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Analysis of The Construction Management Application to Project Success Using Importance Performance Analysis on Superflat Concrete Floor Work

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Keywords

Construction Management Application, Project Success, Superflat Floor, SmartPls 3.0, Importance Performance Analysis.

ABSTRACT

In pursuit of Indonesia's equitable and sustainable development, the surge in industrial city development, notably in Karawang, has led to the construction of various facilities such as factories, warehouses, and workshops. Efficient planning methods, encompassing cost, time, and quality considerations, are imperative for these projects. A critical aspect is the construction of concrete floors, vital for supporting diverse loads like heavy vehicles, static loads from goods, storage racks, and large machines. The ongoing development of the Superflat Concrete Floor Method, with its productivity and precision advantages, underscores the need for effective construction management. This study aims to evaluate the substantial impact of construction management on project success and to map application indicators on the IPA diagram – Importance Performance Analysis. Employing both quantitative and qualitative methods, the research distributed questionnaires with Likert scales to 30 respondents, including contractors, owners, and design planners. Smartpls 3.0 software analysis reveals that Knowledge Management significantly and positively influences the success of the superflat concrete floor project at the Karawang Industrial Factory site. The IPA mapping places Knowledge Management and Total Quality Management in Quadrant I (Keep Up the Good Work), emphasizing their pivotal roles in ensuring project success. This study provides essential insights for stakeholders involved in industrial development, guiding them toward more effective construction management strategies for optimized outcomes.

INTRODUCTION

In carrying out Concrete Floor Work usually uses conventional methods with the implementation of manual casting of complete human labor, but this method has some shortcomings, especially the problem of top elevation of the floor surface which has a deviation between 10mm – 20 mm and is relatively not too flat and manpower productivity which has limits. To optimize the work of Concrete Floor Construction, there are currently technological developments from various methods, one of which is the superflat floor method (Fukase et al., 2020a; Liao et al., 2023).

To optimize the above, there are currently technological developments from various methods, one of which is the superflat floor method (Party, 2016). This method has advantages such as high productivity and tidiness of top elevation of concrete floor surfaces with a maximum division/difference of 1/8" mm per distance of 10 ft.

There are several differences in methods and treatments in the implementation of conventional methods and flat floor methods, especially when the concrete begins to harden if the conventional method of finishing the floor surface uses manual tools that are entirely done by manpower, while in the

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superflat floor method (Fukase et al., 2020b). Using a Screen Saver & Trowel to finish the concrete surface, of course, with the help of these tools the concrete surface will be flatter so the deviation will be lower.

Construction management implementation includes administrative aspects, total quality management aspects, technology management, knowledge management aspects, and in the early stages of the project until the end of the project (Babalola et al., 2023; Cui et al., 2024; Raza et al., 2023). The achievement of success in construction work comes from the contribution made by the application of construction management needs to be known and examined carefully so that the construction work of a project can be carried out effectively and efficiently (K. Liu et al., 2024; Okonkwo et al., 2023; Purwanto, 2021).

In a general sense, Construction Management is an effort carried out through the management process, namely planning, implementing, and controlling project activities from beginning to end by allocating resources effectively and efficiently to achieve a satisfactory result according to the desired target (Aziz et al., 2022; Ismaeel & Kassim, 2023; Q. Liu et al., 2022; Mir et al., 2022). The field of Management will continue to change along with environmental changes which are diminishing resources (Tampubolon, 2020). Currently, the development of the management field, one of which is the field of project management has developed into a discipline that has increased research literature (Putra, 2021). In line with that, working on a project requires proper project management even though the nature of the project is a temporary business that has limited time, budget, and resources, and has its specifications for the goals and products produced (Aziz et al., 2022; Shah & Chandragade, 2023).

The importance of construction management implementation in supporting project success (Simanjuntak & Anggraeni, 2019). This study focuses on the optimization of Concrete Floor Construction through the implementation of the superflat floor method, addressing shortcomings in conventional manual casting methods. The superflat floor method, utilizing tools like Screed Saver & Trowel, demonstrates advantages such as high productivity and precision in achieving top elevation, minimizing deviations to a maximum of 1/8" per 10 ft distance. The research recognizes the evolution of construction management as crucial in achieving project success. Emphasizing aspects like administrative efficiency, total quality management, technology, and knowledge management, the study aims to explore the impact of Construction Management Implementation on the success of the Superflat Floor Concrete Construction Project in the Karawang Factory Area. In a broader context, the research contributes to understanding the evolving field of project management, emphasizing the importance of effective management processes in temporary projects with limited time, budget, and resources.

