Analysis of Labour Productivity in Building Construction with Special Reference to Residential Project

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ABSTRACT - The most challenging issue in Construction industry is to improving the production efficiency. The main outcome from the literature is that there is no standard definition of productivity. It covers the construction labour productivity definitions, aspects, factors affecting it. The productivity of labour is particularly important especially in developing countries, where most of the building construction work is still on manual basis. The aim of this study is to get the latest information and to identify the key factors that affect the labour productivity in and around Pune. So, survey is carried out through questionnaire and distribute to respondents who work at various projects in wide area in Pune and the questionnaires are rated by project managers, experienced engineers and also with labours using their experiences. And the data are collected and analysed; using this the affected factors are identified and ranked, through this necessary step are provided to improve the labour productivity. To investigate effects of labour productivity and affecting factors of it and also recommendations to improve labour productivity in construction.

***Keywords*: Labour productivity, construction management, questionnaire, qualitative research.**

I. INTRODUCTION

Construction industry faces lots of challenges with regard to problems associated with productivity. Productivity is one of the most important factors affecting the overall performance of any organization, whether large or small and the problems are usually associated with performance of labour. The performance of labour is affected by many factors and is usually linked to the performance of time, cost and quality.

Inefficient management of construction resources can result in low productivity. Therefore, it is important for construction managers to be familiar with the methods leading to evaluate the productivity of the equipment's and the labourers in different crafts. To achieve the income expected from any construction project in general, it is important to have a good controlling hand on the productivity factors that contribute in the integrated production composition, like labour, equipment, cash flow, etc. While there are several input resources in a transformational process labour productivity plays a particular role. A deeper comprehension of the factors influencing labour productivity can enable managers to more effectively allocate limited resources, provide workers with better support, or increase workers' motivation.

- **PRODUCTIVITY:** Productivity can be defined in many ways. In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man-hours per unit (unit rate), is also commonly used. Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc.

  Where we can simply it as **Productivity** $= \frac{Output}{Labour\ cost}$

- **LABOUR PRODUCTIVITY:** It is also known as workforce productivity, defined as real economic output per labour hour. Growth in labour productivity is measured by the change in economic output per labour hour over a defined period. Labour productivity is an important economic indicator that is closely linked to economic growth, competitiveness, and living standards within an economy. Labour productivity represents the total volume of output which is measured in terms of Gross Domestic Product, GDP produced per unit of labour which is measured in terms of the number of employed persons during a given time reference period. The indicator allows data users to assess GDP-to-labour input levels and growth rates over time, thus providing general information about the efficiency and quality of human capital in the production process for a given economic and social context, including other complementary inputs and innovations used in production. As there exists no standard definition it can be simplified in an equation as,

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Labour Productivity = $\frac{(Labour\ cost\ or\ work\ hour)}{Output}$

- **RELATION BETWEEN PRODUCTIVITY AND LABOUR (THE KEY FACTORS):**

As earlier discussed for any construction site and gain of the owner or contractor productivity of labour has a direct bearing on his profits. Whereas timely completion as well as the work expected is a result of various factors coming together in a positive manner out of which the key factor is the labour and the management of the construction site which is directly related to his satisfaction and working skills. The factors affecting the performance of labours can broadly be summed up in hereunder discussed categories or variables:

1. **THE MANAGEMENT:** It has a direct effect on the work, like factors of the relation of management with labour, misunderstandings, lack of proper supervision and inspection, change in orders, rework, poor site management etc.
2. **THE LABOURERS:** Management as well as labourers have a direct effect on productivity and it won't be wrong to assume that more than management or any other factors, it's the factors which directly relate to labourers play a vital role in enhanced or poor labour productivity like the factors of health and safety measures, strikes, overtime, working conditions, absenteeism etc. affects the construction in the most direct and negative manner if not taken care of.
3. **FINANCIAL(CAPITAL) FACTORS:** The payment delays, due to finance low wages and no proper arrangements of incentives or any other facility, owners' financial crisis, delay in construction more than the expected date of completion etc. definitely affects the labour productivity.
4. **ALL FACTORS IN RELATION WITH CONSTRUCTION:** All the material related factors, change in designs, low quality of materials, tools and equipment shortage etc. which are in direct proportion to the outcome.
5. **EXPERIENCE FACTOR:** Many times, in construction industry due to complexity of design or the structure to be made it is the experience factor which affects the productivity of the labour as in such cases it is the familiarity with the job, skill experience of the labour and his training in such job due to his experience which directly affects the productivity.
6. **PHYSICAL FACTOR:** In construction industry as already discussed that the laborer on his own plays a vital role in labour productivity and his physical attributes is what directly affects the productivity like his health, any accident on the project site which will have to be looked after by the employer and also labours' bad habits such as taking alcohol and drug abuse, fatigue due to restlessness etc.
7. **PSYCHOLOGICAL FACTOR:** Due to workload, the project location and the existing work environment; labourers mental health is affected which results in stress and can also be due to lack of necessities, personal clashes etc. which eventually affects the way he works and reduces the labour productivity.
8. **SAFETY FACTOR:** Accidents have high impacts on labor productivity. Various accident types occur at the site, such as an accident causing death and resulting in a total work stoppage for a number of days. An accident that causes an injured person to be hospitalized results in a work decrease of the crew for which the injured employee worked. Small accidents resulting from nails and steel wires can stop work and, thus, decrease productivity even insufficient lighting shows decreased productivity because sufficient lighting is required to work efficiently and because insufficient lighting has negative effects. Employing a safety officer helps labors to recognize the required safety regulations and to follow them, which can reduce the number of accidents, thus increasing productivity.
9. **TIME AND WORKLOAD FACTOR:** During construction projects, there are many tasks which causes a loss of productivity. Past study shows productivity decreases with working overtime. The most frequently stated reasons are fatigue; increased absenteeism; decreased morale; reduced supervision effectiveness; poor workmanship, resulting in higher rework; increased accidents. Working overtime initially result in increased output, but continuing overtime may lead to increased costs and reduced productivity. Time used by a construction laborer on productive activities averages about 30% of the total time available. An employee in the field only works effectively for 3.5 hours of his 8-hour shift and spends 20% of his time on direct value-adding activities.
10. **EXTERNAL FACTORS:** Weather conditions are significant factor to consider for completion of any construction project. Adverse winter weather, such as winds and rains, reduces productivity, particularly for external work such as formwork, T-shape work, concrete casting, external plastering, external painting, and external tiling. Adverse weather sometimes stops the work totally contributing to this is natural disasters, project

