

The Effects of Improvement Change Order in Increasing Performance Project Costs on High Rise Construction Building in DKI Jakarta

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ABSTRACT: In the implementation of construction projects are often faced with problems during the project period, one of which is the occurrence of changes. A request to carry out a change in the construction of a project is commonly called a Change Order. Change order occurs at the beginning, middle to end of project construction work, both on building project and infrastructure. This study uses case study of high rise building project in DKI Jakarta (mixed use building) which consists of office and apartment supported by retail culinary. Change order is also one of the main causes in using and managing cost efficiency in project construction and can be a dispute.

The research instrument of this paper consists of 3 factors causing change order, 43 independent variables and 1 dependent variable. This research uses quantitative method with statistical study approaches with SPSS (Statistical Package for the Social Sciences) version 22. The required data is a high-rise building construction project in DKI Jakarta which is mixed using change order. The data obtained were analyzed by Pearson correlation, linear regression method and test model, and R square test.

The purpose of this study is to determine the factors causing the change order, how far the influence of change order on the cost performance and the most dominant cause of change order influence the cost performance.

KEYWORDS: *Change Order, Cost Performance, High Rise Building, DKI Jakarta.*

I. INTRODUCTION

The construction project is a series of activities that process the project resources into its elements. The construction project has 3 characteristics: need resources (human, money, machine, method, material), unique, and requires organization according to Ervianto [1]. In the implementation of construction projects are often faced with problems during the project period, one of which is the occurrence of changes. There has never been a project where all of its activities go according to plan, especially on large and complex projects. This is due to, among other things, the time of drawing up basic planning that has not enough available data and information needed so that the planning materials are largely based on estimates and assumptions of the circumstances to come. A project consists of a specific scope of work, the period of the performance of a predetermined project outcome and the cost of the project budget. Where any or all of these three may undergo changes during the life of the project according to Douglas III [2]. A request to implement a change in the construction of a project is usually called a Change Order based on the source of Nunnally [3]. According to a survey of MoSPI (Ministry of Statistics and Program Implementation) data from 2012 of various types of project construction in India there is a 16.9% cost overrun from the project cost budget. One factor is the change order of the project owner. This is the case with construction projects in Syria, according to a survey from Ahmad [4]. There is a 27% increase in cost overrun. The change order on the construction project is the most significant cause of unexpected contingencies or additional costs, this change order represents a fourth-order risk in a construction project affecting risk analysis in Thailand from Hendrik [5]. Therefore, the main cause of this cost overrun is the change order in project construction from the project owner.

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Construction in Indonesia on change order phenomena among others, namely: the occurrence of change order on building buildings in Denpasar based on sources from Widhiawati [6]. Factors that greatly affect the occurrence of change orders are the design changes of the project owner, it also leads to the modification of contracts in the duration of time (delay) and the cost of construction projects. This also happened in North Maluku Province according to Nurlaela [7].

Indonesia as a developing country, has rapidly growing projects, in which the growth of these projects is done to build the state economy, improve the quality of life, the welfare of society, and the ease of society. One of the most rapidly growing projects in Indonesia is the high-rise building construction project. The rapid development of construction projects in Indonesia can be seen in the business center, politics and culture of Indonesia, namely DKI Jakarta.

Based on the phenomena of building buildings that occur various places abroad and domestically, researchers interested to examine the change order in improving the cost performance of high-rise building construction projects, especially in Jakarta.

The purpose of this study is to determine the factors causing the change order, how far the influence of change order on the cost performance, and the most dominant cause of change order influence the cost performance.

