TEST Engineering & Management

May – June 2020
ISSN: 0193-4120 Page No. 1483 - 1497

Application of Deming Management Method to Improve Quality Management Performance Telecommunication Projects in Indonesia

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Article Info
Volume 83
Page Number: 1483 - 1497
Publication Issue:
May - June 2020

Article History
Article Received*: 11August 2019*
Revised*: 18November 2019*
Accepted*: 23January 2020*
Publication*: 10 May2020*

Abstract:

Quality management ideas and theories from W. Edward Deming have been implemented in the world, especially in the manufacturing and service industries. The focus of this research is to examine the Deming Management Method by including the intervening of the measuring indicators in the telecommunication project with case study in Indonesia.

In this research, we will analyze the effect of the measured indicators and the correlations of the hypothesized relationships that are all positively related. From the formulation of the problem will be analyzed what needs to be evaluated from the relationship between the Deming Management Method and improving quality management, and the Deming Management Method application strategy that can improve the quality management of telecommunications projects in Indonesia.

Keywords: *Deming Management Method, telecommunication.*

I. INTRODUCTION

Quality management has received a lot of attention over the past fifty years in the manufacturing and service sectors. However, many of the same ideas are just beginning to be applied to information technology (IT) projects [5]. Project quality management is becoming increasingly important because as a result of the failure to meet project quality requirements and standards which have negative consequences for all project stakeholders.

The objectives of an information technology project can be affected if additional work and repetitive project activities extend the schedule or budget of the information technology project [6]. However, studies published in the information systems literature tend to focus on measuring the quality of services provided by information systems departments to organizations [7]-[8]-[9]-[10], but there is no research focuses on quality management at the project level, namely the actual development of information systems.

Deming argues that by adhering to certain management principles, organizations can improve product quality and at the same time reduce costs. Cost reduction will include reducing waste production, reducing friction and staff litigation while increasing customer loyalty. The key, in Deming's opinion, is to practice constant improvement and imagine a manufacturing process as a smooth whole, not as part of a system consisting of inappropriate parts.

From the background it can be explained that the phenomenon of service quality decline as a failure to meet project quality requirements and standards will have an impact on the decline in the level of satisfaction of all stakeholders to the results of the project, this is caused by not seeing aspects of project quality.

In general, telecommunication projects have project characteristics that are always related to business processes and organizational systems, there are several project structures that will have interdependence, scope is difficult to identify and

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always change, visible changes in process control are carried out but difficult to trace, stakeholders are more difficult to identify, risk is difficult to identify with a large impact, allocated to those who have specialized and always related to each part. From these unique characteristics, quality management in an organizational system is needed so that it will produce good process outcomes.

One of the goals of quality management is that the results of services or services must satisfy actual needs, meaning that if a product or service has the capability to be used, it means meeting the requirements of customer expectations economically. The product or service is in line with customer expectations and provides confidence that the product or service provided has economic value. The project must produce what is required in the exact specifications or what the customer expects. Deming Management Method has the ultimate goal of customer satisfaction in this case is the stakeholders involved or who receive the results of the project, in the process must improve quality so that customer satisfaction targets can be achieved.

The purpose of this study is to identify quality management indicators measured in the Deming Management Method for improving quality management in telecommunication projects in Indonesia today.

Previous research was limited to manufacturing, infrastructure and construction companies, which had not been studied in telecommunications projects in Indonesia. To complement the previous research, this research will be evaluated on a telecommunications project in Indonesia. In addition, there will be an analysis of the relationship between the application of the Deming Management Method to improve the quality management performance.

II. METHODOLOGY

A. Research Strategies

The right research strategy needs to be planned to get research results that are in line with the expectations and objectives of the research itself.

Table I. Research Strategy

Research Strategies	Result
Literature Study	What are the measuring indicators that can be intensified in the Deming Management Method.
Survey	PLS-SEM to analyse the relationship model.
Survey	IPA (Importance-Performance Analysis) to produce a mapping of the Deming Management Method intervention.

B. Research Flow Chart

The following are the stages of the research that the author composed in conducting this research:

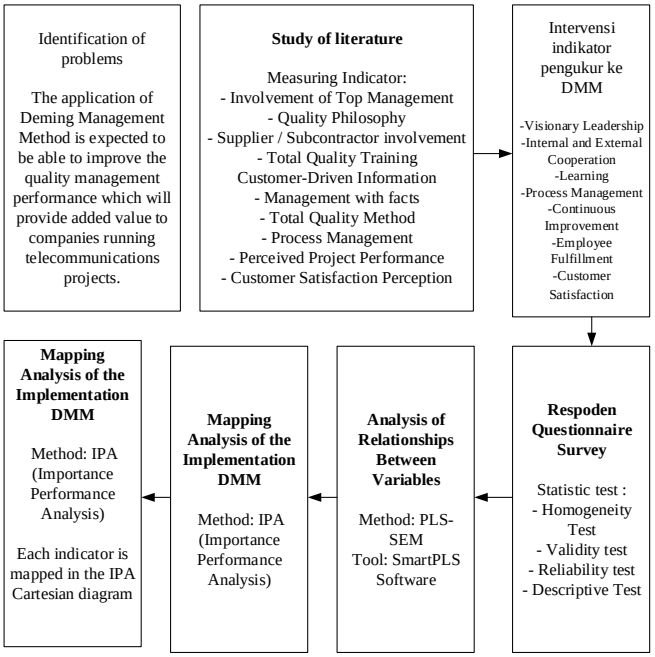

Fig 1. Research Flow Chart

C. Research Variables

According to Douglas and Fredendall [3] and Jack T. Marchewka [5], an indicator that describes the variable Deming management method Anderson, J., Rungtusanathan, M., & Schroeder, R. [1] is described in the following table:

Table II. Variables and Indicators

Variables and Indicators
Top Management Involvement
Top executives of the company where I work bear responsibility for quality performance (X1).
All managers in the company where I work participate in the quality improvement process (X2).
The process of setting goals for quality in my company works comprehensively (X3).
Top management in the company where I work has a goal for quality performance (X4).
Top management in the company where I work applies the importance of quality in relation to cost objectives (X5).
Quality Philosophy
There is a strong commitment in the company where I work for quality at all levels of the organization (X6).
Everyone in the organization in the company where I work is aware of its overall mission (X7).
All members of the organization where I work show concern for the need for quality (X8).
Continuous quality improvement is an important goal of the organization in the company where I work (X9).
The manager at the company I work for tries to plan ahead for changes that might affect performance (X10).
Supplier / Subcontractor Involvement

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Supplier / subcontractor at the company where I work is selected based on quality rather than price (X11).
Suppliers / subcontractors in the company where I work are assessed by a thorough assessment system (X12).
The company where I work provides education for suppliers / subcontractors (X13).
The company I work for offers long-term relationships to suppliers / subcontractors (X14).
Clear specifications are given to suppliers / subcontractors (X15).
Total Quality Training
Quality related training is given to all team members (X16).
Quality-related training is given to managers and other leaders throughout the organization (X17).
Training is given in "Total quality concepts" where the whole organizational philosophy is responsible for quality for all team members (X18).
Training is given in basic statistical techniques (such as histograms and control charts) for all team members (X19).
Top Management in the company where I work is committed to training employees for quality (X20).
Resources are provided for employee training in quality (X21).
Customer Driven Information
Team members know who their customers are (internal or external) (X22).
Team members try to measure the needs of their customers (X23).
The company I work for uses customer requirements as a basis for quality (X24).
The company I work for has more customer focus than competitors (X25).
Management By Fac
Quality data (defects, complaints, results, time, satisfaction, etc.) are available (X26).
Quality data on time (X27).
Quality data areas are used as tools to manage quality (X28).
Quality data is available for team members (X29).
Quality data is available for managers and other leaders (X30).
Quality data is used to evaluate team members and managerial performance (X31).
Total Quality Method
Team members use basic statistical techniques (such as histograms and graphic controls) to study their work processes (X32).
Team members analyze the time needed to get the work done (X33).
Team members keep records and graphs that measure the quality of work displayed in their work area or have access to this information electronically (X34).
Statistical techniques are used to reduce variations in processes (X35).
Total Quality Management procedures (such as brainstorming, cause and effect diagrams, Pareto charts) are used to analyze information for process improvement (X36).
Process Management
A realistic project plan was developed to describe the stages, tasks and resources for estimating schedules and budgets (X37).
Project plans are used to monitor and communicate the status to be planned (X38).
Qualified suppliers / subcontractors are selected and then their progress and performance are tracked by monitoring products and work processes (for example, reviews and acceptance tests) (X39).
Software engineering and management processes are adjusted to suit the current environment and technical needs (X40).
A proactive approach that includes risk identification, risk assessment, and risk mitigation is used to manage risk in all phases (X41).
Continuous Improvement
Team members in the organization try to improve the quality of their work (X42).
Team members in the organization believe that quality improvement is their responsibility (X43).
Team members in the organization analyze their work products to find ways to do a better job (X44).
Best practices are identified, documented, and made available to others in the organization (X45).
Employee Fulfillment
I am proud that the achievement or achievement is able to provide quality solutions (X46).
In general, I enjoy my work (X47).
In general, I find my work challenging (X48).
I like being in the company where I work and for the next 12 months (not including planned / unplanned or retired leave) (X49).
Overall, I have done my job well from last year (X50).
Perceived Performance
Ability to meet schedules (Y1).
Ability to meet the budget (Y2).
Ability to complete work scope or system requirements (Y3).
Perceived Customer Satisfaction
Overall customer satisfaction (Y4).
The perceived value of the work delivered to the customer (Y5).
Potential to work in the future with customers (Y6).

