Key Determinants and Solutions for Enhancing Labour Productivity in India's Construction Sector

K. Nielsen*[1], Dr. M. Hansen[2] & Prof. T. Andersen[3]

[1](Graduate Student), Department of Environmental Sciences, University of Copenhagen, Denmark
[2](Assistant Professor), Department of Environmental Sciences, University of Copenhagen, Denmark
[3](Professor), Department of Environmental Sciences, University of Copenhagen, Denmark

ABSTRACT

Construction projects suffer fromtechnical and complex factors such as manpower, cost, time, quality and safety. Construction sector is diverse as it contains contractors, consultants, designers, owners, and others. Productivity is a problem in many countries and one of the most important factors that affects the overall performance of any small or medium or large construction industry. This paper explainsthat thefactors affecting labour productivity in Indian construction industry through various researches and analysis gives suggestion to improve the productivity and justify extreme affecting factors.

KEYWORDS: labour productivity, factors, improvement, suggestions.

I. INTRODUCTION

In construction labour productivity is one of major elements of every company success and competiveness in construction industry. Labour cost is important from project cost. It includes almost 30-50% from overall cost. (bitar, 2012). The new methods to implement by development of machinery and improved in the total productivity methods. The concept of productivity includes need to be quality of input, output and process. Labour productivity determines economy of projects; it has control over labour productivity. Labour productivity is calculated by ratio of output to the working hours or labour costs. (B. prakash rao, 2015) Labour is more variable and unpredictable than other project cost components, it becomes necessary to understand the effects of different factors on labour productivity. Researchers many identified as factors affecting labour productivity in construction from various countries all over the world and only few of them found Indian construction industry. In this study we are going to identify that different factors affecting labour productivity in Indian construction and ranking the factors need to implement solutions to improve the productivity levels from questionnaire survey.From the previous study we identified the 35 factors that affecting labour productivity and they divided into 8 groups by which namely,1. Supervision (5 factors), 2.Manpower (5factors) 3. Motivation (4factors) 4. Safety (7factors) 5. Material (3factors) 6.project(6groups) 7.Contactors (3 factors) 8. External (3factors). Here we are discussed about the top 3 groups and their affecting factors to find the solution to improve them and justify the results.According to RII, method the top 3 groups are 1.project 2.safety 3.motivation .

II. FACTORS

This study groups the following affecting factors are method of construction, delay in payment of workers, ineffective planning and scheduling of works , poor site condition, poor design in existing drawings.The below table shows the importance index of the factors from the project group,

III. SUGGESSTIONS

For project group: The method of construction is the first negative factor in this project group, use of proper method of construction for any type works at site is added value to the productivity. This is to justify by use of modern methods of construction by offering concrete solutions which reduce construction time and maintained the works. Implementation of prefabricated structures which includes to note different methods and completes the work in quick time.The second factor was timing in payment for workers that affects negatively. the payment for allotted workers to be given timely for after their daily works. The delay payment creates distract the labour mood in their works. Financial services should be provided properly for their project.

Table 1 Importance index and Ranking for project group

Factors	Importance index	Ranks
Method of construction	82%	1
Delay in payment of workers	60%	2
Ineffective planning and scheduling of works	52.66%	3
Poor site condition	52%	4
Poor design in existing drawings	48%	5

For Safety group:
Some of the ranked factors that comes under the safety group are followed on safety rules, implementation of government laws, insufficient safety methods, health issues of labour, alcoholism, insufficient experience of labour, and accidents in construction. The below table shows the ranking factors of safety group are,

The rank 1 factor was follow on safety rules , which affected by not correlate the rules properly by labourers, the employment of a safety officer on construction sites helps the labour to understand required safety regulations to follow them. The fatal injury rate for construction industry is higher than the national average in category for all industries. Potential hazards for construction includes falls, trench collapse, scaffold collapse etc., for construction the 10 OSHA standards most frequently included in agency citation are , scaffolding, fall protection, excavation ladders, head protection, hazards communication, construction, electrical.The second factor was implementation on government laws, which has an importance index of 81% of them cause by not following proper regulations on construction site. Buildings might be more extend and buildings of multi-storeyed buildings by not following the laws. Conditions and modalities of special planning development, and use of buildable land and the construction of facilities, carrying out supervision over the application of this law and supervisors inspection, other issue of significance in development of space landscaping and the use of buildable land and construction of facilities.

