigma di LRT. Kesimpulan dari penelitian ini adalah terdapat key success factor yang signifikan dari Lean Six Sigma pada stasiun LRT. Hasil penelitian mengungkapkan 10 faktor mempengaruhi kinerja biaya Lean Six Sigma meliputi: pengurangan biaya, evaluasi kualitas, plafon, produktivitas, pengelolaan limbah, Kurangnya pemahaman kepemimpinan proyek, gambar, perubahan desain, tingkat cacat dalam proses kerja, dan pengurangan variabilitas. Tahap pengendalian dilakukan oleh koordinator masing-masing divisi untuk mengurangi atau menghilangkan kesalahan dalam aplikasi konstruksi. Pekerjaan pengendalian dilakukan secara teratur dan terorganisir.

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1. Introduction

Transportation is essential to fulfilling the needs of the movement or movement of a person or an item from one place to another. Transportation has an important role and strategy in achieving goals, including in recognizing that transportation is a means of national development to facilitate The economy's wheels strengthen unity and integrity, and they have an impact on practically every element of life. The increasing public need for the movement and movement of goods must be balanced with the fulfillment of appropriate needs by providing strategies, planning, and management of various aspects of transportation such as facilities and infrastructure that can directly serve the community. Many strategies have been tried and implemented by the government to answer the need for transportation. Some of them are MRT, BRT, ERP, LRT, Toll, and others. But especially in this era, where the community does not only need the provision of mass transportation infrastructure but also relates to the quality of infrastructure [1].

The total number of trips to Jabodetabek in 2015 was recorded at a total of 47.5 million journeys made every day. Of the 50 journeys, 50% travel Bodetabek-Jakarta is the distance between Bodetabek and Jakarta. Only 40% of the time is spent traveling within Jakarta. The modal The majority of Jabodetabek's entire mobility is dominated by motorcycles at 75%, private automobiles at 23%, and 2% by vehicles. The quality referred to here is how the facilities not only deliver passengers to their destination but also from the travel time and comfort felt by passengers (efficiently and effectively) in carrying out their movements on population data using vehicles [1].

One of the facilities that can be considered in meeting the needs of public transportation in terms of travel quality is the Light Rail Transit (LRT). Light Rail Transit (LRT) is one of the rail-based mass transportation facilities in mass transportation. This LRT facility is frequently used in many countries throughout the world because it is regarded as one of the best means for the government, especially the Republic of Indonesia's Ministry of Transportation which is aggressively developing LRT as a type of mass transportation that is projected to increase quality in a variety of areas (transportation, urban planning, economy, and infrastructure, among others), particularly in the nation's capital city, Jakarta.

In the implementation of Station LRT construction projects, planning, and good quality control play a significant role in punctuality, cost, and overall project completion quality. In the building project execution process, delays are common. It results in poor a defect in quality following the technical requirements In the end, it results in a project's failure. There are a few factors as to why project delays happen, such in the form of internal variables, external forces, weather disruptions, and image changes. Failure factors for the quality of a project can be seen in Figure 1. Below, where the biggest cause of quality failure is poor communication between related parties in a project, which is about 57%. Project management is considered good if these 3 goals are achieved. In terms of efficiency, what is meant is the appropriate use of resources and the selection of sub-activities. This includes amount, types, the use of other effective sources, and the use of resources and activities covering quality, cost, and time. The factors that influence the success of a project are project factors, project procedures, project management, human factors, and external environmental factor [2]. The three most crucial requirements for project development are cost, quality, and time. To control time, quality, and work value that control waste, Combining lean and six sigma is known as lean six sigma. This is also a corporate mindset, as well as a structured and systematic technique for identifying and removing non-value operations through continuous improvement. improvement of productivity. The ultimate goal is to reach the Six Sigma level.

