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ANALYSIS OF IMPLEMENTATION SUPPLY CHAIN MANAGEMENT MATERIAL PROCUREMENT EFFECT ON CONSTRUCTION PROJECT PERFORMANCE

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Abstract. The implementation of material procurement supply chain management is very much needed by the construction industry to improve project performance. Supply chains can contribute to reduced costs, improve efficiency and improve the delivery of a material's final results promptly on time. So that it is expected to achieve the project objectives in accordance with the cost, quality and time. that had been planned. This research aims to determine the influence of the implementation of supply chain management of material procurement to the performance of construction projects and the biggest challenges in implementing supply chain management of material procurement. The analysis methods used in this study are descriptive methods and regression methods with quantitative approaches. Data collection techniques using a questionnaire and using a Likert scale. The number of respondents as many as 28 people selected from project employees with purposive sampling method. The results showed that the application of material procurement supply chain management characteristics had a positive and significant effect on the performance of construction projects by 39%.The biggest factors that become challenges in implementing supply chain management of material procurement, namely the uncertainty of demand with an average of 2,797 and the smallest factor that becomes a challenge in implementing supply chain management of material procurement, namely internal uncertainty factor with an average of 2,202. Thus, from the results of the research, it is expected that the project can play a more active role in implementing supply chain management of material procurement to improve the performance of construction projects.

Keywords : Supply chain management; Construction project performance; Deployment challenges.

1. INTRODUCTION

Construction projects are complex because they combine a large number of diverse resources [1]. Materials are one of the most important parts of any construction project, because material resources can cost 50%-70% of the project cost [2]. In the event of a failure in the management system for construction materials will result in losses and the project may experience delays in work activities. Seven factors cause delays in the completion of the building project, one of which is the material availability factor of 15.14% [3]. To overcome problems such as delays in the completion of construction projects, the unavailability of materials when needed that result in losses and failures in the construction material management system, a good and appropriate management and control is needed by implementing supply chain management in the material procurement process.

Supply chain management is a cooperative relationship between suppliers that is related to the purpose of obtaining materials or materials needed from suppliers because of the demand for a material [4]. The parties

involved in the construction process will form the supply chain and will indirectly be interconnected and interdependent [5]. The concept of supply chain is applied to construction after seeing success in the manufacturing sector in applying the concept of supply chain and developing to date [4]. The purpose of implementing supply chain management is to reduce the amount of costs, increase the entire supply chain, reduce the time and delivery of materials promptly on time to satisfy customers [6]. The application of supply chain is strategy to improve project performance. Performance in the field of construction is one of the processes in the field of construction management by evaluating and comparing the plan with the results achieved, comparing deviations that occur and making improvements [7]. Project performance is limited by cost, time and quality [8]. Therefore, the application of a supply chain can reduce construction costs, increase efficiency, and improve the delivery of the result of a material accurately and precisely in time [9]. Supply chain management is contained in Presidential Regulation, Perpres No. 26/2012 on Print Blue Development of National Logistics System and Perpres No. 32/2011 on Masterplan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI) in 2011 – 2025. With the main approach is to develop the concept of Supply Chain Management Construction to support the construction of reliable construction infrastructure [10]. In implementing supply chain management, In implementing supply chain management, several challenges must be faced, namely: the complexity of the supply chain structure and uncertainty [11]. Uncertainty is divided into three classifications: demand uncertainty, supply uncertainty and internal uncertainty [11].

Research on supply chain management on project performance has been conducted by researchers before [12]. The results showed that the influence of supply chain management on project performance was 68%. What distinguishes this research from previous research is the focus on the supply chain in the material procurement process where in previous studies the supply chain was described in general terms. And in this study using a questionnaire with purposive sampling method and data processing using statistics software. By using the purposive sampling method in sampling can facilitate the achievement of a research goal, because the sample used based on the necessary criteria and purposive sampling method is easy to do and more efficient. The purpose of this study is to determine the effect of the application of supply chain management characteristics of material procurement on the performance of construction projects on the "X" project and to determine the biggest factor that becomes a challenge in implementing supply chain management of material procurement on the project "X".