METHODS

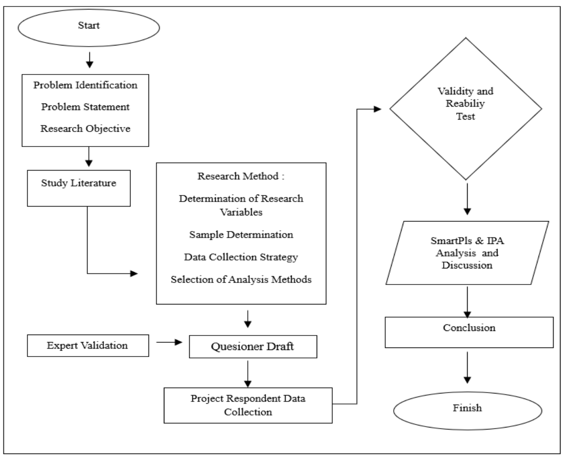

Figure 1. Research Flow Chart

Research Variables

The measuring instruments or indicators in this study are used to determine the Variables in the Implementation of Construction Management in Superflat Concrete Floor Projects (Case Study: Superflat Floor Project Factory Area – Karawang). The measuring instruments in this study have been validated by experts in Table 1.

Table 1. Research Variables

No		Variable's	Operational Definition
1		Administartion	
	A 1	Financial Capability	Criteria regarding the financial capabilities of service provider companies in previous projects and track records related to performance in fulfilling the contracts undertaken.
	A 2	Technical Capabilities	Criteria regarding the technical ability or specialization of the service provider company to be able to complete the project.
	A 3	Experience and Performance	Criteria regarding the company's experience in previous projects and track records related to the Company's performance in fulfilling the contracts undertaken.
	A 4	Managerial Ability	Criteria regarding the ability of service provider companies to plan, organize and control all activities and resources involved.
	A 5	Price Quote	Criteria regarding the bid price and details of reasonable offers offered by the service provider.
	A 6	HSE - Health, Safety and Environment	Criteria regarding the commitment of workers involved in the project environment in carrying out HSE principles and HSE programs in the implementation of work.
	A 7	Subcont Selection & Superflat Floor Applicator / Procurement Method	Criteria regarding the selection of Subcont in the implementation of construction work.
2		Construction Technology Management	
	T 1	Construction Technology Management	Involvement of construction workers during the process of implementing new technology in the project, especially construction technology.
	T 2	Development Management	Involvement of the project team in the process of developing construction technology.
	T 3	Construction Technology Performance	The ability or reliability of the technology used in the construction process.
3		Total Quality Management	
	QM 1	*Continous Improvment*	The ability of the project team to continuously develop to achieve product quality expected construction.
	QM 2	*Teamwork*	The ability of workers to cooperate during the construction process.
	QM 3	*Customer Focus*	The project team works together to get customer satisfaction.
	QM 4	*Leadership*	The ability of Project Manager / Site Manager to lead a team during the construction process.
	QM 5	*Komunikasi dan Koordinasi*	The ability of the project team in communication & coordination in every construction work process.
	QM 6	*Project Quality Plan / Perencanaan Kualitas Proyek*	The ability of the project team to prepare work quality planning according to predetermined standards.

No		Variable's	Operational Definition
4		Knowlegde Management	
	MP 1	*Knowledge sharing*	There is a process of sharing or transferring knowledge during the construction process.
	MP 2	*Information Technology Support*	Availability of technology to support the process of delivering information in the project.
	MP 3	*Knowledge Application*	There is a process of implementation of science carried out by project personnel.
	MP 4	*Developing Knowledge*	There is a process in developing science when the construction process takes place.
	MP 5	*Organizational Culture*	It is an organizational culture that supports the knowledge management process in the project.
5		Project Succes	
	K 1	*On Time Delivery*	The ability of the project team to deliver/applied products in a timely manner.
	K 2	*Minimum Waste*	The presence of residual material produced / Minimum residual material.
	K 3	*Product Standardization*	Produce construction products that have quality in accordance with predetermined standards.
	K4	According to The Initial Design	Construction Implementation in accordance with the initial design of the plan.
	K5	According to Stakeholders' Expectations	in accordance with stakeholder expectations.
	K6	*Zero Accident*	Able to carry out Construction Work without fatal incidents.