II. LITERATURE REVIEW

Project Life Cycle

There are six basic stages in the project life cycle in developing a project from idea to reality. This cycle shows that each construction project will coincide between one stage and another, among others: concept and feasibility studies, engineering and design, procurement, construction, start of work and implementation, and the last is operation and use according to Donald & Boyd [8]. According to A Guide To The PMBOK Fifth Edition [9] there are 5 stages of construction projects, consisting of: Initiating Process Group, explaining the definition and stages of the project. Planning Process group, outlines the definition of goals and planning needed to achieve that goal, and determines the scope of the project. Next Executing Process Group, integrating project resources to implement project management planning. Monitoring and Controlling Process Group, performs measurements and developments to identify differences in project management planning. And the last is the Closing Process Group, the process of formal project product acceptance, as the closure of the project stage. Meanwhile, according to Soeharto [10] stage of construction project cycle has 3 stages, among others: First is the conceptual stage. This stage consists of several activities that include the formulation and formulation of ideas, preliminary analyzes and feasibility studies. Second, the stage of definition or planning and stabilization. This stage consists of the main activities, including planning and making strategic decisions related to the outline of project implementation, setting up the equipment and selecting project participants. And the last stage is the implementation stage. This stage involves reviewing the scope of the project which then establishes the implementation program and communicates it to the project participants, performs detailed engineering design work, procures materials and equipment, controls the cost, time, and quality aspects, and closes the project and submits the project result to the owner.

From the stages mentioned, according to Jacqueline T Doyle [11] of the journal entitled "Lessons Learned on Reducing Change Orders" the stage that contains the most change order is the construction phase. Based on the source of Professional Construction Management occurs in the construction phase. In addition, according to A Guide To The PMBOK Fifth Edition [9] is the executing process group stage of the project, according to Soeharto, "Project Management from Conceptual to Operational" is also at the implementation stage of the project cycle. For that event the possible change order in this study is taken at the construction stage as stated by James M Bolin [12] in the journal entitled "Effective Change Order Management". In addition, the construction phase also involves many parties, so it is possible to change the order.

Change Order

According to the experts the definition of change order, among others: according to Fisk and Reynold [13] change order is as a form of approval or written agreement to modify, add, even change the work of contract documents at the opening of the offer. In addition, according to Soeharto [10] change due to change order is change after approval and signed contract. Briefly the definition of change order according to Schaufelbeger and Holm [14] as a modification of the original contract. Change order as an official document signed by both parties, between project owner and project

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executor by Barrie and Boyd [8]. The definition of change order according to Directorate General of Highways, Ministry of Public Works is added work less to adjust the field volume or schedule changes without changing the terms of the contract. So the definition of change order is the form of contract or written agreement agreed upon by the owner with the project recipient (contractor) to change the initial construction contract agreement. A change order may result in a change of work within the project, whether it is the addition of a job deductions that the contract has specified from the outset. These job changes take place during the construction of the project.

In the implementation of change order according to the above definition to change the request for the plan and or the scope of the construction of the project, demanded the addition in the volume of work even in the contract or contract value in time. So the proposed change order by the contractor according to Fisk and Reynold [13] aims, among other things: to change the contract plan with the change of specific methods in payment. There is also to change the contract specifications, including changes in payments and contract times that change from before. In addition, for the approval of additional new work, in this case including payments and changes in the contract. For administrative purposes, in setting the method of payment of extra work or addition. Another objective is to follow the adjustment to contract unit price in the case of overruns and underruns, which are tailored to specifications. As well as for submission of proposed incentive proposal cost reduction (proposal value engineering). The last goal is to influence the payments made once the demands are resolved.

In general there are two types according to Gilberth [15] in the change order of the directive change (formal change) and constructive change (informal change). Directive change is a proposed change in written form, proposed by the contractor to the owner to change the scope of work, time of execution, fees or matters different from those specified in the contract document. Formal changes usually involve alternatives to the design and material specifications of a construction and are manifested in the form of improvements in the drawings in the contract documents there are usually provisions that govern all the contents. And such provisions usually provide a unilateral freedom to the owner to change the scope of work and require the contractor to follow those changes. This formal change is known before the work is done. The second type is constructive change (informal change). According to Donald and Boyd [8] constructive change (informal change) is an informal act of ordering a modification of a contract on the ground that occurs due to the request of the owner, the plotters or the contractor. constructive change is also described as a change agreement between owner and contractor in cost and time. Construction changes are often the main cause of disputes between owners and contractors due to the execution of work outside of contract documents, therefore contractors should propose changes in writing.