D. Hypotheses

The Deming Management Method allows for the testing of several hypotheses. These hypotheses and their rationale are summarized :

H1: Visionary leadership is positively related to internal and external cooperation

H2: Visionary leadership is positively related to learning

H3: Internal and external cooperation is positively related to process management.

H4: Learning is positively related to process management

H5: Process management is positively related to continuous improvement

H6: Process management is positively related to project team member fulfillment

H7: Continuous improvement is positively related to project performance and customer satisfaction

H8: Project team member fulfillment is positively related to project performance and customer satisfaction.

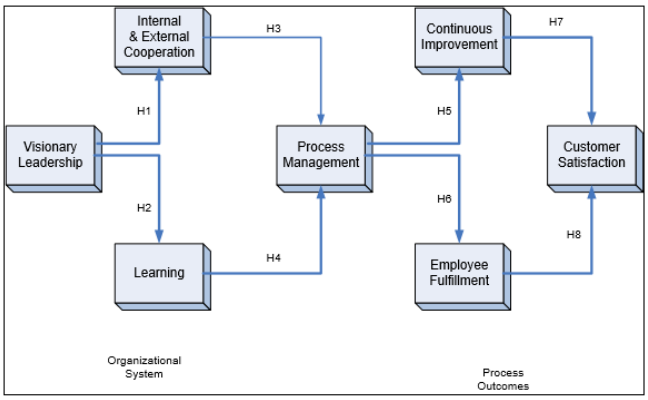

Fig 2. Deming Management Method - Anderson, J., Rungtusanathan, M., & Schroder, R.

III. RESULT AND DISCUSSION

A. Respondent Data Collection

A number of 100 questionnaires distributed to 6 telecommunication service provider companies headquartered in Jakarta, 89 questionnaires was returned, where a response rate of 89% was obtained. A number of 89 returned questionnaires, 4 of them could not be used because the respondents' requirements were not fulfilled, as well as filling in incomplete and incompatible questionnaires, so that in the future 85 questionnaires were obtained which would be processed and used in research.

The following will describe the percentage of respondents based on each category. For gender, male respondents have a percentage of 86% of all respondents, higher than female respondents with a percentage of 14% of all respondents.

Table III. Number of Respondents by Gender

Gender	Number of Respondents
Male	73
Female	12

For ages, it is divided into 6 age groups, namely 21-25 years, 26-30 years, 31-35 years, 36-40 years

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and 41-45 years, and above 45 years. The age of most respondents is in the age group of 26-30 years.

Table IV. Number of Respondents by Age

Age (years)	Number of Respondents
21-25	11
26-30	33
31-35	20
36-40	10
41-45	10
>45	1

For the institution where the respondents work, there are 6 telecommunication service provider companies. The largest number of respondents came from PT. A, PT. D, PT. E and PT. F, a total of 15 respondents, and the smallest number of respondents came from PT. C, a total of 11 respondents.

Table V. Number of Respondents by Work Place

Institution	Number of Respondents
PT. A	15
PT. B	14
PT. C	11
PT. D	15
PT. E	15
PT. F	15

For the position of the respondent, it is divided into 3 groups, namely staff / equivalents, supervisors / equivalents, managers / equivalents / more. Position / staff position / equivalent ranks highest with 37 respondents.

Table VI. Number of Respondents Based on Position / Position

Position	Number of Respondents
Staff / Equivalents	37
Supervisors / Equivalents	33
Managers / Equivalents / More	15

For the old category of respondents working at the institution where they are working now, divided into 3 groups, namely 2-4 years, 5-7 years, and > 7 years. Respondents who have worked for 2-4 years at the institution where they currently work ranks highest at 43 respondents.

Table VII. Number of Respondents by Length of Working at Current Agencies

Length of Work in Current Institutions (years)	Number of respondents
2-4	43
5-7	19
>7	23

Meanwhile, for the final education category, it was divided into 2 groups, namely Bachelor Degree and Master Degree. A total of 77 respondents were Bachelor Degree, and 8 respondents were Master Degree.

Table VIII. Number of Respondents Based on Recent Education

Recent Education	Number of Respondents
Bachelor Degree	77
Master Degree	8

B. Statistics Test

Data from respondents who have been obtained are then tested for homogeneity, validity, and reliability, before later it is used in further research. The following explanation:

B.1 Homogeneity Test

As explained in the previous chapter, a homogeneity test was carried out to determine the understanding of the opinions of the respondents regarding the level of importance and performance of the Deming Management Method for telecommunications projects related to their position, length of work in current institutions, and recent education, in where these three things are used in determining the conditions of respondents. Previously, for each category the group division would be determined and given a numeric code, namely:

Table IX. Group of Respondents for Each Category

Code	Position	Length of Work in Current Institutions (years)	Recent Education
1	Staff / Equivalents	2 - 4	Bachelor Degree
2	Supervisors / Equivalents	5 - 7	Master Degree
3	Managers / Equivalents / More	> 7	

Testing of 2 groups will use the Kolmogorov-Smirnov Test, while testing of 3 or more groups will use the Kruskal-Wallis H Test. The hypothesis used in homogeneity testing is as follows:

Ho = There is no difference in perceptions of respondents with different positions, length of work in current institutions, and recent education

Ha = There are differences in perceptions of respondents with different positions, length of work in current institutions, and recent education

For the Kolmogorov-Smirnov Test, Ho is accepted if the Asymp. Sig. value > level of significant (α) of 0.05, and Ho is rejected if vice versa. For Kruskal-Wallis H Test, Ho is accepted if the Asymp. Sig. value > level of significant (α) of 0.05 and the calculated chi-square value < chi-square table value (for testing on 3 groups, the chi-square value is 5.991 where df = 2). This test will be conducted for the two parts of the questions on the questionnaire, namely the level of importance and level of performance.

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Here are the results of homogeneity testing for the category of position, length of work in current institutions, as well as recent education.

B.1.1 Homogeneity Test Based on Position of Respondents

Because it consists of 3 groups of respondents, Kruskal-Wallis H Test is used for homogeneity based on position. The following are the results of homogeneity tests for the level of importance, where all conditions are met and Ho is accepted (there is no difference in the perception of respondents with different positions):

Table X. Homogeneity Test Results Categories Position of Respondents for Importance Measurement

Position of Respondents					
Importance Measurement					
Variable	df	Kruskal - Wallis H		Asymp. Syg	
X1	2	2,061	Approved	0,357	Approved
X2	2	2,061	Approved	0,357	Approved
X3	2	1,599	Approved	0,449	Approved
X4	2	0,906	Approved	0,636	Approved
X5	2	0,527	Approved	0,769	Approved
X6	2	0,489	Approved	0,783	Approved
X7	2	2,104	Approved	0,349	Approved
X8	2	0,037	Approved	0,982	Approved
X9	2	1,557	Approved	0,459	Approved
X10	2	0,248	Approved	0,884	Approved
X11	2	2,752	Approved	0,253	Approved
X12	2	4,844	Approved	0,089	Approved
X13	2	1,366	Approved	0,505	Approved
X14	2	0,751	Approved	0,687	Approved
X15	2	0,805	Approved	0,669	Approved
X16	2	0,449	Approved	0,799	Approved
X17	2	0,447	Approved	0,8	Approved
X18	2	3,073	Approved	0,215	Approved
X19	2	2,418	Approved	0,298	Approved
X20	2	2,926	Approved	0,232	Approved
X21	2	5,524	Approved	0,063	Approved
X22	2	3,12	Approved	0,21	Approved
X23	2	0,871	Approved	0,647	Approved
X24	2	0,125	Approved	0,94	Approved
X25	2	0,568	Approved	0,753	Approved
X26	2	1,556	Approved	0,459	Approved
X27	2	2,266	Approved	0,322	Approved
X28	2	0,069	Approved	0,966	Approved
X29	2	0,527	Approved	0,769	Approved
X30	2	0,447	Approved	0,8	Approved
X31	2	0,414	Approved	0,813	Approved
X32	2	5,16	Approved	0,076	Approved
X33	2	3,609	Approved	0,165	Approved
X34	2	3,517	Approved	0,172	Approved
X35	2	2,207	Approved	0,332	Approved
X36	2	7,43	Approved	0,024	Approved
X37	2	0,489	Approved	0,783	Approved
X38	2	0,763	Approved	0,683	Approved
X39	2	0,298	Approved	0,862	Approved
X40	2	0,409	Approved	0,815	Approved
X41	2	0,126	Approved	0,939	Approved
X42	2	0,813	Approved	0,666	Approved
X43	2	1,223	Approved	0,543	Approved
X44	2	0,195	Approved	0,907	Approved
X45	2	2,134	Approved	0,344	Approved
X46	2	2,638	Approved	0,267	Approved
X47	2	2,28	Approved	0,32	Approved
X48	2	0,461	Approved	0,794	Approved
X49	2	2,754	Approved	0,252	Approved
X50	2	1,735	Approved	0,42	Approved
Y1	2	1,021	Approved	0,6	Approved
Y2	2	1,573	Approved	0,455	Approved
Y3	2	0,19	Approved	0,909	Approved
Y4	2	5,525	Approved	0,063	Approved
Y5	2	0,022	Approved	0,989	Approved
Y6	2	2,491	Approved	0,288	Approved

Next, a homogeneity test for the level of performance is performed, which uses the same indicator as the measurement of importance. Here are the results of the calculation:

Table XI. Homogeneity Test Results Categories Position of Respondents for Performance Measurement

Position of Respondents					
Performance Measurement					
Variable	df	Kruskal - Wallis H		Asymp. Syg	
X1	2	2,862	Approved	0,239	Approved
X2	2	0,231	Approved	0,891	Approved
X3	2	0,114	Approved	0,944	Approved
X4	2	0,351	Approved	0,839	Approved
X5	2	0,032	Approved	0,984	Approved
X6	2	0,248	Approved	0,884	Approved
X7	2	0,307	Approved	0,858	Approved
X8	2	1,18	Approved	0,554	Approved
X9	2	0,489	Approved	0,783	Approved
X10	2	0,502	Approved	0,778	Approved
X11	2	0,405	Approved	0,817	Approved
X12	2	1,743	Approved	0,418	Approved
X13	2	0,521	Approved	0,771	Approved
X14	2	1,18	Approved	0,554	Approved
X15	2	0,067	Approved	0,967	Approved
X16	2	0,887	Approved	0,642	Approved
X17	2	0,154	Approved	0,926	Approved
X18	2	1,021	Approved	0,6	Approved
X19	2	0,379	Approved	0,827	Approved
X20	2	3,079	Approved	0,214	Approved
X21	2	1,823	Approved	0,402	Approved
X22	2	1,055	Approved	0,59	Approved
X23	2	0,392	Approved	0,822	Approved
X24	2	2,633	Approved	0,268	Approved
X25	2	0,608	Approved	0,738	Approved
X26	2	0,967	Approved	0,617	Approved
X27	2	0,069	Approved	0,966	Approved
X28	2	4,046	Approved	0,132	Approved
X29	2	1,223	Approved	0,543	Approved
X30	2	0,84	Approved	0,657	Approved
X31	2	0,405	Approved	0,817	Approved
X32	2	0,527	Approved	0,769	Approved
X33	2	1,135	Approved	0,612	Approved
X34	2	1,225	Approved	0,542	Approved
X35	2	2,362	Approved	0,307	Approved
X36	2	2,098	Approved	0,35	Approved
X37	2	0,764	Approved	0,683	Approved
X38	2	4,753	Approved	0,093	Approved
X39	2	0,264	Approved	0,876	Approved
X40	2	3,123	Approved	0,21	Approved
X41	2	0,553	Approved	0,758	Approved
X42	2	0,059	Approved	0,971	Approved
X43	2	1,031	Approved	0,597	Approved
X44	2	3,079	Approved	0,214	Approved
X45	2	1,823	Approved	0,402	Approved
X46	2	2,074	Approved	0,355	Approved
X47	2	0,199	Approved	0,905	Approved
X48	2	0,782	Approved	0,677	Approved
X49	2	0,635	Approved	0,728	Approved
X50	2	4,211	Approved	0,122	Approved
Y1	2	4,992	Approved	0,082	Approved
Y2	2	2,394	Approved	0,302	Approved
Y3	2	0,668	Approved	0,716	Approved
Y4	2	0,237	Approved	0,888	Approved
Y5	2	0,237	Approved	0,888	Approved
Y6	2	0,057	Approved	0,972	Approved

B.1.2 Homogeneity Test Based on the Length of Respondents Working in the Current Institutions.

Because it consists of 3 groups of respondents, for the homogeneity test based on the length of respondent working in the current institutions used the Kruskal-Wallis H Test. The following are the results of homogeneity tests for the level of importance, where all conditions are met and Ho is accepted (there are no differences in the perceptions of respondents who have different lengths of respondents working in the current institution):

Table XII. Homogeneity Test Results Categories Length of Respondents Working in the Current Institution for Importance

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Measurement

Length of Respondents Working in the Current Institutions					
Importance Measurement					
Variable	df	Kruskal - Wallis H		Asymp. Syg	
X1	2	0,305	Approved	0,858	Approved
X2	2	1,505	Approved	0,471	Approved
X3	2	2,549	Approved	0,28	Approved
X4	2	0,329	Approved	0,848	Approved
X5	2	1,774	Approved	0,412	Approved
X6	2	3,895	Approved	0,143	Approved
X7	2	1,27	Approved	0,53	Approved
X8	2	0,204	Approved	0,903	Approved
X9	2	0,512	Approved	0,774	Approved
X10	2	3,849	Approved	0,146	Approved
X11	2	0,73	Approved	0,694	Approved
X12	2	1,32	Approved	0,517	Approved
X13	2	2,466	Approved	0,291	Approved
X14	2	1,371	Approved	0,504	Approved
X15	2	0,85	Approved	0,654	Approved
X16	2	2,514	Approved	0,285	Approved
X17	2	1,983	Approved	0,371	Approved
X18	2	0,368	Approved	0,832	Approved
X19	2	2,218	Approved	0,33	Approved
X20	2	5,114	Approved	0,065	Approved
X21	2	0,997	Approved	0,608	Approved
X22	2	2,609	Approved	0,271	Approved
X23	2	1,459	Approved	0,482	Approved
X24	2	3,393	Approved	0,183	Approved
X25	2	0,944	Approved	0,624	Approved
X26	2	4,509	Approved	0,105	Approved
X27	2	0,438	Approved	0,803	Approved
X28	2	1,579	Approved	0,454	Approved
X29	2	3,393	Approved	0,183	Approved
X30	2	3,33	Approved	0,189	Approved
X31	2	4,478	Approved	0,107	Approved
X32	2	3,122	Approved	0,21	Approved
X33	2	1,941	Approved	0,379	Approved
X34	2	2,343	Approved	0,31	Approved
X35	2	1,423	Approved	0,491	Approved
X36	2	5,138	Approved	0,077	Approved
X37	2	0,064	Approved	0,968	Approved
X38	2	0,969	Approved	0,616	Approved
X39	2	4,735	Approved	0,094	Approved
X40	2	2,343	Approved	0,31	Approved
X41	2	2,343	Approved	0,31	Approved
X42	2	5,277	Approved	0,071	Approved
X43	2	0,778	Approved	0,678	Approved
X44	2	1,548	Approved	0,461	Approved
X45	2	1,714	Approved	0,424	Approved
X46	2	3,884	Approved	0,143	Approved
X47	2	0,656	Approved	0,72	Approved
X48	2	3,393	Approved	0,183	Approved
X49	2	2,624	Approved	0,269	Approved
X50	2	5,558	Approved	0,062	Approved
Y1	2	1,603	Approved	0,449	Approved
Y2	2	2,503	Approved	0,286	Approved
Y3	2	0,881	Approved	0,644	Approved
Y4	2	0,942	Approved	0,624	Approved
Y5	2	1,118	Approved	0,572	Approved
Y6	2	4,775	Approved	0,092	Approved

Next, a homogeneity test for the level of performance is performed, which uses the same indicator as the measurement of importance. Here are the results of the calculation:

Table XIII. Homogeneity Test Results Categories Length of Respondents Working in the Current Institutions for Performance Measurement

Length of Respondents Working in the Current Institutions					
Importance Measurement					
Variable	df	Kruskal - Wallis H		Asymp. Syg	
X1	2	0,758	Approved	0,685	Approved
X2	2	1,179	Approved	0,555	Approved
X3	2	1,297	Approved	0,523	Approved
X4	2	1,297	Approved	0,523	Approved
X5	2	1,188	Approved	0,552	Approved
X6	2	1,426	Approved	0,49	Approved
X7	2	2,339	Approved	0,311	Approved
X8	2	2,313	Approved	0,315	Approved
X9	2	1,426	Approved	0,49	Approved
X10	2	2,766	Approved	0,251	Approved
X11	2	1,718	Approved	0,424	Approved
X12	2	0,341	Approved	0,843	Approved
X13	2	1,713	Approved	0,425	Approved
X14	2	2,323	Approved	0,313	Approved
X15	2	0,681	Approved	0,711	Approved
X16	2	0,508	Approved	0,776	Approved
X17	2	2,076	Approved	0,354	Approved
X18	2	2,942	Approved	0,23	Approved
X19	2	0,124	Approved	0,94	Approved
X20	2	4,536	Approved	0,104	Approved
X21	2	4,787	Approved	0,091	Approved
X22	2	1,179	Approved	0,555	Approved
X23	2	0,628	Approved	0,73	Approved
X24	2	1,188	Approved	0,552	Approved
X25	2	2,133	Approved	0,344	Approved
X26	2	0,158	Approved	0,924	Approved
X27	2	1,357	Approved	0,507	Approved
X28	2	1,148	Approved	0,563	Approved
X29	2	1,525	Approved	0,466	Approved
X30	2	1,297	Approved	0,523	Approved
X31	2	1,426	Approved	0,49	Approved
X32	2	1,908	Approved	0,385	Approved
X33	2	2,133	Approved	0,344	Approved
X34	2	1,179	Approved	0,555	Approved
X35	2	1,308	Approved	0,52	Approved
X36	2	2,133	Approved	0,344	Approved
X37	2	0,004	Approved	0,998	Approved
X38	2	1,908	Approved	0,385	Approved
X39	2	0,011	Approved	0,994	Approved
X40	2	0,914	Approved	0,633	Approved
X41	2	0,596	Approved	0,742	Approved
X42	2	0,361	Approved	0,835	Approved
X43	2	0,47	Approved	0,791	Approved
X44	2	3,612	Approved	0,164	Approved
X45	2	1,173	Approved	0,556	Approved
X46	2	0,112	Approved	0,946	Approved
X47	2	0,717	Approved	0,699	Approved
X48	2	0,297	Approved	0,862	Approved
X49	2	0,09	Approved	0,956	Approved
X50	2	0,299	Approved	0,861	Approved
Y1	2	2,583	Approved	0,275	Approved
Y2	2	2,218	Approved	0,33	Approved
Y3	2	3,895	Approved	0,143	Approved
Y4	2	1,297	Approved	0,523	Approved
Y5	2	1,308	Approved	0,52	Approved
Y6	2	3,816	Approved	0,148	Approved

