

IMPORTANCE OF MEASUREMENT OF LABOUR PRODUCTIVITY IN BUILDING CONSTRUCTION

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ABSTRACT: Construction industry is world's most largest and challenging industry. Indian construction industry is one of fastest growing sector globally. Construction Industry plays an important role in development of any country. Labour productivity is one of important factor which affects physical progress of construction project. To perform effective job, construction labour should be familiar with materials, tools and machineries that they use. Within the construction industry, there are a variety of different types of resources that need to be taken into account during any project. These will include materials, finance, machines, manpower and space. Proper management of resources in construction projects can yield substantial savings in time and cost.

Keywords: Labour, Time, Cost, Labour productivity. Factors.

1. INTRODUCTION: Construction is a key sector of the national economy for countries all around the world, as traditionally it took up a big portion in nation's total employment and its significant contribution to a nation's revenue as a whole. However, until today, construction industries are still facing number of problems regarding the low productivity, poor safety and insufficient quality. Productivity is the one of the most important factor that affects overall performance of any small or medium or large construction industry. In construction industry one of the biggest problems faced is of unskilled labour which implies in productivity loss and impacts on cost overrun and schedule daily. Labour productivity is one of important factor which affects physical progress of construction project. To perform effective job, construction labour should be familiar with materials, tools and machineries that they use. Within the construction industry, there are a variety of different types of resources that need to be taken into account during any project. These will include materials, finance, machines, manpower and space. Proper management of resources in construction projects can yield substantial savings in time and cost.

2. Aim and Objective

To find and analyse the factors affecting labour productivity.

- To find the various factors affecting labour productivity in construction industry.
- Analyze and find the Relative Importance of those factors affecting labour productivity.
- To rank the factors based on the analysis.

3. LABOUR 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.

$$\text{Productivity} = \frac{\text{Output}}{\text{Labour cost}}$$

Horner and Talhouni stated "A popular concept in the USA, and increasingly in the UK, is the concept of earned hours. It relies on the establishment of a set of standard outputs or norms for each unit operation. Thus, a number of earned hours are associated with each unit of work completed."

"Productivity may then be defined as the ratio of earned to actual hours. The problem with this concept is in establishing reliable norms, for setting standards. It also depends on the method used to measure productivity, and on the extent to which account is taken of all the factors which affect it." At the project site, contractors are often interested in labour productivity. It can be defined in one of the Labour

$$\text{Productivity} = \frac{\text{Output}}{\text{Labour cost}}$$

Or

$$\text{Labour productivity} = \frac{\text{Output}}{\text{Work hour}}$$

There is no standard definition of productivity and some contractors use the inverse of above,

$$\text{Labour productivity} = \frac{\text{Labour cost}}{\text{work hour output}}$$

Labour productivity is one of the most important factors that affect the physical progress of any construction project. Construction labourers are responsible to operate a variety of equipment. To perform their jobs effectively, construction labourers must be familiar with the duties of other craft workers and with the materials, tools, and machinery they use. Achieving better labour productivity requires detailed

studies of the actual labour cost. Various labours have different variables affecting their productivity levels. For every project, productivity, cost, quality, and time have been the main concern. Better productivity can be achieved if project management includes the skills of education and training, the work method, personal health, motivational factors, the type of tools, machines, required equipment and materials, personal skills, the workload to be executed, expected work quality, work location, the type of work to be done, and supervisory personnel.