2. METHODS

The research began in May 2021 to June 2021. The research was conducted at the "X" Apartment Project located in East Jakarta. Data collection is carried out using questionnaires and project data. Sample selection is done by purposive sampling method based on predetermined criteria. The respondent criteria used as a sample are employees who have at least 2 years of work experience in the field of building construction and are appointed as competent staff in the field of material management.

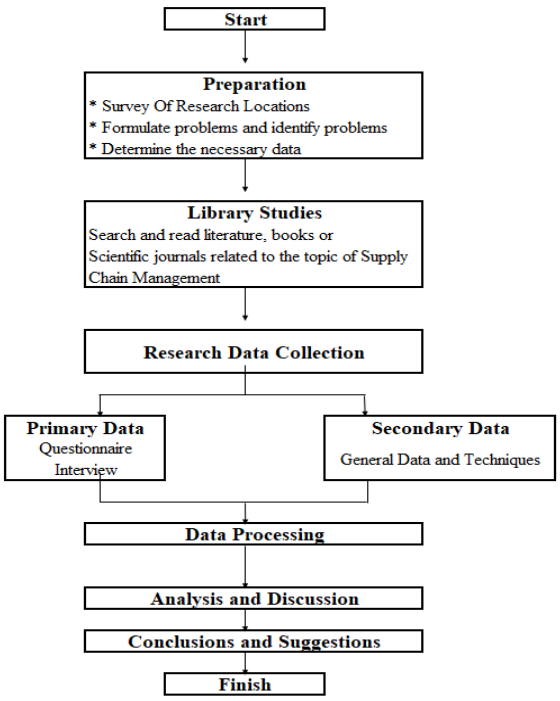

Figure 1. Research Flowchart

Figure 1 is a research flowchart. The research phase begins with the selection of research objects that will be reviewed with location observations. Then proceed with identifying and formulating the problems raised in the discussion of this research, then conduct a literature study, then data collection activities in the form of distributing questionnaires. After the data obtained is sufficient, then data using SPSS Statistics 25. The calculated value is used as a material for discussion and conclusions are drawn.

Methods of Collecting Data with Questionnaires

In this method, the author distributes questionnaires to respondents, namely related project parties who are competent in the field of material management by containing questions related to the implementation of supply chain management in material procurement, construction project performance and challenge factors in implementing supply chain management. Filling using a likert scale. This study uses descriptive research and causal associative research with a quantitative approach. Descriptive research aims to find the average, standard deviation, minimum and maximum [13]. Associative causal research to find out the effect or relationship between variables [14]. This research uses validity, reliability, normality, simple linear regression test, hypothesis testing and R^2 test [15].

3. RESULTS AND DISCUSSION

This result is obtained from data processing using SPPS Statistic 25, namely the effect of the application of supply chain management of material procurement to the performance of construction projects and challenges in implementing supply chain management of material procurement, the following results are obtained

