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ISSN: 0474-9030

Vol-68-Issue-30-February-2020

A Critical Review on Labour Management and Factor Affecting Labour Productivity

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Abstract

Construction industry is fast growing industry in all over the world. Unique design brings complexity in construction. Today's scenario depicts that there are numerous stakeholders are associated on single project. Completion of project on time and cost with best quality is the primary base of project management. Major construction onsite is done by the labour. Without them, completion of construction work is quite hard and if done then it consumes more cost than estimated cost. Labour management is as important as other parameters consider on site, because labours cost is about 30% to 50% of estimated project cost. So, it requires quite detailed management on site. Paper included the types of factors that are most affecting on Labour Productivity (LP). Literature paper concluded that through effective labour management, overall project cost and completion can be lowered down up to 15% or more. Also, stated that LP can be improved by adopting various initiatives.

Keywords: *Construction, Construction Labour Productivity (CLP), Labour, Labour Productivity Factors, Productivity, Management*

1. Introduction

Construction industry is fast growing industry in all over the world. Unique design brings complexity in construction. Today's scenario depicts that there are numerous stakeholders are associated on single project. Vaishant Gupta et al. (2014) observed that construction industry is depending on 3-M resources. There are means of 3-M is manpower, machine and materials. 3-M are basic input in construction industry. [6] The construction industry faces challenges with regard to problems associated with effective productivity and good labour management. Insufficient labour management on construction to result in low productivity. Proper labour management can help with effective productivity. Most construction industry 30% to 50% of the total cost the of project is spent on labours and labour management H. Randolph Thomas (2012) out that many construction professionals believe construction costs and schedules can be reduced by 15% or more. In order to achieve significant reductions in cost and improvements to LP, a focus on site management is important. However, there are few publications that relate to site operations. If properly done, a benchmarking study should culminate in a prescription (validated practices) for productivity improvement.

1.1 Labour Productivity

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ISSN: 0474-9030

Vol-68-Issue-30-February-2020

"Productivity refers to quantities produced per employee hour of effort" and further it is defined as "the ratio of output to input". Productivity can be defined by any of the equations

Productivity = Output ÷ input

= Units ÷ work-hours

= (Total output) ÷ (Total work-hours)

According to Henry alinwate et al. (2004) LP rates are used as indicators of the construction time performance. They are used in planning and scheduling of construction, controlling of the cost and worker performance, estimating and accounting. If a company wishes to reduce risk, increase profits, or gain market share, there is direct need within the firm to have accuracy data on and use of LP. [3]

1.2 Factors affecting Construction Labour Productivity

Following table 1 shows various factors affecting to construction labour productivity.

Table 1. List of different factors affecting labour productivity

Material Factors	***Management Factors***
1. *Tools and equipment shortages* 2. *Material shortage* 3. *Delay in arrival of materials* 4. *Inefficiency of equipment* 5. *Low quality of raw materials* 6. *Unsuitability of materials location* 7. *Late supply of materials in market* 8. *Project site far from suppliers*	1. *Delay in payment* 2. *Misunderstand between labour/superintendents* 3. *Site managers' leadership style* 4. *Poor scheduling and coordination* 5. *Lack of labour supervision* 6. *Crew size and composition* 7. *Working overtime* 8. *Construction method* 9. *Incentive programs*
Human/Labour Factors	***Technological Factors***
1. *Skill of labour* 2. *Shortage of experienced labour* 3. *Physical fatigue* 4. *Motivation of labour* 5. *Labour disloyalty* 6. *Age of labour* 7. *Level of education* 8. *Lack of competition*	1. *Clarity of technical specification* 2. *Coordination level among design disciplines* 3. *The extent of variation/change order during execution* 4. *Design complexity level* 5. *Rework* 6. *Site layout*
External Factors	
1. *Rain* 2. *Ground condition* 3. *High wind*	

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ISSN: 0474-9030

Vol-68-Issue-30-February-2020

4. *High/low temperature*
5. *Security*
6. *Design changes*
7. *On site accidents*

2. Literature Review

This is the heart of the review paper containing the work done by various others and the outcomes of various research paper. Following are some literature review form different international journals and conferences about the factors affecting to the CLP and its effect on output of project. Also, contains positive and negative impact of factors which affect CLP.

H. Randolph Thomas et al. (1994) *worked on 22 masonry projects to compare two approaches for forecasting LP. The first approach is to divide current work-hour total by percent complete (PC) of the activity and second method uses the factor model to develop a predicted labour-productivity curve. At the completion of the labour-productivity forecast, actual deviations from this curve are reflected. According to that study error in factor model in less than 50% as compare to the PC approach and suggest that factor model is more reliable method for forecasting LP.* ***[26]***

Awad S. Hanna et al. (2008) *worked on impact of shift work on LP. They were studied qualitative and quantitative approach for productivity in case on qualitative approach they were detailed that why and how shift work affects to the LP and also stated appropriate use of shift work. In quantitative approach they determined the relationship between the shift work and labour efficiency. They finding out shift work had potential be both detrimental and beneficial to the CLP. Also, shift work is an effective schedule compression technique if it is used for short time for labour intensive construction.* ***[7]***

Abdulaziz M. Jarkas et al. (2012) *worked on importance of factors perceived to affect LP on construction sites in Kuwait. They were finding out around 45 factors which were affected to the productivity of labour in construction. Paper results were used to fill the gap in knowledge of factors that could be used by industry practitioners and construction managers to affect LP.4 The results were obtained to identify constructability as the salient concept affecting LP, corroborating the significance of applying this concept to the construction industry and asserting the pivotal role of designers/engineers in the process.****[13]***