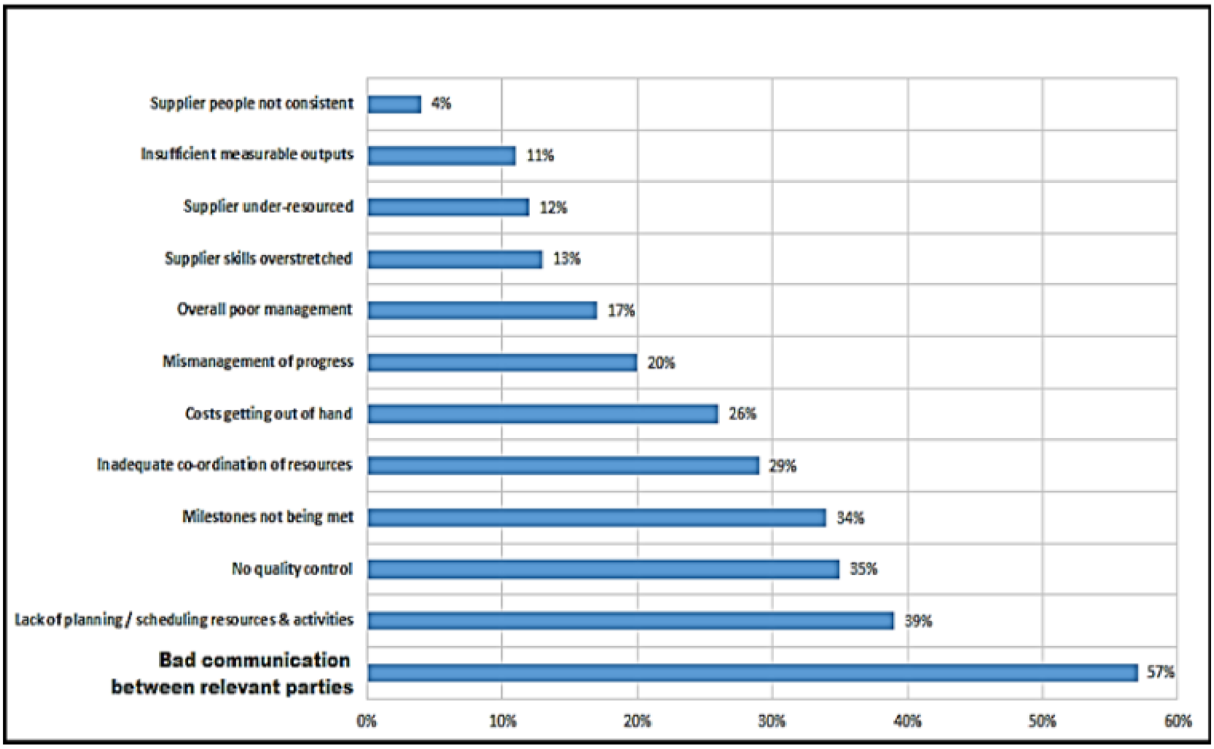

Figure 1. Major causes of project failure.

1.1. Lean Six Sigma

Lean six sigma is a systemic approach to identifying and eliminating waste or things that have no worth added by using radical continuous improvement to achieve six sigma performance levels [3]. Combining lean with six sigma, lean six sigma is a method for business that identifies and eliminates waste or non-value-added operations through radical continuous improvement to reach six sigma levels by distributing products and information using systems pull from pursuing excellence and perfection in the form of producing for both internal and external clients only 3.4 defective products with relation to a million opportunities or production [4].

There are 0.002 defects per million or 2 defects per billion when using six sigma. Motorola's idea of 6 sigma, on the other hand, "allows for an average shift of 1.5 sigma." Motorola's six sigma number, which likewise reflects a breakdown rate not exceeding 3.4 per million, therefore, assumes an acceptable shift of 1.5 sigma. A process quality level between 4 and 5 sigma is implied by a value of 3.4 faults per million in a centralized process. This is the idea that Motorola introduced and made popular, subsequently becoming known as Six Sigma [5].

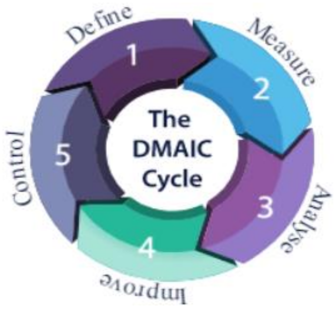

Figure 2. Cycle of Lean Six Sigma.