In reviewing the issue of change order through several references found on the causes of change orders that can be caused by many factors. The following are the factors causing the change order summarized based on the source of 8 experts grouped in three parts: Construction, Administration, and Resources. The following is a grouping of factors and causes change change variables.

Table 1: Factors and Variables Causes Change Order

Factors	Variables Cause Change Order
CONSTRUCTION	Mistake in planning & design, design improvements during construction, Changes in working methods during construction, Incompatibility between drawings and field conditions, Unclear detail/drawing specifications, Lack of knowledge about the character of the material to be used, Addition of working scope, Reduction of work scope, Value engineering, Incomplete field investigation, Late material delivery, Late access to field on project, Limited access in the field.
ADMINISTRATION	Improvement of urban planning regulations, change of decision maker by owner, Changes in law / government, Increase of facility for environment of population in area around project, Project schedule estimated too solid, Lack of project control, Lack of anticipation of sudden condition, Specification sent Incorrect, late in approval of drawings, contract design and clarification, Acceleration of work administration, slowdown of work administration, Sudden schedule change, Late contractor schedule, Mistake and omissions in determining volume estimation, Coordination of bad documents, additional requirements / procedures of job improvement, Material specification changes.
RESOURCE	Lack of worker experience, Lack of worker knowledge, Lack of good teamwork among workers, overworked, Workers unable to follow procedures, Lack of QA/QC knowledge, Lack of equipments, Low worker skills, Failure supplying skilled labor, Material not available in market, Owner dispute with representative design, Mistake in job execution

Based on table 1 shows the factors and variables that cause a change order consisting of 3 factors and 43 variables.

Impact of Change Order on Project Cost Performance According to Ibbs [15] from the journal "Quantitative Impacts Project Change: Size Issues, Journal of Construction Engineering and Management, ASCE, Vol. 123, No. 3 "states that change has a great influence on the performance of a construction project. Changes to the scope of work may result in

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additional project costs and schedule renewals. In this study changes in implementation can affect project cost performance. Increased change order that occurs in the construction phase can affect the cost performance of the contractor in working on high-rise building construction projects especially mixed use in DKI Jakarta.

High Rise Building Project in DKI Jakarta

In Act No. 28 of 2002 concerning buildings, it is understood that the definition of a building is a physical form of a construction work that integrates with its place of residence, partly or entirely above and / or in the soil and / or water, which functions as a human place conduct their activities, whether for housing or shelter, religious activities, business activities, social activities, culture, or special activities. Based on clause 1 above, the function of building buildings can be divided into several kinds. Classification of building building according to its function is regulated in article 5 that is: (a) Function of building building include function of residence, religion, business, social and culture, and special function. (b) The building of residential function as referred to in verse (1) includes buildings for residential houses, residential houses, flats and temporary houses. (c) The building of the religious function building referred to in verse(1) includes mosques, churches, temples, temples and pagoda. (d) The building of business function function as referred to in verse (1) covers buildings for offices, commerce, industry, hotels, tourism and recreation, terminals and storage. (e) The building of social and cultural functions referred to in verse (1) includes buildings for education, culture, health services, laboratories and public services. Classification of buildings based on altitude based on Provincial Regulation. Activities of building construction include inspection of implementation documents, field preparation, construction activities, final inspection of construction works and delivery of final work results. For high-rise buildings included in the category of buildings based on altitude classification. Buildings are categorized high-rise if they have more than 8 (eight) storey building floors. High-rise buildings by function are grouped into 2, there are single and mixed-use buildings. Single building can function as residential / apartment, office and hotel, including as retail building or educational facility. While the mix-used building, which has a variety of functions, among others, there are lodging facilities, and offices equipped with commercial areas in one building. High-rise building projects include large projects with relatively high overall project costs. This causes the use of structural systems and utilities that are not easy and cheap, in addition to the use of materials and building construction equipment particular. Based on buildings in DKI Jakarta which is regulated by No. 7 of 2010 on Building Building clause 10 verse 6 that is: (a) Building high-rise buildings. (b) Medium-level buildings. (c) Low-rise buildings. And Local Regulation No. 7 of 2010 clause 10 verse 6 that is: (a) The meaning of high-rise building is a building that has a number of building floors more than 8 (eight) floors. (b) What is meant by a medium-rise building is a building that has a number of floors of buildings 5 (five) floors up to 8 (eight) floors. (c) What is meant by a low-rise building is a building that has a number of floors up to 4 (four) floors.

