ICETIA 2016

PROCEEDING

The 1st International Conference On Engineering Technology Innovation For Archipelago

(ICETIA - 2016)

"Green Technology For A Better Future"

Faculty Of Engineering
Universitas Khairun

antam   ULP PROV-MALUT   PPLP MALUT

Greetings from Dean of Engineering Faculty

Bismillahirrahmanirrahim,
Assalamu Alaykum Warahmatullahi Wabarakatuh.
Gratitude Praise to Allah SWT, who given us a guidance and blessing.

Faculty of Engineering is one of eight faculties at Khairun University. Currently, Faculty of Engineering has entered its 15th years. Recently, Faculty of Engineering has six study programs. They are Civil Engineering, Mechanical Engineering, Electrical Engineering, Architectural Engineering, Informatics Engineering, and the last is Mining Engineering. We have 84 lecturers, 15 skilled staffs, and around 1,600 registered students.

I thank to you all honorable keynote speakers from Malaysia, Japan International Cooperation Agency (JICA), Timor Leste, and private sector. Participants to the conference mostly come from Eastern Indonesia. To all participants, we welcome you to Ternate and join this conference.

The title for this conference is "The 1st International Conference on Engineering, and Technology Innovation for Archipelago (ICETIA 2016)." The main theme is "Green Technology for a Better Future." It lasts for two days on October 27-28, 2016. The conference will be held annually.

The main purpose of this activity is to collect and disseminate recent innovation in engineering, science, and green technology to be applied in archipelago region. The conference meets university academicians and researchers, industries, and government, both local and regional in Eastern Part of Indonesia.

In line with the theme of this conference, we hope we can explore and expand all of our potencies. The conference of course enriches the capacity of stakeholders in engineering, science, and technology.
The steering committee and organizing committee gave special thanks to Khairun University Rector, Prof. Dr. Husen Alting, S.H., M.H. and all Vice Rectors who are always supporting our activities.
Last but not at least, I, on behalf of Engineering Faculty Khairun University, thanks to all of our generous sponsors succeeding this conference.

Ternate, October, 27, 2016

Selamat datang…!
Welcome…!
歡迎
Bem-vindo…!

Ir. Ahmad Seng, M.Eng.
Dean of Engineering Faculty
Khairun University

Cost Estimate of Early Stage forBuilding Construction in Ternate City UsingRegression Methods

Edward Rizky Ahadian[1], Muhammad Rizal[2]
Email: edoeny12@gmail.com[1], adams.rizal@yahoo.co.id[2]

The cost is one of the main factors because it involves the capital that would have to come out in the implementation of a construction project, a successmeasure of the constructionproject.An early cost estimation done at the conceptual stage of a projectcycle known as a conceptual estimate cost that can bedefined as a costestimate that do based on the buildingconcept will be built.An early cost estimate required by a thorough investigation into a construction project in order to provide the cost as early as possible that necessary so can take the decision or policy and plotting as good as, considering the condition of the Ternate City that having limited budget.This research is using quantitative method research, done by the statisticsapproach (regression analysis) onresearch variables with the link relations the development cost building with parameters from the concept of the building will be built.The research results show that from the result of statisticstesting obtained linearequation $Y = -1{,}677E9 + 4.214.311{,}110X_1$ with Y is the development cost building and X_1 is floor area of a building. And have the determinationcoefficients (r^2) as much as 0,852.The results of the validation model shows that results gained by use the model chosen than the constructioncost, varying from -6,14% until +3,05%.Variation what happened to the development cost building in Ternate City can be explained by broad floor of a building and indicated the bigger floor area of a building construction of a building, so would tend to the budget that needed to construct a building.

Key words: cost estimates, linear regression, building construction

1. INTRODUCTION

1.1 Background

Implementationconstruction cost that according with planning is a success measureof construction project. A project said successful if completed in time, the total cost is according to a plan budget, and quality of work according to the plan and specification. A good construction estimate cost will support completion of constructionprojects in accordance with the cost that planned before. An early cost estimation done at the conceptual stage of a project cycle known as a conceptual estimate cost that can be defined as a cost estimate that do based on the building concept will be built. This estimation can be carried out by using physical parameters of the beginning design with a unit price concerned.

This early cost estimation required by a thorough investigation into a construction project like owner, consultants or contractor in order to provide the cost as early as possible that required in implementing a project. So they can take the decision or policy and plotting as good as, considering the condition of the Ternate City that having limited budget.