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location etc. which plays a key role in affecting the labour productivity.

II. METHODOLOGY FOR THE QUANTITATIVE RESEARCH

A Likert scale of 1 to 5 has been used for analysis of risk factors. A likert scale is a type of psychometric response scale is named after Rensis Likert, and is the most widely used scale in survey research. When responding to a likert questionnaire item, respondents specify their level of agreement to a statement. The scale is named after, the mean values of each risk factor will be calculated by average sum formula.

Relative importance index (RII) is obtained by using below given formula:

$$RII = \frac{\Sigma w}{A \times N} = \frac{5n_5+4n_4+3n_3+2n_2+n_1}{A \times N}$$

RII ranges from zero to one ($0 \leq$ index ≤ 1).

"w" is weighting given to each criterion by the respondents it ranges from 1 to 5 where 1 is very less and 5 is very high;

"A" is highest weight (5 is the highest in this paper);

"N" is total number of respondents;

n_1, n_2, n_3, n_4, and n_5 are number of respondents for each factor affecting labour productivity.

- **IDENTIFICATION OF KEY FACTORS AND RANKING:**

The responses / data obtained from questionnaire survey are presented in a table shown below, analysis was carried out to find out the mean value and relative importance index. All the 46 factors were ranked in descending order, first 15 key factors were selected for further analysis to find out that these are the factors which should be taken care of and should be hassle free dealt with in the construction industry so that decline in labour productivity can be avoided.

a. **Small Construction Site:** Below is the analysis and ranking on the basis of data collected from small construction site the sample size being 30.

Tabular analysis of the factors on the basis of their mean value and RII.

Sr No.	Factors	Respondents view					No. of respondents	Mean value	RII
		Very Low	Low	Mode-rate	High	Very High			
		Rating							
		1	2	3	4	5			
1.	Lack of training sessions	0	6	12	9	3	30	3.3	0.66
2.	Lack of labour recognitions program	20	4	4	2	0	30	1.6	0.32
3.	Leadership and competency of construction management	0	2	8	11	9	30	3.9	0.78
4.	Incentive program	0	3	10	10	7	30	3.7	0.74
5.	Planning and management	2	5	15	5	3	30	3.06	0.613
6.	Addition in scope of work	3	7	13	5	2	30	2.86	0.573
7.	Lack of labour surveillance	1	3	17	4	5	30	3.3	0.66
8.	Specification alteration during execution	2	8	14	4	2	30	2.86	0.57
9.	Clarity of technical specification	5	5	16	3	1	30	2.66	0.533
10.	Construction method	0	0	12	10	8	30	3.86	0.773
11.	Payment delay by owner	0	0	8	15	7	30	3.96	0.793
12.	Working overtime	1	3	16	5	5	30	3.33	0.666
13.	Basic wage	1	2	5	22	0	30	3.6	0.72
14.	Financial difficulties of the owner	2	10	11	4	3	30	2.86	0.573
15.	Lack of place for eating & relaxation	1	0	6	13	10	30	4.03	0.806
16.	Dispute due to discrepancy in contract documents	5	4	17	3	1	30	2.7	0.54
17.	Absenteeism of worker	0	0	3	22	5	30	4.06	0.813
18.	Communication between site manager and labour force	0	0	20	5	5	30	3.5	0.7
19.	Labour strikes	0	0	0	20	10	30	4.33	0.86
20.	Misunderstanding between labour and superintendent	1	4	23	2	0	30	2.86	0.573
21.	Insufficient lighting	0	0	25	3	2	30	3.23	0.646

