



“FACTORS AFFECTING LABOUR PRODUCTIVITY AT A RESIDENTIAL BUILDING”

SNEHAL KANGANE¹, YOGITA FULSE²

¹M.Tech student, Civil Engineering Department SOET, Sandip University Nashik

²PG Coordinator, Civil Engineering Department SOET, Sandip University Nashik

Abstract: Development is the world's biggest and most testing industry . The result of the development business establishes one portion of the gross capital and is 3 to 8% of the Gross Domestic Product. It gives work to around 35 million individuals in India. The objective of this paper is to identify and rank the (RII) relative importance index of factors affect the labour productivity on construction sites and work sampling was used to measure the percentage of work for Plastering and Brick Work. The questionnaire comprised (45) factors classified were divided into 7 Groups. The analysis reveals Top Ten Factors affecting labour productivity are: Labour Strikes , Lack of Labour experience , Payment delays, Augmentation of Government regulations, Lack of experience of Supervisor, Unavailability of material on time , Quality of required work , Misunderstanding among owner, contractor, and designer , Alcoholism, Disputes with the owner. And also shows that the percentage of productivity work, contributory work and unproductive work for Plastering and Brick Work was 56%,25%,20% and 43%,37%,21%, respectively. The results obtained can be used by the professionals for improving the labour productivity in construction projects.

Keywords: Relative Importance Index, Labour Productivity, Work Sampling, Factors

I. Introduction

A few examinations identified with work efficiency are performed for development industry in past. A few of them were identified with ascertaining the impact of efficiency factors. Quantifiable computations about the impacts of those elements are needed for a considerable length of time, it incorporates assessment of the development project, it's planning and scheduling. Not with standing, past concentrate on shows that it is hard to ascertain such an effect, and at present there are no generally acknowledged principles to quantify factors causing work efficiency misfortune in development industry. This absence of techniques for estimating impacts features the need to improve quantifiable appraisals for the variables influencing usefulness in building development.

Development is the world's biggest and most testing industry . The result of the development business establishes one portion of the gross capital and is 3 to 8% of the Gross Domestic Product (GDP) in many nations (Arditi and Mochtar, 2000)[7]. The development business in India offers more than 5% to the country's GDP. It gives work to around 35 million individuals in India.

One of the greatest worry for any association is to work on their usefulness, addressing the successful and proficient change of assets into attractive items and deciding business benefit. In this way the powerful use and legitimate administration in regards to work efficiency is vital in development tasks without which those exercises may not be imaginable.

II. Research Objective

The goal of this review centers around sees from the development business about different variables influencing work productivity, examines factors influencing the work efficiency sway, and recommends suitable measures that can be taken to further develop work efficiency. The point is upheld by the goal expressed underneath.

- ✓ Study and examine different elements influencing work efficiency in construction industry.
- ✓ Investigate and compute the Relative Important Index (RII) of those variables influencing work productivity.
- ✓ To quantify the efficiency by work sampling technique.

III. Literature Review

Increment of efficiency was determined preceding mid-1906's, in the development business (Stall, 1983)[11]. Afterward, decrease in efficiency has stayed of extraordinary concern issue in the development business everywhere. In 1968, the Construction Roundtable was set up because of worry about the expanded expense of development coming about because of an

expansion in the expansion rate and a critical decrease in development productivity (Thomas and Kramer, 1988)[10]. The exploration found the need for an ascent in efficiency was maybe more extreme in the development area contrasted with some other area. It was important to carry out, beyond what many would consider possible, industry-wide standards of creation all through the development cycle.

Makulsawatudom et al (2004)[5] explored the impact of 23 elements on the productivity of the development business in Thailand and deduced that lack of material, deficient delineations, unskillful administrators, lack of tools and outfit, labor absenteeism, poor communication, instruction time, poor point layout, examination detention and rework, are the most basic.

Enshassi et al., (2007)[4] directed exploration and feature the issues related with building projects in Palestinian which are material inventory, booking strategies. In addition number preparing g led to further develop the booking strategies of workers for hire however these work didn't zero in on projects planning programming like Primavera and Microsoft Project.

Chan and Kaka (2007)[3] controlled a poll study in the United Kingdom to comprehend the distinction in insight among project supervisors and development labourers of variables influencing development work productivity. The middle class test positioned oversight, effortlessness of building configuration, level of site insight, data stream and correspondence with sub-project workers as the main five variables. In any case Quality requirement, utilisation of plants, communication within gangs, health and safety management, and Construction Design and Management (CDM) were thought of as significant by common labourers. This review gave understanding into factors essential to the two gatherings and stressed the requirement for coordinating the distinctions in assessment between the two gatherings to accomplish usefulness improvement.