Some project are of an emergency nature and must be completed in the least time possible. For such project the owner will negotiate a contract with a contrctor. The contractor may be asked to prepare a conceptual cost estimate for the project for which there are no, or limited, plans and specifications.

An early cost estimate ofbuilding construction can be carried out by studying the influence of certain variables based on the concept of building will be built.The concept of building such as the floor buildingarea and the number of the floor is physicalpart of a building and on old research can represent a lot of the constructioncost implementation, so the volume changeat the variable can influence to the costthat required to complete a building construction.The components can be assumed as parameters that can be analyzed in regression in making a formulation for estimating the early cost stage of development buildings had been building.

1.2 Formulation of Problem

As mentioned previous, in approximating or estimating the

development cost of a building, can be conducted by taking into consideration the variables that can affect the construction cost. Those variables are like the parameters from the buildings concept that will be built with the regressionapproach.The resulting will help performing the calculations estimation time of implementation building construction that brief and as expected. So the formulation problem of this research is how the equation regression model to estimate the development cost building in Ternate City.

1.3 Objective Research and Benefits
Based on the problems formulation above, so the purpose of this research is to get the regression equation that can be used to estimate the cost of an early stage of development buildings in Ternate City.From the study, expected to give the benefit to the industry construction agents in Ternate City, where the regression equation that obtained can be used to estimate the amount of required so can help in investmentanalysis or interpretation policy and long-term planning for sustainability development in the center of limited allocated budget.

2. LITERATURE REVIEW
2.1 The Meaning of Estimation
Estimation in the broadest sense is the effort to rate, or estimate a value the analysis calculation and on the basis of experience [2]. The purpose of conducting estimation is to get the estimate thatmost approach the real casewill be held, considering the possibilities.The estimates on something which has not been known may be regarded as an obstacle of the progress of the project. Basically, accuracy an estimationvery depends on the quantity and quality of the information available. The less and inferior quality that information available, so the lower accuracy estimation done.One of the key to successfully a service company construction that is having the ability to estimate money and time required by a project, and carry them out in accordance or approaching with what it has been estimated.

2.2 Types of Estimates
Estimates are performed throughout the life of a project, beginning with the first estimate and extending throught the various phases of design and into construction. Cost estimates can be divided into at least two different types, depending on the purposes for which are prepared and the amount of information known whn the estimates are prepared. There are approximnate estimates (sometimes called feasibiity, screening, authorization, preliminary, conceptual, order of magnitude, equipmnet factored or budget estimates) and detailed estinates (sometime called final, bid/tender or definitive estimates) [2].

2.3 Conceptual Cost Estimating
The accuracy of any estimate will depend on the amount of information known about project. The preparation of conceptual cost estimate requires knowledge and experience with the work required to complete the project. Cost information from previous project of similar type and size is essential. The estimator must combine all known information with his or her personal experience and use considerable judgement to prepare a reliable conceptual estimates.

2.4 Regression Analysis
Regression Analysis is an analysis measure the impact between variables free to variables bound [7]. Regression Analysis used when we want to know the dependent variable (Y) can be a prediction through the independent variable (X). Analysis regression can be regression analysis linear, non linear, and multiple regression.

2.5 Correlation Analysis
A statical measure that can describe the relationship between a variable to another variables is the coefficient of determination and correlation coefficient. The coefficient of determination had given r^2 symbol, and the correlation coefficient is symbol. Mathematically are relationship between two coefficient is indicated as follow :
- Coefficient of Determination (r^2). Coefficient determination is measure tha cab be used to determin the influence of independentvariable X on the dependent variable Y.
- Coefficient of correlation (r). The correlation coefficient is measure of both that can be used to measure the degree of density relationship independent variable X and the dependent variable Y.

2.6 Testing Regression Quation

Having obtained the model of linear or non linear aquation, then to declare whether a model or equation that has been obtained really the most appropriate modal, need to do some testing of the model. Criteria testing the model is [1].

- Measurement of the percentage effect of all independent variables (The coefficient of determination r^2). The percentage of the Independent variable value intended by the coefficient of determination (r^2)

- Testing of regression coefficient (Test partial) this test aims to determine whetever the independent variables included in the equation individually affect the value of the dependent variable. For testing regression coefficient permormed by t_{count}, then t must b greater than t_{table}.

- Test on the influence of the independent variables together (stimulant test). This test is performed to determine whether all the independent variables have the same effect on dependent variables have the same effect on dependent variable. Test carried out using test F, than F_{count} should be greater than F_{table}.