In Figure 2, the Lean Six Sigma cycle uses statistical tools to identify several vital factors. The basic principles of Lean Six Sigma are as follows:

- Identify product value (goods and/or services) based on customer perspective, where customers want superior quality products (goods and/or services) at competitive prices and on schedule.
- Identification of For each product (goods and/or services), value flow process mapping (mapping processes on value flow) should be done.
- Remove non-value-added waste from every step of the process value chain.
- Organizing so that information Utilizing the Pull system, materials and products move through the value flow process easily and effectively.
- Constantly looking for improved instruments and methods for achieving excellence and ongoing development. The most factor responsible for improving process quality and generating profits consists of five stages known as DMAIC (defining, measuring, analyzing, improving, controlling).

1.2. Key Success Factors

Consider the Oxford Dictionaries' definition of success: Success is defined as the attainment of a goal or objective; success is defined as the completion of a goal or goal. Tuman (1986) defines "project success" as "having everything turn out as expected: anticipating all project requirements and having sufficient resources promptly," defining "project success" as "getting everything as expected, fulfilling all project requirements, and having sufficient resources to meet the requirements following the time specified" in a proceeding at the Project Management Institute seminar in Montreal, Canada [6].

While D. Ronald Daniel of McKinsey & Company originally produced or released the definition of success characteristics in 1961. A management term describing a component that is required for an organization or project to fulfill its objectives is a critical success factor (CSF). Key Success Factors (KSF) and Key Result Areas (KRA) are alternate terms (KSF) [6]. It was then further developed into the definition of Critical Success Factors by John F. Rockart between 1979 and 1981 and published in the Harvard Business Review. Rockart stated that defining those few favorable activities results is necessary for a particular manager to reach his or her goals, and defining several activities or activities that can provide the desired results is, of course, requires special management to achieve the desired goals. where James A. Johnson and Michael Friesen used it in 1995 in a variety of industries, including the health sector [6].

In this case, researchers use program assistance data analysis with SPSS (Statistical Products and Solution Services). This technique is used to gauge how closely all independent variables and X (independent) characteristics are related. of Lean Six Sigma in the LRT Station Project with the dependent variable / Y (dependent) cost performance improvement. A measurement is said to be reliable or consistent if the results of these measurements can produce similar results if used again under the same circumstances [7].

2. Research Methodology

The research method is the basis of the scientific method to obtain correct data with the aim of being discoveries so that the results can be used to understand, solve and solve problems. This study employs quantitative descriptive methods. A descriptive analysis method describes the data as it has been collected without trying to draw generalizations or conclusions that apply to the entire population. While Utilizing research equipment for data collecting and quantitative or statistical data processing with the goal of testing prepared hypotheses, quantitative research is a research approach founded on the positivist ideology that is used to analyze certain populations or groups [8]. The research strategy can be seen in Figure 3. In carrying out this research the researcher followed the rules made in the form of a research flow, so that there were no deviations in the research process. Statistical Product and Service Solutions (SPSS) is a technique for identifying the variables that have the greatest impact on the study object. Additionally, the results of the questionnaire are input into statistical calculations for this analysis approach, which will then be processed into influential factors. SPSS determines the most significant factor using a weighted ranking system value given to the respondent following completion of the questionnaire. There independent variables and dependent variables are the two types of variables used in this study. In the Independent Variables, there are LRT Station Work (X1), Lean Six Sigma Implementation (X2). However, cost performance (Y1) are dependent variables. The data processing stage using SPSS can be seen in Figure 4.

Processing using SPSS and finding things, and influencing factors. In this discussion, researchers will explain the factors that affect cost performance at LRT stations based on Lean Six Sigma. In determining the factors that affect the object of research, the author uses the average statistical analysis method. Statistical calculations process this analysis method using the questionnaire's results as input, which will then be transformed into influencing variables. The average method determines who has the most influence factor with a system of rankings based on the weighted score given from the respondents following completion of the questionnaire. The average method is operated using the Microsoft Excel 2016 while the outcomes of the application program average analysis will be conducted using a variety of test validity, reliability, regression equations, and hypothesis testing H1 and H0 [9].