3.1 Indicators on Research Variables

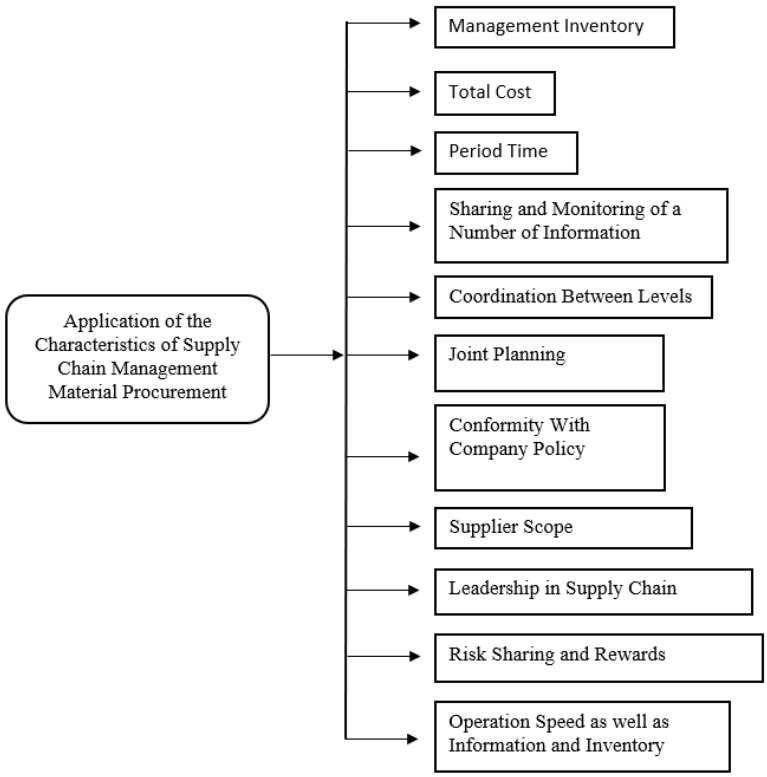

Figure 2. Indicators characteristics of Supply Chain Application Material Procurement

Figure 2 is an variable indicator of application characteristics of supply chain material procurement consisting of 11 indicators, namely management inventory, total cost, period time, sharing and monitoring of a number of information, coordination between levels, joint planning, conformity with company policy, supplier scope, leadership in supply chain, risk sharing and rewards, operation speed as well as information and inventory.

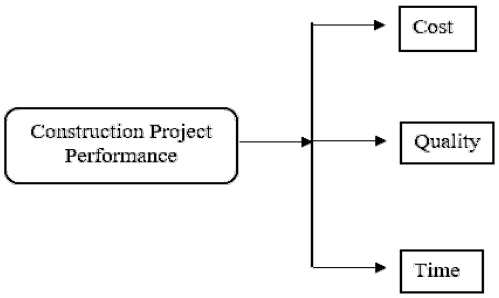

Figure 3. Indicator Construction Project Performance

Figure 3 is an indicator of construction projects performance variables consists of 3 indicators namely cost, quality and time

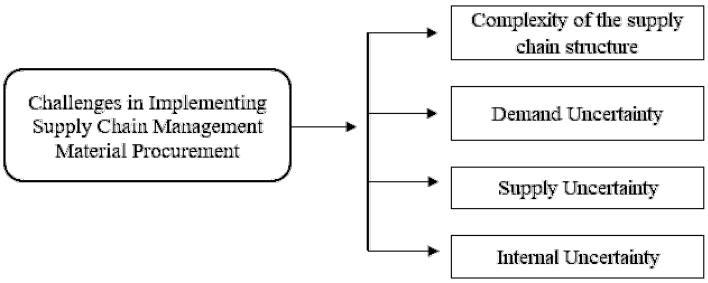

Figure 4. Indicator Challenges In Implementing Supply Chain Management Material Procurement

Figure 4 is an indicator of the challenge variables in implementing supply chain management for material procurement which consists of 4 indicators, namely the complexity of the supply chain structure, demand uncertainty, supply uncertainty and internal uncertainty.

3.2. The Effect of Material Procurement Supply Chain Management on Construction Project Performance

Table 1. Hypothesis Test Results (t test)

Model	B	Std.Error	t	Sig.
(Constant)	10.615	6.803	1.560	.131
Total X	.345	.086	3.996	.001

Table 1 is the result of hypothesis testing, the results of the study show that the application of supply chain management characteristics of material procurement has a significant effect on project performance. This is evidenced from the results of hypothesis analysis (t test) with $t_{count} \geq t_{table}$ (3.996 ≥ 2,056) significant level 5%, and the probability value of sig is 0.001 ≤ 0,05. If $t_{count} > t_{table}$ and value significance < 0,05, then Ha is accepted and Ho is rejected.

