FACTORS AFFECTING THE ANALYSIS OF LABOUR PRODUCTIVITY IN INDUSTRIAL CONSTRUCTION

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Abstract - *The productivity level of construction industry is mostly depending upon three factors they are labour characteristics, management systems and external issues. Different researchers have determined different factors that influence construction productivity. Understanding the level of productivity, it is important to develop innovative practices to improve construction productivity. Many researchers have done study on the labour productivity of residential and commercial projects, but no one considered this industrial labour productivity criteria. So, this study focuses on mainly the industrial labour productivity. This study aims to find out the factors affecting the labour productivity in industrial construction, and to find the solution to improve the productivity issue in project work. Which leads to increase in profitability due to higher output as well as lowering operating cost due to increased efficiency. Ultimately, cost overrun and time delay will be reduced as we go on way to increase productivity. The data collection has been done on the basis of questionnaire survey and the data analysis has been done by the Relative Important Index (RII) method. The affecting people of this thesis is within Gujarat region only.*

*Key Words***:** Labour productivity, factors, analysis, construction industry

1. INTRODUCTION

Construction industry is world's generally biggest and challenging industry. Human asset has a key job in expanding productivity in development industry. With the compelling and ideal utilization of HR can help in productivity development. The construction ventures are generally work based with fundamental utilization of hand devices and hardware's in which work cost comprises of about 30% to half of all out task cost.

Indian construction industry is one of quickest developing segment universally. The construction area gives second biggest work after horticulture. India shares about 8% of absolute GDP and furthermore gives work to around 35 million people groups straightforwardly or by implication.

In construction industry, probably the most serious issue confronted is of untalented work which infers in productivity misfortune and effects on cost invade and plan every day. Work productivity is one of significant factor which influences physical advancement of construction venture. Construction venture is supposed to be effective in the event that it is finished in plan term and assessed cost. For that reason productivity must be proficient. Productivity forecasting assumes a significant job in vital and operational arranging.

There are number of variables that legitimately influence the productivity of work, therefore it is significant for any association to examine and distinguish those components and make a proper move for improving efficiency. At the miniaturized scale level, if we improved productivity, ultimately it reduces or decreases the unit cost of project and gives overall best performance of project. For each task, productivity, cost, quality, and time have been the principle concern. Better efficiency and improving work execution can be accomplished if venture work the executives incorporates the abilities of instruction and preparing, the work technique, individual wellbeing, inspirational variables, the kind of apparatuses, machines, required hardware and materials, individual aptitudes, the remaining task at hand to be executed, expected work quality, work area, the sort of work to be done, and administrative staff.

Work productivity is a champion among the most basic factor that impact adventure execution being developed. In India a standout amongst other troublesome looked by the advancement business is to pull in and to accomplish capable work. Cost overwhelms and plan delays are a portion of the serious issues brought about by work efficiency in order to rival worldwide economy. The construction business needs to upgrading the measures of advancement especially work execution.

It is hard to improve advancement gainfulness among the workers without perceiving factors that sway proficiency among them. Wasteful association of improvement resource can understand low profitability. Accordingly it is essential for authorities, brief specialists and engineers to be OK with the strategies inciting assess the productivity of the sorts of gear and the workers in different claims to fame. To accomplish the compensation anticipated from any improvement meander overall, it is imperative to have a normal controlling hand on the productivity factors

that contribute in the fused age structure, like work equipment, pay.

In an industry with serious gifted work deficiencies like the present construction industry, one approach to counterbalance the difficulties of a decreased work power is through an expansion in specialist productivity. Sadly, construction productivity has declined as much as 20% in the course of the last 5 or more decades, notwithstanding critical productivity increments across most different businesses.

1.1 Need for Study

- To identify the factors affecting productivity of industrial construction.
- To provide the satisfactory solution for the most affected factors of labour productivity to the construction work.

1.2 Objective

- To study the need of solution which affects the labour productivity, which leads to time delay and cost overruns of project.
- To improve the profitability due to higher output.

1.3 Scope of work

The work has been done within Gujarat, India region.

1.4 Research methodology

This research have derived research methodology in three phase:

1. **LITERATURE REVIEW**
   Literature review has been done by referring previously published papers, journals and books if necessary and also may refer some case studies if needed.

2. **DATA COLLECTION**
   A questionnaire survey and analysis of the derived responses has been carried out by considering a number of Engineers, Contractors, Site supervisor, CEO, Proprietor etc.

