

DEVELOPING AN EFFECTIVE WORKFLOW MODULE FOR PRODUCTIVITY ANALYSIS USING STATISTICAL METHODS IN VARIOUS CONSTRUCTION SITES

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Abstract

Productivity plays a vital role in the success of any construction project. Productivity improvements leads to the higher cost saving with minimal investment. The main objective of the study is to find out the factors affecting construction productivity. The various types of risks were identified and based on the risk factors that affects construction productivity a questionnaire was framed. A questionnaire survey was carried out in the southern part of India. The questionnaire is distributed to various civil engineers, contractors, site engineers, planning engineers and total of 53 respondents were obtained. The analysis is carried out using Statistical Product and Service Solutions (SPSS). From the analysis mean and their respective ranks were found out, based on which the conclusions are made.

Keywords: Productivity , Questionnaire , risk ,questionnaire survey

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1. INTRODUCTION

Construction industry plays a vital role in developing the country's infrastructure ultimately improving the country's economical status. Number of planners, engineers and consultants are involved throughout the completion of any construction project. Systematic planning leads to the successful implementation of the plan thus leading to the successful completion of the project. Productivity plays a very important role in any construction site. Thus improving productivity by applying various modern methods leads to the project success which saves both money and time. Effective utilization of the 4M's namely men, material , machinery , money leads to the success of any construction project .Productivity in general is the ratio between the output and the input. It is the key factor for the project's success. It can be improved by proper implementation and tracking of works that is being carried out in the construction site. The project standards are rated based on productivity. The overall analysis of productivity gives an idea about the delays and factors of delay that affects the construction activities which leads to the cost overrun and time over run. The delay can be minimized by proper scheduling of activities using and subsequently scheduling can also be done if there is any error in scheduling of activities , thereby improving productivity.

Productivity plays a vital role both in micro and macro levels. The construction cost can be minimized by improving the productivity ultimately completing the construction project within the stipulated time. The software by name SPSS is are used , the construction delays are also reduced by this study.

2. LITERATURE REIVIEW

Saleh al Hadi Jumi, Abdelnaser Omran, Abdul Hamid Kadhira Pakir, (Nov 2009) has found that delays can lead to many negative effects such as lawsuits between owners and contractors, increased cost, loss of productivity and revenue and termination. Even though various studies have been taken into account , these studies discuss only the common and general causes of delays in construction project. Thus a comprehensive study on these delays is essential. The study leads to focus on specific causes of delaying like insufficient coordination and effective communication.

Jarek Hegazy, Mohammad Said; Moustafa Kassab(2011) recorded all progress events, including rework and calculate the expected project delay. Analyse the project delay to identifying the number of days attributed each parties action.

Per-Eeick Josephson ; Bengt Lasso ; Hengli (April 2002)says that rework has become an endemic feature of the procurement process in construction that invariably leads to time and cost over runs in projects in order to improve the performance, it is necessary to identify the causes and cost of construction network

Oko John Aneh, Emeka Emmanuel, Oregboh (Nov 2011) says that the history of construction industry world wide is full of projects that were completed with significant time and cost over runs. In an attempt to reverse this trend, this study aims at establishing the relationship between time over run and labour productivity on construction site in Lagos.

Polycorp Olabu Alumbugu, Saidu, Ibrahim, Abdullaih Sa Adu Gulma (Vol 6 no 4 2014) Wasiuadenran Ola-Awo analyse the relationship between workin height and productivity of masonry worker on construction site by investigating two project site. Data were also gathered by observing work activity on site.

3. FACTORS AFFECTING PRODUCTIVITY IN CONSTRUCTION SITE

- Lack of material
- Lack of equipment
- Absentiseem
- Supervision delays
- Delays in clients decision
- Labour personal conflict
- Shortage of unskilled labour
- Uncertain productivity of men
- Improper time management assistance
- Poor management assistance
- Inadequate scheduling process
- Price fluctuation in the market
- Inadequate site investigation
- Inspection delay
- Unrealistic time and cost schedule
- Incomplete design
- Errors in choosing the construction method
- Changes in monsoon cycle

4. QUESTIONNAIRE ANALYSIS

The data collected from the from all 53 respondents are fed into the SPSS software and their respective mean , rank , overall mean and overall rank are obtained. The questions in the questionnaire survey are framed based on the risk factors which affect the construction productivity.

4.1 Questionnaire details

The tables given below are the results obtained from the SPSS analysis. The questionnaire are rated on laggard scale is given in the table 4.1. Ranking is based on extent of agreeing on a scale of 1-5 as follows.

Strongly disagree	Disagree	Neutral	Agree	Strongly disagree
1	2	3	4	5

Table 4.2 are the results obtained from the analysis which falls under technical risk.

