The G-2 Modular Construction Project Delay Factors at Golden Veroleum Liberia

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Abstract—In a work plan, it is often found that there are factors that will become obstacles in completing a project, both internal and external factors in the project. The same thing also happened to the G-2 modular housing development project in Golden Veroleum Liberia which experienced operational constraints. Therefore, this study aims to analyze the most dominant factors influencing the delay in construction of the G-2 Modular housing in Golden Veroleum Liberia. This research is a quantitative survey research in which questionnaires and interviews as a data collection tool are distributed to respondents, the data obtained is validated and also tested for reliability before further analysis using factor analysis and multiple linear regression. The results of the multiple regression analysis obtained that there are two variables that significantly affect work delays: (1) the problematic place characteristic factor (X4) with value $\beta = 0.144$, $t = 3.928$ and Sig = 0.000, (2) the lack of workforce expertise (X1) with value $\beta = 0.098$, $t = 2.431$ and Sig = 0.019. Based on the results of data analysis, the Characteristics of the problematic place is the most dominant factor affecting work delays.

Keywords— Project delay, Modular, Golden Veroleum Liberia.

I. INTRODUCTION

Golden Veroleum Liberia, which is one of the largest palm oil companies in Liberia, is currently developing employee housing to meet the housing needs of its employees. With limited natural resources as well as human resources in Liberia, to meet the housing needs of employees in large quantities and also in a fast time, it is necessary to have a practical type of building, easy to work on in a short time but still fulfills the principles of decent housing. So The modular house is considered to be one of the solutions in providing employee housing, especially in large quantities by the palm oil company Golden Veroleum Liberia.

In 2017, the Golden Veroleum Liberia plantation budgeted for the construction of 284-unit G-2 Modular housing for employees, which have been constructed in 7 different locations. Since the start of the construction of the G-2 Modular housing in May 2017 until the end of January 2021, the building has not yet been completed in its entirety, from the Monthly Infra GVL data in January 2021, the overall building experienced a delay of 8.8% of the 100% target that had been set. This delay is thought to be caused by many factors that affect the implementation of the development, starting from the preparation of the housing site, delivery of goods, transportation to the field and also implementation in the field. Data on monitoring progress of the G-2 Modular budget building for 2017 Golden Veroleum Liberia as of January 30, 2021 are shown in Table 1.

Based on the data in Table 1, the progress of the G-2 Modular housing development should be 100%, but the reality on the ground is that up to January 30, 2021, the G-2 Modular building in the Golden Veroleum Liberia has yet to be completed, for that research needs to be done.

TABLE 1. Data Monitoring Progress of G-2 Modular Housing.

No	Location	Item Building	Quantity (unit)	Progress until 30 July 2021	Target of completion until 30 July 2021	Delay until 30 July 2021
				% Progress	% Progress	% Progress
1	BTWE	G-2 Modular	80	98.54%	100.00%	1.46%
2	TNRE	G-2 Modular	19	87.48%	100.00%	12.52%
3	KPYE	G-2 Modular	25	100.00%	100.00%	0.00%
4	DWNE	G-2 Modular	30	53.19%	100.00%	46.81%
5	KBDE	G-2 Modular	30	100.00%	100.00%	0.00%
6	TSTE	G-2 Modular	32	96.91%	100.00%	3.09%
7	SROE	G-2 Modular	0	95.75%	100.00%	4.25%
	TOTAL G-2 Modular		**0**	**91.20%**	**100.00%**	**8.80%**

Source: Monthly Report January, 2021

Which is more detailed regarding the factors causing the delay in the construction of the G-2 Modular housing.

II. STUDY LITERATURE

A. Construction Management Overview

According to Mulyani in Puspitasari et al. (2020) revealed that a construction project is a series of project activities related to the field of construction (development) which has a limited time dimension with the allocation of certain sources of funds, in order to realize an idea that is feasible to implement. To complete a construction project, one must adhere to the triple constraint. The three constraints are: (1) Budget, (2) Schedule, (3) Quality. Construction management is how the resources involved in the project can be applied appropriately. Resources in construction projects are grouped into 5M (manpower, material, machinery, money and method).