III. RESEARCH METHODOLOGY

Research Process

Research is a long and thorough process which begins with an interest in knowing a particular phenomenon. The idea is intended to be more familiar with the relationship between the main part especially the occurrence of change order during the construction process takes place on the project cost performance. The framework of this research process is from the initial stage, literature review, analysis, and discussion. The initial stage is the first stage in the study used to determine the tools needed to achieve the research objectives. This section consists of problem issues after it emerged formulation of the problem.

The literature review is derived from the construction management guide book that can be helpful in this research. In addition, there are also relevant journals in the last 10 years of local and international journals with the aim of identifying the effect of change order improvements in improving cost performance in high-rise buildings in DKI Jakarta. Furthermore, at the stage of analysis is a stage to collect data consisting of primary and secondary data, followed by analyzing of the two data that will proceed later to be used in evaluating and providing recommendations on the Effect of Change Order Improvement in Improving Cost Performance of Building Construction Construction Project Building High in DKI Jakarta.

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Research Respondents

Research respondent is person or agency that will become source of information and answer questions of research questionnaire. Respondent in this research is staff or assignee working in specialist contractor in high rise building especially mix-used in DKI Jakarta with minimum age 23 years old, minimum education level of diploma, minimum 2 years experience especially in high building project, has reputation both in construction projects, have knowledge of change order, and the minimum positions that fill out this questionnaire are field implementers. In this research there are 51 respondents who fill this questionnaire.

Research Instruments

According to Syofian [16] the research instrument is a tool that can be used to acquire, process, and interpret information obtained from respondents conducted using the same measuring pattern. To be able to say a good research instrument, at least meet the five criteria, namely: validity, reliability, sensitivity, objectivity, and the feasibility. The research instrument used in this study is a questionnaire that will be distributed to respondents and interviews directly to the respondents.

In this research is divided into 2 data to be used, namely: Primary Data is data collected by the researcher directly from the first source (from the results of direct interviews) and temporary object of research conducted (answer the questionnaire of respondents). Primary data is data collected and processed solely by direct researchers from respondents. Secondary data is data published or used by non-processing organization, ie data obtained from other journals and literature related to this research. Secondary data is data obtained in the form of finished, that is processed and presented by other parties.

Research Methods

According to Sugiyono [17] research method is divided into 3, namely: quantitative research methods, qualitative, and combinations (mixed methods). In this study the researchers conducted a case study on high-rise project in DKI Jakarta. In order to get the results of research in accordance with the expected hence required the appropriate research methods. Research methods need to consider three things, namely the types of questions used, the constraints on the events studied, and the focus of ongoing events or just completed.

The statistical calculation based on the questionnaire answers will be processed by validity test, reliability test, correlation and intercorrelation analysis, factor analysis, determinant variable analysis, regression analysis, and model test. Using the tools of SPSS (Statistical Package for the Social Sciences) version 22.