3. **DATA ANALYSIS**
   Relative Importance Index (RII) Method to carry out the relative analysis using a questionnaire survey.

2. Literature review

This literature review has been done to establish theoretical framework for the topic/subject area. Define key terms, identify studies, models, terminologies, case studies and so on supporting the topic. Total 14 research papers has been studied.

2.1 Learnings from literature

- Construction industry is very vast industry in India, and in the state of Gujarat, it is growing enormously. But the cost overrun issue and time overrun issue is becoming more and more tragic as the productivity of construction is way too low as compared to the any other industry.
- This study have found many factors affecting the productivity of construction industry, if we take steps to reduce the causes of that factors, we can definitely overcome the problem of productivity issue in construction industry.
- If causes of factors reduced to minimum, then the profitability will be more as the output will be increased. It leads to lower operating cost due to increased efficiency.

3. Data collection

Data collection is the way toward social occasion and estimating data on factors of enthusiasm, in a built up deliberate style that empowers one to respond to expressed research questions, test theories, and assess results. There is a general understanding among specialists and industry experts that one of the significant deterrents to advance improvement in construction organizations and effective construction ventures is the absence of fitting performance estimation. For constant and supportable improvement, it is important to have an all around planned estimation framework with substantial performance measures and indicators, which can check and screen performance just as giving long haul vital choices to the organization. Here quantitative overview has been finished. 80 questionnaire were dispersed.

For achieving the objective, questionnaire was made in which respondents should have to rate the different parameters according to analytical hierarchy process method. The five-point scale which ranges from 1 to 5:

SCALE	IMPORTANCE
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly agree

The quantitative data analysis has been done to identify the best factors affecting the productivity in construction of industrial projects.

3.1 Questionnaire Design

Questionnaire have been divided into two parts:

- General information about respondent i.e. company name, respondent name, qualification, experience, designation, and contact no.
- Factors affecting the productivity of construction industry are to be listed, and 5 options are given, best suitable option must be ticked by the respondent.

3.2 Sample Size Determination

The Engineers of government, developer, Contractor, accountant and Consultant were targeted for the survey. These details were considered to be the size of the population to determine the sample size of the study. For a representative population statistical sample, the formula shown below,

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where,

Z = statistic value for the confidence level (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (0.5 used for sample size needed)

c = confidence interval, expressed as decimal (e.g. 0.05 = ±5) ss = 385

Where,

pop = population (100)

New sample size = 80

4. DATA ANALYSIS

Data analysis is the path toward bringing order, structure and essentialness to the mass of accumulated data. The explanation of breaking down data is to acquire usable and significant information.

The analysis regardless of whether the information is quantitative or subjective may:

- Summarise and depict the data
- Identify relations between factors
- Evaluate factors
- Identify the distinction between factors
- Forecast results.

4.1 Relative Important Index

Relative Importance Index (RII) method was used as data analysis method to assess the relative importance of cost factors regarding construction project. A five-point Likert Scale was adopted. Results of analysis was presented in the next chapter. The relative importance index, RII, was computed for each factor to identify the most and the least significant cost factors in in different construction project. The causes were examined and the ranking of their attributes was done using the Relative Importance Index (RII). The relative importance index is given as:

$$RII = \sum w/A*N$$

Where,

RII   = Relative Important Index

W   = Weighting given to each factor by the respondents (ranging from 1 to 5)

A   = Highest weight (here 5)

N   = Total number of respondents.

4.2 Top 10 Factors on impact of industrial construction

Table-1: Table of top 10 factors determined by RII method

Types of factors	Factors affecting impact of labour productivity in industrial construction	RII = $\sum w/A*N$
Workforce factor	Lack of skills and experience of workers	0.8851
Miscellaneous	Design changes	0.8851
Supervision	Incomplete/revise drawing	0.8629
Management team	Poor health of worker	0.8592
Externals	Variation in drawing	0.8592
Management team	Poor site management	0.8518
Externals	Unsafe working condition	0.8481
Management team	Bad leadership skill	0.8407
Management team	Inadequate construction method	0.8111
Miscellaneous	Working overtime	0.8074
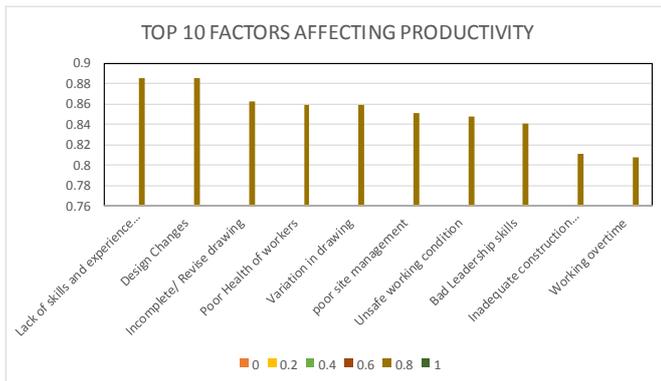
Graph-1: Top 10 factors affecting productivity

