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Study on Factors Affecting the Productivity and the Ways to Overcome in Construction Industry

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Abstract - The study of productivity in the construction industry is gaining importance due to its positive effects on the economy of the construction companies and of the country asa whole. Nowadays, improving the productivity of building projects may have a direct impact in the survival of companies because of the great rivalry existing between them. In this project the factors that impact the performance of construction works and, therefore, the planning and the building costs. The productivity of labour is particularly important especially in developing countries, where most of the building construction work is still on manual basis. This paper reports on a survey made on project managers and experienced engineers of building projects in kerala where anincrease in productivity is being sought. The survey will be carried out by a questionnaire and responses. The ten most significant factors affecting labour productivity for small, medium and large companies are identified. The knowledge and appropriate management of these factors can improve theplanning of the work during the project development phase and the execution phase. This will have positive effects regarding time shortening for the execution of activities and, as a result, cost reductions.

Key Words: Construction Industry, Labour Productivity, Factors, Production Loss.

I.INTRODUCTION

Productivity is one of the important aspects for the companies in the construction industry. Improvement in the productivity of the construction industry is therefore of critical importance considering its significant contribution to the GDP. Improved productivity will help contractors not only to be more efficient and profitable whilst executing the jobs, knowing actual productivity levels could also make the contractors more competitive whilst bidding for the projects.On the other hand, the shortages faced by the construction industry could be overcome by better productivity on site and utilization of available manpower resources. All contractors within the India face the same amount of constraints; same specifications apply and therefore the bottom line performance of contractors is influenced by how effective & well planned, the construction methods are, andwhether the construction operatives work at optimal productivity. Several labour productivity related studies were performed from past and most of them were related to the factors affecting productivity. Achieving better labour productivity requires detailed study of the actual labour costas well as nature and type of labour. Different labours have different variables which can considerably affect their productivity levels. For every project, productivity, cost, quality, and time are the main factors of concern. Better productivity can be achieved if project management includes the skills of educating and training the labourers on various factors including the work method, personal health, motivational factors, type of tools, materials and machines required, personal skills, workload to be executed, expectedwork quality, the type of work to be done etc.

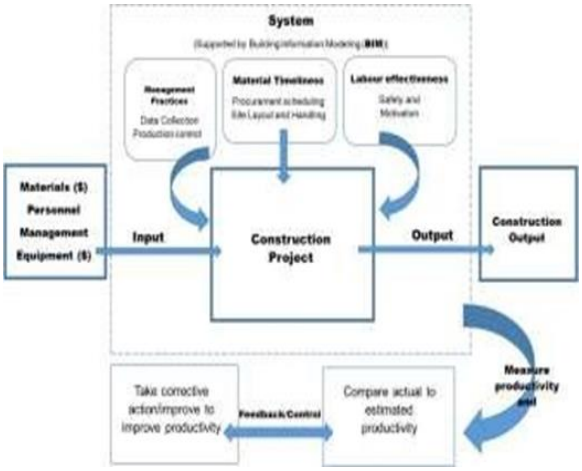


Fig.1 The role of building information modeling

Construction industry has several external and internal factors which are never constant and are difficult to

anticipate. These factors are responsible for a continuous variation in labour productivity. There lies the importance of monitoring and quantifying the effects of these factors, by which we can analyze how far the productivity is affected and suggest methods to improve productivity. Safety management is expected to take account of all risks and accidents that may possibly be expected that put project employees at risk. The health and safety of any workplace is very important to diminish such risks, legally and ethically, but in mainly dangerous contexts such as the construction industry HS takes on perilous importance as daily activitiesof the industry are highly unsafe. It is thus important to identify suitable safety activities and strategy. Past research in the area show clearly that construction projects create frequent possible threats to the lives of employees, and serious injuries and mortalities are frequent in the construction industry. Thus, the consideration and management of safety, along with consideration to H&S generally, is undeniably fundamental to any construction project. By proper H&S planning many of the myriad H&S risks in construction can be prevented. Injuries and fatalities resulted in accidents in the construction industry still an obstacle clings construction industry to its infamous positionas the industrial sector responsible for more occupation accidents, than any other. Consequently, the improvement of H&S in construction is still an essential goal for all contributors in the construction processes. Safety management is likely to take account of all risks and accidents that may believably be expected that put project employees at risk, to minimize such risks. It is thus important to identify appropriate safety actions and strategies to accommodate potential serious H&S problems.

