Instruments For Assessing Material Management Strategies and Evaluating Workforce Efficiency

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Abstract- *Labor Productivity is a very important element in the process of construction project management especially with regard to the estimation of the duration of the construction activities. Planning, monitoring and evaluating materials management practices is also important for enhancing construction productivity. This study describes method in which we developed a tool for scoring materials management practices for building projects and, on that basis building a tool for predicting productivity of labor. The research was carried out in two phases. Based on the analysis, tools for measuring and planning the materials management practices were developed. Based on the results and values obtained the productivity of the labor for such were predicted and thus results are shown in graphical pattern.*

I. INTRODUCTION

Poor materials management can result in increased costs during construction. Efficient management of materials can result in substantial savings in project costs. If materials are purchased too early, capital may be held up and interest during storage or get stolen unless special care is taken. Delays and extra expenses may be incurred if materials required for particular activities are unavailable. Effective construction materials management process is a key to success of a construction project. Costs for materials handling, may range from 30-80% of total construction costs. Therefore, there is a need for efficient material management in order to control, productivity and costs in construction projects. Construction is one of the country's biggest ventures of the world and has been assuming a critical part in financial improvement, and additionally in lessening unemployment. Profitability is one of the essential viewpoints for the organizations in the development business. Change in the efficiency of the development business is accordingly of basic significance thinking about its huge commitment to the Gross Domestic Product. The construction company with the most efficient operations has a greater chance to make more money and deliver faster construction project to the project owner. Improving labor productivity can alleviate the shortage of skilled craft-workers, enhance the working conditions, and enhance the overall quality of a product. For every project, productivity, cost, quality and time have been the main concern. As appeared in Fig. 1, it is called "triple imperative". Here, labor productivity is a key halfway idea that can possibly influence these components and that ought to be considered in understanding the conceivable associations between them.
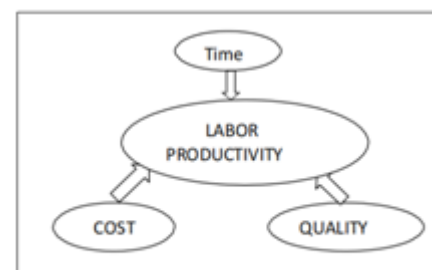

Fig 1 Triple Imperative

Construction performance & productivity improvement are enter center regions in development industry for any country. Indian construction industry frames a necessary piece of economy. Constructions constitutes 40% to half of India's capital consumption on ventures in different areas, for example, roadways, streets, railroads, vitality, airplane terminals, water system,and so forth and is the second biggest industry in India after farming. It represents around 11% of India's GDP. Improving productivity is significant worry for any benefit arranged association. When all is said in done terms productivity is named as ratio between input & output. Appropriate administration of accessible resource can help in enhancing productivity. Labor is the most imperative resource for a construction company.30% to half of aggregate cost of venture is spent on labors. Nature of the development to a great extent relies on the nature of work done by labor. Labor productivity specifically influences development efficiency; it is essential to know the factors influencing work efficiency.

II. IDENTIFY, RESEARCH AND COLLECT DATA

During Stage I of the quantitative data analysis, the weight computed for each practice was used in the preparation of the weighted scoring tool. The weights were computed using the relative importance index (RII) technique.

According to Lam et al. (2007), the mean value and the RII could be used for ranking variables. However, the RII technique is suitable for deriving relative indices between 0 and 1. Thus, it would be easy to compare various variables. Hence, the following RII equation is adopted (El-Gohary and Aziz 2014)

$$RII = \frac{5(n5) + 4(n4) + 3(n3) + 2(n2) + n1}{5(n1 + n2 + n3 + n4 + n5)} \quad (1)$$

Where n1 = number of respondents who selected not important; n2 = number of respondents who selected slightly important; n3 = number of respondents who selected somewhat important; n4 = number of respondents who selected very important; Using above formula RII for all the practices is calculated from the values and data collected from the responses. RII for all the practices is tabulated below:And n5 = number of respondents who selected extremely important.

Table 1: values of RII for all practices

Name of Practice	Corresponding RII
Procurement plan for material	0.78
Long lead material identification	0.70
Material status database	0.65
Material delivery schedule	0.75
Material inspection process	0.78
Material inspection team	0.56

The weights obtained using this equation was proportionally distributed among the five levels of the practices, and the weighted scoring tool was developed. During Stage II of the quantitative data analysis, the data collected from the building construction projects were transformed into equivalent scores using the weighted scoring tools, and projects scores were computed. The analysis was then conducted to validate the weighted scoring tools.

Weighted Scoring Tool of the Materials Management Practices:

To prepare the weighted scoring tools, the weight of each practice is proportionally distributed among the five levels of implementation of a particular practice. The following formula is developed to compute the weight proportions of the practices.

Where N ranges from 0 to 4; Level 0 = 0; and RII denotes the weight of a practice.