Table 2Importance index and Ranking for safety group

Factors	**Importance index**	**Rank**
Follow on safety rules	81.34%	1
Implementation of government laws	81%	2
Insufficient safety methods	62%	3
Health issues on labour	59.34%	4
Alcoholism	48%	5
Insufficient experience of labour	46.67%	6
Accidents in construction	44.10%	7

For Motivational group
From the motivation group the factors separated by this section are four factors which affected their productivity levels of this group. The ranked factors are, Incentives offered to labour, followed by Lack of motivation towards work, the 3rd one is, lack of financial motivation system, the final factor was Training offered to labour. The below table 3 shows the ranking factors of the motivational group;

Table 3 Importance index and Ranking for Motivational group

Factors	Importance index	Rank
Incentives offered to labour	79.33%	1
Lack of motivation	76%	2
lack of financial motivation system	70.67%	3
Training offered to labour	68%	4

The incentives offered to labour is the ranked 1 on the motivational group with an importance index of 79.33% this might be lead down the productivity by not giving the incentives properly to the workers. The different types of incentives are compensation, recognition, rewards, and appreciation. For retaining the workers by offering employees to competitive salaries along with annual increases following a performance review is a strong incentive for them to stay with you. The results is to justify that to clearly communicate and structure any bonus or incentive plans so employees understand exactly what the parameters are for receiving compensation.The second factor was Lack of motivation towards work this may effects on 76% from the productivity factor. Lack of motivation gets disturbed by the work by being stressed, lack of self-confidence, not realising the importance of works. This results is to justify by the conducting the programs and helps to thanking the work, motivate the works. Deci and flaste (1996) pointed out that intrinsic motivation results from the action that produces self-satisfaction, self-confidence and enjoyment.

Supervision Group
From the factors affecting labour productivity there are 5 factors comes under supervision group. The below table shows negative factors from the supervision group that affects labour productivity are Co-ordination problem among labour and supervisor, followed by Shortage of Technical Staff in the Site Area, Mistakes Done by Labour, Absenteeism OF Supervisor, and Rework in construction.

Table 4 Importance index and Ranking for Supervision group

Factors	ImportanceIndex	Rank
Communication problem among labour and supervisor	66.00%	1
Shortage of Technical Staff	51.33%	2
Mistakes Done by Labour	50.00%	3
Absenteeism OF Supervisor	47.33%	4
Rework in construction	41.33%	5

From the ranked group of supervision Co-ordination problem among labour and supervisor was affects most important factors among the 5 factors. The co ordination problem creates a Low productivity in construction. The misunderstanding between labour and supervisor which creates the bad relations that affects the working mood, in experience labour in works that affects their works. An important site visiting and guidance of which make the work down in the site. This results is to justify that by meets operational standards by contributing construction information to strategic plans and reviews: implementing production, productivity, quality, and customer service standards, identifying construction management system improvements. The second factor from this group was shortage of technical staff in site that had an importance index of 51,33%. This affects the guidance of working process on site that relates improper works and delay in productivity of works. Inspection on the works affects productivity it has high impact factors in the us, UK, Nigeria and Indonesia (Guhathakurta el.al 1993- olomalaiye 1996). This result is to justify by the intake of technical staff must be prevent from the absenteeism.

IV. MANPOWER GROUP

The manpower group has the 5 factors affecting labour productivity which they ranked are followed by difference in age of labour, working at overtime, facilities to labour quarters, insufficient transport facilities to labour, lack of suitable rest area for labour. The below table shows the negatively affecting factors from the manpower group;

Table 5 Importance index and Ranking for Manpower group

Factors	Importance index	Rank
Difference in age of labour	56.67%	1
Working at overtime	55.33%	2
Facilities to labour quarters	52.67%	3
Lack of food	46.70%	4
Lack of suitable rest area for labour	45.33%	5

The difference in age of labour is the first position ranked affecting factors at this group with value of 56.67%. This has ranked 16th position from overall affecting 36 factors. Heizer& render (1990) support this results citing that age of workforce affects jobsite productivity. The difference was moreover, many younger workers have higher expectations for comfort, safety, flexible work hours, and training than did construction workers of the past. In addition, the prestige of the construction industry has diminished; therefore, operating and managing construction equipment is often not the first choice for many potential workers. This result is justified by labour speed agility and strength of the younger age labour is more hence to improve the productivity.Working at overtime was the second factors that made negative impact and decreases the productivity which can supported by hinze (1999) determine that by increase the workforce which affects the labour productivity. This result is to justify by workforce of increase causes overcrowding of labour and interference between labour and gangs which reduces labour productivity.

V. MATERIAL GROUP

The material group was affected group it includes the ranking factors are quality of materials followed by inadequate transport facility for materials , materials shortage in construction.