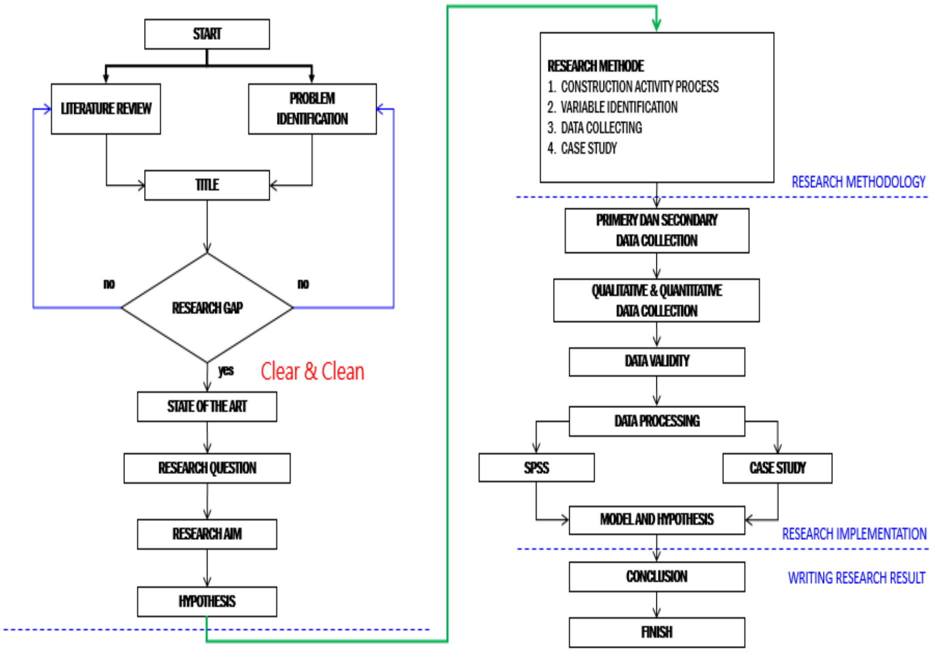

Figure 3. Research flowchart.

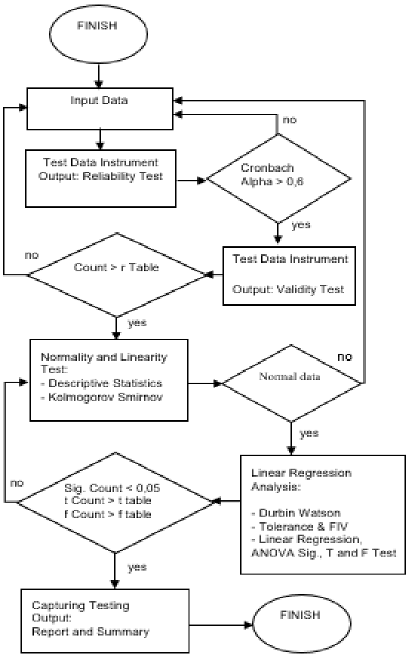

Figure 4. SPSS flowchart [11]**.**

Figure 3 shows the stages and results of the average statistical analysis in this study. The data that must be input is data generated from the preparation of questionnaires obtained from literature studies (international journals, e-books, national journals and related books) to obtain key success factors or critical points of discussion material used as components such a survey questionnaire variables Main Factor and sub factor. Next, they are collected in the form of a question list to be asked of the respondents who have been calculated using the Slovin method. There are three variables and three main factors in the research: variable, main factor, and sub factor.