Jarkas and Radosavljevic,(2012)[2] concentrated on efficiency issue in development industry of Kuwait. The goal of their review was to perceive factors upsetting efficiency and write them as per their overall significance record (RII). In the outcome, most critical elements that influence work efficiency were, late installment, modify, financial motivation, and change in guidelines, unskilled supervisors, planning shortcomings, materials deficiency, and inaccessibility of drawings.

Table 1. Summary of factors affecting labour productivity in the past studies.

Euthor	Top Five Factor influencing Labour productivity
Present Study India	Labour Strikes, Lack of Labour experience, Payment delays, Augmentation of Government regulations, and Lack of experience of Supervisor.
USA (Mahesh,2012)	Lack of required construction material, Shortages of power and water supply, Accident during construction, Lack of required construction tools and Insufficient lighting.
Malaysia(Abdul Kadir et al.,2005)	Material shortage at project site, Stoppage of material delivery due to financial problems, Change order by CO causing project delay, Not timely issuance of drawing by consultants and Not able to organize site activities.
Egypt(Enshassi et al.,2006)	Material shortage, Lack of labour experience, Lack of labour surveillance, Misunderstanding between labourers and superintendents and Drawings and specifications change during execution.
Thailand (Makulsa watudom et al.,2004)	Lack of material, incomplete drawing, incompetent supervisors, Lack of tool and equipment and Absenteeism.
Indonesia (Kaming et al.,1997)	Lack of material, Rework, Absenteeism, Interference and Lack of tools

IV. Methodology

4.1 Research Design

The exploration plan that were utilized in this review is related both quantitative and qualitative design to give spellbinding and illustrative data and to control key elements and factors to determine frequencies. The review will be upheld with questionnaire survey and meeting to remember the thoughts of the partners for case development area.

4.2 Survey Questionnaires

"Study research is characterized as assortment of various information by asking individuals inquiries" (Fowler, 1993)[9]. The information assortment process utilized in this exploration had the choice of two essential techniques: surveys questionnaires and individual meetings. The survey configuration practice progressed on an imparting premise. It was ordered into profile the respondent and different variables influencing work productivity in building development. Inquiries in the respondent profile were made to gather data, for example, work position, insight of the work, areas of the current and contact data. It was considered, these inquiries in the review were of incredible critical to the exploration by investigating efficiency misfortune worries from a wide range of profiles from various locales. It was practical to guess that an area can affect the deficiency of efficiency because of different field disturbances, particularly topographical and climatic conditions.

4.3 Method of Data Analysis

4.3.1 Relative Importance Index

In this exploration, a clear factual strategy has been utilized for the examination of the information which gives general outlines and details all together that some sort of understandings and conversations can be made on the outcomes. Besides, writing checked on was likewise utilized as one of the fundamental support points for the investigation of the discoveries. The gathered info were basically examined as so much as rate, and positioning of calculations even as tables and graphs that have used for the examination yield show.

(RII) Relative Importance Index will be utilized to break down the data gathered through poll Survey. The overall equation is given beneath:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{A * N} \quad \dots\dots \text{Eq 1}$$

Where:

W is the weight given to each factor by the respondents and reaches from 1 to 4

A = The most highest weight = 4

N = The total No. of respondents.

For investigating the information, I will propose to utilize the Relative Importance Index method and is determined utilizing the accompanying equation:

$$\text{Relative Importance Index (\%)} = \frac{4(n_4) + 3(n_3) + 2(n_2) + 1(n_1) \times 100}{4(n_1 + n_2 + n_3 + n_4)} \quad \dots\dots \text{Eq 2}$$

The overall significance list was utilized to rank the elements. Where n₁, n₂, n₃, and, n₄ are the total No. of respondent who chose, in this review, an ordinal estimation scale 1 to 4 was utilized to decide the impact level. Respondents were approached to rank elements influencing work productivity as per the level of significance (4 = influences with enormous degree; 3 = influences with normal degree; 2 = influences with little degree; and 1 = Not effects)

4.3.2 Work sampling method

It is the procedure that actions the percent of time specialists spend in different classes of undertakings, like direct work, transportation materials, or pausing (Chavan and Salunkhe, 2016)[1]. In this strategy data can be acquired rapidly and financially as well as to predetermine levels of precision (Olomolaiye et al., 1998)[8]. Action examining is a strategy where countless momentary perceptions are made throughout some undefined time frame of works, machines or cycles. In each perception there will be records of what's going on right then and there period. It gives the vital data to assist with deciding how time is being utilized by the labor force, distinguish the trouble spot that cause the work slowdown, and set up a pattern measure for usefulness improvement.