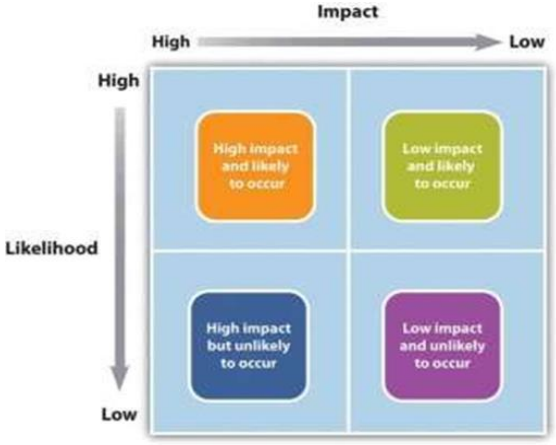


Fig.2 Productivity Planning

1.1 Problem Statement

In the construction industry productivity loss is oneof the greatest and severe problems. Present construction contracts lack enough to classify recompense for productivity loss due to field factors. Of various project-costs components such as labors materials and equipment's, laborcomponent is considered the most risk. Whereas others components (equipment and material) are determined by the market price and are, consequently, beyond the influence of project management. Labor cost in the construction industry is estimated to be about 33%- 50% of the entire project cost. Because labor is more variable and unpredictable than other project-cost components, it becomes necessary to understand the effects of different factors on labor productivity and their construction trades associated. An increase in productivity can reduce the labor cost in a direct proportion. It can either benefit or reduce aproject's profit, making it of vital interest to the construction industry for its success.

1.2 Productivity at The Job Site

Contractors and owners are often concerned with the labor activity at job sites. For this purpose, it is convenient to express labor productivity as functional unitsper labor hour for each type of construction task. However, even for such specific purposes, different levels of measure may be used. For example, cubic yards of concrete placed per hour is a lower level of measure than miles of highway pavedper hour. Lower-level measures are more useful for monitoring individual activities, while higher-level measures may be more convenient for developing industry-wide standards of performance. While each contractor or owner is free to use its own system to measure labor productivity at asite, it is a good practice to set up a system which can be used to track productivity trends over time and in varied locations. Considerable efforts are required to collect information regionally or nationally over a number of years to produce such results. The productivity indices compiled from statistical data should include parameters such as the performance of major crafts, effects of project size, type andlocation, and other major project influences. In order to develop industry-wide standards of performance, there mustbe a general agreement on the measures to be useful for compiling data. Then, the job site productivity data collected by various contractors and owners can be correlated and analyzed to develop

certain measures for each of the majorsegment of the construction industry. Thus, a contractor orowner can compare its performance with that of the industry average.

1.1.1 Factors Affecting Job-Site Productivity

Job-site productivity is influenced by many factors which can be characterized either as labor characteristics, project work conditions or as non-productive activities. The labor characteristics include:

- Age, skill and experience of workforce
- leadership and motivation of workforce

The project work conditions include among other factors:

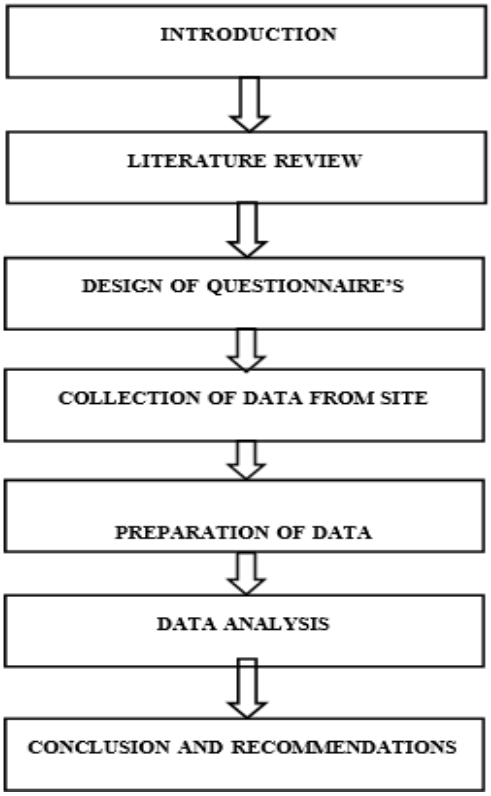
- Job size and complexity.
- Job site accessibility.
- Labor availability.
- Equipment utilization.
- Contractual agreements.
- Local climate.
- Local cultural characteristics, particularly in foreignoperations.

1.11 Aim and Objective

- To identify the factors which affect the variation of productivity in the construction projects.
- To evaluate the impact of influenced factors on the variation of productivity.
- To suggest recommendations to improve productivity in construction projects. To determine ten most critical construction trades affecting the productivity of typical types of building and infrastructure projects in Kerala
- To develop methodology for measuring the productivity of the trades selected in above;
- Based on the productivity performance of the selected trades, to establish benchmark indicators of the tradesin terms of productivity;
- Views from the construction industry about various affecting labor productivity to the selected trades;
- To compare and evaluate the productivity performanceof the selected trades with that of other developed countries
- To make recommendations to improve labor productivity in construction.

II.METHODOLOGY

The methodology of the study is described and explained based on the objectives and the aims of the study. In this study the focus is on collecting data from the project construction site. The research through literature reviews and discussion with some parties involved in the Construction industry identified a total of nine major causes which are mainly effecting in the productivity of construction projects. The methodology adopted in thisresearch.



The market demand in construction fluctuates greatly, often within short periods and with uneven distributions among geographical regions. Even when the volume of construction is relatively steady, some types of work may decline in importance while other types gain. Under an unstable economic environment, employers in the construction industry place great value on flexibility in hiring and laying off workers as their volumes of work waxand wane. On the other hand, construction workers sense their insecurity under such circumstances and attempt to limit the impacts of changing economic conditions through labor organizations. There are many crafts in the construction labor forces, but most contractors hire from only a few

of these crafts to satisfy their specialized needs. Because of the peculiar characteristics of employment conditions, employers and workers are placed in a more intimate relationship than in many other industries. Labor and management arrangements in the construction industry include both unionized and non-unionized operations which compete for future dominance. Dramatic shifts inunionization can occur.

1.3 Factors Affecting Productivity

The questionnaire design practice advanced on a communicating basis. It was categorized into profile of the respondent and various factors affecting labor productivity inbuilding construction. Questions in the respondent profile were created to collect information such as job position, experience of the work, locations of the current and/or previous works and contact information. It was studied, thesequestions in the survey were of great important to theresearch by analyzing productivity loss concerns from a variety of different profiles from different regions. It was practical to anticipate that a location can have an impact onthe loss of productivity due to various field disturbances, especially geographical and climatic conditions.