B.1.3 Homogeneity Test Based on Respondent's Last Education

Because it consists of 2 groups of respondents, for the homogeneity test based on the last education of the respondents used the Kolmogorov-Smirnov Z Test. Here are the results of the test:

Table XIV. Homogeneity Test Results Categories of Respondents' Last Education for Importance and Performance Measurement

Education of Respondents					Education of Respondents			
Importance Measurement					Performance Measurement			
Variable	df	Asymp. Syg			Variable	df	Asymp. Syg	
X1	2	1	Approved		X1	2	1	Approved
X2	2	1	Approved		X2	2	1	Approved
X3	2	0,455	Approved		X3	2	1	Approved
X4	2	0,95	Approved		X4	2	1	Approved
X5	2	1	Approved		X5	2	0,918	Approved
X6	2	1	Approved		X6	2	1	Approved
X7	2	1	Approved		X7	2	1	Approved
X8	2	0,999	Approved		X8	2	1	Approved
X9	2	1	Approved		X9	2	1	Approved
X10	2	1	Approved		X10	2	1	Approved
X11	2	1	Approved		X11	2	1	Approved
X12	2	0,872	Approved		X12	2	1	Approved
X13	2	1	Approved		X13	2	1	Approved
X14	2	0,987	Approved		X14	2	1	Approved
X15	2	1	Approved		X15	2	1	Approved
X16	2	0,995	Approved		X16	2	0,877	Approved
X17	2	0,455	Approved		X17	2	1	Approved
X18	2	1	Approved		X18	2	1	Approved
X19	2	0,999	Approved		X19	2	1	Approved
X20	2	1	Approved		X20	2	1	Approved
X21	2	0,995	Approved		X21	2	1	Approved
X22	2	0,913	Approved		X22	2	1	Approved
X23	2	1	Approved		X23	2	0,986	Approved
X24	2	1	Approved		X24	2	0,918	Approved
X25	2	0,987	Approved		X25	2	1	Approved
X26	2	1	Approved		X26	2	1	Approved
X27	2	1	Approved		X27	2	1	Approved
X28	2	1	Approved		X28	2	1	Approved

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X29	2	1	Approved		X29	2	1	Approved
X30	2	0,973	Approved		X30	2	1	Approved
X31	2	1	Approved		X31	2	1	Approved
X32	2	1	Approved		X32	2	1	Approved
X33	2	1	Approved		X33	2	1	Approved
X34	2	1	Approved		X34	2	1	Approved
X35	2	1	Approved		X35	2	1	Approved
X36	2	1	Approved		X36	2	1	Approved
X37	2	1	Approved		X37	2	1	Approved
X38	2	1	Approved		X38	2	1	Approved
X39	2	1	Approved		X39	2	1	Approved
X40	2	1	Approved		X40	2	1	Approved
X41	2	0,987	Approved		X41	2	1	Approved
X42	2	1	Approved		X42	2	0,877	Approved
X43	2	1	Approved		X43	2	0,973	Approved
X44	2	0,987	Approved		X44	2	0,877	Approved
X45	2	0,995	Approved		X45	2	0,777	Approved
X46	2	1	Approved		X46	2	1	Approved
X47	2	0,973	Approved		X47	2	1	Approved
X48	2	1	Approved		X48	2	1	Approved
X49	2	1	Approved		X49	2	1	Approved
X50	2	1	Approved		X50	2	1	Approved
Y1	2	0,877	Approved		Y1	2	1	Approved
Y2	2	0,981	Approved		Y2	2	1	Approved
Y3	2	1	Approved		Y3	2	0,986	Approved
Y4	2	0,987	Approved		Y4	2	0,995	Approved
Y5	2	1	Approved		Y5	2	1	Approved
Y6	2	1	Approved		Y6	2	1	Approved

B.2 Validity Test

As explained in the previous chapter, the validity test is intended to measure the validity of the instrument used in this study. To test the validity, IBM SPSS Statistics Version 25 software is used. The calculated r value is then compared with the r table value for N = 85 with a 95% (2-tailed) confidence interval of 0.213. For the level of importance, each indicator is declared valid, where the value of r count > r table. For the level of performance, each indicator is also declared valid, where the value of r count > r table. Because all indicators are declared valid, all indicators can be included in the reliability test. Here are the test results:

Table XV. Validity Test Results

	Importance				Performance		
Indicator	r Count	r Table	Test Result		r Count	r Table	Test Result
X1	0.560	0.213	Valid		0.683	0.213	Valid
X2	0.565	0.213	Valid		0.818	0.213	Valid
X3	0.556	0.213	Valid		0.606	0.213	Valid
X4	0.598	0.213	Valid		0.761	0.213	Valid
X5	0.562	0.213	Valid		0.770	0.213	Valid
X6	0.620	0.213	Valid		0.733	0.213	Valid
X7	0.528	0.213	Valid		0.846	0.213	Valid
X8	0.626	0.213	Valid		0.657	0.213	Valid
X9	0.698	0.213	Valid		0.915	0.213	Valid
X10	0.471	0.213	Valid		0.774	0.213	Valid
X11	0.675	0.213	Valid		0.889	0.213	Valid
X12	0.594	0.213	Valid		0.765	0.213	Valid
X13	0.629	0.213	Valid		0.607	0.213	Valid
X14	0.676	0.213	Valid		0.733	0.213	Valid
X15	0.623	0.213	Valid		0.734	0.213	Valid
X16	0.631	0.213	Valid		0.749	0.213	Valid
X17	0.664	0.213	Valid		0.768	0.213	Valid
X18	0.560	0.213	Valid		0.804	0.213	Valid
X19	0.678	0.213	Valid		0.802	0.213	Valid
X20	0.622	0.213	Valid		0.683	0.213	Valid
X21	0.510	0.213	Valid		0.685	0.213	Valid
X22	0.600	0.213	Valid		0.837	0.213	Valid
X23	0.532	0.213	Valid		0.736	0.213	Valid
X24	0.678	0.213	Valid		0.724	0.213	Valid
X25	0.700	0.213	Valid		0.664	0.213	Valid
X26	0.581	0.213	Valid		0.818	0.213	Valid
X27	0.411	0.213	Valid		0.794	0.213	Valid
X28	0.494	0.213	Valid		0.756	0.213	Valid
X29	0.576	0.213	Valid		0.744	0.213	Valid
X30	0.631	0.213	Valid		0.736	0.213	Valid
X31	0.539	0.213	Valid		0.821	0.213	Valid
X32	0.600	0.213	Valid		0.820	0.213	Valid
X33	0.669	0.213	Valid		0.906	0.213	Valid
X34	0.542	0.213	Valid		0.807	0.213	Valid
X35	0.747	0.213	Valid		0.822	0.213	Valid
X36	0.520	0.213	Valid		0.707	0.213	Valid
X37	0.563	0.213	Valid		0.831	0.213	Valid
X38	0.662	0.213	Valid		0.827	0.213	Valid
X39	0.597	0.213	Valid		0.775	0.213	Valid
X40	0.618	0.213	Valid		0.756	0.213	Valid
X41	0.545	0.213	Valid		0.834	0.213	Valid
X42	0.586	0.213	Valid		0.615	0.213	Valid
X43	0.545	0.213	Valid		0.537	0.213	Valid
X44	0.670	0.213	Valid		0.489	0.213	Valid
X45	0.642	0.213	Valid		0.602	0.213	Valid
X46	0.544	0.213	Valid		0.554	0.213	Valid
X47	0.465	0.213	Valid		0.655	0.213	Valid
X48	0.329	0.213	Valid		0.532	0.213	Valid
X49	0.562	0.213	Valid		0.503	0.213	Valid
X50	0.454	0.213	Valid		0.506	0.213	Valid
Y1	0.486	0.213	Valid		0.721	0.213	Valid
Y2	0.305	0.213	Valid		0.679	0.213	Valid
Y3	0.533	0.213	Valid		0.688	0.213	Valid
Y4	0.328	0.213	Valid		0.683	0.213	Valid
Y5	0.583	0.213	Valid		0.806	0.213	Valid
Y6	0.543	0.213	Valid		0.656	0.213	Valid

B.3 Reliability Test

As explained in the previous chapter, the reliability test is intended to measure the level of consistency of the instruments used in the study. To test reliability, the IBM SPSS Statistics Version 25 software is used. From the test results, the reliability value for the importance level is 0.962, while for the performance level is 0.983. Based on these results, it can be said that the instrument used in this study has a very high level of reliability (> 0.9). Following are the results of SPSS calculations:

Table XVI. Reliability Test Results

Importance			Performance	
Cronbach's Alpha	N of Items		Cronbach's Alpha	N of Items
.962	56		.983	56

B.4 Descriptive Test

Descriptive testing is done to get a general overview of statistics about the data that has been obtained, including the calculation of the average value (mean), middle value (median), and the value that most often appears (mode). Respondents and variables that have been excluded from the previous testing phase will not be included in the descriptive test. Here are the results of the calculation:

Table XVII. Descriptive Test Results

	Importance				Performance		
Indicator	Mean	Median	Modus		Mean	Median	Modus
X1	4,812	5	5		3,86	4	4
X2	4,812	5	5		3,8	4	4
X3	4,788	5	5		3,86	4	4
X4	4,8	5	5		3,86	4	4
X5	4,824	5	5		3,81	4	4
X6	4,812	5	5		3,84	4	4
X7	4,8	5	5		3,81	4	4
X8	4,753	5	5		3,8	4	4
X9	4,741	5	5		3,84	4	4
X10	4,859	5	5		3,88	4	4
X11	4,8	5	5		3,82	4	4
X12	4,8	5	5		3,84	4	4
X13	4,765	5	5		3,84	4	4

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X14	4,776	5	5		3,84	4	4
X15	4,8	5	5		3,81	4	4
X16	4,765	5	5		3,82	4	4
X17	4,788	5	5		3,78	4	4
X18	4,812	5	5		3,85	4	4
X19	4,753	5	5		3,85	4	4
X20	4,788	5	5		3,87	4	4
X21	4,859	5	5		3,88	4	4
X22	4,812	5	5		3,8	4	4
X23	4,835	5	5		3,85	4	4
X24	4,765	5	5		3,81	4	4
X25	4,776	5	5		3,81	4	4
X26	4,824	5	5		3,72	4	4
X27	4,906	5	5		3,82	4	4
X28	4,847	5	5		3,75	4	4
X29	4,824	5	5		3,87	4	4
X30	4,788	5	5		3,86	4	4
X31	4,812	5	5		3,84	4	4
X32	4,812	5	5		3,78	4	4
X33	4,788	5	5		3,81	4	4
X34	4,847	5	5		3,8	4	4
X35	4,741	5	5		3,79	4	4
X36	4,835	5	5		3,81	4	4
X37	4,812	5	5		3,74	4	4
X38	4,788	5	5		3,78	4	4
X39	4,812	5	5		3,69	4	4
X40	4,8	5	5		3,75	4	4
X41	4,765	5	5		3,78	4	4
X42	4,741	5	5		3,82	4	4
X43	4,847	5	5		3,79	4	4
X44	4,776	5	5		3,82	4	4
X45	4,765	5	5		3,85	4	4
X46	4,776	5	5		3,79	4	4
X47	4,788	5	5		3,8	4	4
X48	4,753	5	5		3,79	4	4
X49	4,729	5	5		3,78	4	4
X50	4,765	5	5		3,75	4	4
Y1	4,824	5	5		3,85	4	4
Y2	4,706	5	5		3,82	4	4
Y3	4,671	5	5		3,85	4	4
Y4	4,765	5	5		3,86	4	4
Y5	4,812	5	5		3,79	4	4
Y6	4,824	5	5		3,82	4	4

C. Analysis of Relationships Between Variables

To analyze the relationship between variables and obtain the relationship model, the PLS-SEM method is used through the SmartPLS 3 software. Data processed at this stage is the opinion of the respondents regarding the performance of the Deming Management Method at the telecommunications operator companies in Indonesia where they are currently working. First, we make the modeling first (figure 3). The blue circle represents the variable we will use, while the yellow box represents the indicators that are derived from each variable. The relationship between variables and indicators is a reflective relationship, where the existing indicators manifest the relevant variables.

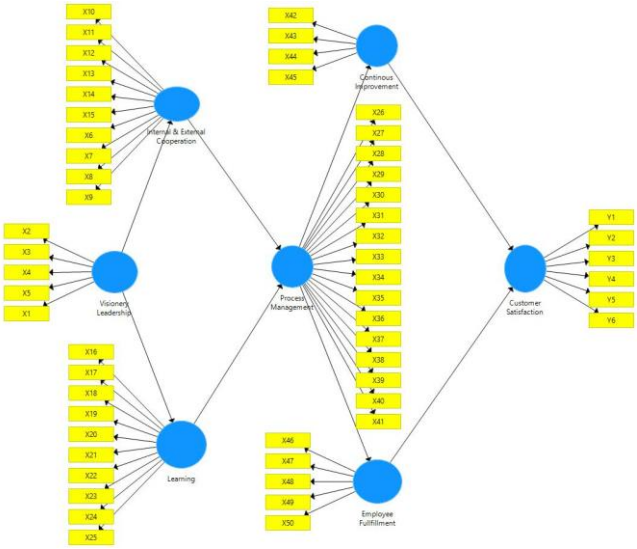

Fig 3. Modeling Analysis of Relationships Between Variables

We can see in Figure 3, the seven variables of Deming Management Method namely Visionary Leadership, Internal and External Cooperation, Learning, Process Management, Continuous Improvement, Employee Fulfillment and Customer Satisfaction will be examined the relationship of each process. Furthermore, the calculation results that have been obtained will be checked and analyzed through the following various stages:

C.1 Number of Iterations

In this study, the number of iterations needed for the SmartPLS 3 software to process the data is 7 times iteration (the maximum number is 300 iterations). This shows that there are no abnormalities of research data, such as the sample size that is too small, the existence of data that has extreme values, and too many values are the same in each indicator. Therefore, there is no need to change / replace data.

C.2 Indicator Reliability

Before the data can be analyzed, several tests must be carried out on the data that has been processed. The first is the reliability testing of each indicator. For this study, the indicator is considered reliable if it has an outer loadings value above 0.7. Here are the results of the test:

Table XVIII. Indicator Reliability Indicator Recapitulation

Variable	Indicator	Outer Loadings	Reliability
Visionary Leadership	X1	0,831	Reliable
	X2	0,763	Reliable
	X3	0,735	Reliable
	X4	0,923	Reliable
	X5	0,877	Reliable
Internal & External	X6	0,818	Reliable
	X7	0,899	Reliable

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Cooperation	X8	0,733	Reliable
	X9	0,923	Reliable
	X10	0,743	Reliable
	X11	0,901	Reliable
	X12	0,787	Reliable
	X13	0,712	Reliable
	X14	0,774	Reliable
	X15	0,744	Reliable
Learning	X16	0,797	Reliable
	X17	0,780	Reliable
	X18	0,824	Reliable
	X19	0,792	Reliable
	X20	0,718	Reliable
	X21	0,748	Reliable
	X22	0,831	Reliable
	X23	0,715	Reliable
	X24	0,779	Reliable
	X25	0,747	Reliable
Process Management	X26	0,848	Reliable
	X27	0,775	Reliable
	X28	0,774	Reliable
	X29	0,730	Reliable
	X30	0,739	Reliable
	X31	0,864	Reliable
	X32	0,849	Reliable
	X33	0,934	Reliable
	X34	0,800	Reliable
	X35	0,831	Reliable
	X36	0,736	Reliable
	X37	0,888	Reliable
	X38	0,889	Reliable
	X39	0,771	Reliable
	X40	0,799	Reliable
	X41	0,902	Reliable
Continuous Improvement	X42	0,960	Reliable
	X43	0,878	Reliable
	X44	0,731	Reliable
	X45	0,935	Reliable
Employee Fullfillment	X46	0,977	Reliable
	X47	0,755	Reliable
	X48	0,943	Reliable
	X49	0,926	Reliable
	X50	0,932	Reliable
Customer Satisfaction	Y1	0,917	Reliable
	Y2	0,719	Reliable
	Y3	0,830	Reliable
	Y4	0,828	Reliable
	Y5	0,802	Reliable
	Y6	0,880	Reliable

C.3 Internal Consistency Reliability

In addition to indicators, each variable also needs to be tested for reliability. Variables can be said to be reliable if they have composite reliability values above 0.7 and cronbach's alpha above 0.6. We can (see table XIX) that all variables have composite reliability values above 0.7 and cronbach's alpha above 0.6, so it can be said that all variables are reliable.

Table XIX. Internal Consistency Reliability Recapitulation

Variabel	Cronbach's Alpha	Composite Reliability
Continuous Improvement	0,900	0,932
Customer Satisfaction	0,911	0,930
Employee Fulfillment	0,946	0,960
Internal & External Cooperation	0,939	0,949
Learning	0,925	0,937
Process Management	0,968	0,971
Visionary Leadership	0,884	0,916

C.4 Convergent Validity

Furthermore, each variable needs to be checked for convergent validity, to test the ability of a variable to represent the indicators associated with it. If the variable has a value of AVE > 0.5, it can be said that the indicator is sufficient to represent the indicators associated with it. We can (see table XX) that all variables have the value AVE > 0.5, so it can be said that all variables are strong enough to represent the indicators associated with it.

Table XX. Recapitulation of Convergent Validity

Variable	Average Variance Extracted (AVE)	Information
Continuous Improvement	0,776	OK
Customer Satisfaction	0,692	OK
Employee Fulfillment	0,828	OK
Internal & External Cooperation	0,651	OK
Learning	0,599	OK
Process Management	0,681	OK
Visionary Leadership	0,687	OK

C.5 Discriminant Validity

To test discriminant validity, cross loadings are needed. To be considered valid, the value of an indicator's cross loadings on the variables affected must be greater than the value of the indicator's cross loadings on variables that are not affected. We can (see table XXI) that all indicators are declared valid, where the value of the cross loadings of each indicator to the variables affected is greater than the value of the cross loadings of each indicator to the variables that are not affected.