3. Result and Analysis

In Table 1 shows a list of key success factors obtained from literature study and expert validation. The minimum number of respondents answering the required questionnaire is a limitation in collecting the required results [9]. According to [9] respondent's needs can be obtained using (1) and (2). Based on the p-value obtained the value of Z, based on the table Z normal distribution, Z = 1.96. Then the minimum needs of respondents are: m = 384.16, and n = 48.26. Each variable will be tested using the SPSS tool, namely the item-total value that is corrected for correlation (calculated validity). If the value is more than 0.2027, then it can be declared valid and the value of Cronbach's Alpha (calculated reliability). If the value is more than 0.600, it can be stated realistically. Table 2 and Table 3 show the results of data grouping which are both realistic and valid. Regression is used to estimate the value of the dependent variable from the independent variable value [10]. To determine the effect of the independent variables in this study, namely the LRT Station

(X1), Lean Six Sigma (X2), on the dependent variable, namely Cost (Y1) multiple linear regression was used because the independent variable in this study was more than one variable [10]. The results are clearly visible from Table 4.

Table 1. Key success factor.

Variable	Main Factor	No	Sub Factor	Reference
Station LRT Cawang	Tender Document	X1.01	Technical specifications	[12]
		X1.02	Bill Of Quatity	[12]
		X1.03	Drawing	[12]
		X1.04	Time Schedule	[13]
	Work	X1.05	Steel Structure	[14]
		X1.06	Wall	[13]
		X1.07	Ceiling	[13]
		X1.08	Floor	[13]
		X1.09	Signage	[13]
Lean Six Sigma	Define	X2.01	Cost reduction	[15]
		X2.02	Waste reduction	[15]
		X2.03	Product quality	[15]
		X2.04	Productivity	[15]
		X2.05	Flexibility	[15]
	Measure	X2.06	Material	[16]
		X2.07	Design changes	[16]
		X2.08	Communication	[16]
		X2.09	Waste management	[16]
	Analyze	X2.10	Knowledge of the project	[17]
		X2.11	Aligning the agendas involved	[17]
		X2.12	Lack of leadership understanding of the project	[17]
		X2.13	Availability of experts	[17]
		X2.14	Availability of experts according to their fields	[17]
	Process	X2.15	Supported operating system	[18]
		X2.16	App update	[18]
		X2.17	Supported PC devices	[18]
	Improve	X2.18	Defect rate in work process	[19]
		X2.19	Evaluating quality	[19]
		X.20	Variability reduction	[19]
Cost	Cost	Y.01	Not good design	[20]
		Y.02	Not enough contract duration	[20]
		Y.03	Lack of experience	[20]
		Y.04	Late delivery of materials and tools	[20]
		Y.05	Staff relationship with workforce	[20]
		Y.06	Drawing approval process	[20]
		Y. 07	Planning and Scheduling	[20]
		Y.08	Management and supervision	[20]
		Y.09	Method suitability	[20]

The preparation of the instrument in this study was obtained from the identification of the sub-factors as in the table above, then the sub-factors were arranged into the subject of the research the instrument is a questionnaire in the form of question items, respondents will answer by choosing the answers that have been provided with a scale of 1-6, from various answer criteria. The scale is designed in such a way that a scale of 1 is the least expected answer choice (unexpected answer) and a scale of 6 is the most expected answer choice (expected answer). The minimum Determined is the number of respondents by the following equation.

$$n = \frac{m}{1 + \left[\frac{m-1}{N}\right]}, \text{ and} \quad (1)$$

Notes:

Z = 1.96 (Values from the distribution table Z)
P = 0.50 (Degree of variation between population elements)
Ɛ = 0.05 (Limited population sample value)
N = 38.0 (Total number of sub factors)

$$m = \frac{z^2 P(1-P)}{\varepsilon^2}, \text{ so} \quad (2)$$

m = 384.16, and
n = 34.671.

Then obtained the minimum number of respondents as many as 35 people. With a total of 60 questionnaires distributed, there were 5 questionnaires which were not received back, while 55 questionnaires were accepted again. The following is a diagram of the distribution of the response data from this research questionnaire.

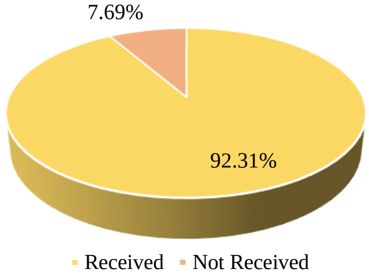

Figure 5. Questionnaire questionnaire delivered.