- Accidents
- Construction method
- Drawings and specifications alternated during execution
- Government regulation
- High quality of required work
- Increasing number of laborers
- Inefficiency of equipment
- Inspection delay
- Insufficient transportation
- Insufficient lighting
- Labor absenteeism
- Labor disloyalty
- Lack of competition
- Lack of financial motivation system
- Lack of labor experience
- Lack of periodic meeting with labor
- Labor personal problems
- Lack of place eating and relaxation
- Lack of training sessions
- Low quality of raw materials
- Material shortage
- Misunderstanding among laborers
- Misuse of time schedule
- Payment delays
- Rework
- Supervisors' absenteeism
- Tool and equipment shortages
- Unsuitability of materials storage location
- Violation of safety precautions
- Weather change
- Working at high places
- Working overtime

III.CONSTRUCTION FIELD SURVEY

1.4 Type of Research

In this study research design is descriptive in nature descriptive research involves survey of facts, findings and enquiries of different kinds. The major purpose of descriptive research is description of the state of affairs as itexists at present the main characteristics of this method of the research are that the researcher has no control over thevariables.

1.5 Methods of Research Design

3.2.1 Primary Data

A questionnaire was used to conduct the whole survey to control the response bias and to increase the reliability of the data, a structural pattern of question was also used in the questionnaire. The advantage of this specified construction of the questionnaire are being administrative simplicity and easy in data processing analysis, and the interpretation. The questionnaire consist of dichotomous and the multi choice question to allow as possibilities to be covered. The question was asked directly to the consumer and in the direct disguised form so as to avoid confusion and to get the best and reliable answer.

3.2.2 Secondary Data

Secondary data's are in the form of finished products as theyhave already been treated statistically in some form or other. The secondary data mainly consist of a data and information. The secondary data collected from records, company websites and also discussion with the management of the organization. Secondary data was also collected from journals, magazines and books.

3.2.3 Sample Size

Sample size taken for this study is 50

3.2.4 Sampling Method

A convenience sample is a type of non- probability sampling method where the sample is taken from a

group of people easy to contact or to reach. For example, standing at a mall or a grocery store and asking people to answer question would be an example of a convenience sample. this type of sample is also known as grab sampling or availability sampling. there are no other criteria to the sampling exceptthat people be available and willing to participate. in addition, this type of sampling method does not require thata simple random sample is generated, since the only criteria is whether the participants agree to participate.

3.2.5 Tools Used for Analysis

- Correlation analysis
- Percentage analysis
- Chi square analysis

3.2.6 Correlation Coefficient

Correlation coefficient, a measure of a strength of the linearrelationship between two variables that is defined in terms of the (sample) covariance of the variables divided by their(sample) standard deviations.

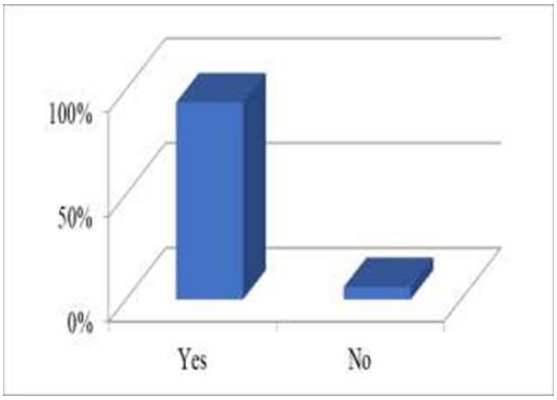
3.2.7 Percentage Analysis

Percentage analysis is a frequency distribution to display the data that specifies the percentage of observation that exist for each data point or grouping of data points. It is particularly useful method of expressing the relativefrequency of survey responses and other data. Many times, percentage frequency distributions are displayed as tablesand as pie chart.