Table 2. Simple Linear Regression Test Results

Model	B	Std.Error	t	Sig.
(Constant)	10.615	6.803	1.560	.131
Total X	.345	.086	3.996	.001

Table 2 is the result of a simple linear.regression test, the regression equation is obtained Y = 10.615+ 0,345X. The constant value is 10,615, where project performance based on cost indicators, quality and time on construction is good and has a positive value. A positive value of 0.345 illustrates that, every one unit increase in the implementation of material procurement supply chain management variables will cause an increase in project performance of 0.345. Thus, the more implementation of material procurement supply chain management is implemented, the more construction project performance will increase. The t value is obtained from B divided by the standard error, the greater the t value, the smaller the significance value. Based on the value of simple linear regression test results, the standard error value is 0.086 and the t value is r 3.996 and produces a sig value of 0,001 < 0,05. So it can be concluded that Ha is accepted and Ho is rejected. Where there is a significant influence on the implementation of material procurement supply chain management on the performance of construction projects.

Table 3. Coefficient of Determination Test Results

R	R Square	Adjust R Square	SEE
.624[a]	.390	.365	4.370

Table 3 is the result of the coefficient of determination test, the value coefficient of determination or R square is 0.39 or equal to 39%. Standard Error of Estimate (SEE) is 4.370.

3.3 Challenges in Implementing Material Procurement Supply Chain Management

Table 4. Descriptive Statistics Variable Challenges in the Implementation of Supply Chain Management Material Procurement (Indicator of the Complexity of Supply Chain Structure)

Item	Min	Max	Sum	Mean	Std. Deviation
Z1.1	2	5	102	3.642	.780
Z1.2	1	5	68	2.428	1.168
Z1.3	1	5	79	2.821	1.123
Z1.4	1	4	67	2.392	1.065
Z1.5	1	5	74	2.642	1.095
Average				2.785	

Table 4 is the result of the value of the indicator of the complexity of the supply chain structure, the most dominant item is shown in Z1.1, namely material suppliers are also partners of other parties with the highest number of 102 and an average of 3,642. The Supply Chain Structure Complexity indicator has a total average score of 2,785 answers which are in the category “Just Agree” [16]-[17].

Table 5. Descriptive Statistics Variable Challenges in the Implementation of Supply Chain Management Material Procurement (Indicator of Demand Uncertainty)

Item	Min	Max	Sum	Mean	Std. Deviation
Z2.1	1	4	69	2.464	.744
Z2.2	2	5	91	3.250	1.142
Z2.3	1	5	75	2.678	.983
Average				2.797	

Table 5 is the result of demand uncertainty indicator value, the most dominant item is shown in Z2.2, namely a change in demand with the largest number of 91 and an average of 3,250. The Demand Uncertainty Indicator has a total average score of 2,797 answers which are in the category “Just Agree” [16]-[17].

Table 6. Descriptive Statistics Variable Challenges in the Implementation of Supply Chain Management Material Procurement (Indicator of supply uncertainty).

Item	Min	Max	Sum	Mean	Std. Deviation
Z3.1	1	5	70	2.500	1.138
Z3.2	1	4	61	2.178	.818
Z3.3	1	5	73	2.607	1.314
Average				2.428	

Table 6 is the result of supply uncertainty indicator value, the most dominant item is shown in Z3.3, namely the uncertainty of the quality and quantity of existing materials with the highest number of 73 and an average of 2,607. The supply uncertainty indicator has a total average score of 2,428 answers which are in the category "Do not agree" [16]-[17].

Table 7. Descriptive Statistics Variable Challenges in the Implementation of Supply Chain Management Material Procurement (Indicator of internal uncertainty)

Item	Min	Max	Sum	Mean	Std. Deviation
Z4.1	1	4	62	2.214	.686
Z4.2	1	3	57	2.035	.637
Z4.3	1	4	66	2.357	.911
Average				2.202	

Table 7 is the result of internal uncertainty indicator value, the most dominant item is shown in Z4.3, namely the uncertainty of the quality of the parties (HR) in management with the highest number of 66 and an average of 2,357. The Internal Uncertainty Indicator has a total average score of 2,202 answers which are in the category "Do not agree" [16]-[17].