(Oglesby et al., 2002)[6], In this technique working day can be divided into three significant parts: contributory time, productivity time, and unproductive time.

1. **Productivity time:** Time spent in components straightforwardly associated with the genuine course of assembling or adding to a unit being built;
2. **Contributory time:** Time spent in components not straightforwardly added to yet vital for finish the unit;
3. **Unproductive time:** Idle time or time spent in not helpful or any remaining component.

The review pointed toward gathering data in normal result each work hour, Productivity time, contributory time and useless time for plastering, and brickworks.

V. Data Collected From Survey

This section managed the investigation and conversation of the information accumulated from a poll overview. The examination of a poll overview that was gathered from the connected literature review, site perception and interview with related experts contains 45 creative mind of various elements influence work efficiency in building construction.

The absolute of 45 distinguished factors was ordered into various seven sections as indicated by its interrelated ideas, those are: Material factors, Labour's factors, Management factors, Project Characteristics Factor, Communication Factors, External Factors and Miscellaneous Factors.

Information were dissected by The Relative Importance Index. The outcome and conversation of information were done per the course of action of targets of the review. To examine the elements that influence the development work efficiency in building development, while in absolute fifty (50) sets of overview surveys have been circulated to the designated respondent.

Fifty (50) sets of the survey were disseminated to the various consultants, contractors and were dispersed to the clients. An aggregate of 50 polls was focused on to be disseminated and out of these 32 which is 64% are effectively answered, and I accepted that should have been sufficient for this review. After all generally RIIs were processed, factors were organized in diving request as per their positions, the most highest RII rank show that they maximumly affect work efficiency.

On the other hand, factors with the most lower rank demonstrate that they significantly affect work efficiency. Each table will introduce the variables positioned under the gathering in which they were arranged. Besides, the variables were positioned from 1-45 as per their worth of Relative significance list.

1. Analysis for Relative Importance Index Groups factors.

Table 2. Summary of RII for Labour Factors

Sr. no.	Labour Factors	Total	RII	Total Rank	Rank in this Group
A	Labour Strikes	103	0.8046	1	1
B	Lack of Labour experience	101	0.7890	2	2
C	Alcoholism	95	0.7421	9	3
D	Misunderstanding among labourers	93	0.7265	16	4
E	Absenteeism	89	0.6953	25	5
F	Lack of competition among labourers	87	0.6796	32	6
G	Labour Disloyalty	84	0.6562	39	7
H	Labour Age	82	0.6456	45	8
I	Personal problems	82	0.6456	41	9

Table 3. Summary of RII for Materials Factors

Sr. no	Materials Factors	Total	RII	Total Rank	Rank in this Group
A	Unavailability of material on time	96	0.75	6	1
B	Quality of required work	95	0.742	7	2
C	Insufficient lighting at night	93	0.726	17	3
D	Increase in material price	92	0.718	20	4
E	Inadequate transportation facilities for workers	87	0.679	31	5
F	Lack of required construction tools/ equipment	86	0.671	34	6
G	Material storage location	80	0.625	44	7

Table 4. Summary of RII for Project Characteristics Factors

Sr. no.	Project Characteristics Factors	Total	RII	Total Rank	Rank in this Group
A	Inadequate construction method	92	0.7187	19	1
B	Project objective not well defined	87	0.6796	30	2
C	Poor condition of camping	87	0.6796	33	3
D	Differing site condition from plan	85	0.6645	36	4
E	Poor access within construction site	85	0.6645	37	5
F	Poor site condition	84	0.6562	38	6

Table 5. Summary of RII for communication Factor

Sr. no	Communication Factors	Total	RII	Total Rank	Rank in this Group
A	Misunderstanding among owner, contractor, and designer	95	0.7421	8	1
B	Disputes with the owner	95	0.7421	10	2
C	Change orders from the designer	93	0.7265	14	3
D	Change orders from the owner	93	0.7265	15	4
E	Disputes with designer	89	0.6953	26	5

Table 6. Summary of RII for Management Factor

Sr. no	Management Factors	Total	RII	Total Rank	Rank in this Group
A	Payment delays	99	0.7734	3	1
B	Incomplete Drawings	94	0.7343	11	2
C	Design changes	91	0.7109	22	3
D	Variations in the drawings	88	0.6875	27	4
E	Complex design in the provided drawings	88	0.6875	28	5
F	Lack of weekly project evaluation meetings	86	0.6718	35	6

Table 7. Summary of RII for External Factors

Sr. no	External Factors	Total	RII	Total Rank	Rank in this Group
A	Lack of experience of Supervisor	98	0.76562	5	1
B	Supervision delays	92	0.71875	18	2
C	Lack of Training sessions	91	0.71093	23	3
D	Inspection delays from the authorities	87	0.67968	29	4
E	Implementation of government laws	81	0.63281	43	5

Table 8. Summary of RII for Miscellaneous Factors.