Table XXI. Discriminant Validity Recapitulation

	Visionary Leadership	Internal & External Cooperation	Learning	Process Management	Continuous Improvement	Employee Fulfillment	Customer Satisfaction
X1	0,831	0,644	0,716	0,630	0,464	0,233	0,619
X2	0,763	0,807	0,818	0,777	0,653	0,380	0,715
X3	0,735	0,717	0,587	0,496	0,364	0,192	0,603
X4	0,923	0,725	0,789	0,719	0,444	0,293	0,674
X5	0,877	0,749	0,790	0,716	0,415	0,386	0,652
X6	0,743	0,818	0,716	0,657	0,320	0,440	0,581
X7	0,755	0,899	0,846	0,809	0,575	0,386	0,714
X8	0,641	0,733	0,633	0,600	0,270	0,380	0,534
X9	0,810	0,923	0,908	0,892	0,639	0,440	0,787
X10	0,673	0,743	0,748	0,756	0,306	0,397	0,896
X11	0,790	0,901	0,876	0,860	0,606	0,412	0,817
X12	0,745	0,787	0,750	0,686	0,554	0,496	0,556
X13	0,741	0,712	0,592	0,521	0,402	0,148	0,570
X14	0,619	0,774	0,770	0,685	0,492	0,384	0,577
X15	0,598	0,744	0,718	0,723	0,450	0,471	0,547
X16	0,835	0,704	0,797	0,708	0,378	0,367	0,665
X17	0,719	0,786	0,780	0,721	0,598	0,336	0,655
X18	0,701	0,804	0,824	0,798	0,502	0,412	0,630
X19	0,785	0,818	0,792	0,722	0,540	0,528	0,591
X20	0,579	0,707	0,718	0,633	0,471	0,374	0,540
X21	0,554	0,637	0,748	0,668	0,459	0,377	0,577
X22	0,722	0,834	0,831	0,818	0,566	0,394	0,766
X23	0,593	0,706	0,715	0,717	0,290	0,446	0,793
X24	0,798	0,669	0,779	0,693	0,353	0,355	0,632
X25	0,638	0,613	0,747	0,656	0,462	0,217	0,571
X26	0,683	0,721	0,736	0,848	0,438	0,592	0,676
X27	0,709	0,753	0,737	0,775	0,424	0,374	0,891
X28	0,612	0,695	0,743	0,774	0,468	0,422	0,676
X29	0,627	0,694	0,723	0,730	0,275	0,446	0,841
X30	0,723	0,664	0,804	0,739	0,489	0,233	0,674
X31	0,749	0,766	0,788	0,864	0,478	0,449	0,658
X32	0,683	0,782	0,786	0,849	0,428	0,503	0,681
X33	0,758	0,863	0,870	0,934	0,504	0,582	0,709
X34	0,704	0,815	0,790	0,800	0,617	0,362	0,682
X35	0,673	0,782	0,796	0,831	0,520	0,477	0,709
X36	0,598	0,690	0,706	0,736	0,415	0,345	0,559
X37	0,661	0,731	0,748	0,888	0,445	0,556	0,710
X38	0,666	0,763	0,767	0,889	0,495	0,514	0,633

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X39	0,627	0,638	0,657	0,771	0,419	0,472	0,636
X40	0,594	0,695	0,707	0,799	0,515	0,421	0,640
X41	0,666	0,763	0,787	0,902	0,428	0,528	0,653
X42	0,547	0,558	0,565	0,545	0,960	0,357	0,413
X43	0,427	0,480	0,515	0,468	0,878	0,306	0,370
X44	0,464	0,483	0,450	0,410	0,731	0,297	0,262
X45	0,571	0,530	0,567	0,540	0,935	0,287	0,451
X46	0,309	0,438	0,421	0,496	0,286	0,977	0,339
X47	0,476	0,582	0,608	0,594	0,520	0,755	0,394
X48	0,293	0,395	0,408	0,488	0,249	0,943	0,358
X49	0,275	0,382	0,378	0,443	0,246	0,926	0,334
X50	0,261	0,383	0,365	0,462	0,239	0,932	0,328
Y1	0,656	0,681	0,670	0,697	0,319	0,305	0,917
Y2	0,770	0,651	0,708	0,615	0,396	0,251	0,719
Y3	0,550	0,620	0,613	0,713	0,222	0,396	0,830
Y4	0,586	0,660	0,653	0,657	0,267	0,347	0,828
Y5	0,710	0,793	0,796	0,778	0,539	0,365	0,802
Y6	0,607	0,609	0,607	0,629	0,289	0,256	0,880

Furthermore, after the stages to test the feasibility of the data to be used in the PLS-SEM research method, then it can then be analyzed the results obtained, to illustrate the relationship and influence between variables. The following explanation:

C.6 R^2 Value

R^2 value describes the relationship between one variable with other variables connected with it. In general, a value of R^2 0.25 illustrates a weak relationship. R^2 value ± 0.50 illustrates a moderate (moderate) relationship. While the value of R^2 ± 0.75 illustrates a strong relationship (substantial).

Table XXII. Recapitulation of R^2 Value

Variable	R Square	Information
Internal & External Cooperation	0,782	Substantial
Learning	0,813	Substantial
Process Management	0,861	Substantial
Continuous Improvement	0,316	Moderate
Employee Fulfillment	0,310	Moderate
Customer Satisfaction	0,252	Weak

C.7 Path Coefficient

The path coefficient value illustrates the effect of one variable on another. The effect can be said to be significant (meaning) if the value of the path coefficient is greater than 0.1. The greater the value of the path coefficient, the greater the influence exerted.

From the results obtained, we can draw the conclusion that Visionary Leadership has a significant relationship to Internal & External Cooperation and Learning. Internal & External Cooperation and Learning have a significant relationship to Process Management. Process Management has a significant relationship to Continuous Improvement and Employee Fulfillment. Employee Fulfillment and Employee Fulfillment have a significant relationship to Customer Satisfaction.

Table XXIII Path Coefficient Recapitulation

Variable	Variable Effected	Path Coefficients	Relationship
Visionary Leadership	Internal & External Cooperation	0,884	Significant
	Learning	0,902	Significant
Internal & External Cooperation	Process Management	0,266	Significant
Learning	Process Management	0,673	Significant
Process Management	Continuous Improvement	0,562	Significant
	Employee Fulfillment	0,557	Significant
Continuous Improvement	Customer Satisfaction	0,335	Significant
Employee Fulfillment	Customer Satisfaction	0,274	Significant
Customer Satisfaction			

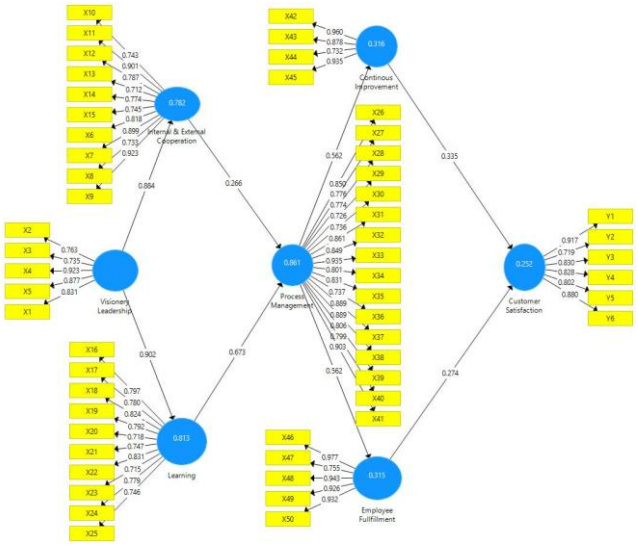

Fig 4. Output Analysis of Relationships between Variables

C.8 Structural Path Significance in Bootstrapping

SmartPLS 3 software can do a T-test to test the significance of the model, both inner and outer models, with a method called bootstrapping. Later, the calculated t value generated as output will be compared with the t table value. If the value of t count is greater than the value of t table, then the relationship between variables can be said to be significant (influential). Using a two-tailed t-test, with a confidence interval of 90% and N = 85 (df = 83), the t table value is 1.663. Here is the explanation:

Table XXIV. Structural Path Significance Recapitulation

	Standard Deviation	T Statistics	Decisions
Continuous Improvement -> Customer Satisfaction	0,117	2,876	Supported
Employee Fulfillment	0,126	2,179	Supported

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-> Customer Satisfaction			
Internal & External Cooperation -> Process Management	0,148	1,79	Supported
Learning -> Process Management	0,147	4,578	Supported
Process Management -> Continuous Improvement	0,111	5,089	Supported
Process Management -> Employee Fulfillment	0,099	5,657	Supported
Visionary Leadership -> Internal & External Cooperation	0,035	25,631	Supported
Visionary Leadership -> Learning	0,027	33,056	Supported

From the x.x table, we can draw some conclusions, namely: Visionary Leadership influences Internal & External Cooperation, Visionary Leadership influences Learning, Internal & External Cooperation influences Process Management, Learning influences Process Management, Process Management influences Continuous Improvement, Process Management influences Employee Fulfillment, Continuous Improvement influences Customer Satisfaction, and Employee Fulfillment influences Customer Satisfaction

Next, we test the significance of each indicator for the variables that influence it. We can in table xx that all indicators have a significant influence on the variables affected, where the value of t is greater than the value of t table for the confidence interval of 90% and N = 85 (df = 83) where the value of t table is 1.663 and for 95% confidence interval and N = 68 (df = 66) where the t table value is 1,988 and for the 99% confidence interval and N = 68 (df = 66) where the t table value is 2,636