From a total of 55 respondents in this study, among others came from various professional backgrounds, namely; Board of Directors as many as 6 people; Site Engineer or Field Executor as many as 14 people; 10 consultants, both planning and supervisory elements; Site Manager or Field Manager as many as 17 people and Project Manager or Project Manager as many as 10 people. The following is a diagram of the distribution of respondents' professional data.

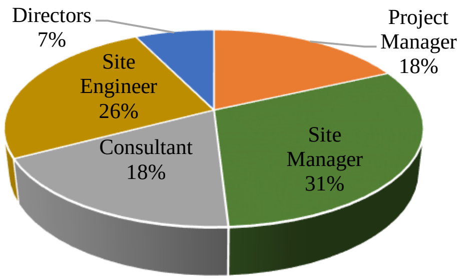

Figure 6. Respondent's profession.

Among the existing building construction projects, in this study there were 6 respondents who had worked on residential building projects, 13 people in commercial buildings, 11 people in office buildings and 25 people who had worked on public buildings.

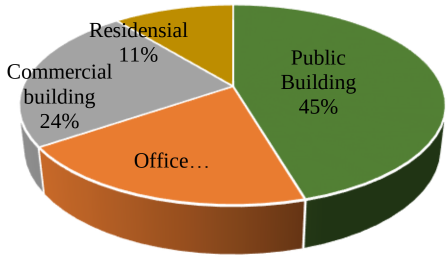

Figure 7. Respondents' past projects.

3.1. Reliability Test

The degree to which the outcomes of a test are considered reliable a study can be trusted [8], and the data reliability test is an instrument used to assess the degree of accuracy that the data collection tool actually demonstrates, accuracy, or stability. An instrument that works well is an instrument which, when utilized repeatedly, will produce the same data. A good instrument will not tend to lead respondents to choose certain answers. The results of the reliability test of the variable are if it is said to be trustworthy provides a Cronbach's Alpha coefficient if it is said to be trustworthy than 0.6 (as the standard value for generally accepted reliability of a research instrument). The complete reliability test results are presented in the following Table 2.

Table 2. Result of reliability.

Variables	Cronbach's Alpha	Comparative Value	Description
Station LRT Cawang	0.717	0.600	Reliable
Lean Six Sigma	0.870	0.600	Reliable
Cost	0.746	0.600	Reliable

It can be seen that the X1, X2 and Y factors that are included in the SPSS all have a Cronbach's Alpha value > from the minimum requirement of 0.6 so the above is Reliable.

3.2. Validity Test

A validity test is a test that determines how reliable or valid a measurement tool [8]. A validity test is employed to quantify how valid the instrument can provide information from the properly investigated variables. The validity test was carried out by inputting each of the existing data according to the variable factors into the SPSS worksheet. Based on the table of r values, the minimum value of r calculated is 0.244 and the value of sig. (significance) all respondents must be less than (<) 0.05 so that the data is declared valid. The table below shows the results of the X1, X2, and Y factor data tests which are valid data.

Table 3. Result of validity.

Variable	Cronbach's Alpha	Comparative Value	Description
Station LRT Cawang	0.717	0.3202	Valid
Lean Six Sigma	0.870	0.3202	Valid
Cost	0.746	0.3202	Valid

3.3. Normality Test

3.3.1. Outlier Test (looking for abnormal data)

An outlier is a data observation circumstance with distinct features that very contrasting other data [21]. If there are outliers, the data can be excluded from the analysis, in SPSS the data is indicated by a crescent or star symbol. The figure below shows the results of the variable outlier test from this study where there is no crescent or star symbol in the diagram, then the data can be declared normal.