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22.	Working in high altitude	10	5	10	5	0	30	2.33	0.466
23.	Crew size and composition	1	0	22	5	2	30	3.23	0.646
24.	Holidays	2	3	1	14	10	30	3.9	0.78
25.	Reassignment of staff/crew	4	4	12	5	5	30	3.1	0.62
26.	Misunderstanding among labour	0	2	5	10	13	30	4.13	0.826
27.	Age factor of labour	1	5	11	6	7	30	3.43	0.686
28.	Increasing no. of labour in order to accelerate work	3	5	10	10	2	30	3.1	0.62
29.	Availability of health and safety training	0	2	7	15	6	30	3.83	0.766
30.	Shortage of personal protective equipment	3	4	9	7	7	30	3.36	0.67
31.	Disease and epidemic	7	8	9	3	3	30	2.56	0.513
32.	Accident due to construction equipment/machinery	3	5	13	9	0	30	2.93	0.586
33.	Accident due to moving traffic adjacent to project site	4	4	12	10	0	30	2.93	0.586
34.	Violation of safety precautions	0	4	4	10	12	30	4	0.8
35.	Accident as a result of poor site safety program	0	6	8	9	7	30	3.56	0.713
36.	Poor performance of sub-contractors	3	5	8	8	6	30	3.3	0.66
37.	Inspection and instruction delay	4	3	4	9	10	30	3.6	0.72
38.	Improper project planning	0	0	6	16	8	30	4.06	0.813
39.	Delay in arrival of material	0	2	8	13	7	30	3.83	0.766
40.	Temperature / rain	1	1	12	14	2	30	3.5	0.7
41.	Interference	2	5	9	8	6	30	3.66	0.673
42.	Proportion of work subcontracted	0	7	6	9	8	30	3.6	0.72
43.	Labour related laws and government regulation	0	7	7	11	5	30	3.46	0.693
44.	Material shortage	0	0	5	12	13	30	3.9	0.78
45.	Project location	0	0	5	12	13	30	4.26	0.853
46.	Unavailability of equipment	0	1	4	8	17	30	4.36	0.873

Tabular representation of factors ranked on the basis of RII and Mean Value:

Sr No.	Factors	Mean	RII	Rank
1.	Unavailability of equipment	4.36	0.873	1
2.	Labour strikes	4.33	0.86	2
3.	Project location	4.26	0.853	3
4.	Misunderstanding among labour	4.13	0.826	4
5.	Absenteeism of worker	4.06	0.813	5
6.	Improper project planning	4.06	0.813	6
7.	Lack of place for eating & relaxation	4.03	0.806	7
8.	Violation of safety precautions	4	0.8	8
9.	Payment delay by owner	3.96	0.793	9
10.	Material shortage	3.9	0.78	10
11.	Holidays	3.9	0.78	11
12.	Leadership and competency of construction management	3.9	0.78	12
13.	Construction method	3.86	0.773	13
14.	Improper project planning	3.83	0.766	14
15.	Availability of health and safety training	3.83	0.766	15

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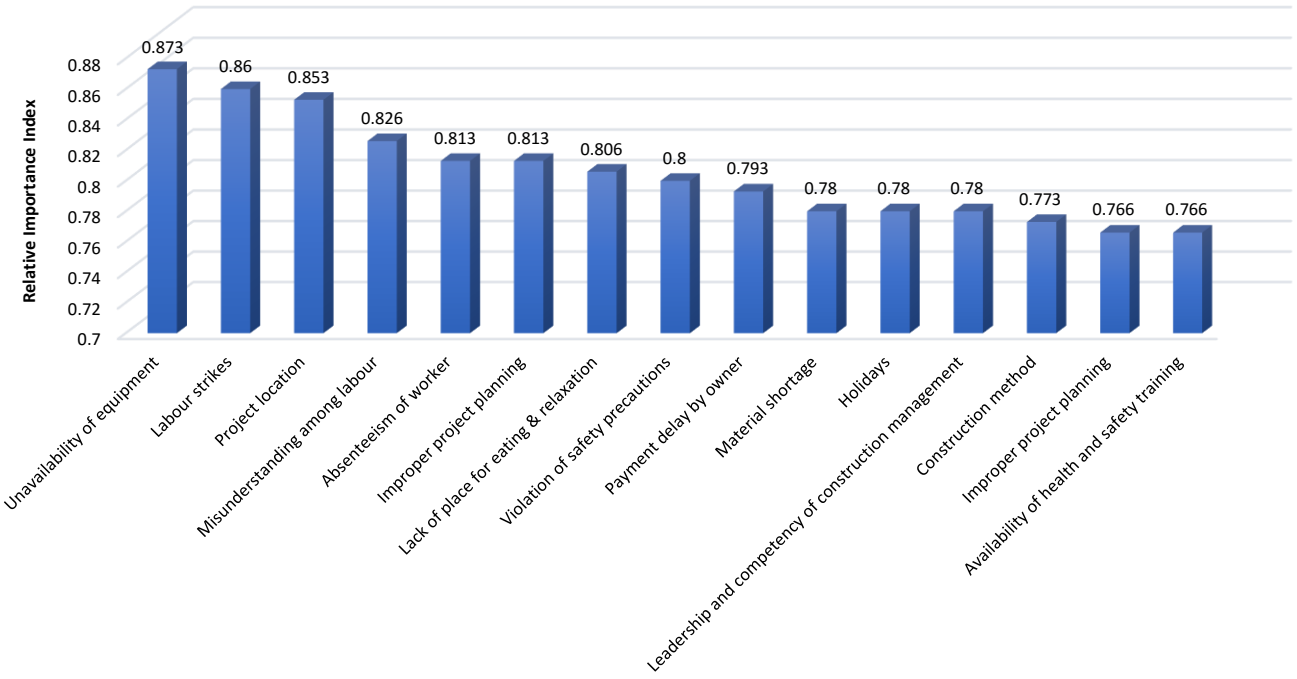