(Sources of researchers, 2024)

In this study, to measure variables, the Likert Scale is used, which is a method of measuring attitudes or counter-responses by stating the level of good and the level of not good towards certain subjects and objects, as follows Table 2.

Table 2. Likert Scale

Value	Measurement Scale Criteria	Code	Description
5	Totally Agree / Very Good	SS	Respondents strongly agree with the statement because it is very in accordance with the circumstances in the site.
4	Agree / Good	S	Respondent Agrees with the statement because it is in accordance with the circumstances on the site.
3	Quite Agree	CS	Respondents quite agree with the statement because it is quite in accordance with the circumstances on the site.
2	Disagree / Not Good	TS	Respondents Disagree with the statement because it is not in accordance with the circumstances on the site.
1	Strongly Disagree / Very Bad	STS	Respondents Strongly Disagree with the statement because it is not at all in accordance with the circumstances on the site.

Source: (Yogie Latansa, 2019)

RESULTS

Descriptive Analysis

In this study, the primary data collection process was carried out by distributing questionnaires to the project team on Superflat Concrete Floor Work in the Karawang Factory area – West Java. The questionnaire contains 27 questions according to research variables and indicators regarding the Implementation of Construction Management to Project Success. From the distribution of the questionnaire, as many as 30 response data were obtained that had been filled in completely. The distribution of this questionnaire is carried out by 2 (two) methods, namely the first method offline or meeting in person and then filling in the hardcopy of the research questionnaire and the second method online or through the Google media application as a tool. In Table 3. Explained about the recapitulation of questionnaire filling from respondents as follows:

Table 3. Respondent Recapitulation

No	Variable's	Respondents' Answers 1 STS	 2 TS	 3 R	 4 S	 5 SS	Total	Mean	Std
1	Administation								
A 1	Financial Capability	0	0	3	11	16	133	4.290	0.679
A 2	Technical Capabilities	0	0	3	13	14	131	4.226	0.669
A 3	Experience and Performance	0	0	3	16	11	128	4.129	0.640
A 4	Managerial Ability	0	0	4	15	11	127	4.097	0.679
A 5	Price Quote	0	0	8	14	8	120	3.871	0.743
A 6	HSE - Health, Safety and Environment	0	1	3	16	10	125	4.032	0.747
A 7	Subcont Selection & Superflat Floor Applicator / Procurement Method	0	0	5	15	10	125	4.032	0.699
2	Construction Technology Management								
T 1	Construction Technology Management	0	0	11	13	6	115	3.710	0.747
T 2	Development Management	0	0	8	16	6	118	3.806	0.691
T 3	Construction Technology Performance	0	0	12	30	18	246	7.935	0.691
3	Total Quality Management								
QM 1	*Continous Improvment*	0	0	4	17	9	125	4.032	0.648
QM 2	*Teamwork*	0	0	3	13	14	131	4.226	0.669
QM 3	*Customer Focus*	0	1	2	15	12	128	4.129	0.740
QM 4	*Leadership*	0	1	0	13	16	134	4.323	0.681
QM 5	*Komunikasi dan Koordinasi*	0	0	5	16	9	124	4.000	0.681
QM 6	*Project Quality Plan / Perencanaan Kualitas Proyek*	0	0	2	15	13	131	4.226	0.615
4	Knowlegde Management								
MP 1	*Knowledge sharing*	0	0	3	19	8	125	4.032	0.592

No	Variable's	Respondents' Answers 1 STS	2 TS	3 R	4 S	5 SS	Total	Mean	Std
MP 2	*Information Technology Support*	0	0	4	17	9	125	4.032	0.648
MP 3	*Knowledge Application*	0	0	4	16	10	126	4.065	0.664
MP 4	*Developing Knowledge*	0	0	6	15	9	123	3.968	0.712
MP 5	*Organizational Culture*	0	1	3	18	8	123	3.968	0.712
5	Project Succes								
K 1	*On Time Delivery*	0	1	1	20	8	125	4.032	0.648
K 2	*Minimum Waste*	0	1	6	15	8	120	3.871	0.788
K 3	*Product Standardization*	0	0	2	17	11	129	4.161	0.596
K4	According to The Initial Design	0	1	4	16	9	123	3.968	0.759
K5	According to Stakeholders' Expectations	0	1	3	17	9	124	4.000	0.730
K6	*Zero Accident*	0	1	2	6	21	137	4.419	0.774

Source: (Processing Results, 2024)

Validity & Reliability Test

The first step in the process of processing research data before with the help of PLS-SEM is to test the validity and reliability of the questionnaire given to respondents after validation by experts. A validity test is an indicator used to determine whether the questionnaire used is valid on the research indicator. In this case, as with the research of its predecessors, a significance value (α) of 5% was used with 30 respondents, then it is known that the value of r table = 0.3494. The results of the questionnaire can be seen in Table 4.