4. METHODOLOGY AND DATA COLLECTED

The process of methodology consist of eight steps is given in figure 4.1,

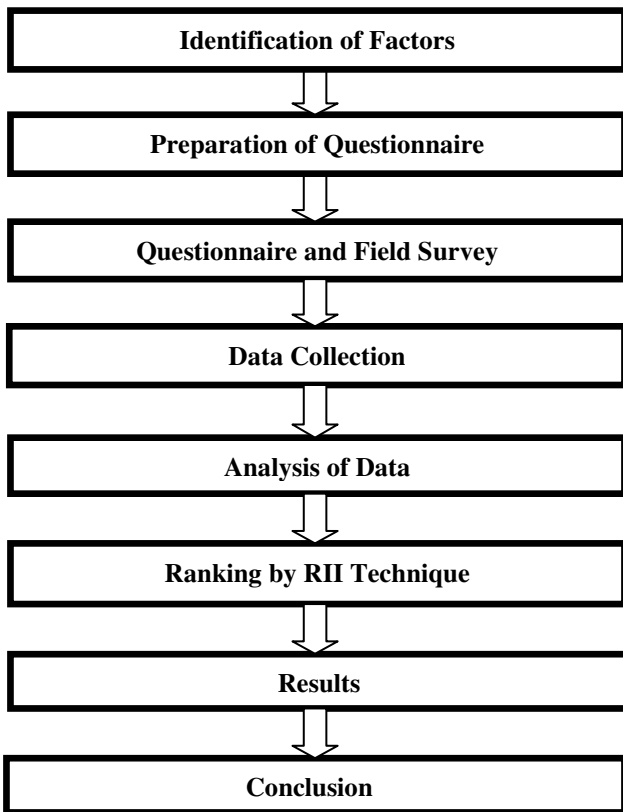


Fig No. 3.1. Methodology process

The data collected in the questionnaire was analyzed by Relative Importance Index (RII) method to determine relative importance of factors affecting labour productivity in building construction. The RII was used to rank those different factors which made it possible to cross compare the relative importance of those factors.

The formula to calculate relative importance index is as follows,

$$R.I.I. = \frac{\sum W}{A \times N}$$

Where,

RII = Relative Importance Index

W = Weightage given to each factor by respondent ranging from 1 to 4.

A = Highest Weight (i.e. 4)

N = Total number of respondents

Based on the literature work, various factors has been identified which may affect labour productivity at construction site. Among all those factors, 39 most commonly recurring factors as shown in table 3.1 are identified to focus on, which generally influences performance of labours on construction field.

Table 4.1: Identified Factors Affecting Labour Productivity In Building Construction

Sr.No.	Factors Affecting Labour Productivity in Building Construction
1.	Manpower
	a) Lack of experience
	b) Disloyalty
	c) Misunderstanding among labourers
	d) Lack of competition between the Labourers
	e) Age
	f) Personal problems
	g) Alcoholism
	h) Absenteeism
	g) Sex
2.	External
	a) Implementation of government laws
	b) Rework
	c) Supervision delays
	d) Inspection delays from The authorities
	e) Variations in the drawings
	f) Complex designs in the provided drawings
	g) Incomplete drawings
	h) Payment delays
	i) Training sessions
j) Design Changes	
3	Communication
	a) Change orders from the designers
	b) Change orders from the owners
	c) Disputes with owner
	d) Disputes with designer
e) Misunderstanding between the owner, the contractor and the designer	
4	Resources
	a) Lack of required construction materials
	b) Increase in the price of materials
	c) Lack of required tools and/or equipment's
d) Poor site conditions	

	e) Differing site conditions from the plan
	f) Poor access within construction job site
	h) Insufficient lighting
	i) Inadequate construction method
	j) Inadequate transportation facilities for workers
	k) Material storage location
5	Miscellaneous
	a) Shortage of water and/or power supply
	b) Working overtime
	c) Weather conditions
	d) Accidents during construction
	e) Project objective is not well defined

5. Result And Discussions

The data collected from questionnaire survey was analyzed by using Relative Importance Index. Different professionals have given their respective responses on the basis of their own experience and opinions. A factor whose R.I.I. is maximum has been given first rank and thus ranking has been assigned with decreasing R.I.I.

Table 5.1: RII and Ranking of Identified Factors Influencing Performance of Labour in Building Construction.