Graphical Representation of the Top 15 key factors affecting Labour Productivity in Small Construction Site.

Graphical Representation of the Top 15 key factors affecting Labour Productivity in Small Construction Site

b. Medium Construction Site: Below is the analysis and ranking on the basis of data collected from medium construction site the sample size being 70.

Tabular analysis of the factors on the basis of their mean value and RII.

Sr No.	Factors	Respondents view					No. of respondents	Mean value	RII
		Very Low	Low	Mode-rate	High	Very High			
		Rating							
		1	2	3	4	5			
1.	Lack of training sessions	0	4	22	34	10	70	3.71	0.742
2.	Lack of labour recognitions program	2	6	25	26	11	70	3.54	0.708
3.	Leadership and competency of construction management	0	4	8	36	22	70	4.08	0.817
4.	Incentive program	0	6	20	24	20	70	3.82	0.765
5.	Planning and management	1	10	12	37	10	70	3.64	0.728
6.	Addition in scope of work	2	6	13	29	20	70	3.84	0.768
7.	Lack of labour surveillance	2	6	14	25	23	70	3.87	0.774
8.	Specification alteration during execution	2	6	13	20	29	70	3.97	0.794
9.	Clarity of technical specification	9	4	37	12	8	70	3.08	0.617
10.	Construction method	0	3	20	30	17	70	3.87	0.774
11.	Payment delay by owner	0	2	5	48	15	70	4.08	0.817
12.	Working overtime	0	8	30	12	20	70	3.62	0.725
13.	Basic wage	3	7	0	45	15	70	3.88	0.777
14.	Financial difficulties of the owner	8	15	29	11	7	70	2.91	0.582
15.	Lack of place for eating & relaxation	0	1	30	39	0	70	3.54	0.708

 DOI : 10.35291/2454-9150.2020.0628

16.	Dispute due to discrepancy in contract documents	0	12	37	12	8	70	3.25	0.651
17.	Absenteeism of worker	0	0	5	53	12	70	4.1	0.82
18.	Communication between site manager and labour force	0	10	48	7	5	70	3.1	0.62
19.	Labour strikes	0	2	3	10	55	70	4.68	0.937
20.	Misunderstanding between labour and superintendent	3	6	35	8	18	70	3.45	0.691
21.	Insufficient lighting	0	0	9	50	11	70	4.02	0.805
22.	Working in high altitude	7	19	22	12	10	70	2.98	0.597
23.	Crew size and composition	13	20	29	2	6	70	2.54	0.508
24.	Holidays	5	6	15	30	14	70	3.6	0.72
25.	Reassignment of staff/crew	6	2	32	20	10	70	3.37	0.674
26.	Misunderstanding among labour	0	7	15	20	28	70	3.98	0.797
27.	Age factor of labour	4	17	20	19	10	70	3.2	0.64
28.	Increasing no. of labour in order to accelerate work	4	10	18	28	10	70	3.42	0.685
29.	Availability of health and safety training	3	7	22	23	15	70	3.57	0.714
30.	Shortage of personal protective equipment	12	15	16	15	12	70	3	0.6
31.	Disease and epidemic	15	15	16	10	14	70	2.9	0.58
32.	Accident due to construction equipment/machinery	8	12	32	15	3	70	2.9	0.58
33.	Accident due to moving traffic adjacent to project site	0	4	29	27	10	70	3.61	0.722
34.	Violation of safety precautions	0	0	20	23	27	70	4.1	0.82
35.	Accident as a result of poor site safety program	0	2	19	27	22	70	3.98	0.797
36.	Poor performance of sub-contractors	4	9	15	25	17	70	3.6	0.72
37.	Inspection and instruction delay	0	10	17	19	24	70	3.81	0.762
38.	Improper project planning	3	2	16	32	17	70	3.82	0.765
39.	Delay in arrival of material	0	8	12	27	23	70	3.92	0.785
40.	Temperature / rain	3	5	28	22	12	70	3.5	0.7
41.	Interference	10	16	17	13	14	70	3.07	0.614
42.	Proportion of work subcontracted	0	5	15	37	13	70	3.82	0.765
43.	Labour related laws and government regulation	5	0	13	41	11	70	3.757	0.751
44.	Material shortage	4	4	27	12	23	70	3.65	0.731
45.	Project location	0	0	18	25	27	70	4.12	0.825
46.	Unavailability of equipment	0	3	6	21	40	70	4.4	0.88

Tabular representation of factors ranked on the basis of RII and Mean Value.

