Factors Affecting Productivity In Building Projects of Gujarat : A Review

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Abstract- With its potential for cost savings and resource efficiency, productivity is still a hot topic in the construction industry. One of the most crucial challenges in both industrialized and developing nations is productivity. The industrialized nations understand the value of social welfare and economic expansion. Developing nations grappling with issues of inflation, unemployment, and resource constraint aim to optimize resource utilization for the purpose of fostering economic growth and enhancing the quality of life of their populace. Being a recently developed region with a large number of projects scheduled for the near future, productivity is a matter of special relevance for projects located in Gujarat. The purpose of this study is to determine the variables influencing labor productivity in construction projects
Keywords: Productivity, Labour, Building projects, Improvement.

I. INTRODUCTION

The majority of the world's construction sectors are extremely concerned about low productivity. One of the biggest issues facing the construction industry is low artisan productivity. Numerous factors influence labor performance, which is typically correlated with time, cost, and quality performance. Every project has some construction-related challenges, such as those involving supplies, finances, equipment, and local contractors' fees. In light of the ongoing decline in construction labor productivity, it is imperative to determine the factors influencing it and then select the most important ones from the pool of options.

The ratio of industrial output to input used in its creation is known as productivity. Stated differently, it is a gauge of the pace at which work is completed. It can alternatively be expressed as the total output divided by the entire input. A better understanding is still required to increase labor productivity, even though the previous ten years have seen the identification and evaluation of factors affecting labor productivity. Due to its historical large share of the labor force and substantial contribution to overall national revenue, the construction industry is an important part of the economies of many nations.

Research on labor productivity in the Indian construction industry is desperately needed nowadays, especially in areas where labor productivity can be significantly increased. As a first step towards improving labor productivity efficiency, it is necessary to identify the factors that led to these changes. The management might then act to improvise on that matter with regard to those aspects that hold sway. Numerous research on the subject of determining the factors impacting construction labor productivity exist outside of India, but they are not relevant to the Indian context.

1.1 Indian scenario

The average yearly turnover for the construction industry is 3.85 lakh crore. However, the industry reports that a number of issues cause us to lose a significant amount of money each year, with low productivity being one of the main issues (Rami Huges, 2014). In fact, India has productivity losses of even more than 30%, which raises severe concerns for those in the building industry. In essence, the productivity of the labor force, equipment, and procedures used in a construction project determines its timely and successful completion. Authorized organizations including the Bureau of Indian Standards, CPWD, and others have created a number of standards to establish productivity guidelines for different construction-related tasks.

However, it is vital that the productivity of the resources involved in any project is closely monitored and appropriate steps are taken for their improvement in order to maximize both cost and time as well as to

minimize the waste of other resources as well (which is also the core philosophy of Lean Construction) (CIDC). In an attempt to identify the fundamental causes or contributing elements to low productivity, every resource's construction productivity will be examined and analyzed. Suggestions for improvement will be offered.

Bureau of Indian Standards, among others, to establish productivity standards for a range of construction-related tasks. However, it is vitally important that the productivity of the resources used in any project be regularly reviewed and appropriate steps are made for their improvement in order to maximize both cost and time as well as to minimize wastage.

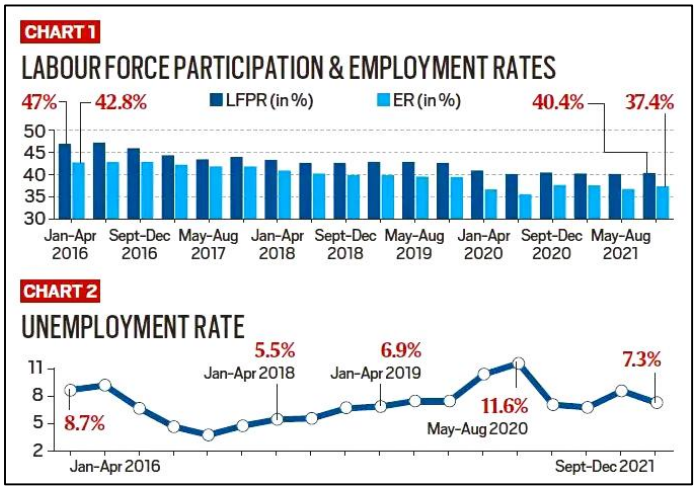


Chart1: labour force participation and employment rates from 2016-2021
Source:
https://drishtiias.com/images/uploads/1651145038_Labour_Force_Participation_Drishti_IAS_English.png

II. LITERATURE REVIEW

Numerous investigations have been conducted to identify the variables influencing labor productivity in building projects.

When it was originally used in an article by Quesnay and Veggi in 1766, the word productivity was invented (1987). 1883, more than a century later, defines productivity as "faculty to produce." As time went on, the definition was modified to include "the relationship between output and means employed to produce that output."