FACTORS	R.I.I	RANK
Manpower		
Lack of experience	0.833	1
Disloyalty	0.61	20
Misunderstanding among labourers	0.496	28
Lack of competition between the Labourers	0.458	30
Age	0.811	2
Personal problems	0.477	29
Alcoholism	0.511	26
Absenteeism	0.542	25
Sex	0.64	17
External		
Implementation of government laws	0.723	8
Rework	0.508	27
Supervision delays	0.689	14
Inspection delays from The authorities	0.644	16
Variations in the drawings	0.576	23
Complex designs in the provided drawings	0.614	19
Incomplete drawings	0.591	21
Payment delays	0.803	4

Training sessions	0.716	9
Design Changes	0.587	22
Communication		
Change orders from the designers	0.621	18
Change orders from the owners	0.576	23
Disputes with owner	0.61	20
Disputes with designer	0.591	21
Misunderstanding between the owner, the contractor and the designer	0.799	5
Resources		
Lack of required construction materials	0.697	13
Increase in the price of materials	0.561	24
Lack of required tools and/or equipment's	0.807	3
Poor site conditions	0.735	7
Differing site conditions from the plan	0.705	11
Poor access within construction job site	0.735	7
Insufficient lighting	0.784	6
Inadequate construction method	0.712	10
Inadequate transportation facilities for workers	0.735	7
Material storage location	0.701	12
Miscellaneous		
Shortage of water and/or power supply	0.784	6
Working overtime	0.682	15
Weather conditions	0.807	3
Accidents during construction	0.716	9
Project objective is not well defined	0.542	25

Table 5.2: RII and Ranking of TOP 10 Identified Factors Influencing Performance of Labour in Building Construction.

FACTORS	R.I.I	RANK
Lack of experience	0.833	1
Age	0.811	2

Lack of required tools and/or equipment's	0.807	3
Weather conditions	0.807	3
Payment delay	0.803	4
Misunderstanding between the owner, the contractor and the designer	0.799	5
Insufficient lighting	0.784	6
Shortage of water and/or power supply	0.784	6
Poor site conditions	0.735	7
Implementation of government laws	0.723	8
Accidents during construction	0.716	9
Inadequate construction method	0.712	10

6. Conclusion

The questionnaire survey showed ranking of factors as per experience and knowledge of the respondents. Relative importance index values of all factors come out to be in between 0.458 to 0.833. Apart from that, some affecting factors that can be controlled on site by the professionals have studied. Based on questionnaire survey and field survey, following salient conclusion has been drawn.

1. It was found that Resources factor is on first rank in group factor with RII value 0.717. If there is lack of materials, tools and equipments on construction site, affects the work of labour due to which output decreases, which directly affect the labour productivity.
2. Organizations should make sure there is enough lighting present at the construction sites which can indirectly reduce the number of accidents.
3. Purchased material should be stored at appropriate location and should be easily accessible and close to constructed buildings to avoid wasting labor time for multiple handling materials.
4. Most of the respondents have given importance to experience of the labour in particular construction work. This factor has been ranked on first position with RII 0.833. Lack of labour experience has a great influence on productivity. This result is acceptable because experience improves both the intellectual and physical abilities of laborers which, consequently, increase labour productivity.
5. During this study it was found that Age factor affects the labour productivity on construction site. As the RII value for this factor is 0.811 which is on second rank. This result is justified because speed required performing particular task and strength decline over time affecting labor productivity.

6. According to maximum respondents lack of tools and equipment's is third most important factor with RII value of 0.807. Extra attention is required on quality of construction materials and tools used in their projects because using suitable materials and tools reduces both the time taken to finish the work and wastage of materials. Using suitable materials and tools also has a positive effect on the task and thus, better labor productivity can be achieved.
7. Payment delay has been ranked at fourth position by respondents with RII equals to 0.803. Payment delays in the construction industry are adversarial and disastrous. The risk of delayed payment from the owner impacts the duration and cost of the project.

7. FUTURE SCOPE FOR STUDY

- The current research study was limited to the building construction industry in Amravati region.
- Future study could be done in other parts of the India and could emphasize specific types of building construction, including commercial, education, government buildings, skyscrapers, etc.
- Other additional factors can be identified for such study to work on and to assess them.
- Similar work can be done in detail for individual factor to determine its effect on productivity of labour.

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