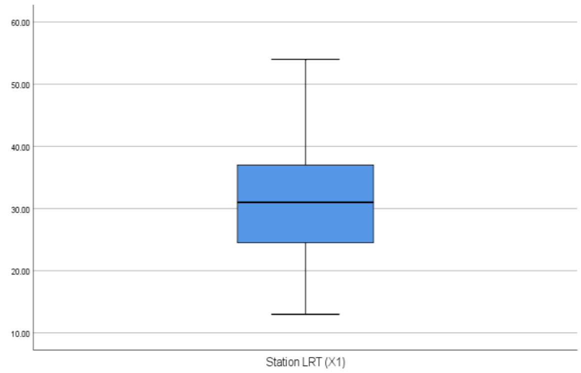

Figure 8. LRT station data check.

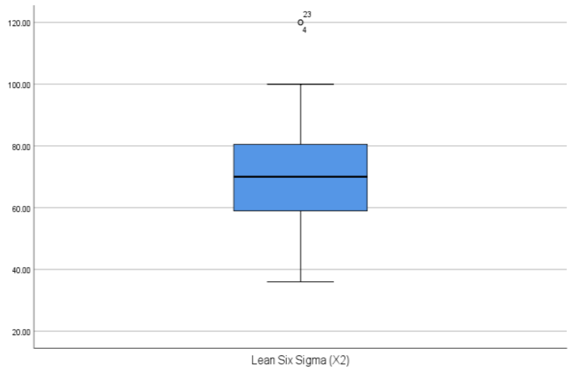

Figure 9. Lean Six Sigma data check.

3.3.2. Kolmogorov Smirnov Test

The significance value of Kolmogorov Smirnov is above 0.05. In other words, if it is greater than 0.05, the value of Kolmogorov-Smirnov is not significant, and the residuals are generally prevalent. Based upon the results of the normality test through SPSS, the importance score for X1 is 0.904 and X2 is 0.989, both of which are greater than (>) 0.05, so It can be determined that the information is reliable are generally prevalent.

Table 3. Kolmogorov-Sminorv test.

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		55
Normal Parameters[a,b]	Mean	0.0000000
	Std. Deviation	4.82777032
Most Extreme Differences	Absolute	0.081
	Positive	0.043
	Negative	-0.081
Test Statistic		0.081
Asymp. Sig. (2-tailed)		0.200[c,d]

Note: a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

3.4. Linear Regression Analysis

3.4.1. Multicollinearity Test

The goal of the multicollinearity test is to determine whether there is a strong or perfect correlation between the independent variables in the regression model.

Table 4. Multicollinearity test results.

Varaible	Collinearity Tolerance	Statistic VIF
Station LRT Cawang	0.454	2.202
Lean Six Sigma	0.454.	2.202

If the Tolerance value is greater than > 0.10, it denotes the absence of multicollinearity. And if If the VIF score is less than 10.00, multicollinearity is present does not occur, then based on the table of multicollinearity test results above, it is obtained:

- The value of the X1 variable Tolerance: 0.454 > 0.10 means that is not multicollinearity.
- The value of the X2 variable Tolerance: 0.525 > 0.10 means that is not multicollinearity.
- The value of VIF variable X1: 2.202 < 10.00 means that is not multicollinearity.
- The value of VIF variable X2: 2.202 < 10.00 means that is not multicollinearity.

3.4.2. T-test

To determine what the variable X's impact is partially on Y (T-test).

Table 5. T-test

Coefficients[a]						
		UC		SC		
Model		B	SE	B	t	Sig.
	(Constant)	10.778	2.680		4.022	0.000
1	Station LRT Cawang	0.172	0.053	0.383	3.229	0.002
	Lean Six Sigma	0.439	0.105	0.493	4.164	0.000

Dependent variable: Cost

The t-test or linear regression The partial test is used to evaluate the individual effects of each independent variable on the dependent variable. the t-test by comparing results as a foundation for decisions t_{count} with t_{table}:

- Variable X1 (LRT Station) has a positive and significant effect on Y1 this is illustrated by sig (X1) 0.00 < 0.05, the coordinate value of t table = t (a/2; n-k-1) = t (0.55/2; 38- 2-1) = t (0.025; 35), at t_{table} = 1.690; t_{count} = 3.229, t_{count} = 3.229 > 1.690, then H0 is rejected and H1 is accepted.
- Variable X2 (Lean Six Sigma) has a positive and significant effect on Y1 this is illustrated by sig (X1) 0.026 < 0.05, the coordinate value of t_{table} = t (a/2; n-k-1) = t (0.55/2; 38 -2-1) = t (0.025; 35), at t_{table} = 1.690; t_{count} = 4.164, t_{count} = 4.164 > 1.690, then H0 is rejected and H2 is accepted.