IV. ANALYSIS AND RESULTS

Based on the table of factors and variable causes of change order ie construction factor (13 variables), administrative factors (18 variables) and resource factor (12 variables) tested the validity where the correlation value of Pearson r fulfilled the requirement greater than r table and continued for intercorrelation test and get valid data result consist of 13 variables those are Mistake in planning & design (X1), design improvements during construction (X2), Changes in working methods during construction (X3), Incompatibility between drawings and field conditions (X4), Unclear detail/drawing specifications (X5), Addition of working scope (X7), change of decision maker by owner (X15), Specification sent Incorrect (X21), late in approval of drawings, contract design and clarification (X22), Mistake and omissions in determining volume estimation (X28), Material specification changes (X28), Material not available in market (X41) and Mistake in job execution (X43).

Multiple Linear Regression Analysis

After that, based on the calculation results using SPSS program can be seen in the Coefficients that the regression model obtained is: $Y = -0.906 + 0.388 X_4 + 0.415 X_2 + 0.181 X_2 + 0.099 X_5 + 0.122 X_7$. From the existing regression equation, the constant value B obtained by all positive value variables which means the more frequent occurrence of causes of change order, it will further decrease the cost performance of high-rise building construction project in DKI Jakarta.

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Hypothesis Testing

Hypothesis in this research are:

Ho = the causes of change order factor does not significantly affect cost performance.

Ha = the factors causing the change order significantly influence the cost performance.

Based on the above hypothesis will be continued analysis of test models are T, F and D.

T Test

From T test, the value of t in SPSS program is found in the t test result table below. The value of t table is $t = 2.014103$ and seen from the existing significant level, obtained the result of hypothesis: Reject Ho and take Ha, the factors causing the change order significantly influence the cost performance of high-rise building construction project in DKI Jakarta.

Table 2: Results of T Test

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
	(Constant)	-.906	.379		-2.389	.021		
	X4	.388	.056	.457	6.943	.000	.937	1.067
	X2	.415	.075	.387	5.514	.000	.825	1.212
	X22	.181	.045	.268	3.992	.000	.900	1.111
	X5	.099	.037	.189	2.649	.011	.802	1.247
	X7	.122	.052	.158	2.323	.025	.874	1.145

Based on table 2 shows the results of analysis of SPSS software to get the value of T test.

F Test

By using SPSS program can be seen the results of F arithmetic = 21.412 and F table = 2.42 with significant results 0.000. so it can be seen that $F_{arithmetic} > F_{table}$ then Ho rejected means Ha accepted. Furthermore it can be seen that significant < 0.05 maha Ho rejected means Ha accepted.

Table 3: Results F Test

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	17.495	5	3.499	40.195	0.000
	Residual	3.917	45	.087		
	Total	21.412	50			

Based on table 3 shows the results of analysis of SPSS software to get the value of F test.

Determination Coefficient Test

To determine the coefficient of determination of independent variables in a regression model can be done by looking at the value of R square or adjusted R square values contained in the summary model table results of regression analysis. Based on the result of using SPSS program the value of R square is 0.817, which means the variables X4, X2, X22, X5 and X7 are simultaneously able to explain Y (cost performance) of 81.7%, while the remaining 18.3% is explained by factors outside the independent variables.

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Table 4: Model Summary Result of Regression Analysis

Model Summary ^f										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.623 ^a	.388	.376	.5171	.388	31.075	1	49	.000	
2	.809 ^b	.655	.641	.3923	.267	37.142	1	48	.000	
3	.870 ^c	.758	.742	.3323	.103	19.889	1	47	.000	
4	.892 ^d	.795	.777	.3088	.038	8.423	1	46	.006	
5	.904 ^e	.817	.797	.2950	.022	5.397	1	45	.025	2.098

a. Predictors: (Constant), X4

b. Predictors: (Constant), X4, X2

c. Predictors: (Constant), X4, X2, X22

d. Predictors: (Constant), X4, X2, X22, X5

e. Predictors: (Constant), X4, X2, X22, X5, X7

f. Dependent Variable: Y

Based on table 4 shows the results of analysis of SPSS software to get the summary result of regression analysis.