Table XXV. Summary of Significance of Indicators for Variables

	Standard Deviation	T Statistics	Decisions
X1 <- Visionary Leadership	0,077	10,767	Supported
X2 <- Visionary Leadership	0,073	10,433	Supported
X3 <- Visionary Leadership	0,097	7,547	Supported
X4 <- Visionary Leadership	0,03	30,81	Supported
X5 <- Visionary Leadership	0,044	19,856	Supported
X6 <- Internal & External Cooperation	0,064	12,797	Supported
X7 <- Internal & External Cooperation	0,035	25,321	Supported
X8 <- Internal & External Cooperation	0,085	8,64	Supported
X9 <- Internal & External Cooperation	0,021	43,548	Supported
X10 <- Internal & External Cooperation	0,095	7,783	Supported
X11 <- Internal & External Cooperation	0,035	25,712	Supported
X12 <- Internal & External Cooperation	0,078	10,126	Supported
X13 <- Internal & External Cooperation	0,098	7,259	Supported
X14 <- Internal & External Cooperation	0,087	8,867	Supported
X15 <- Internal & External Cooperation	0,089	8,351	Supported
X16 <- Learning	0,074	10,832	Supported
X17 <- Learning	0,075	10,439	Supported
X18 <- Learning	0,073	11,241	Supported
X19 <- Learning	0,078	10,192	Supported
X20 <- Learning	0,11	6,525	Supported
X21 <- Learning	0,099	7,566	Supported
X22 <- Learning	0,065	12,868	Supported
X23 <- Learning	0,107	6,677	Supported
X24 <- Learning	0,074	10,512	Supported
X25 <- Learning	0,092	8,09	Supported
X26 <- Process Management	0,04	21,066	Supported
X27 <- Process Management	0,08	9,731	Supported
X28 <- Process Management	0,065	11,819	Supported
X29 <- Process Management	0,093	7,784	Supported
X30 <- Process Management	0,087	8,422	Supported
X31 <- Process Management	0,057	15,174	Supported
X32 <- Process Management	0,052	16,198	Supported
X33 <- Process Management	0,018	51,559	Supported
X34 <- Process Management	0,076	10,579	Supported
X35 <- Process Management	0,056	14,907	Supported
X36 <- Process Management	0,085	8,666	Supported
X37 <- Process Management	0,032	27,487	Supported
X38 <- Process Management	0,039	22,908	Supported
X39 <- Process Management	0,052	15,538	Supported
X40 <- Process Management	0,059	13,539	Supported
X41 <- Process Management	0,034	26,741	Supported
X42 <- Continuous Improvement	0,02	48,066	Supported
X43 <- Continuous Improvement	0,053	16,54	Supported
X44 <- Continuous Improvement	0,106	6,935	Supported
X45 <- Continuous Improvement	0,033	28,225	Supported
X46 <- Employee Fulfillment	0,014	67,514	Supported
X47 <- Employee Fulfillment	0,092	8,246	Supported
X48 <- Employee Fulfillment	0,027	34,538	Supported
X49 <- Employee Fulfillment	0,037	24,736	Supported
X50 <- Employee Fulfillment	0,034	27,049	Supported
Y1 <- Customer Satisfaction	0,057	15,996	Supported
Y2 <- Customer Satisfaction	0,107	6,732	Supported
Y3 <- Customer Satisfaction	0,096	8,665	Supported
Y4 <- Customer Satisfaction	0,097	8,552	Supported
Y5 <- Customer Satisfaction	0,072	11,198	Supported
Y6 <- Customer Satisfaction	0,065	13,473	Supported

D. Analysis of the Application Deming Management Method

After obtaining the relationship model between variables, the Deming Management Method will be analyzed in telecommunications projects in Indonesia, particularly in telecommunications operator companies, with the IPA (Importance Performance Analysis) method. To be able to map each indicator in the IPA Cartesian diagram, it is first necessary to find the average value of the importance and performance level of each Deming Management Method variable, which is then used to place the X and Y axes in the Cartesian diagram. After that, it can

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also be calculated the level of suitability of performance against the interests of each indicator.

Table XXVI. Level of Conformity for DMM

	Indicator	Importance (Yi)	Performance (Xi)	Conformity Level (Tki) (%)	Information
Visionary Leadership	X1	4,812	3,859	80,196	Very Good
	X2	4,812	3,800	78,973	Good
	X3	4,788	3,859	80,590	Very Good
	X4	4,800	3,859	80,392	Very Good
	X5	4,824	3,812	79,024	Good
	Mean	4,807	3,838	79,834	Good
Internal & External Cooperation	X6	4,812	3,835	79,707	Good
	X7	4,800	3,812	79,412	Good
	X8	4,753	3,800	79,950	Good
	X9	4,741	3,835	80,893	Very Good
	X10	4,859	3,882	79,903	Good
	X11	4,800	3,824	79,657	Good
	X12	4,800	3,835	79,902	Good
	X13	4,765	3,835	80,494	Very Good
	X14	4,776	3,835	80,296	Very Good
	X15	4,800	3,812	79,412	Good
	Mean	4,791	3,831	79,961	Good
Learning	X16	4,765	3,824	80,247	Very Good
	X17	4,788	3,776	78,870	Good
	X18	4,812	3,847	79,951	Good
	X19	4,753	3,847	80,941	Very Good
	X20	4,788	3,871	80,835	Very Good
	X21	4,859	3,882	79,903	Good
	X22	4,812	3,800	78,973	Good
	X23	4,835	3,847	79,562	Good
	X24	4,765	3,812	80,000	Very Good
	X25	4,776	3,812	79,803	Good
	Mean	4,795	3,832	79,907	Good
Process Management	X26	4,824	3,718	77,073	Good
	X27	4,906	3,824	77,938	Good
	X28	4,847	3,753	77,427	Good
	X29	4,824	3,871	80,244	Very Good
	X30	4,788	3,859	80,590	Very Good
	X31	4,812	3,835	79,707	Good
	X32	4,812	3,776	78,484	Good
	X33	4,788	3,812	79,607	Good
	X34	4,847	3,800	78,398	Good
	X35	4,741	3,788	79,901	Good
	X36	4,835	3,812	78,832	Good
	X37	4,812	3,741	77,751	Good
	X38	4,788	3,776	78,870	Good
	X39	4,812	3,694	76,773	Good
	X40	4,800	3,753	78,186	Good
	X41	4,765	3,776	79,259	Good
	Mean	4,813	3,787	78,686	Good
Continuous Improvement	X42	4,741	3,824	80,645	Very Good
	X43	4,847	3,788	78,155	Good
	X44	4,776	3,824	80,049	Very Good
	X45	4,765	3,847	80,741	Very Good
	Mean	4,782	3,821	79,889	Good
Employee Fulfillment	X46	4,776	3,788	79,310	Good
	X47	4,788	3,800	79,361	Good
	X48	4,753	3,788	79,703	Good
	X49	4,729	3,776	79,851	Good
	X50	4,765	3,753	78,765	Good
	Mean	4,762	3,781	79,397	Good
Customer Satisfaction	Y1	4,824	3,847	79,756	Good
	Y2	4,706	3,824	81,250	Very Good
	Y3	4,671	3,847	82,368	Very Good
	Y4	4,765	3,859	80,988	Very Good
	Y5	4,812	3,788	78,729	Good
	Y6	4,824	3,824	79,268	Good
	Mean	4,767	3,831	80,378	Very Good

We can see that for the visionary leadership variable has an conformity level of 79.834% (good), internal & external cooperation variables have an conformity level of 79.961% (good), the learning variable has an conformity level of 79.907% (good) , process management variables have an conformity level of 78.668% (good), continuous improvement variables have an conformity level of 79.889% (good), employee fulfillment variables have an conformity level of 79.397% (good) and customer satisfaction variables have an conformity level of 80.387% (very good).

Next, each indicator is mapped into the IPA Cartesian diagram, so that a position is obtained with respect to the interest-performance relationship for each indicator. The indicator in quadrant I shows high importance but its performance is still low, so it needs to get more attention ("concentrate here"). The indicators in quadrant II show high importance supported by high performance, so they need to be maintained ("keep up the good work"). Indicators in quadrant III show low importance, where performance is also low, so it does not need to be the main priority ("low priority"). Indicators in quadrant IV show low importance but high performance ("possible overkill"). Quadrant division and mapping in Cartesian diagram for each process can be seen in the following table and figure:

Table XXVII Division of Visionary Leadership Quadrants

Indicator	Number on Diagram	Quadrant
X1	1	II
X2	2	I
X3	3	IV
X4	4	IV
X5	5	I

Fig 5. IPA Visionary Leadership Cartesian Diagram

Table XXVIII Division of Internal & External Cooperation Quadrants

Indicator	Number on Diagram	Quadrant
X6	1	II
X7	2	I
X8	3	III
X9	4	IV
X10	5	II
X11	6	I
X12	7	II
X13	8	IV
X14	9	IV
X15	10	I

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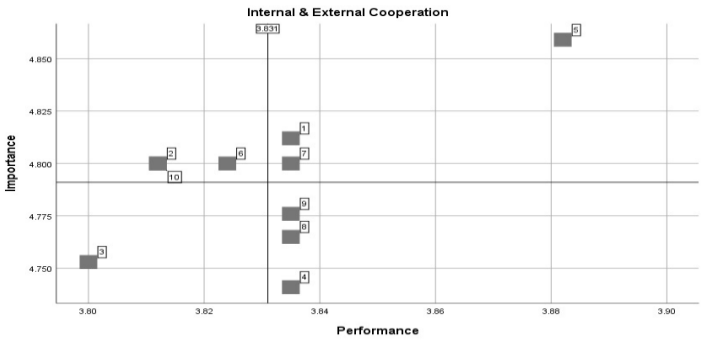

