



Framework for Productivity of Precast Concrete Elements Using Multivariable Linear Regression Technique

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ABSTRACT

A statistical tool that allows us to analyse how multiple independent variables are related to a dependent variable is known as multi variable linear regression technique. The examination of these relationships leads to the formation of networks of variables that provide the basis for the development of theories about a phenomenon. For the productivity estimation, there can be so many factors that influence the productivity of Precast element. Precast concrete products are generally used to shorten project duration and provide higher quality and more sustainable construction projects. There are many factors affecting productivity in precast concrete construction sites are availability of experience labour, availability of tools and equipment, frequency of inspection, payment delay, healthy management, health status, quality of framework, maintenance. This study contributes to the construction management knowledge by providing simple but effective models to increase productivity precast elements.

INTRODUCTION

Productivity rates of precast concrete element are the basis for accurate estimation of time and costs required to complete a production. Productivity could be defined as "the relationship between the performance of the required quality and the inputs" for a specific production situation; in the construction industry, it is generally accepted as "manpower output for hours worked". Optimizing material, equipment and labour use is a key factor in maximizing the productivity and minimizing cost of construction projects. Improved productivity helps contractors not only to be more efficient and profitable. Most of the

construction agencies focus on material and equipment management to reduce cost and increase efficiency. However, the construction labours are the most dynamic element in the construction industry and their cost represents 30 to 50% of the overall construction cost.

There are various independent factors that affect the productivity of precast concrete elements. The relation between these factors can be used to predict and analyse the productivity. Linear regression technique is one the technique which will help for the analysis of productivity of precast concrete for particular site. This study will help for prediction and development of effective precast concrete element.

Literature Review:

A. Mohamad Rafi and K. Jagadeesh, (2015)^[1]:

This study investigates the factors influencing labour productivity through various project natures, methods to improve productivity and factors affecting project performance. The data required for the study were collected through surveys with 150 construction companies. The data collected were analysed through reliability analysis, factor analysis, multiple linear regression analysis, in 43 variables that influence labour productivity. The regression model was then evaluated and the impact of each component analysed. It is practically a difficult task for everyone to improve work productivity up to 100%. But if you have adequate control over the above factors, productivity can be greatly improved.

EmadAbd-El Hamied El-Maghraby, (2014)^[2]:

In this research a new regression model using correlation analysis method for predicting the production rate of pouring ready mixed concrete using tower cranes is build. The researcher performed a field study observation, by observing pouring concrete operations for a total of 418 concrete operation cycles of pouring slabs, beams, columns, and walls at ten residential and commercial construction projects in Cairo and Alexandria - Egypt in order to collect the required data to use them as input variables for building the model. These projects were selected because they used tower cranes extensively on pouring concrete activities. The observation started with a questionnaire survey based on comprehensive literature review to identify the most important factors affecting pouring concrete and to get a link channel with site engineers and project managers. The researcher used written descriptions, photographs and informal discussions to collect data through observation, regarding to schedule of pouring concrete operations at each project. the research objectives, the researcher carried out a regression analysis on the observed data to obtain a model that will estimate productivity rates of concrete operations to help planners and estimators to predict the production rate of pouring ready mix using tower cranes. The regression analysis methodology used in this study is Enter method as it named in Statistical Package for the Social Sciences programme. This method is the standard and simplest method for estimating a regression equation, the researcher specifies the set of predictor variables that make up the model, and the success of this model in predicting the criterion variable is then assessed. The validation exercise demonstrated that the model derived for estimating pouring concrete production rate produces good results when comparing with the actual pouring concrete production rate. The result of the model validation presents an average percentage error of 2.8197% between actual production rate and estimated production rate which is reasonable and acceptable error.

Faiq Mohammed Sarhan Al-Zwainy et al., (2013)^[3]:

In this study, the author developed a model of estimating construction productivity for marble finishing work on floors using the multivariate linear regression technique (MLR). The model was developed on the basis of 100 data collected in Iraq for different types of projects, such as commercial,

residential and educational projects. Ten influential people are used to predict productivity based on the MLR model and include age, experience, amount of attention to work, floor height, marble tile size, safety conditions, health status of the work group, conditions climatic conditions, site conditions and availability of building materials. The study reveals that MLR has the ability to predict the productivity of floor marble finishes with a high degree of accuracy with 96.3%.

P. Dayakar et al., (2012)^[4]:

This document identifies the factors that influence labor productivity and also investigates the causes, i.e. the problems of in situ work and their effects on construction projects. Some of the important factors influencing labor productivity are the quality of site management, lack of material, timely payment of wages, work experience, misunderstanding between work and the superintendent. The problems faced by the work on the construction sites in Chennai and its surroundings are discussed in detail here. Problems such as lack of availability of adequate housing, basic services, low salaries, problems related to safety, security etc. They are present in almost all Indian shipyards. This work focuses on labor productivity indices that are reduced day by day, which in turn damages the organization's profitability. In this study, we sought to correlate the harmful effects of falling labor productivity with the productivity of other resources, such as materials, equipment and capital. Data analysis was collected using MS-Excel methods and SPSS software.

JishaChakkappan and Lakshmi G Das (2014)^[5] :

Labour play an vital role in the productivity of precast element. The goal of this research is to analysis of labour affecting the productivity using multiple linear regression tech. Analysis of such factors help to estimate the future cost of project. Survey was conducted to identify the major factors. Factors considered for analysis where age, equipment availability ,availability of experienced labours, working location, payment delays, material availability, etc. the technique used for analysis was SPSS software .Analysis of this model help for increasing level of accuracy of the work. By using this study model was build with excellent degree of accuracy of coefficient of correlation are 95.60% which indicate relationship between dependent and independent variables of developed model is good and based on real life information.

I. Abdel Rashid, S. Y. AboulHaggag, H. M. Elhegazy, (2015) ^[6]:

The range of steel structure is increasing day by day for different functions. Improving the productivity of the crew is an difficult subject, it is affected at various stages such as erection stage, transportation stage, placing stage. In this paper the measurement scale was used to measure the input factors (design, fabrication, planning, training, material handling, quality, time and weathering) as well as output i.e. productivity. The range on scale denote the productivity (0-poor, 5-average,10-good). Using Matlab modelling analysis of the crew productivity of construction of steel structure. The results of this modelling were compare with other projects it was proved that the results got sfor this modelling are effective and are very easy to use. This modelling helps us to know how the data can be used to improve, evaluate and measure the crew production.

Scope of work:

- 1) The work can be scheduled in proper manner so that it can be completed within particular fixed time and cost.
- 2) Cost of precast concrete element can be reduced by proper use of resources.
- 3) Model develop can be used in optimization of man power and increase the production.

Objectives:

- To understand the concept of linear regression technique.
- To understand the manufacturing process of the precast concrete elements.
- To study the factors affecting the productivity of precast elements.
- To collect the data from manufacturing unit.
- To analyse the data using SPSS.
- To develop the model which will help to optimize the cost and increase the production.

Methodology:

- Literature review.
- Selecting area of study.
- Finding factors affecting productivity.
- Data collection.
- Analysis using SPSS.
- Development of framework.

Conclusion:

- This reported study will help for formation of precast productivity estimation model
- Model will help to predict the production of precast concrete with high level of accuracy.
- Model will help to increase the productivity of precast elements by using Linear Regression technique.

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