Table 4.2 Input data of technical risk

Q no	Question	Mean	Rank
1	Inadequate site investigation	4.30	2
2	Incomplete design	4.55	1
3	Uncertainty over the availability of construction materials	4.1	5
4	Lack of supervision of site engineer	4.125	4
5	Error in choosing construction method	3.975	9
6	Inadequate specification and standards by the architect	4.075	6
7	Poor communication between the site engineer and labours	4.250	3
8	Not completely understanding the clients requirements	3.975	10
9	Inspection delay by the Planning engineer	4.0	8
10	Shift work	4.055	7

Table 4.3 are the results obtained from the analysis which falls management risk

Table 4.3 Input data of management risk

Q no	Question	Mean	Rank
1	Delay in clients decision	4.2	3
2	Stoppages due to dispute between owner and contractor	4.27	1
3	Labour personal conflict	3.85	8
4	Shortage of unskilled labor	3.9	7
5	Time management of labours	3.92	6
6	Poor project management assistance	3.55	11
7	Non involvement of construction crew in production objectives	4.2	4
8	Time management of equipments	3.85	9
9	Uncertain productivity of machinery	3.67	10
10	Inadequate program scheduling	4.3	2
11	Uncertain productivity of men	4.10	5

Table 4.4 are the results obtained from the analysis which falls financial risk.

Table 4.4 Input data of financial risk

Q no	Question	Mean	Rank
1	Standard wage schemes in firm	4.24	1
2	Price fluctuation in the market	4.02	4
3	Financial difficulties of owners	4.22	2
4	Financial difficulties of contractors	3.65	10
5	Additional works added during the course of construction process	4.12	3
6	Delays in payment to the members of the construction projects	3.70	9
7	Inflation in the market	3.97	6
8	Fluctuation in foreign exchange	3.82	8
9	Effect of availability of finance from contractor side	3.95	7
10	Effect of availability of finance from owner side	3.97	5

Table 4.5 are the results obtained from the analysis which falls environmental risk.

Table 4.5 input data of Environmental risk

Q no	Question	Mean	Rank
1	Changes in Weather	3.925	5
2	Effect of wind prevailing in the construction site	4.075	4
3	Unexpected rainfall	4.225	1
4	Change in the level of water table due to unexpected rainfall	3.875	6
5	Water scarcity	4.125	3
6	Changes in the monsoon cycle	4.150	2
7	Extreme heat	3.70	7

Table 4.6 are the results obtained from the analysis which falls under quality related risk.

Table 4.6 Input data of quality related risk

Q no	Question	Mean	Rank
1	Unrealistic time assessment	4.0	5
2	Unrealistic cost assessment	3.95	8
3	Material selection for construction work	4.27	1

4	Material usage for the construction work	4	6
5	Poor inspection of the site	4.13	2
6	Inadequate design	4.1	4
7	Poor work execution	4.12	3
8	Report on non to quality standards	3.67	10
9	Inspection delay	4	7
10	Rework	3.93	9

Table 4.7 are the results obtained from the analysis which falls under safety related risk

Table 4.7 Input data of safety related risk

Q no	Question	Mean	Rank
1	Accident	4.25	3
2	improper lighting	4.22	4
3	Improper Ventilation	4.07	7
4	Noise pollution	3.65	
5	Carelessness of the labours	4.2	5
6	Not following the safety rules	4.27	2
7	Distraction of labours among themselves	4.02	9
8	Performing multiple work tasks	4.07	8
9	Not giving proper rest to workers	4.42	1
10	Improper usage of safety protection items	4.15	6

Table 4.8 are results obtained from the analysis which gives the overall mean and overall rank of all the questionnaire that is being fed into the SPSS software

Table 4.8 Input data of overall mean and overall rank

Risk	Overall mean	Overall rank
Technical risk	4.1505	1
Management risk	4.0127	4
Financial risk	3.970	6
Environmental risk	4.0107	5
Quality related risk	4.1075	3
Safety related risk	4.136	2

5. RESULTS AND DISCUSSION

Based on the analysis obtained from SPSS and the questionnaire survey we have found that the factors under technical risk have got the maximum mean and highest rank. Many respondents have given importance to technical risk. The factors affecting productivity based on technical risk

affects the construction productivity to a greater extent. By proper checking and inspection of activities in the construction site these problems can be minimized to greater extent. Before the commencement of the construction project the factors that affect the productivity of that particular project should be analyzed by referring to the past records and by analyzing through software's like SPSS. An engineer should be appointed to check these thus improving construction productivity. Next comes the safety related risk, more importance should be given to safety. The people involved in the project should be taught about safety and an engineer should be appointed to track thus improving productivity. Financial risk cannot be taken into consideration because companies are not telling the financial details fully as it affects the companies development.

Based on my survey the factors based on the technical and safety related risk affects the construction productivity. I am glad to tell that we are working to develop a schedule on MS Project which improves productivity to a greater extent.

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