Fig 6. IPA Internal & External Cooperation Cartesian Diagram

Table XXIX Division of Quadrant Learning Quadrants

Indicator	Number on Diagram	Quadrant
X16	1	III
X17	2	III
X18	3	II
X19	4	IV
X20	5	IV
X21	6	II
X22	7	I
X23	8	II
X24	9	III
X25	10	III

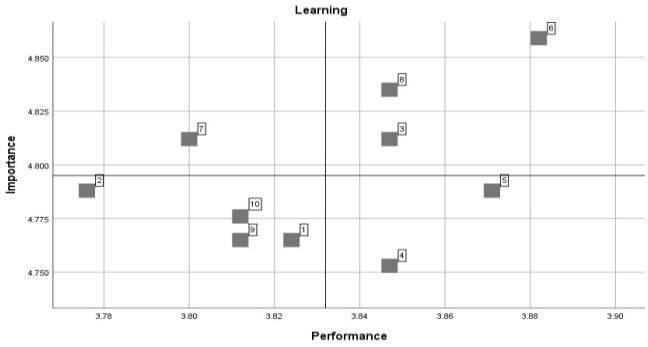

Fig 7. IPA Learning Cartesian Diagram

Table XXX. Division of Process Management Quadrants

Indicator	Number on Diagram	Quadrant
X26	1	I
X27	2	II
X28	3	I
X29	4	II
X30	5	IV
X31	6	IV
X32	7	III
X33	8	IV
X34	9	II
X35	10	IV
X36	11	II
X37	12	III
X38	13	III
X39	14	III
X40	15	III
X41	16	III

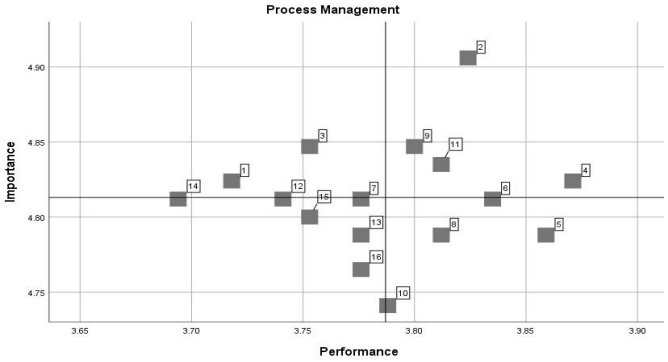

Fig 8. IPA Process Management Cartesian Diagram

Table XXI. Division of Quadrant Continuous Improvement

Indicator	Number on Diagram	Quadrant
X42	1	IV
X43	2	I
X44	3	IV
X45	4	IV

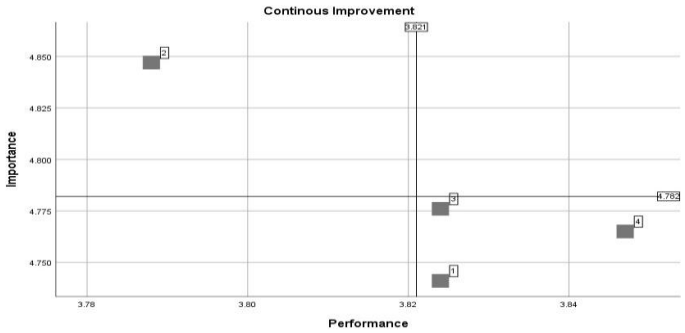

Fig 9. IPA Continuous Improvement Cartesian Diagram

Table XXXII. Division of Employee Fulfillment Quadrants

Indicator	Number on Diagram	Quadrant
X46	1	II
X47	2	II
X48	3	IV
X49	4	III
X50	5	I

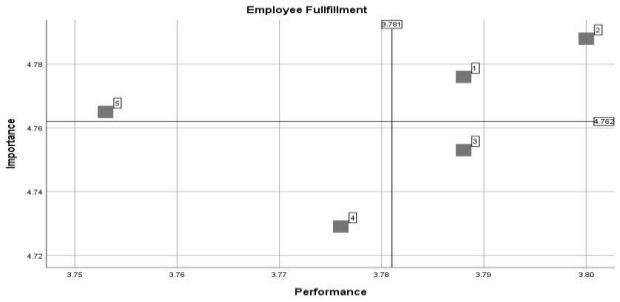

Fig 10. IPA Employee Fulfillment Cartesian Diagram

Table XXXIII Division of Customer Satisfaction Quadrans

Indicator	Number on Diagram	Quadrant
Y1	1	II
Y2	2	III
Y3	3	IV
Y4	4	IV
Y5	5	I
Y6	6	I

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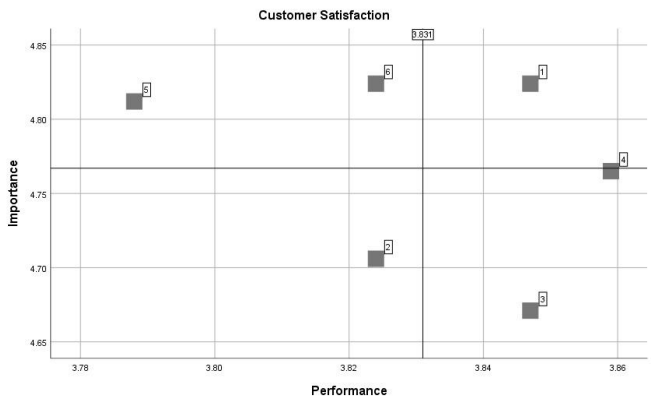

Fig 11. IPA Customer Satisfaction Cartesian Diagram

Based on the mapping of the Cartesian diagram in Figure IPA Cartesian diagram, as well as the explanation in Table Divison Quadrans, it can be seen that for Indicators X2, X5, X7, X11, X15, X22, X26, X28, X43, X50, Y5, and Y6 are in quadrant I, which are indicators that are considered important by respondents, but their performance is still considered low, so their application needs to be improved and developed.

Indicator X1, X6, X10, X12, X18, X21, X23, X27, X29, X34, X36, X46, X47, and Y1 is in quadrant II, which is an indicator that is considered important by the respondent, and has a high performance, so the application needs to be maintained.

Table XXXIV. Recapitulation of DMM Indicators in Quadrants I and II

Indicator	
Visionary Leadership	All managers in the company where I work participate in the process of quality improvement (X2) - K1
	Top management in the company where I work implements the importance of quality in relation to cost objectives (X5) - K1
	Top executives of the company where I work assume responsibility for quality performance (X1) - K2
Internal & External Cooperation	Everyone in the organization in the company where I work is aware of its overall mission (X7) - K1
	Supplier / subcontractor at the company where I work is selected based on quality rather than price (X11) - K1
	Clear specifications are given to suppliers / subcontractors (X15) - K1
	There is a strong commitment in the company where I work for quality at all levels of the organization (X6) - K2
	The manager at the company I work for tries to plan ahead for changes that might affect performance (X10) - K2
	Supplier / subcontractor in the company where I work is assessed by a thorough assessment system (X12) - K2
Learning	Team members know who their customers (internal or external) are (X22) - K1
	Training is given in "Total quality concepts" where the whole organizational philosophy is responsible for quality for all team members (X18) - K2
	Resources are provided for employee training in quality (X21) - K2
	Team members try to measure the needs of their customers (X23) - K2
Process Management	Quality data (defects, complaints, results, time, satisfaction, etc.) are available (X26) - K1
	Quality data areas are used as tools for managing quality (X28) - K1
	Quality data on time (X27) - K2
	Quality data available for team members (X29) - K2
	Team members keep records and graphs that measure the quality of work displayed in their work area or have access to this information electronically (X34) - K2
	Total Quality Management procedures (such as brainstorming, cause and effect diagrams, Pareto charts) are used to analyze information for process improvement (X36) - K2
Continuous Improvement	Team members in the organization believe that quality improvement is their responsibility (X43) - K1
Employee Fulfillment	Overall, I have done my job well from last year (X50) - K1
	I am proud that achievement or achievement is able to provide quality solutions (X46) - K2
	In general, I enjoy my work (X47) - K2
Customer Satisfaction	Perceived value of work delivered to customers (Y5) - K1
	Potential to work in the future with customers (Y6) - K1
	Ability to meet schedules (Y1) - K2

IV. CONCLUSION

Based on a number of stages of the research conducted, an analysis of the data obtained, as well as a discussion carried out, it can be concluded that :

1) Literature study process obtained indicators measuring Deming Management Method that can improve quality management telecommunications projects in Indonesia.
2) Analysis of application Deming Management Method on telecommunication project in Indonesia, it can be seen that for Indicators X2, X5, X7, X11, X15, X22, X26, X28, X43, X50, Y5, and Y6 needs to be improved and developed. Indicator X1, X6, X10, X12, X18, X21, X23, X27, X29, X34, X36, X46, X47, and Y1 needs to be maintained.
3) Analysis of relationships between variables can be proven that : Visionary leadership is positively related to internal and external cooperation (H1), visionary leadership is positively related to learning (H2), internal and external cooperation is positively related to process management (H3), learning is positively related to process management (H4), process management is positively related to continuous improvement (H5), process management is positively related to project team member fulfillment (H6), continuous improvement is positively related to project performance and customer satisfaction (H7), project team member fulfillment is positively related to project performance and customer satisfaction (H8).

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