Table 4. r Calculate Validity Indicator Values

No		Variable's	r_{hitung}	r_{tabel}	Remarks
1		Administation			
	A 1	Financial Capability	0.7822	0.3494	Valid
	A 2	Technical Capabilities	0.7625	0.3494	Valid
	A 3	Experience and Performance	0.6277	0.3494	Valid
	A 4	Managerial Ability	0.7156	0.3494	Valid
	A 5	Price Quote	0.8011	0.3494	Valid
	A 6	HSE - Health, Safety and Environment	0.6467	0.3494	Valid
	A 7	Subcont Selection & Superflat Floor Applicator / Procurement Method	0.8098	0.3494	Valid
2		Construction Technology Management			
	T 1	Construction Technology Management	0.7697	0.3494	Valid
	T 2	Development Management	0.4692	0.3494	Valid
	T 3	Construction Technology Performance	0.5243	0.3494	Valid

No		Variable's	r_{hitung}	r_{tabel}	Remarks
3		Total Quality Management			
	QM 1	Continous Improvement	0.7375	0.3494	Valid
	QM 2	Teamwork	0.7586	0.3494	Valid
	QM 3	Customer Focus	0.7606	0.3494	Valid
	QM 4	Leadership	0.5298	0.3494	Valid
	QM 5	Komunikasi dan Koordinasi	0.7064	0.3494	Valid
	QM 6	Project Quality Plan	0.7193	0.3494	Valid
4		Knowlegde Management			
	MP 1	Knowledge sharing	0.6663	0.3494	Valid
	MP 2	Information Technology Support	0.7936	0.3494	Valid
	MP 3	Knowledge Application	0.7916	0.3494	Valid
	MP 4	Developing Knowledge	0.7033	0.3494	Valid
	MP 5	Organizational Culture	0.8529	0.3494	Valid
5		Project Succes			
	K 1	On Time Delivery	0.7495	0.3494	Valid
	K 2	Minimum Waste	0.7487	0.3494	Valid
	K 3	Product Standardization	0.8201	0.3494	Valid
	K4	According to The Initial Design	0.7317	0.3494	Valid
	K5	According to Stakeholders' Expectations	0.7944	0.3494	Valid
	K6	Zero Accident	0.4688	0.3494	Valid

Source: (Processing Results, 2024)

Reliability test is used using the Alpha-Cronbach formula where the reliability is declared satisfactory if the value obtained exceeds 0.6. In Table 7. The results of the Reliability Test state that as follows:

Table 5. Value of Reality Test

Reability Coefficient	
N of Cases	30
Alpha – Cronbach	0.9622
N of Items	27

Source: (Processing Results, 2024)

PLS-SEM/ SmartPls Analysis

In line with what has been explained earlier, in this study a data processing process was carried out using PLS-SEM analysis with Smart PLS 3.0 software. The steps carried out in PLS-SEM analysis include Conceptual model, path diagram construction, path diagram conversion, and model evaluation.

Evaluation of Measurement Models and Structural Models (Outer Model and Inner Model)

Validity Test

The validity test in Smart PLS modeling can be seen in the Discriminant Validity on the AVE (Average Variance Entrance) value and Loading Factor in each latent variable. The indicator is valid if it has a loading factor value of ≥ 0.7, if the indicator has a value of <0.7 it will be dropped or issued (Irwan & Adam, 2015). In Figure 2. The loading factor values on the outer model are displayed between the indicator and its variables.