Table 6 Importance index and Ranking for Material group

Factors	Importance index	Rank
Quality of materials	61.33%	1
Inadequate transport facilities to materials	56.00%	2
Materials shortage in construction	52.68%	3

The first factor was quality of materials and it has an impact negative importance index value of 61.33% that affects more on productivity at this group at Indian construction industry. The use of quality standard materials is important by use of old materials also affects the works or damage the works. This result is to justify that the type of equipment's affects the productivity new equipment has high productivity rate whereas old equipment's tends to give low productivity rate. The second factor which affected in this group was inadequate transport facilities for materials, which has an importance index value of 56.00% that made decrease the productivity level. In the construction sites it is necessary proper equipment's uses to get off the materials as construction. Use of more equipment's and more workers to may use at proper right time to improve the loss in productivity level by these factors.

For contract group

The contractors group has three negativity affecting factors that decrease the labour productivity rates, the first affected factor from this group was inspection delayed by engineers, inexperience for contractor in work, change of order of works by contractor.

Table 7 Importance index and Ranking for Contract group

Factors	Importance index	Rank
Inspection delayed by engineers	48.00%	1
Inexperience of contracting works	46.75%	2
Change of order of works	44.00%	3

The first factor was inspection delayed by engineers which affects productivity by late completion of works, delay of engineers at works, Changes in planning of works, site distance, unavailability materials. This results is to justify by engineers must had transport facility to be at right time of construction works. Needs of effective plan to execute the works. Completion of work must be done in right time. The inexperience of contractor in works was the second negativity factors affecting from this group, it has an improper knowledge of work, selecting of inexperienced contractor, repetition of works, poor managerial skills, improper communication between contractor and other parties. This results of affecting factor to be justify by selection of experience and well known contractors for works done at right time. Skilled contractor's works at different environment conditions. Proper skills and knowledge and these to improve the productivity level of contracts.

VI. EXTERNAL GROUP

The external group has three negative factors that affects labour productivityare weather conditions, followed by cultural shock among migrant labours, strikes and demonetization.

Table 8 Importance index and Ranking for External group

Factors	Importance index	Rank
Weather conditions	58%	1
Cultural shock among migrant labours	57%	2
Strikes and demonetisation	45.33%	3

The first factor that affected from this group was weather conditions; it has an increase and decrease of temperature and has low effect on labour productivity. The reasons are adverse effects of winds and rain affects productivity, increase in temperature, unavailability of water due to climatic change, delay in scheduling works. This results is to justify by the way of contractor has to make better estimates, enable contract principles, minimize disputes of results from delays, cost savings as the results of weather conditions. Cultural shock among migrant labours is the second factor that affects the labour productivity of this group which it has the 57% 0f importance index value. This affects the language, healthcare. Reverse culture makes misunderstanding between labours. Changes in environmental conditions also affect them. This results is to justify by the means of labourers from the others state is to move on with living environment conditions for their needs. They also must be provided healthcare, safety, incentives etc., and other facilities.

VII. CONCLUSION AND SUGGESTIONS

By the identification of factors influencing construction productivity being based on a review of literature and suggestions from local experts in building construction. The affected factors have eight groups and the top 3 are project, safety and motivational group.

For project group

By use of modern methods of construction by offering concrete solutions which reduce construction time and maintained the works.The delay payment creates distract the labour mood in their works.Selection of proper site area and provide clear planning and scheduling for works.

For safety group

An accident that causes an injured person to be hospitalized results in a work decrease of the crew for which the injured employee worked. 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 labours to recognize the required safety regulations and to follow them, which can reduce the number of accidents, thus increasing productivity.

For motivational group

The clearly communicate and structure of any bonus or incentive plans so employees understand exactly what the parameters are for receiving compensation. Giving of proper incentives at time and appreciation of works helps the labour to improve the level of work in productivity.

VIII. REFERENCES

[1] Adnan enshassi, sheriff Mohamed, Ziad Abu Mustafa and EduardMayer (2007) “factors affecting labour productivity in building projects in the Gaza strip”

[2] A.M Jarkas , C.G. Bitar ,” Factors Affecting Construction Labour Productivity In Kuwait” Journal Of Construction Engineering and Management 10.1061/(ASCE)CO 1943-7862.0000501, 2012, pp. 811-820

[3] Hanna A.S, Taylor CS, Sullivilan KT (2005) “Impact Of Extend Overtime On Construction Labour Productivity” Journal of Construction Engineering and Management 131(6), pp734-739.

[4] B.Prakash Rao, Ambika Sreenivasan, Prasad Babu NV (June 2015) “ Labour Productivity-Analysis and Ranking