1.6 Data Analysis and Interpretation

3.3.1 The extent of change order during execution

Opinion	No. of Responses	Percentage
Yes	47	94%
No	3	6%
Total	50	100%

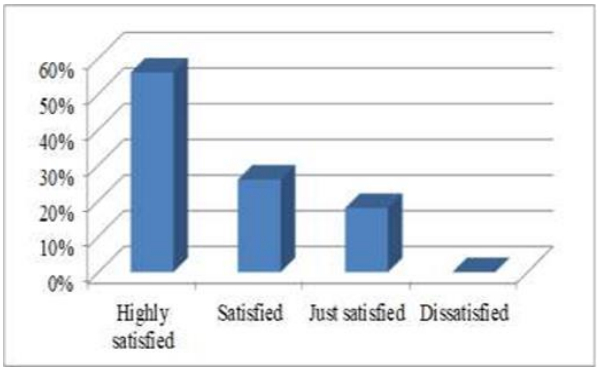


Interpretation:

From the above table it can be inferred that 94 % of the employees think The extent of variation/change order during execution, 6% do not think so

3.3.2 Design Complexity Level

Opinion	No. of Responses	Percentage
Highly satisfied	28	56%
Satisfied	13	26%
Just satisfied	9	18%
Dissatisfied	0	0%
Total	50	100%



Interpretation:

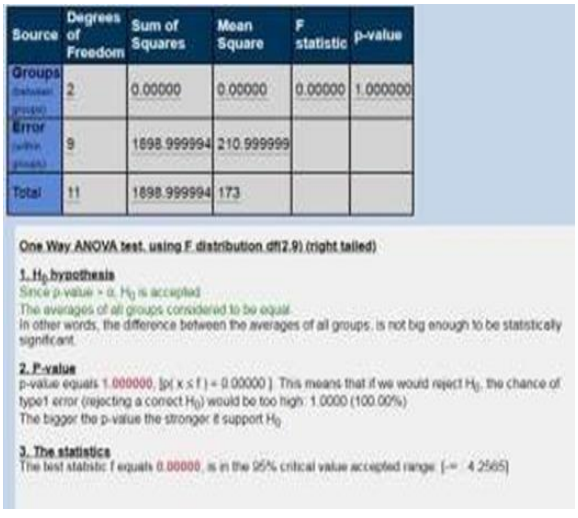
From the above table it can be inferred that 56% of the employees are highly satisfied with Design Complexity Level.26% are satisfied with Design Complexity Level. 18% are just satisfied with Design Complexity Level

3.3.3 One Way ANOVA Test

Statistic Data

α: 0.05

Significant level (0-1), maximum chance allowed rejectingH0 while H0 is correct (Type1 Error)



Source	Degrees of Freedom	Sum of Squares	Mean Square	F statistic	p-value
Groups	2	0.00000	0.00000	0.00000	1.000000
Error	9	1898.999994	210.999999		
Total	11	1898.999994	173		

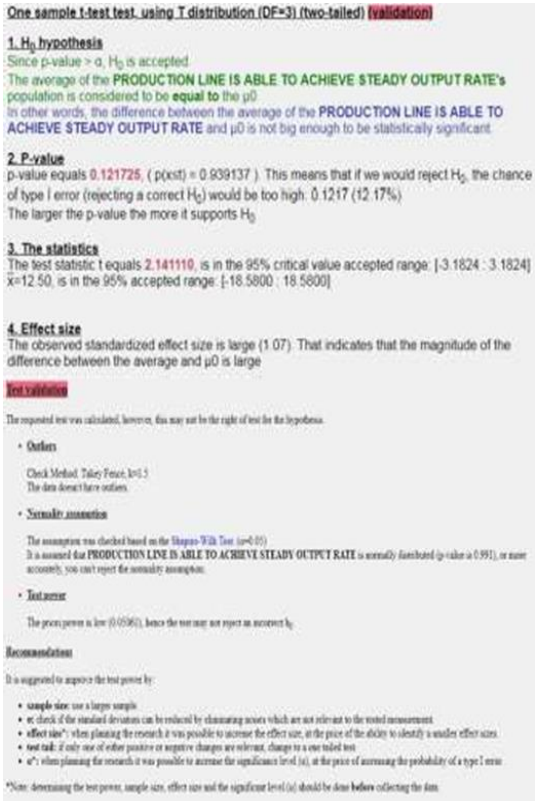
One Way ANOVA test, using F distribution df(2,9) (right tailed)