Table 8. Variable Challenges for Implementing Supply Chain Management Material Procurement

Indicator	Code	Statement
Complexity of Supply Chain Structure	Z1.1	Material suppliers are also partners of other parties
	Z1.2	Frequent changes of members in a supply chain
	Z1.3	Flow of information, goods and funds between supply chain members
	Z1.4	Parties in the supply chain have their own interests
	Z1.5	The number of parties involved increases the potential for conflict
Uncertainty of Demand	Z2.1	Uncertainty about the type, timing or location of a project
	Z2.2	There is a change in request
	Z2.3	Uncertainty on the number of requests
Supply Uncertainty	Z3.1	Delivery time uncertainty
	Z3.2	Uncertainty in material prices
	Z3.3	Uncertainty about the quality and quantity of materials available
Internal Uncertainty	Z4.1	Information technology uncertainty
	Z4.2	Uncertainty in the availability of working capital
	Z4.3	Uncertainty in the quality of the parties (HR) in management

Source: Siahaya (2013)

Table 8 is a statement of each indicator of the challenges in implementing supply chain management of material procurement. Each indicator has 3-5 statements.

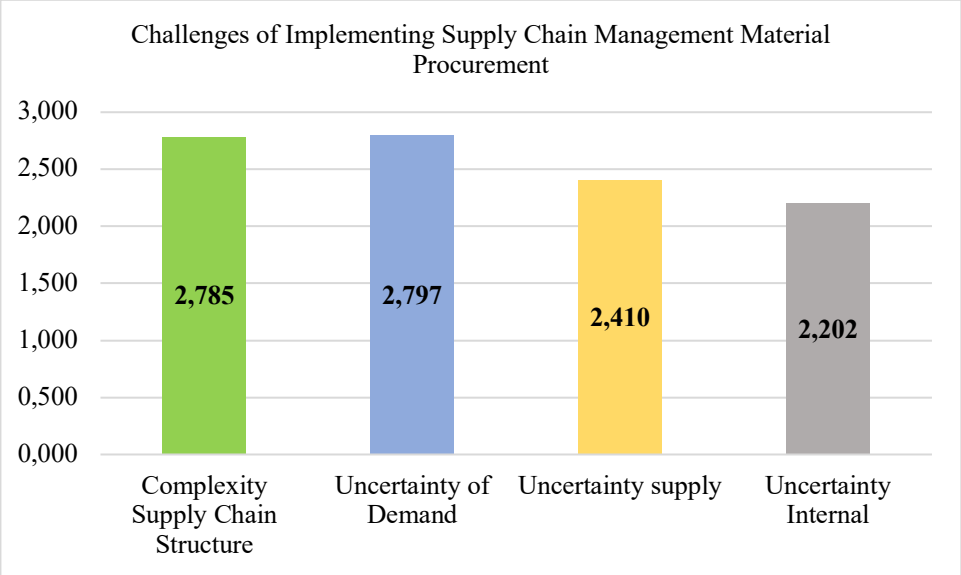

Figure 5. Graph of Challenges in implementing supply chain management in material procurement

Figure 5 is a graph of the challenges in implementing supply chain management of material procurement, of which the biggest factor is the uncertainty of demand and the smallest factor is the internal uncertainty obtained based on the average.

Based on the results of the analysis that has been done shows that by applying supply chain management characteristics to material procurement can improve project performance. Parties involved in a construction project are advised to further implement supply chain management of material procurement in a construction project to improve project performance by overcoming challenges in implementing supply chain management.

4. CONCLUSION

The conclusions from the research results are obtained as follows:

1) It is concluded that the application of supply chain management characteristics of material procurement has a positive and significant effect on the performance of construction projects. This is evidenced by the results of the hypothesis analysis (t test) and the sig probability value of 0.001 ≤ 0,05. The results also show that the value (R^2) is 0.39 where the application of the characteristics of the supply chain management of material procurement affects the performance of construction projects by 39% and the remaining 61% is influenced by other factors not examined and discussed in this research.
2) The biggest factor that becomes a challenge in the implementing of supply chain management for material procurement is the demand uncertainty factor with an average of 2,797 and the smallest factor that becomes a challenge in the implementing of supply chain management for material procurement is the internal uncertainty factor with an average of 2,202. The order of factors from the biggest to the smallest challenges in implementing supply chain management in material procurement are demand uncertainty, supply chain structure complexity, supply uncertainty and internal uncertainty.

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