Sr No.	Factors	Mean	RII	Rank
1.	Labour strikes	4.68	0.937	1
2.	Unavailability of equipment	4.4	0.88	2
3.	Project location	4.12	0.825	3
4.	Violation of safety precautions	4.1	0.82	4
5.	Absenteeism of worker	4.1	0.82	5
6.	Leadership and competency of construction management	4.08	0.817	6
7.	Payment delay by owner	4.08	0.817	7
8.	Insufficient lighting	4.02	0.805	8
9.	Misunderstanding among labour	3.98	0.797	9
10.	Accident as a result of poor site safety program	3.98	0.797	10
11.	Specification alteration during execution	3.97	0.794	11
12.	Delay in arrival of material	3.92	0.785	12
13.	Basic wage	3.88	0.777	13
14.	Lack of labour surveillance	3.87	0.774	14
15.	Construction method	3.87	0.774	15

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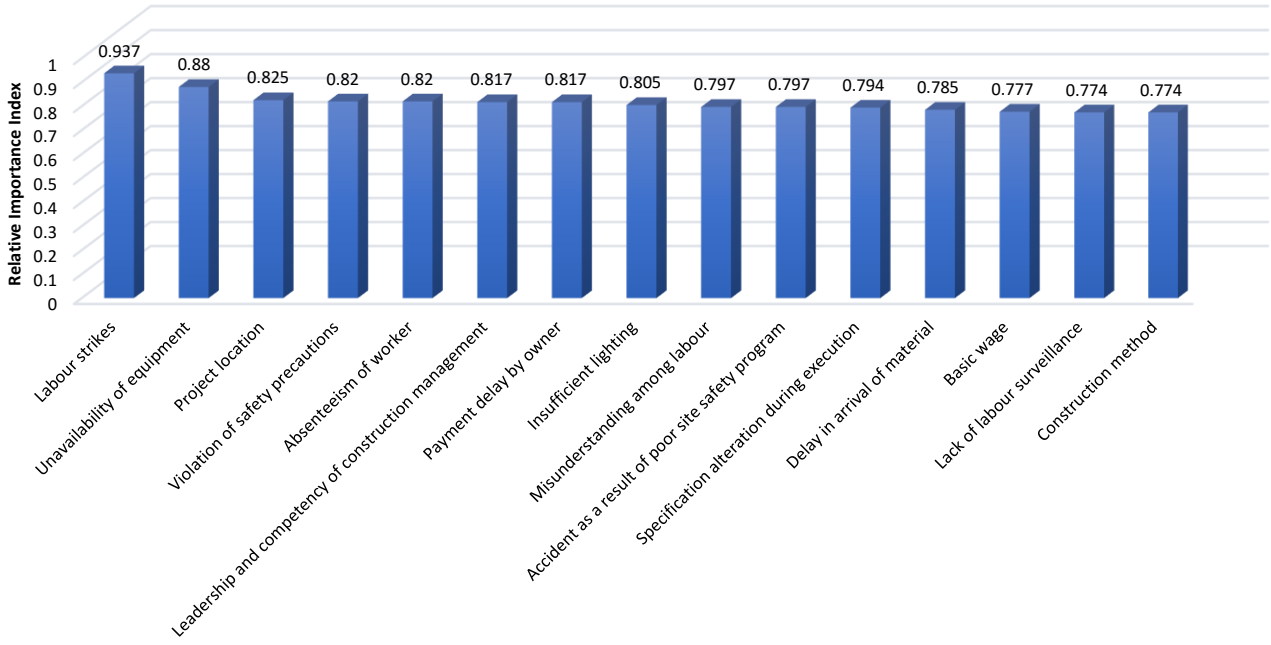

Graphical Representation of Top 15 key factors affecting Labour Productivity in Medium Construction Site.

Graphical Representation of Top 15 key factors affecting Labour Productivity in Medium Construction Site.

C. Large Construction Site: Below is the analysis and ranking on the basis of data collected from large construction site the sample size being 100.

Tabular analysis of the factors on the basis of their mean value and RII.