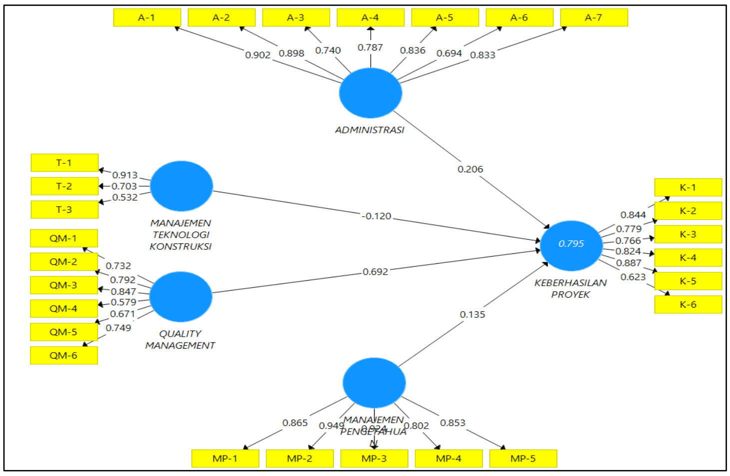

Figure 2. Value Loading Factor Modeling

From Figure 2, several indicators have a loading factor value of <0.7. The indicator is removed and then re-run on SmartPLS 3.0. The results are as follows in Figure 3.

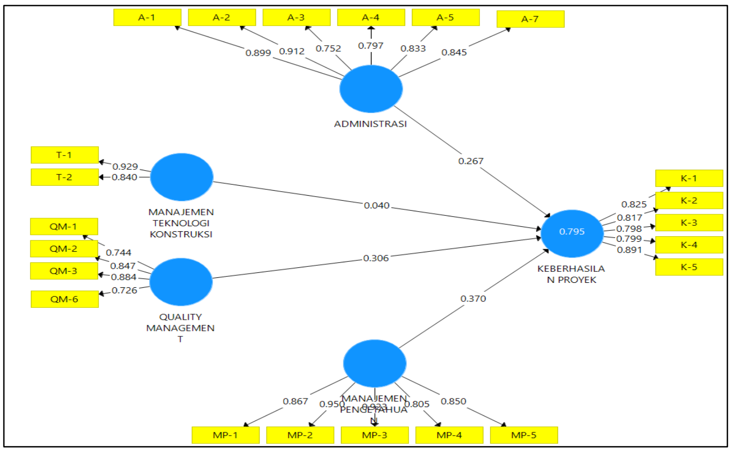

Figure 3. Value Loading Factor Re-modeling

Based on Figure 3, all indicators have a loading factor value of ≥ 0.7. This indicates that all indicators are valid. According to (Muhson, 2022) the guidelines state that the relative construct AVE value must be greater than 0.5 by proving the validity & and estimation of the reliability of indicators and constructs. The AVE values in this modeling are shown in Table 6.

Table 6. AVE Values

No	Variable's	AVE Values
1	Administrations	0,708
2	Technology's Management	0,784
3	Total Quality Management	0,645
4	Knowledge Management	0,775
5	Projects Succes	0,683

Source: (Processing Results, 2024)

Reliability Test

An indicator is considered realistic if it has a Cronbach's Alpha Value of > 0.6 and a Composite Reliability Value of 0.7 (Muhson, 2022). To see these values are shown in Table 7.

Table 7. Reliability Values

No.	Variable's	Cronbach's Alpha	Composite Reliability
1	Administrations	0.916	0.935
2	Technology's Management	0.733	0.879
3	Total Quality Management	0.813	0.878
4	Knowledge Management	0.928	0.945
5	Projects Succes	0.884	0.915

Source: (Processing Results, 2024)

Based on Table 7, each latent variable has a value of Cronbach's Alpha > 0.6 and Composite Reliability > 0.7. This means that all indicators have a good and reliable realistic value.

Structural Model Evaluation (Inner Model)

R – Square Test

The R-Square test aims to measure how well the PLS-SEM model explains the variation of endogenous latent variables (variables influenced by other latent variables) in the model. In the context of PLS-SEM, R-Square can be calculated for any endogenous latent variable (Marliana, 2019). The R-Square value ranges between 0 and 1, and the higher the value, the better the model can explain the variation of that latent variable (Putra, 2021). The R-Square in this research modeling is contained in Table 8.

Table 8. R-Square Test

	R Square
Project's Success	0.795

Source: (Processing Results, 2024)

Path Coefficient

Table 9. Path Coefficient

No.	Variable's	Project's Success
1	Administrations	0.267
2	Technology's Management	0.040
3	Total Quality Management	0.306
4	Knowledge Management	0.370

Source: (Processing Results, 2024)

Based on Table 9. Regarding the Path coefficient, it was found that the path coefficient value of the latent variable is positive, which means that all latent variables related to the implementation of construction management on the successful project have a positive impact.