Anu V. Thomas et al. (2013) *illustrated the application of benchmarking techniques to understand productivity variability among the different types of labour employed for same king of work. They developed regression model to find out impact of various factors on construction LP and finding out that majority of construction productivity losses arise as a result of managerial inefficiencies. Also, suggested that LP is measured and their records maintained and compared timely to improve productivity of construction labour.****[24]***

Nay chi soe et al. (2014) *studied four categories of labour management practices effect on project. They were used taking questionnaire survey as a principal tool and analysis of result were taken by RII method and in addition, H-test or Kruskal-Wallis test were used to check the opinions of all respondents. They finding out that factors on increase LP and reducing LP were identical on other hand the opinions on manpower problems in construction were not*

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ISSN: 0474-9030

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identical. Therefore, manpower problems were not considered as improvement in the capabilities of labour. ***[19]***

Vaishant Gupta et al. (2014) *worked on 55 factors that affecting the LP and then gives recommendation that details of every work were present at site in well define format. Payment were made timely and effective labour supervision helps to increase LP. Also, find out that more than 8hr/day shift efficiency on workers were less than 90% and they only physically present at site not mentally. To achieve desired goals of project regular meeting and skilled and knowledgeable labour required.* ***[6]***

Dharani K (2015) *identified factors which are affected to LP and also studied causes of labour problems on site and its effects on the construction projects Also, finding that small firms in India are not able to fulfil requirements of labours. They try to studied ill effects of falling LP with the productivity of others resources were material, equipment and capital. They finding that most of the construction labours were engaged with others profession therefore they not give full importance to construction work and tend to work informally. They suggested that use of modern management techniques, provide skilled training, motivation through incentives programs and governments involvements were helped in improvement of LP.* ***[4]***

Prachi R. Ghate et al. (2016*) studied importance of measurements of LP in Mumbai region and find out factors affecting to the CLP. From the analyses of factors, they were finding out skilled labour factor highly affected to the LP. Also, stated that skilled labours were done work in less time without compromising in quality of work. From their studied conclude that if we were changed labour in construction work semi-skilled to skilled it helps to reduce 20% of construction cost of project.* ***[18]***

Xiaodong Li et al. (2016) *studied impacts of high-temperature conditions on CLP. For two different construction projects, Wet Bulb Globe Temperature (WBGT) data and LP data related to direct working time, indirect working time and idle time were measured. The data were taken by them at two different time in a day for day and night. They were finding that effects of temperature decreases LP of direct work time decreasing by 0.57% and for idle time it was increased by 0.74% when the temperature in WBGT was increased by 10C and also finding that increment in direct work time by 0.33% as worker's experience increased by 1 year and decreasing 0.72% as worker's age increased by 1 year.****[16]***

M Archana Menon et al. (2018) *developed field LP data acquisition method by integrating a 3D model with associated information. They were evaluated the productivity rates of labour of formwork and made comparison between the actual productivity and planned productivity. They were found that actual number of labours were increased when the actual work volume expected. Also, estimated minimum percentage of future productivity as 41.87% for beams, 19.68% for columns, 45.56% for floors and 49.57% for building of planned productivity.* ***[17]***

S. Sivaraj et al. (2018) *identified the affecting and improving productivity factors in construction through labour management. The researches were carried out in 122 samples. The data were analysed and found the top important reducing and increasing factors in construction through labour management. They concluded all reducing factors were 98.4% to 64.24% and all increasing factors were 97.86% to 73.34% importance from given*

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ISSN: 0474-9030

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*responses. From that they were given recommendations to improve LP in construction through labour management.**[21]***

Oladiran, O. J. et al. (2019) *studied five category of factors which are affecting productivity of construction operatives, assessed management policies for improvement of productivity on site and suggested solution to the problem of LP in case of building project. They were finding out that training and good welfare amenities were among management policies that could be engaged by organization to improve productivity of labour.* ***[28]***

Table 2 shows the list of various factors affecting to labour productivity by different authors in their research work.

Table 2: List of most important factors affecting labour productivity as per research carried out by authors

Country	***Researcher***	***Year***	***Numbers of investigated factors***	***Most Important Factors Affecting Labour Productivity***
Uganda	*Alinaitwe et al.[2]*	*2007*	*36*	• *Lack of material* • *Rework* • *Lack of craft worker skill*
Gazza Strip	*Enhassi et al. [5]*	*2007*	*45*	• *Material shortage* • *Lack of labour experience* • *Misunderstandings between labour and superintendent* • *Drawing and specification alteration during execution*
Turkey	*Kazaz et al. [12]*	*2008*	*37*	• *Quality of site management* • *Material management* • *On time payment*
Palestine	*Mahamid [17]*	*2013*	*31*	• *Rework* • *Lack of cooperation and communication between construction parties* • *Financial status of owner* • *Lack of labour experience* • *Lack of materials*

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ISSN: 0474-9030

Vol-68-Issue-30-February-2020

Kuwait	*Jarkas et al. [11]*	*2012*	*45*	• *Clarity of technical specifications* • *The extent of variation* • *Coordination level among design disciplines*

3. Conclusions

From the literature review, following are the major findings.

1.Labour productivity and labour management is an essential factor in construction project as labour parameter contains 30% to 50% of total project cost.

2.Professional stated that through labour management, construction cost and schedule can be reduced by 15% or more.

3.Managerial factors like shortage of material, lack of labour supervision, lack of leadership, delay in payment and communication between site manager and labour are the most affecting factor on labour output/ labour productivity.

4.Shift of more than 8 hours day is not recommended because it reduces LP.

5.By adopting various initiatives, LP can be improved like training, good welfare amenities, friendly environment and motivation.

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ISSN: 0474-9030

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