Sr No.	Factors	Respondents view					No. Of respondents	Mean value	RII
		Very Low	Low	Mode-rate	High	Very High			
		Rating							
		1	2	3	4	5			
1.	Lack of training sessions	0	7	20	54	19	100	3.85	0.77
2.	Lack of labour recognitions program	5	8	57	21	9	100	3.21	0.642
3.	Leadership and competency of construction management	0	7	12	41	40	100	4.14	0.828
4.	Incentive program	0	10	32	40	18	100	3.66	0.732
5.	Planning and management	0	6	27	59	8	100	3.69	0.738
6.	Addition in scope of work	0	0	15	45	40	100	4.25	0.85
7.	Lack of labour surveillance	0	5	17	35	43	100	4.16	0.832
8.	Specification alteration during execution	0	0	16	39	45	100	4.29	0.858
9.	Clarity of technical specification	0	8	10	62	20	100	3.94	0.788
10.	Construction method	0	1	20	30	49	100	4.27	0.854
11.	Payment delay by owner	0	0	13	67	20	100	4.07	0.814

 DOI : 10.35291/2454-9150.2020.0628

12.	Working overtime	0	1	5	57	37	100	4.3	0.86
13.	Basic wage	0	2	10	78	10	100	3.96	0.792
14.	Financial difficulties of the owner	9	20	47	11	13	100	2.99	0.598
15.	Lack of place for eating & relaxation	0	0	40	49	11	100	3.71	0.742
16.	Dispute due to discrepancy in contract documents	0	13	67	20	0	100	3.07	0.614
17.	Absenteeism of worker	0	0	0	85	15	100	4.15	0.83
18.	Communication between site manager and labour force	0	9	75	10	6	100	3.13	0.626
19.	Labour strikes	0	0	0	89	11	100	4.11	0.822
20.	Misunderstanding between labour and superintendent	0	0	21	65	14	100	3.93	0.786
21.	Insufficient lighting	0	0	18	67	15	100	3.97	0.794
22.	Working in high altitude	5	15	25	40	15	100	3.45	0.69
23.	Crew size and composition	1	10	39	30	20	100	3.58	0.716
24.	Holidays	2	1	10	54	33	100	4.15	0.83
25.	Reassignment of staff/crew	4	5	56	20	15	100	3.37	0.674
26.	Misunderstanding among labour	0	8	10	25	57	100	4.31	0.862
27.	Age factor of labour	0	0	20	47	33	100	4.13	0.826
28.	Increasing no. of labour in order to accelerate work	0	7	12	56	25	100	3.99	0.798
29.	Availability of health and safety training	12	10	17	37	24	100	3.51	0.702
30.	Shortage of personal protective equipment	11	24	23	18	24	100	3.2	0.64
31.	Disease and epidemic	10	23	25	20	22	100	3.21	0.642
32.	Accident due to construction equipment/machinery	0	6	30	40	24	100	3.82	0.764
33.	Accident due to moving traffic adjacent to project site	0	14	21	38	27	100	3.78	0.756
34.	Violation of safety precautions	0	0	18	39	43	100	4.25	0.85
35.	Accident as a result of poor site safety program	0	4	22	41	33	100	4.03	0.806
36.	Poor performance of sub-contractors	0	9	19	35	37	100	4	0.8
37.	Inspection and instruction delay	0	8	13	36	43	100	4.14	0.828
38.	Improper project planning	0	10	8	57	25	100	3.97	0.794
39.	Delay in arrival of material	0	2	5	76	17	100	4.08	0.816

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40.	Temperature / rain	0	13	18	39	30	100	3.86	0.772
41.	Interference	0	24	40	30	6	100	3.18	0.636
42.	Proportion of work subcontracted	1	10	37	24	28	100	3.68	0.736
43.	Labour related laws and government regulation	0	33	41	22	4	100	2.97	0.594
44.	Material shortage	5	13	38	34	10	100	3.31	0.662
45.	Project location	0	0	30	39	31	100	4.01	0.802
46.	Unavailability of equipment	0	0	15	21	64	100	4.49	0.898

Tabular representation of factors ranked on the basis of RII and Mean Value:

Sr. No.	Factors	Mean	RII	Rank
1.	Unavailability of equipment	4.49	0.898	1
2.	Misunderstanding among labour	4.31	0.862	2
3.	Working overtime	4.3	0.86	3
4.	Specification alteration during execution	4.29	0.858	4
5.	Construction method	4.27	0.854	5
6.	Violation of safety precautions	4.25	0.85	6
7.	Addition in scope of work	4.25	0.85	7
8.	Lack of labour surveillance	4.16	0.832	8
9.	Holidays	4.15	0.83	9
10.	Absenteeism of worker	4.15	0.83	10
11.	Inspection and instruction delay	4.14	0.828	11
12.	Leadership and competency of construction management	4.14	0.828	12
13.	Age factor of labour	4.13	0.826	13
14.	Labour strikes	4.11	0.822	14
15.	Delay in arrival of material	4.08	0.816	15