B. Definition of G-2 Modular Housing

Adinda (2014) stated that Prefabricated home or often also called modular house is a house whose parts are produced in a workshop, modular is produced centrally and integrated, using

advanced and modern manufacturing technology so that quality is maintained, then parts of the house are mobilized safely to the project site accompanied by professional workers who are tasked with assembling the parts of the house at a predetermined project site location, but some are directly assembled at the workshop and then transported to the site using a special vehicle which is then connected to the on-board foundation at site. Prefabricated home is not a 'mobile home' because the building is still based on a certain foundation.

The Modular Housing which has been constructed in the Golden Veroleum area of Liberia consists of: (1) the Lower Building which is the foundation where the Modular material will be assembled, the foundation is made of a foundation of Cast concrete 1 pc : 3 sand : 5 crush rock, Ground beam dimensions 15/30 cm of reinforced concrete mix 1 pc: 2 sand : 3 crush rock , Floor from concrete rebate 1 pc : 3 sand : 5 Kr, (2) Upper building (Modular Structure) which is the main structure of a modular building consisting of the main frame of light steel, the walls are made from calsiboard, the Trusses from light steel, the roof structure uses a Zingalumunium roof. the ceiling uses a Cross T frame with a calsiboard ceiling covering, Doors and Windows use PVC doors and windows.

C. Project Delay

According to Ervianto in Puspitasari et al. (2020) as implementation time that is not utilized in accordance with the activity plan, causing one or several following activities to be delayed or not completed exactly according to the planned schedule. Project delays are caused by the contractor or from the owner. Delay in construction projects means an increase in the implementation time for the completion of the project that has been planned and stated in the contract documents. The active role of management is one of the keys to successful project management.

Kraiem and Dickman in Messah (2013) state that delays can be divided into 3 main types, namely: (1) Non-Excusable Delays caused by the actions, omissions, or mistakes of the contractor. (2) Excusable delays caused by events beyond the control of both the owner and the contractor. (3) Delays that deserve compensation (Compensable Delays) are delays caused by actions, negligence or mistakes of the owner.

III. RESEARCH METHODOLOGY

A. Research Methods

This research is descriptive quantitative research, describing the current state of the subject or object of research based on the facts that appear or as they are. The research method used by the author is a survey method where the research is carried out using a questionnaire as a research tool. The final objective of this study is to determine the factors that cause delays in the completion of the G-2 modular housing development in Golden Veroleum Liberia and the strategies that must be carried out to overcome them. There are two instruments used in this study, namely using interviews, and closed method questionnaires. The indicators for the two variables are then elaborated by the author into a number of questions so that primary data is obtained. This data will be analyzed using the relevant

statistical tests to test the hypothesis. While the measurement technique used is the Likert Scale technique.

B. Time and Place of Data Collection

This research data collection will be carried out in April 2021 to July 30, 2021. Field sampling is carried out in the G-2 Modular Golden Veroleum Liberia housing development project area which consists of: (1) West Sinoe Region which includes Butaw Estate and Tarjuwon Estate. (2) East Sinoe Region which includes Duwele Estate and Tatuweh Estate, (3) Grandkru Region which includes Saroken Estate.

C. Population & Saturated Sample

The population in this study are those who directly or indirectly participate in the implementation of the construction of the G-2 Modular housing in the Golden Veroleum Liberia as shown in Table 2.

TABLE 2. Respondent Data

No	Project Team	Quantity
1	Modular Engineer	7
2	Exspart Manager (GVL)	11
3	Local Supervisor	8
4	Contractor	45
	Total Population	71

D. Research Variables

The variables in this study consisted of independent variables and dependent variables, the independent variables in this study were: X1 = Labor Factor, X2 = Material Factor, X3 = Equipment Factor, X4 = Place Characteristics Factor, X5 = Financial Factor, X6 = Situation Factor, X7 = Change Factor, X8 = Scope and Contract/Work Document Factor, X9 = Planning and Scheduling Factor, X10 = Job Inspection, Control and Evaluation System Factor, X11 = Managerial Factor. Meanwhile, the dependent variable is Y = work delay.