3. RESEARCH METHODOLOGY

Data building projects that have been completed are derived from the contract documents obtained from the contractor,owner, consultant and other relevant agencies in the city of Ternate. Contractors data, obtained from the combined national construction executive Indonesia (GAPENSI) Ternate city. Electus city's annual inflation data and construction cost index (IKK). Each regional site from central bureau statistic North Maluku.

3.1 Variable Research

There are 2 (two) groups of variable in this research. Namely independent variable (X) and dependent variable (Y). Variable dependent is the cost of buildings the building (Y). While variable independent (X) obtained of the studies literature and the results of the study before, where the floor area the buildings is X_1 in parts m^2, and the number of the floor the buildings is X_2.

3.2 Data Analysis

The data collected edited and then tabulation. Data collected be normalized the cost of the project at the time of year construction the building (2010 until 2016) against years become a point of reference that is in 2016. After is done making model with using analysis of multiple regression and evaluation model with the test determinan F and the T. Having acquired passed the model, performed validation model with use the model the regression equation to estimate construction cost the building. In doing this research used the tools of SPSS 17 to perform the process regression analysis. The selection of variables used to determine the independent variable which included in of analysis stepwise method. In this method, for each stage, independent variable with the correlation paing strongly with dependent variable included in the model first.

Next followed by other variables to stay testing whether the first in still maintained at model. If the probability first variable insignificant again and variable will be removed from our analysis. This process stop if there is no more independent variable needed to get or issued in the equation.

4. RESULTS AND DISCUSSION

The are 22 data of public building collected. Testing statistical have been done on alternative equation an estimate of the cost construction execution the building, obtained that equation an acceptableor escaped testing statistics are $Y = -1{,}677E9 + 4.214.311{,}110X_1$ with the coefficients determination (r^2) as much as 0,852. The coefficients this shows the proportion of variability total dependent on the variables described by models regression. Model chosen having the power a prediction good based on r^2. The bigger r^2, the more the proportion of variation variable bound (dependent variable) inexplicable by the

variations variable free (independent variable) [8].

The result of the validation to two development projects building which are not used in the process regression analysis, in this case X_1 as the floor area of buildings (m^2), there are had been or irregularities between the amount of the charges calculated by applying the equation an estimate of the cost compared with the value of the contract the range between -6,14% to with +3,05%. Forms of deception which occur of the estimation results by models chosen not too large even small enough. In general model is the simplification and abstraction of the state of being indeed.

The regression equation in linear Y = -1,677E9+ 4.214.311,110X_1, in this with X_1 as the floor area of a building (m^2), have the coefficients determination r^2 of 0,852. This indicates that or can be conclude that 85,2% a variation that arose for funds the construction of the building or variable dependent (Y) can be explain by the floor area the building via equation linear -1,677E9 + 4.214.311,110X_1, and the rest 14,8% in stir by other factors are not taken into account in the model. The other factors can be factors does not expect such as the change design, an icrease in the operational costs, etc. Remember value r^2 range 0% to with 100%, it can be said that floor area building in make clear the cost of building the building good enough. With the slope (the regression coefficient b) as much as + 4.214.311,110 on similarities linear Y = -1,677E9 + 4.214.311,110X_1 , each the addition of variable values X_1(the floor area building) of 1 m^2 so variable dependent Y (development cost building) will increase Rp.4.214.311,110.

5. CONCLUSIONS AND RECOMMENDATIONS

From the analysis a conclusion can be drawn as follows :

5.1 Conclusions

- of two variables independent (x) that is used only one variable failed because they did not fulfill the conditions and having a correlation in which is fairly low is as much as 59%, where to the method stepwise,

a variable that has a low correlation to be expelled from the equation.The variables such is the variable the number of the floor of a building (x_2).Whomeets persyratan only variable the floor area building (x_1) .

- Model the regression equation is linear obtained namely linear y = -1,677e9 + 4.214.311,110x1 with the coefficients determination r2 of 0,852 or 85.2 %.Where the rest 14,8 % influenced by other factors.Model estimation this suggested for use on building with widespread in over 600 square meters.

- The results of validation performed with estimate the cost of buildingthe building not in enter in making model.The estimation results obtained the difference ranged from -6,14% to with +3,05%.Forms of deception which occur of the estimation results by models chosen not too large even small enough.

5.2 Recomendations

As for advice that can be given is that need to research by involving samples more data , different locations , function the building more diversified , and the addition of other variables affect the cost building construction to the development of model .This research process can proceed with did side-by-side comparisons method estimation that there is to choose model that can be estimate with the most likely accurate.

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