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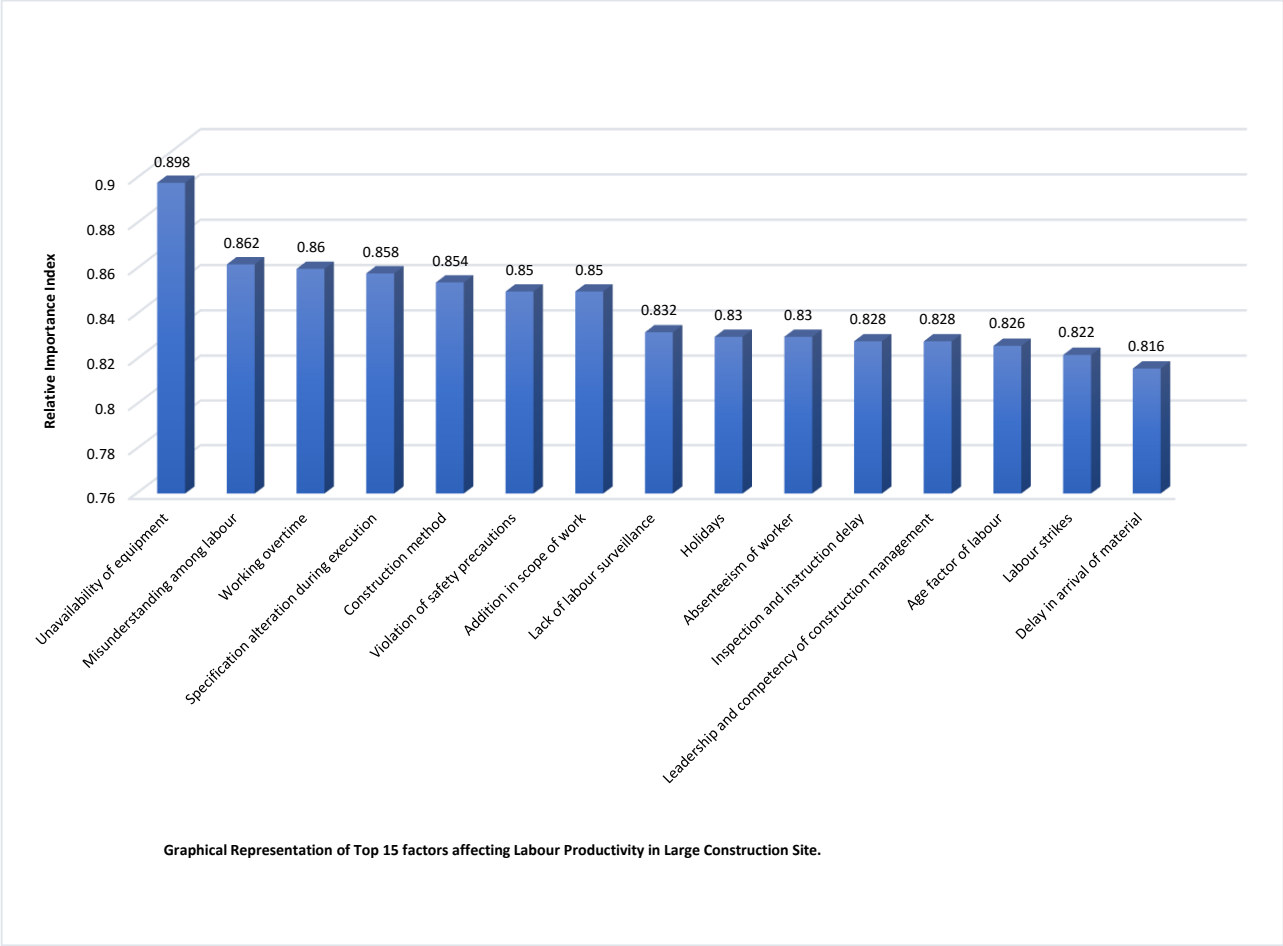

Graphical Representation of Top 15 factors affecting Labour Productivity in Large Construction Site.

- **SUGESSTIONS:** Below are the key factors which are somewhat present in all type of construction sites i.e. small, medium and large; ranked here by scrutinizing it's rank or priority as according to the RII of the three sites. The researcher therefore tries to suggest effective remedial measures to overcome and eliminate the effect of these factors in Labour Productivity in consultation with the respondents and the project officials.

Remedial Suggestions/Measures:

Sr No.	Factors	Remedial Suggestions/Measures
1.	Unavailability of equipment	This can be due to failure of equipment or mismanagement which can be avoided by using good quality equipment, regular inspections, preventative maintenance and in advance check of the equipment to be used the next day so that the work is not hampered due to unavailability.
2.	Project location	Although it cannot be changed as the work cannot be stopped on the basis of location but proper living, working and safety arrangements can be done to avoid any inconvenience.
3.	Misunderstanding among labour	This can be maintained by developing a safe and communicative work environment to avoid clashes amongst the labours.
4.	Labour strike	If the basic necessities of the labours are taken care of and if there is a proper two-way dialogue system there is minimum chances of such strikes to take place.
5.	Violation of safety precaution	This is one of the most important factors which should be taken care of and should be dealt with while the project is being planned as construction sites are prone to accidents as it involves working on heights and to avoid any casualties.
6.	Accident as a result of poor site safety program	It is interconnected with the safety programs as accidents may be caused due to the type of work and equipment being dealt with so to avoid the accidents the safety programs should be according to the kind of work to be done.
7.	Absenteeism of worker	As absenteeism can equate to decreased productivity it should of primary concern and this can be avoided by attracting the workers through incentives and providing them shelter near the construction site.
8.	Payment delay by owner	To avoid payment delays the owner should on his own fix a date per week/month for the payment and to avoid delay he can also deposit and in advance save the payment with him so when the time comes delay can be avoided and no unnecessary delay is caused in the project because this too can increase his burden when come to the budget of the project.
9.	Construction method	Although every project requires its own method of construction but completion can be sped up by using new techniques and enhanced equipment should be used which are less time taking for the basic construction methods which are same for all type of projects