4.3 Reliability test

The term reliability in psychological research refers to the consistency of a research study or measuring test.

Split-Half Reliability Tests:

The reliability is calculated by Spearman Brown formula which is used where scale is administered.

$$Rsb = \frac{2Rhh}{1 + Rhh}$$

Rsb or α = 0.7743 > 0.70 , hence it has good reliability.

5. CONCLUSION

5.1 General conclusion

The study has been identified the affecting and improving productivity factors in construction through labour management. The data has been collected from questionnaire survey and analyse by Relative Important Index method. The most relative factors has been screened and take it aside. The factors has been analyse thoroughly and after seeing the current scenario of construction industry, the solution has been given, which was help to enhance the labour productivity. Increment in labour productivity leads to lower cost overrun and time overrun, so that the completion of the project was get complete in budgeted time and in budgeted amount.

Construction industry is very vast industry in India, and in the state of Gujarat, it is growing enormously. But the cost overrun issue and time overrun issue is becoming more and more tragic as the productivity of construction is way too low as compared to the any other industry. The study has been found many factors affecting the productivity of construction industry, if steps can be taken to reduce the

causes of that factors, the construction industry can definitely overcome the problem of productivity issue in construction industry. If causes of factors reduced to minimum, then the profitability will be more as the output will be increased. It leads to lower operating cost due to increased efficiency.

5.2 Research related conclusion

Labour productivity is an important aspect of construction industry that may be used as an index for efficiency of production. Efficient management of construction resources can lead to higher productivity which can help to achieve cost and time saving. Hence, the study has been done on factors affecting analysis of labour productivity in construction of industrial projects.

After analysing all the top ten factors with higher impact on labour productivity during the industrial construction, the recommendation and explanation have been found out.

Here are the top 10 factors affecting the labour productivity in industrial construction analysed by the RII method are listed.

5.3 Recommendation for top 10 factors affecting the analysis of labour productivity

1. **Lack of skills and experience of workers**
    - Increment in the mass of skilled and experienced worker at the site.
    - Providing the training session for the unexperienced workers.

2. **Design Changes**
    - Finalization of design drawing should be done before the starting of work.
    - Concern the Architect while finalizing the design drawing.

3. **Incomplete or Revised drawing**
    - Before the starting of work, the complete drawing of the structure should be on hand, which approved by structural engineers and architects also.

4. **Poor health of workers**
    - Providing the health insurance to every worker as they don't have enough money to spend in hospital costs.
    - Giving proper medication to ill workers and giving them the facility to get well soon.

5. **Variation in drawing**
   - Try to convince the architect and owner not to variate the design of the structure and let the design of the structure as it is.
   - Never start the work of the structure, if the drawing is not finalized at the start off the project.

6. **Poor site management**
   - Hiring of competent supervisors.
   - Material management and man force management should be done to avoid the delay of work.

7. **Unsafe working condition**
   - Cleaning of site every day, so the floors will not become slippery or littered.
   - Maintain the equipment frequently.
   - Lighting should be done at each and every angle of work site.
   - Stairways should be covered by the rope so that none would fall off.
   - Providing safety gears.
   - Dangerous chemicals and substances should be placed at secure place.
   - Safety net should be provided to work at high rise.

8. **Bad leadership skills**
   - To elect the leader who has good communication skills, general management skills, patience, decisiveness etc.

9. **Inadequate construction method**
   - To use proper methodology for construction work.
   - While deciding the construction method, discussion should be done with project managers and site supervisors, so that the management should be done for the finalized construction method.

10. **Working overtime**
    - Management should not allow the labourers to working overtime more than their capacity.

5.4 Future scope

This study includes the labour productivity of industrial construction, and it is having scope of only Gujarat state. Time comes with many difficulties in every work. This study is not the end. So, the future study in this topic would be the study of different construction projects of different region regarding labour productivity in the industry.

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