Furthermore, productivity is defined as a "relative measure of labor efficiency, either good or bad, when compared to a stabilized base or norm" by the American Association of Cost Engineers.(Salmon & Associates, 2000) whereas "the ratio between total output expressed in dollars and all inputs expressed in dollars as well" is how Arditindmochtar (2000) defines productivity.Productivity was defined as "how much is produced per unit input" by Honer and Duff (2001).

Surveying 100 respondents in 2006, M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan, and A.A.A. Ali from Malaysia found that 70 were contractors, 11 were developers, and 19 were consultants.They ranked the elements influencing labor productivity using the relative importance index (RII) technique. According to their analysis, the essential components were: (1) technology; (2) human/labor; (3) management; and (4) external.

In Kuwait in 2012, Abdulaziz M. Jarkas and Camille G. Bitar conducted a poll.The aim of this study was to ascertain and prioritize the variables that are thought to impact labor productivity on building sites.

In order to accomplish this goal, a statistically representative subset of the contractors was asked to take part in a 45-item productivity factor questionnaire survey. Important factors, according to their findings, were: (1) Technical specifications' clarity; (2) The extent of variation or change orders throughout execution; and (3) The degree of coordination among different design disciplines.

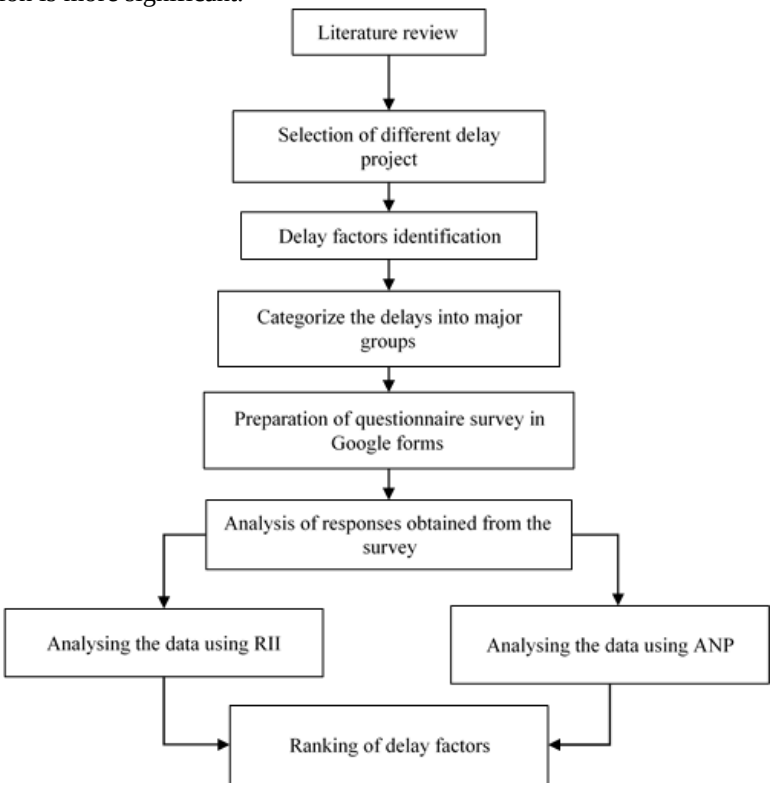
Egypt's Khaled, Mahmoud El-Gohary, and Remon, Fayek Aziz conducted the study in 2013.Thirty productivity criteria were included in the questionnaire, which was divided into three main categories: (a) human/labor; (b) industrial; and (c) management. The relative importance index approach was employed. For every aspect and every year of the participants' experience, an index was calculated.

In 2013, a comprehensive review on labor productivity in the construction industry was conducted by Wen Yi1 and Albert P.C. Chan. The objectives of this assessment were to determine important research areas and examine the current state of the art and trends in CLP (critical labor productivity) research. The aforementioned studies are conducted outside of India. It is necessary to conduct this kind of research in India. The goal of this study is to investigate labor productivity aspects within the Indian setting. The study's purview is restricted to the Indian state of Gujarat.

III. METHODOLOGY

This study employed a questionnaire as its research instrument, and it was created to guarantee that it addressed the study's objectives, which were divided into several categories. The purpose of the first section of the questionnaire is to collect data regarding the profile of the firm and the respondents. The second section asks respondents to rate the different features of labor productivity-affecting factors.A questionnaire to examine its impact on labor productivity in the construction industry will be developed based on the parameters found in earlier research.Ten major categories were used to identify a total of 33 factors. The degree of influence of factors was measured using a 5-point Likert scale, while the amount of effect was measured using a 4-point Likert scale.

Microsoft Excel was used for the analysis of the survey data that was gathered. The factors impacting labor productivity from the respondent's point of view have been examined and ranked according to their relative importance, frequency, and severity. An index's higher value indicates that a factor influencing labor productivity in building construction is more significant.