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10.	Improper project planning	It can be avoided by spending the time upfront on good definition of the project and good planning which will take less time and effort.
11.	Material shortage	It can only be avoided by proper inspection by the management and placing of order for the materials in advance.
12.	Insufficient lighting	The management should take care of the lighting facilities along with other facilities as in bad weather days and also when proper lighting facility is not available, the labour is forced to stop his work.
13.	Basic wages	The basic wage should not be a problem as the government has given clear guidelines as to what should be the daily basic of a worker and this can solely be avoided by the management by abiding and working by those rules.
14.	Lack of labour surveillance	Labour surveillance plays a major role as many times labours take extra time for relaxation which directly hampers the schedule of work and target work to be achieved on the particular day, for this the management should be active and regular inspection is necessary.
15.	Leadership and competency of construction management	Major role is played by the management which starts from project planning, hiring the labours, inspection, work to be done in time and handing over the project on time and this not only requires skill, attentiveness and hard work but competence. To avoid this, professionals should be appointed who can develop strategy which will have positive effect on the workforce, can build better teams, can adapt change, can lead, can handle any communication problems amongst the labours or between labours and management and can deliver on time.

III. CONCLUSION

Labour Productivity is one of the critical and very important element of any construction project. Effective usage and taking care of the factors which affect the labour productivity and a positive practice in any construction project controls the cost, quality and time too.

In construction project the labourer and the management are the main components, its them which affect the factors not inversely but directly such as factors like strikes, accidents and clashes between the labourers and the management, construction design alteration etc. which also directly is the reason behind fluctuation of the budget about 60% or more of the total budget of the project. Therefore, managing the factors which affect the labourer and anything which affects him by way of management is essential component of any successful project execution. If it is not managed properly, it will generate a major cost variance, affect schedule and even quality of the project. Hence, nowadays the project management also needs an essential and proper planning focused specifically towards labour productivity.

This study has been carried out by the researcher on the factors affecting the labour productivity through a closed ended questionnaire survey method and has tried to sort top 15 key factors affecting labour productivity. The researcher has tried to contribute to this area of construction industry by bifurcating these factors according to the type of construction site.

According to the survey these are the top 15 factors which affect Labour Productivity according to the type of construction site:

Sr No.	Small Construction Site	Medium Construction Site	Large Construction Site
1.	Unavailability of equipment	Labour strikes	Unavailability of equipment
2.	Labour strikes	Unavailability of equipment	Misunderstanding among labour
3.	Project location	Project location	Working overtime
4.	Misunderstanding among labour	Violation of safety precautions	Specification alteration during execution
5.	Absenteeism of worker	Absenteeism of worker	Construction method
6.	Improper project planning	Leadership and competency of construction management	Violation of safety precautions
7.	Lack of place for eating & relaxation	Payment delay by owner	Addition in scope of work
8.	Violation of safety precautions	Insufficient lighting	Lack of labour surveillance
9.	Payment delay by owner	Misunderstanding among labour	Holidays
10.	Material shortage	Accident as a result of poor site safety program	Absenteeism of worker
11.	Holidays	Specification alteration during execution	Inspection and instruction delay
12.	Leadership and competency of construction management	Delay in arrival of material	Leadership and competency of construction management
13.	Construction method	Basic wage	Age factor of labour
14.	Improper project planning	Lack of labour surveillance	Labour strikes
15.	Availability of health and safety training	Construction method	Delay in arrival of material

From the above table, it can be stated that the factors affecting the labour productivity differs from site to site and the type of construction site also determines those factors. Although maybe somewhere these factors somewhat remain the same if seen broadly but differ when prioritized from the eyes of workforce present at a particular type of construction site.

Therefore, the researcher seeks to highlight these factors in the light of type of construction sites being small, medium or large. For example, from the study it is clear that like other factors labour strikes play a key role as a factor affecting labour productivity but it is interesting to observe that where this factor is in one of the top factors according

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to the ranking which means a factor of priority which should be taken care of in small and medium construction sites but when it comes to large construction site although being a factor in affecting the labour productivity when prioritizing the factors it is in a much lower rank when compared to small and medium construction site.

Lastly, where there are so many factors which can affect labour productivity negatively which can be broadly categorised as physical, psychological, health as well as safety, external etc. the researcher through this study tries to prioritize the top 15 key factors according to the type of construction site and by identifying these the major factors it can be resolved primarily to help enhance labour productivity in construction industry.

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