V. CONCLUSION

Conclusion in this research are:

1. the factors causing the change order are Mistake in planning & design (X1), design improvements during construction (X2), Changes in working methods during construction (X3), Incompatibility between drawings and field conditions (X4), Unclear detail/drawing specifications (X5), Addition of working scope (X7), change of decision maker by owner (X15), Specification sent Incorrect (X21), late in approval of drawings, contract design and clarification (X22), Mistake and omissions in determining volume estimation (X28), Material specification changes (X28), Material not available in market (X41) and Mistake in job execution (X43).
2. The amount of contribution or influence of these factors on the cost performance of high-rise building construction project in Jakarta is 81.7% consisting of inconsistency between the picture with the field condition (X4) is 38.8%, design improvement during construction (X2) is 26.7%, late in approval of drawings, contract design, and clarification (X22) is 10.3%, Unclear detail/drawing specifications (X5) is 3.7%, and the addition of work scope (X7) is 0.22%. While the remaining of 18.3% is associated with other factors or variables not examined in this study.
3. The most dominant factor affecting the cost performance of high-rise building construction project in DKI Jakarta is construction factor with variable mismatch between picture and field condition. Where this variable has the largest R square value is 0.388 (38.8%), with the largest value of T is 6.943 and the regression coefficient value of 0.388 with a significant value of 0.000.

REFERENCES

- [1] Ervianto, Wulfram I, "Manajemen Proyek Konstruksi Edisi Pertama", Salemba Empat, Yogyakarta.
- [2] Douglas III, Edward E, "Effective Management of Project Change Orders", Journal of AACE International Transaction, 2003.
- [3] Nunnally, S., "Construction Methods and Management Third Edition", Prentice Hall: New Jersey, 1993.
- [4] Ahmad, S., Dlak, P., Hasan, B., "Deviation in the Cost of Projects" Syria, 2014.
- [5] Hendrik, Wibowo, A, "Permodelan Faktor Pengaruh Change Order Pada Proyek Konstruksi", Samarinda, 2010.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

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- [6] Ida, A. R. Widhiawati, Faktor-Faktor Penyebab Change Order Pada proyek Konstruksi Gedung, Denpasar, 2016.
- [7] Sri, D. Nurlaela, Analisis Faktor-Faktor Penyebab Change Order dan Pengaruhnya Yang Dominan Terhadap Kinerja Biaya Pelaksanaan Proyek Konstruksi di Lingkungan Pemerintah Provinsi Maluku Utara (Jurnal Ilmiah Media Engineering Vol. 3, No. 1), Maluku Utara, 2013.
- [8] Barrie, Donald S., & Paulson, Boyd C, Professional Construction Management Third Edition, McGraw-Hill: Singapore, 1992.
- [9] An American National Standard, A Guide to the Project Management Body of Knowledge (PMBOK) Fifth Edition, United States of America, 2013.
- [10] Soeharto, Imam, Manajemen Proyek Dari Konseptual Sampai Operasional, Erlangga: Jakarta, 1995.
- [11] Doyle, Jacqueline Therese, Lessons Learned On Reducing Change Orders, AACE International, 2008.
- [12] Bolin, James M, Effective Change Order Management, Long International: 2017.
- [13] Fisk, Edward R. & Reynold, Wayne D, Construction Project Administration Eight Edition, Pentice Hall Inc: New Jersey, 2006.
- [14] Schaufelberger, John. E. & Holm, Len, Management of Construction Project A Constructor's Perspective, Prentice Hall: New Jersey, 2002.
- [15] Ibbs, C. W, Quantitative Impacts Project Change: Size Issues, Journal of Construction Engineering and Management, ASCE. Vol 123, No. 3, 1997.
- [16] Siregar, Syofian, Statistika Deskriptif untuk Penelitian, Raja Grafindo Persada: Jakarta, 2016.
- [17] Sugiyono, Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D, Alfabeta: Bandung, 2014.