Plug the coefficients of numbers from column B into the equation:

$$Y1 = 10.778 + 0.172\ X1 + 0.439\ X2$$

3.4.3. F-Test

The F test is used to determine how X affects Y.

Table 6. F-test.

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	2538.311	2	1269.156	52.436	.000b
Residual	1258.598	52	24.204		
Total	3796.909	54			

The test results are concluded based on the values below:

- As shown by sig, variables X1 and X2 have a positive and significant impact on Y1. (F) $0.000^b < 0.05$
- Coordinate value of f_{table} = f (k; n-k) = t (3; 55-3) = t (3; 52). See in table f that $f_{table} = 2.78$; $f_{count} = 52.436$

The calculated f-value = 52.436 > 2.70, then H0 is rejected and Ha is accepted. Based on the questionnaire data that has been tested, it can be obtained the factors that most influence the cost performance of the Lean Six Sigma project on the LRT station based on the Mean and Ranking, as shown in the Table 7 below.

Table 7. Mean and ranking.

Rank	Number	Sub Factor	Mean	Sub Factor
1	10	X2.01	3.7455	Cost reduction
2	28	X2.19	3.6909	Evaluating quality
3	07	X1.07	3.6182	Ceiling
4	14	X2.04	3.6000	Productivity
5	18	X2.09	3.6000	Waste management
6	21	X2.12	3.5818	Lack of leadership understanding of the project
7	03	X1.03	3.5818	Drawing
8	16	X2.07	3.5818	Design changes
9	27	X2.18	3.5818	Defect rate in work process
10	29	X2.20	3.5818	Variability reduction

The initial stage of the questionnaire aims to validate variables causing delays at PT.X at the time of construction implementation stage is obtained from several literatures studies. Experts were asked to fill out a questionnaire given in the column provided with relevant/irrelevant answers, the results of this questionnaire are also used as basis for narrowing down type variables in case of research so that the results of the main questionnaire become more accurate, and in the future, it will be easier to specify in this section, which fix will be done to avoid delays. Respondent profile from the initial stages of the questionnaire are people who experienced and actively participate in PT. X. The results of data collection in the first stage of the questionnaire addressed to the expert concluded that there are 38 variables declared relevant to the variables causing the change project costs at PT. X.

4. Conclusion

Transportation is essentially designed to meet the requirements of the movement or movement of a person or an item from one place to another. Transportation has an important role and strategy to achieve goals, including recognizing that transportation is a method of facilitating the wheels of the economy, strengthen unity and integrity in national development and affect Almost every element of life is covered. The increasing needs of the community for the movement and movement of goods must be balanced with the fulfillment of appropriate needs by providing strategies, planning and management of various aspects of transportation such as facilities and infrastructure that can actually directly serve the community.

In the implementation of the LRT Station construction project, good The timeliness, cost, and quality of a project's overall completion are all influenced by scheduling and quality control. Project delays are common in the process of implementing construction projects. This as a result, the quality is low and does not meet technical criteria. At long last, it caused a project's failure. This study will analyze the key success key success factor for lean six sigma implementation on Light Rail Transit Station Construction Project.

The conclusion of this study is that there is a significant key success factor for lean six sigma implementation on Light Rail Transit Station Construction Project. Based on the outcomes, of the study, ten (10) factors that affect cost performance using Lean Six Sigma include: cost reduction, evaluating quality, ceiling, productivity, waste management, lack of leadership understanding of the project, drawing, design changes, defect rate in work process, and variability reduction. The control phase is carried out by the coordinator each division to reduce or eliminate errors in construction application. Control work is carried out regularly and in an organized manner.

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