IV. DATA COLLECTION

Project Managers, Contractors and Engineers of different cities of Gujarat such as Ahmadabad, Vadodara, Jamnagar, Valsad, etc. city were targeted for the survey. Normally response rate is very low so the questionnaire was distributed to the various stakeholders more than the sample size requirement. A total of 126 questionnaires were distributed to different stakeholders in. This study received 95 responses. Response rate for this survey is 75.39%.

V. DATA ANALYSIS

The primary data collected from the questionnaire survey were analyzed using Relative Importance Index method for ranking each factor from the perspective of project managers, contractors and engineers. A Five-point Likert scale was used for rating of the level of effect of factors, where 5 means critical effect and 1 means no effect. This was transformed to important indices for each factors as follows:

$RII = WA \times N \ldots$ (Equation 1)

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight (i.e., 5 in this case), and N is the total number of respondents. Higher the value of RII, more important was the factor affecting labour productivity.

Table 2: Top most factor affecting labour productivity by RII method

FACTORS	RII	RII(%)	RANK
Clarity of technical specification	0.409	40.927	29
The extent of variation	0.468	46.755	28
Coordination level among design disciplines	0.468	46.755	28
Design complexity level	0.502	50.199	21
Rework	0.513	51.258	16
Site layout	0.515	51.523	14
Inspection delay	0.498	49.801	22
Site restricted access	0.485	48.477	25
Motivation of labour	0.469	46.887	27
Skill of labour	0.481	48.079	26
Physical fatigue	0.505	50.464	20
A shortage of experienced labour	0.510	50.993	18
Lack of labour supervision	0.567	56.689	1
Working over time	0.493	49.272	23
Crew size and composition	0.514	51.391	15
Unsuitability of storage location	0.511	51.126	17
Shortage of materials	0.506	50.596	19
Construction method	0.487	48.742	24
Payment delay	0.528	52.848	9
The economic condition in the country	0.548	54.834	4
Ease to delivery to the site	0.518	51.788	13
The nature of the project site	0.514	51.391	15
The area of project location	0.530	52.980	8
Availability of labour in the market	0.530	52.980	8
Temperature	0.525	52.450	11
Public holidays	0.519	51.921	12
Construction managers lack of leadership	0.526	52.583	10
Available of material in the market	0.531	53.113	7
Public holiday	0.550	54.967	3
labour management	0.546	54.570	5
Construction managers lack of leadership	0.551	55.099	2
Accidents as a result of poor safety	0.542	54.172	6
material managment	0.525	52.450	11

ANP METHOD: Using this method, inquiries ought to be made for every component.It is very useful in group decision-making and is applied globally in a wide range of decision-making contexts, including government, business, industry, healthcare, and education.Each component of the hierarchy is given a numerical weight or priority, which makes it possible to compare disparate and frequently incommensurable components to one another un a logical and consistent manner. The AHP stands apart from other decision-making methods thanks to its feature.

Additionally, it offers a mechanism for calibrating the numerical scale used to quantify both qualitative and quantitative achievements. The whole comparison spectrum is covered by the scale, which goes from 1/9 for _least valued than_ to 9 for _absolutely more important than_. Several essential and fundamental steps in this system are: 1. Identify the issue, 2. Extend the problem's aims or take into account all relevant variables, goals, and consequences. 3. Determine the standards that affect the conduct. 4. Organize the issue into a hierarchy of levels

that include the objective, requirements, supplementary requirements, and possible solutions. 5. Adjust each element on the numerical scale by comparing it to each other in the relevant level. An (n_1) /2 comparison is necessary for this, where n is the number of components that have the considerations that Additionally, it offers a mechanism for calibrating the numerical scale used to quantify both qualitative and quantitative achievements. The scale is as follows: 1 for _equal_, 9 for _absolu diagonal elements are equal or _1_, and 1/9 for _least valued than_. The other elements are just the reciprocals of the previous comparisons. 6. Compute each criterion's or alternative's highest Eigenvalue, consistency index (CI), consistency ratio (CR), and normalized values. 7. A decision is made using the normalized values if the maximum Eigenvalue, CI, and CR are acceptable; if not, the process is repeated until these values fall within the appropriate range. Group consensus is included with the aid of AHP. Usually, a questionnaire is used to compare each piece and get the geometric mean.

V. FUTURE SCOPE

Both residential and commercial project types are taken into consideration for research purposes in this study. Therefore, work on other kinds of construction projects, such as industrial and infrastructure projects, can be extended. Only those factors that have an impact on labor productivity during building construction are noted and examined here. Researchers can also assess productivity on building sites by using case studies and analyzing the data for various project kinds.

V. ACKNOWLEDGMENT

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VI. CONFLICTS OF INTEREST

The authors have declared no conflict of interest.

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