Significance Evaluation Test

In this study by the formulation and purpose of the problem, to determine the magnitude of the influence of construction management implementation on project success, statistical testing was carried out, where latent variables were declared to have a significant effect if T statistics ≥ T table. Therefore, this model sets a significance (α) of 5% with a total of 30 samples. Then obtained a T_{table} Value of 1.960. The following statistical values are obtained from the SmartPLS 3.0 Modeling process in Table 10. and Figure 4. See the following:

Table 10. T-Value Modeling Statistics

No	Variable's	T Statistics (|O/STDEV|)	P Values
1	Administrations > Projects Success	1,574	0,116
2	Construction technology Managagement -> Projects Success	0,288	0,773
3	Total Quality Management > Projects Success	1,566	0,120
4	Knowledge Management > Projects Success	2,174	0,030

Source: (Processing Results, 2024)

Following Table 10. Regarding modeling Statistics, it is stated that Knowledge Management has P Values < 5% which means that the latent variable has a significant positive effect on project success. while the Technology Management, Administration, and Quality Management have P Values > 5% which means that these variables do not have a significant positive effect. Shown in Figure 4.

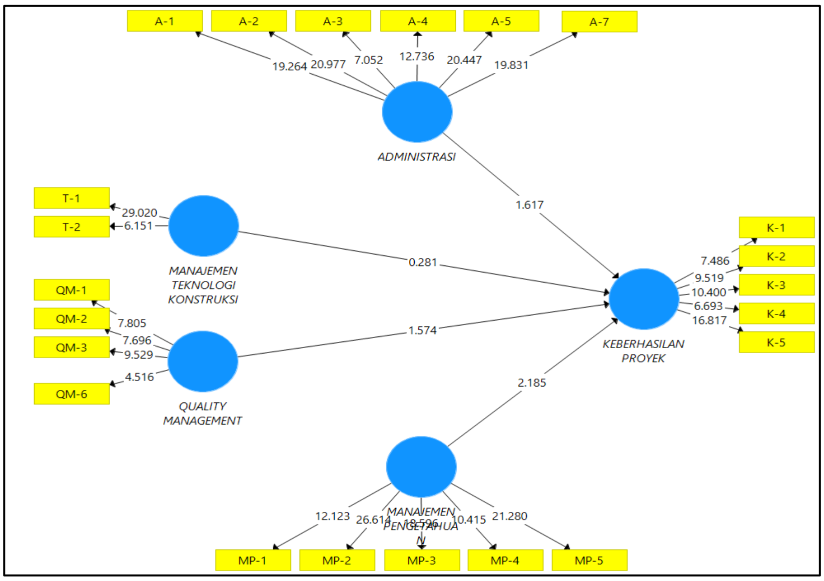

Figure 4. Varied T-statistical Values

Based on the data in Table 10 and Figure 4, there are varied T-statistical Values, it can be taken that the Administrative, Quality Management, and Construction Technology have a Statistical Value of <1.960 which means that these three variables have an insignificant level of construction management application of the Project Success Variable. Knowledge Management has the highest value and has a positive significance to project success of 2.174.

Analysis of the Application of Construction Management to Project Success

In this study, to find out which indicators have an Applications Performance Value on Project Success, an Importance Performance Analysis Test was conducted. The results are shown in Table 11.

Table 11. Performance Value to Project Success

No		Variable's	Importance/ Projects Success	Performance Applications
1	A 1	Financial Capability	0.045	71.667
2	A 2	Technical Capabilities	0.047	68.333

3	A 3	Experience and Performance	0.042	63.333
4	A 4	Managerial Ability	0.040	61.667
5	A 5	Price Quote	0.043	50.000
6	A 7	Subcont Selection & Superflat Floor Applicator / Procurement Method	0.048	58.333
7	T 1	Construction Technology Management	0.020	41.667
8	T 2	Development Management	0.015	46.667
9	QM 1	Continous Improvment	0.092	58.333
10	QM 2	Teamwork	0.076	68.333
11	QM 3	Customer Focus	0.073	75.556
12	QM 6	Project Quality Plan /	0.091	68.333
13	MP 1	Knowledge sharing	0.062	58.333
14	MP 2	Information Technology Support	0.076	58.333
15	MP 3	Knowledge Application	0.075	60.000
16	MP 4	Developing Knowledge	0.060	55.000
17	MP 5	Organizational Culture	0.088	70.000
		Mean	**0.060**	**60.000**

Source: (Processing Results SmartPls 3.0, 2024)

In connection with Table 10, then the 17 indicators above are mapped into 4 quadrants based on the value of performance applications with the importance value of project success.
As on the table above, the next mapping is carried out on the Importance Performance Analysis diagram in the following Figure 5.