IV. RESULT AND DISCUSSION

A. Validity Test

The validity test uses SPSS with the corrected-item-correlation method and compares the r - value obtained with the r-table value. The r - value is sought using the two-sided r-test table with a significant level of 0.05. For the amount of data (n) as much as 62, the value of r is 0.246. This r value is then compared with the corrected item total correlation output value. If the corrected item total correlation value is bigger than the value of r, then the variable is said to be valid. From the output, there are two invalid indicators, namely the X1.2 indicator with the corrected item total correlation value of 0.124 and X4.4 with the corrected item total correlation value of -0.302, less than 0.246, so it can be concluded that the indicator is invalid and must be removed from the program and questionnaire. After the invalid indicators are issued, the questionnaire is then re-validated to ensure that all indicators have r greater than 0.246 and from the results of SPSS processing data obtained r count data greater than 0.246 so that the data is valid.

134

B. Reliability Test

Reliability test using SPSS with Cronbach's Alpha method compares the r - value obtained with the r table value. After doing some analysis, the results obtained as Table 3.

TABLE 3. Cronbach's Alpha Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
.970	45

The value of r was searched using a two-tailed test r table with a significant level of 0.05. For the amount of data (n) as much as 62, the value of r is 0.246. This r value is then compared with the value of Cronbach's alpha output. If the value of Cronbach's alpha is bigger than the value of r, then the questionnaire is said to be reliable. The value of Cronbach's alpha is greater than the value of r, so the questionnaire is declared reliable.

C. Factor Analysis.

In this study, it consisted of 11 latent variables which were indicated as the cause of delays in the construction of the modular G-2 housing which was formed from several indicators of delay factors, for this reason, in this study the Confirmatory Factor Analysis (CMA) method was used. The correlation between 11 variables influenced each other quite strongly. it can be seen if the Determinant of Correlation Matrix is close to zero (0), the value of KMO MSA (Kaiser-Meyer Olkin Measure of Sampling Adequacy) > 0.5 and the value of Sig. <0.05. In the results of this analysis, all variables and indicators are valid and can be used for the next process except Variable X7 = Change factor because the KMO value is not above 0.5 and the value of Anti Image Correlation is also not more than 0.5 so that the variable X7 is not suitable for use in subsequent processes.

D. Regression Analysis Results

From the results of data processing with SPSS obtained the results of the coefficient of determination as shown in table 4. From the Table 4 can be seen that the correlation value (R) of the factors tested with the delay in the G-2 Modular Housing Development Project is 0.722, the correlation coefficient of 0.722 indicates that there is a fairly strong relationship between the factors tested and the occurrence of delays in housing development projects. G-2 Modular. The output display of the SPSS model summary also shows the adjusted R^2 of 0.427, this means that 42.7% of the variation in delays in the construction of the G-2 Modular housing in GVL can be explained by variations of the ten independent variables X1, X2, X3, X4, X5, X6, X8, X9, X10, X11. While the rest (100% - 42.7% = 57.3%) is explained by other reasons outside the model. The standard error of estimate (SEE) is 0.808.

In the SPSS analysis, the results of the F test are also obtained as shown in Table 5.

Based on Table 5, the F-count value is 5.554 with sig. of 0.000 with =0.05 (5%) and degrees of freedom df1=k=10 and df2=n-(k+1) = 62-(10+1) = 51, then F-table= 2.02 is obtained, so F-Calculate is greater than F-table 5.554 > 2.02), other than that, the results obtained are sig. of 0.000 is smaller than the

confidence level (0.000 <0.05), which indicates that the calculated value is in the rejection region of H0 so that H1 is accepted. Thus, this study shows that the 10 factors tested simultaneously have a significant effect on the delay in the construction of the G-2 Modular housing.