Sr. no	Miscellaneous Factors	Total	RII	Total Rank	Rank In This Group
A	Augmentation of Government regulations	99	0.77343	4	1
B	Working overtime	93	0.72656	12	2
C	Violation of safety laws	93	0.72656	13	3
D	Shortage of power and water supply	91	0.71093	21	4
E	Strikes called by political parties	91	0.71093	24	5
F	Weather condition	81	0.63281	42	6
G	Accidents during construction	75	0.58593	45	7

2. Overall Factors Affecting Labour Productivity According to RII Value.

The Result in table 9. shows overall ranking of 45 factors that negatively affect labour productivity, identified in this study.

Factors	RII	Total Rank
Labour Strikes	0.804	1
Lack of Labour experience	0.789	2
Payment delays	0.773	3
Augmentation of Government regulations	0.773	4
Lack of experience of Supervisor	0.765	5
Unavailability of material on time	0.75	6
Quality of required work	0.742	7
Misunderstanding among owner, contractor, and designer	0.742	8
Alcoholism	0.742	9
Disputes with the owner	0.742	10
Incomplete Drawings	0.734	11
Working overtime	0.726	12
Violation of safety laws	0.726	13
Change orders from the designer	0.726	14
Change orders from the owner	0.726	15
Misunderstanding among labourers	0.726	16
Insufficient lighting at night	0.726	17

Supervision delays	0.718	18
Inadequate construction method	0.718	19
Increase in material price	0.718	20
Shortage of power and water supply	0.710	21
Design changes	0.710	22
Lack of Training sessions	0.710	23
Strikes called by political parties	0.710	24
Absenteeism	0.695	25
Disputes with designer	0.695	26
Variations in the drawings	0.687	27
Complex design in the provided drawings	0.687	28
Inspection delays from the authorities	0.679	29
Project objective not well defined	0.679	30
Inadequate transportation facilities for workers	0.6796	31
Lack of competition among labourers	0.6796	32
Poor condition of camping	0.6796	33
Lack of required construction tools/ equipment	0.6718	34
Lack of weekly project evaluation meetings	0.6718	35
Differing site condition from plan	0.664	36
Poor access within construction site	0.6640	37
Poor site condition	0.656	38
Labour Disloyalty	0.656	39
Labour Age	0.640	40
Personal problems	0.640	41
Weather condition	0.632	42
Implementation of government laws	0.632	43
Material storage location	0.625	44
Accidents during construction	0.585	45

3. Analysis for Work Sampling

Table 10. Result of Comparison of work sampling Average

Activities	Work%	Unit	Day1	Day2	Day3	Day4	Day5	Day6	Average
Plastering	PW	Sqm/man-day	55%	56%	57%	54%	56%	56%	56%
	CW	Sqm/man-day	25%	23%	28%	27%	25%	20%	25%
	UW	Sqm/man-day	20%	21%	15%	19%	19%	24%	20%
Brick works	PW	Sqm/man-day	45%	40%	43%	43%	39%	45%	43%
	CW	Sqm/man-day	36%	40%	33%	33%	41%	37%	37%
	UW	Sqm/man-day	19%	20%	24%	24%	20%	18%	21%

VI. Conclusion

This research is intended to identify the causes of probable factors affecting labor productivity in building construction. This study investigates all possible factors through a structured questionnaire. The survey results are subjected to analysis, and the ranking of factors is calculated using the Relative Important Index. The basic ideas of the research is to study various factors affecting labor productivity on construction.

The top ten labour productivity influencing factors rated by their level of effect and frequency of occurrence in building construction projects are:- Labour Strikes with RII of 0.804 , Lack of Labour experience with RII of 0.789, Payment delays with RII of 0.773, Augmentation of Government regulations RII of 0.773, Lack of experience of Supervisor with RII of 0.765, Unavailability of material on time with RII of 0.75, Quality of required work, Misunderstanding among owner, contractor, and designer, Alcoholism and Disputes with the owner has the same RII of 0.742 that is ranked 7th ,8th ,9th and 10th level of ranks from where the total of 45 identified factors.

VII. Future Research

The current research study was limited to the building construction industry. Future study could be done in other parts of the world and could emphasize specific types of building construction, including commercial, education, government buildings, skyscrapers, etc. A review like the current examination is required for transportation activities to find factors that influence the efficiency of highway development, which will help branches of transportation to reduce unnecessary expense accelerations and project plan delays.

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