As an example, for the practice procurement plan for materials, RII=0.78;

Level 0 = 0;
N=0, Level 1 = 0 + 0.78/5 = 0.16;
N=1, Level 2= Level 1 + 0.16 = 0.32;
N=2, Level 3 = Level 2 + 0.16 = 0.48;
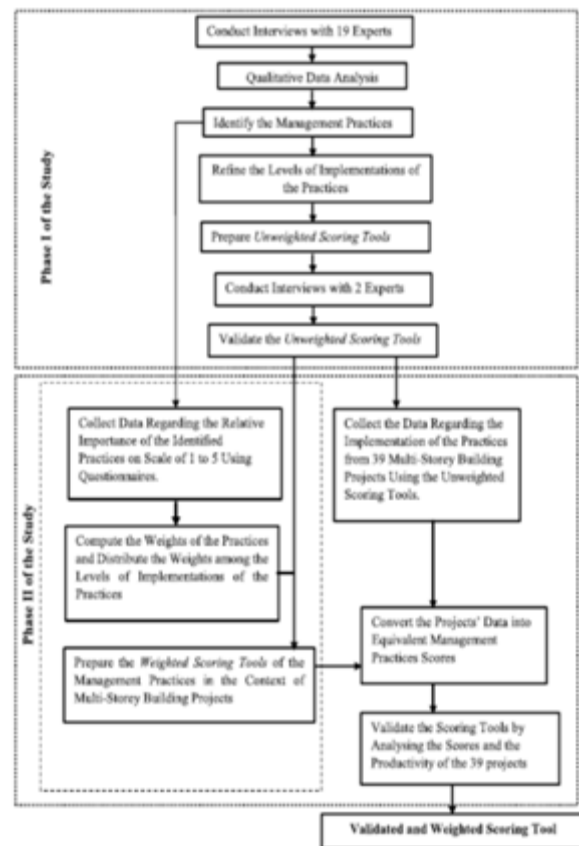N=3, Level 4 = Level 3 + 0.16 = 0.63;
N=4, Level 5 = Level 4 + 0.16 = 0.78.

Fig 2 Procedure of developing scoring tool

DATA COLLECTION

Questionnaire survey

After finalizing the set of practices generally adopted, it is found that too many factors were there in literature review to be considered separately in one questionnaire. So, reducing the number of factors is the predictable. To accomplish this purpose, a questionnaire survey is conducted to ascertain the level of importance given tothese practices. Questionnaires are prepared by adding the respondent profile which collects general information such as name, education, working experience. The next set of questions is targeting the Identified Factors from construction site monitoring which affect project performance. Hence, each respondent has to answer the

questions according to their understanding, knowledge and experience of that project. This simple and straight method is selected to collect the data from the construction site.

III. RESULTS AND DISCUSSION

This chapter represents results obtained after calculations and after getting the values following the methods described in the methodology section.

By using the values which we have got in table no.4 we have plotted the bar chart which shows the values of all the material management practices score in single chart and thus from that chart we came up for the conclusion of the work. Chart is given below:
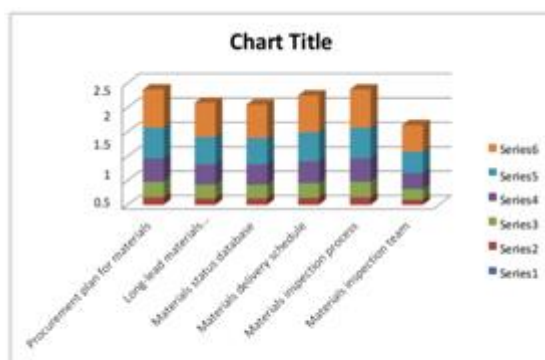

Figure 1: Bar chart showing result of the weighted scores

Discussion

As we can see in the above chart that there are 6 series i.e levels for each practices and thus each level is shown in different color. This chart is prepared by taking the values of the weighted scores of all the practices and thus by inserting those values in the table we get this ready chart. Bigger the bar for specific practice more effective practice the practice is and more will be the required productivity for such practice. Thus, by getting the values of the weighted scores and studying this chart we can predict effectiveness of material management practice and thus we can predict labor productivity of the same. Overall Procurement plan for materials and material inspection process has the highest ratings in all the practices whereas material inspection team has the lowest rating in all practices. Job knowledge proves to be the most important among all other practices.

IV. CONCLUSION

- From the above study we can conclude that from all the 6 material management practices the best practice or highly accepted practice that is adopted are procurement plan for

materials and material inspection process in the specific area where this research is carried out.

- Once we come to conclusion of the best practice comment for labor productivity for such practice can be done.

- As the practice is best among all the practices adopted for the research there must be appointment of the labor in those practice having high productivity/skills.

- As it is best practice among all good inspection team on such practice must be adopted and chances of error in such practice must be minimum to avoid any interruption in the work.

- Likewise material inspection team is given less wattage of all the practices adopted which shows no special inspection team is adopted for inspection of material and thus we can comment that productivity required there is much less as compared to other practices adopted in this study.

- Other than this adaptability, Job Knowledge, Judgment, Motivation, labor productivity are the factors derived from the study. Job Knowledge is highly rated by all classes and proves to be the most important factor which firms consider in labor productivity among all other factors.

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