TABLE 4. Coefficient of Determination

Model Summary^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.722^a	.521	.427	.605	1.755

a. Predictors: (Constant), TotalX11, TotalX4, TotalX1, TotalX5, TotalX3, TotalX9, TotalX6, TotalX2, TotalX10, TotalX8

b. Dependent Variable: Y

Source: Data Analysis

TABLE 5. ANOVA test results

ANOVA^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	20.357	10	2.036	5.554	.000^b
Residual	18.692	51	.367		
Total	39.048	61			

a. Dependent Variable: Y

b. Predictors: (Constant), TotalX11, TotalX4, TotalX1, TotalX5, TotalX3,

Source: Data Analysis

Furthermore, to partially test the significance of 10 variables on the delay in the construction work of the Modular G-2 housing in Golden Veroleum Liberia, a T-test was carried out, the complete results of which were in accordance with Table 6. Hypothesis testing is done by comparing the t-table with the t-count. This test aims to partially test the significance of the research results. The regression coefficient significance test in this study uses IBM SPSS 20 as shown in Table 6. The significance level (α) is 5% and the degrees of freedom (df) = n-(k+1) = 62-(10+1) = 51. the t-table of the t-table value of the t-distribution of two parties is 2.008.

TABLE 6. Partial test results (T-Test)

Coefficients^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Remark
	B	Std. Error	Beta			
1 (Constant)	1.947	.572		3.404	.001	
TotalX1	.098	.040	.296	2.431	.019	Significant
TotalX2	.004	.042	.021	.098	.922	No significant
TotalX3	-.066	.038	-.305	-1.727	.090	No significant
TotalX4	.144	.037	.516	3.928	.000	Significant
TotalX5	.077	.059	.165	1.308	.197	No significant
TotalX6	.067	.060	.198	1.132	.263	No significant
TotalX8	.054	.070	.233	.774	.442	No significant
TotalX9	-.102	.056	-.520	-1.814	.076	No significant
TotalX10	.003	.033	.017	.077	.939	No significant
TotalX11	-.006	.067	-.017	-.091	.928	No significant

Source: Data Analysis

To make it easier to understand the test criteria, the t-count and t-table values were compared. The results of this T-test show

135

that there are 2 factors that significantly affect the delay in the work of Modular G-2 at Golden Veroleum Liberia, namely X4 = Place Characteristics Factor with a significance of 0.000 and X1 = labor factor with a significance of 0.019.

The ten independent variables included in the model, only two variables (X1 and X4) were significant at =5%, this can be seen from the probability of their significance being far below 0.05. So, it can be concluded that the variable delay in the G-2 Modular Housing Construction Work (Y) is influenced by X1, X2, X3, X4, X5, X6, X8, X9, X10 and X11 with the following mathematical equation:

$$Y = 1.947 + 0.098X1 + 0.004X2 - 0.066X3 + 0.144X4 + 0.077X5 + 0.067X6 + 0.054X8 - 0.102X9 + 0.003X10 - 0.006X11 + \varepsilon i$$

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusion

Based on the results of data analysis and discussion of the Analysis of Factors that affect the delay in the construction of the G-2 Modular building in Golden Veroleum Liberia, it can be concluded that of the eleven factors that influence there are two factors that significantly affect the delay in the construction of the G-2 Modular housing in GVL, namely the Place Characteristics Factor (X4) with a value of = 0.144, t = 3.928 and Sig = 0.000 and the labor factor (X1) with a value of = 0.098, t = 2.431 and Sig = 0.019 and of the two factors the most dominant factor affecting delays housing development G-2 Modular is the Characteristics Factor of the place (X4).

The characteristics of this place are formed from several influencing indicators, namely: X4.1 = Material storage area, X4.2 = Access to the project location is problematic and X4.3 = Workspace requirement. of the three indicators according to the descriptive analysis, the indicator X4.2 = Access to problematic locations is an indicator that greatly influences the delay in the construction of the G-2 Modular housing in Golden Veroleum Liberia with an index value of 65.48%.

B. Recommendations

Based on the results of the research and the conclusions that have been presented, the researchers provide suggestions in the hope that they can be useful for all interested parties. Any of these suggestions are:

1. Based on the results of the analysis of place characteristics factors are the dominant factors that affect work delays where the problematic road variable is the main factor causing this delay, for that it is necessary to find a solution so that field work does not occur delays, this solution can be done with sending building materials in the dry season and repairing the access road to the location.

2. For further research, more detailed research is still needed on other factors that affect work delays. Because based on the results of this study, it shows that the correlation coefficient is 0.72 and the R2 value is 0.427, so that even though the relationship between the tested factors and the delay in the G-2 Modular housing development project is strong enough, there are still other factors that influence.

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