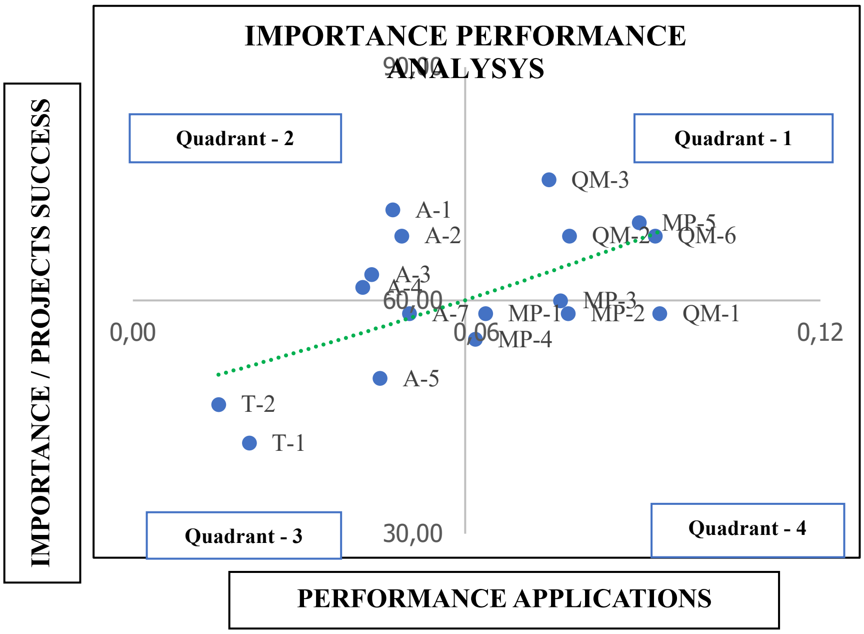

Figure 5. Importance Performance Analysis

Based on the results of PLS-SEM and IPA analysis that have been displayed, a mapping of the implementation of construction management indicators on the success of the superflat concrete floor project was obtained in a case study (Superflat Concrete Floor Project in the Karawang Factory Area) as in the following explanation in Table 11.

Table 12. Construction Management Implementation Mapping

Quadrant	Categories	Indicators
I (High Performance, High Importance)	Keep Up the Good Work	QM-2 Teamwork QM-3 Customer Focus QM-6 Project Quality Plan MP-3 Knowledge Application MP-5 Organizational Culture
II (Low Performance, High Importance)	Concentrate Here	A-1 Financial Capability A-2 Technical Capabilities A-3 Experience and Performance A-4 Managerial Ability
III (Low Performance, Low Importance)	Low Priority	A-5 Price Quote A-7 Procurement Method T-1 Construction Technology Management T-2 Development Management
IV (High Performance, Loe Importance)	Possible Overkill	QM-1 Continous Improvement MP-1 Knowledge sharing MP-2 Information Technology Support MP-4 Developing Knowledge

CONCLUSIONS

The research, conducted through PLS-SEM/SmartPLS analysis, establishes a significant positive impact of Knowledge Management variables, specifically Knowledge Application and Organizational Culture, on the success of Superflat Concrete Floor Projects in the Karawang Factory Area. The identified positioning of these variables in Quadrant I underscores their pivotal role in project success. The research objectives focused on evaluating this impact, revealing the importance of incorporating effective Knowledge Management practices. The IPA Mapping – Importance Performance Analysis highlights the need to maintain high levels of Construction Management Implementation Performance (Quadrant I) and directs attention to Construction Technology Management and Administration Variables (Quadrant IV). The implications stress the importance of emphasizing Knowledge Application and fostering a conducive Organizational Culture for project success. Recommendations include further research on the nuanced interactions between Quality Management and Knowledge Management, as well as a deeper investigation into variables like Price Quotation and Procurement Method. Overall, these findings provide valuable insights for practitioners and researchers, guiding the refinement of construction management practices in the context of Superflat Concrete Floor Projects.

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