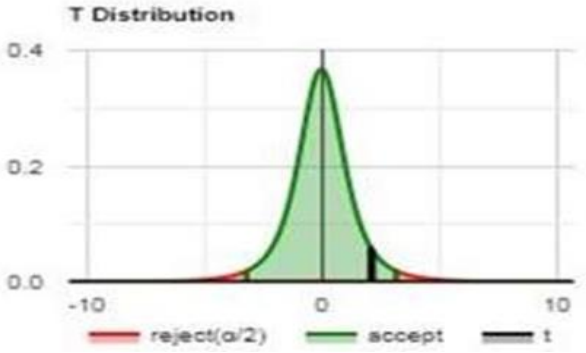
1. H_0 hypothesis
Since p-value > α, H_0 is accepted
The averages of all groups considered to be equal
In other words, the difference between the averages of all groups, is not big enough to be statistically significant

2. P-value
p-value equals 1.000000, [p(x ≤ f) = 0.00000]. This means that if we would reject H_0, the chance of type1 error (rejecting a correct H_0) would be too high: 1.0000 (100.00%)
The bigger the p-value the stronger it support H_0

3. The statistics
The test statistic f equals 0.00000, is in the 95% critical value accepted range: [-∞ , 4.2565]

3.3.4 T -Test





IV.FINDINGS, SUGGESTIONS & CONCLUSION

1.7 Summary of Findings

- Employee attitude towards the current performance production method is very much satisfactory, none of the employees said in the survey that they were Unsatisfied.
- From the production department, we have found that all the employees are fully cooperative in the full operationprocess.
- All employees also agreed the fact that the past and present production system is transparent and bias free.
- According to the employees majority of them told that performance appraisal was able to improve their performance. It also increased productivity as well because they felt that company is interested in their performance and adopting methods to improve it.
- The majority of the employees also told that productionsystem was also helping in finding their hidden talent and putting into action as well.
- Promotion process in this organization is based on a mix of experience, performance and educational qualification, in which experience to be the first factor in the textile industry.
- The company also did provide opportunity for growth and development and also helped to identify strength, weakness and hidden talent.

1.8 Suggestions

- Implement more methods of production and update the employees about the type of method used for performance evaluation.
- The whole performance of operation should be kept more transparent and freer from bias in the future.
- More opportunities should be provided for expressing their ideas and plans to implement their level performance.
- Overtime should be taken care of at the time of performance appraisal, which would motivate the employees to perform better for longer hours.
- Suggestion could be obtained from employees regarding framing the performance production and operation system.

1.9 Conclusion

Construction tasks are often expensive and arguments andclaims are frequent, which generally affect progress

of projects. Productivity of various trades in the construction industry is critical for an accurate estimation of the time and cost of a job. Having better productivity would mean optimal utilization of manpower resources; more accurate estimates of cost to build, better profits, high morale of employees and better relations between employer and employee. This is all the more important in Kerala as the construction industry workforce come from a varied background, and different cultures and there is shortage of manpower. The environment of a construction firm should be made suitable to implement projects with successful completion. In any industry, it is necessary to find the factors which hinder the smooth completion of a particular task in order to solve and overcome them. In the Phase II the recommendations, will be made based on the study, which will found to be important factors of consideration for improving labour productivity.

Future Study

Distinguished various research limitations and key areas for further study about strategies for improving construction labor productivities. Limitations mark the potential weakness of the study, which were not within my control as the literature review. Difficulty in gaining access to construction company leaders because of their busy schedules created time constraints. I would recommend and conduct further studies to explore issues not covered in the study. One recommendation for further study is to conduct quantitative research to measure the constructs identified in this research and assess the relationship between these variables and labor productivity. Another recommendation is that researchers expand the research domain to determine whether the themes I identified in this study are the same for other business sectors or in other locations.

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