FACTORS AFFECTING LABOUR PRODUCTIVITY IN CONSTRUCTION INDUSTRY AND RII METHOD

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Abstract*:*

A project entitled " Factors Affecting Labour Productivity in Construction Industry of North- East Haryana" was conducted during summer 2022 at Bhakra Water Services I&WR Deptt. Haryana The main goals of this study, is to identify and rank the factors affecting labor productivity in Haryana State, with geographical area of 4.4 Million Hectares located in North-Western part of India, is mostly arid and semi arid with limited rain fall ranging from 300mm in the South-West to 1100 mm in the North-East. The State constitutes 1.35% of total area of the country and has little over 2.09% of the total population of the country. The economy of the State is primarily depends on agriculture. Agriculture is the primary sector under State economy and majority of the population is directly or indirectly dependent on agriculture and its allied activities. Accordingly, State has accorded high priority to agriculture since its creation on 1st November 1966. The strong infrastructure facilities like roads, external network of canals, Rural development of Market yards etc. were created which provided much needed impetus to agriculture development in the State. Creation of these facilities coupled with agriculture research support and excellent extension network to disseminate the information related to improved farm practices for farmers yielded tangible results. The State has been converted from a food despite to a food surplus State. The State has become the second highest contributor of food grains to the central pool and has contributed about 15.6% of food grains to the central pool despite of a very less 1.4% area of country. To determine the objective of questionnaire survey the demographic information has obtained such as Name of company, profession, Working experience, Qualification. The questionnaire contained 29 factors and distribute among site engineers as per rate scale between 1 to 5. To set the format Questionnaire survey has arranged into following categories such as (1). Human labor, (2). Site and resource management, (3). Workforce characteristic, (4). Payment Delay, (5). External characteristic factors. The data analysis during survey 45 questioner distributed among site engineers on construction site and data obtained through RII (Relative important index) method and by ranking factors which showed result as (1). Strength and physical structure of labor, (2). Clarity of communication on site, (3). Shortage of skilled construction workers, (4). Quality experience and training, (5). Morality. This study obtained result,which helps to set a gap under knowledge of different factors whose affecting on labour productivity and develop more in sight of factors and enhance the efficiency of assets. This study has found more recommendation for several construction manager and provide awareness to improve labour productivity in construction projects.

Keywords: **Labour productivity, relative importance index, rank construction project, performance delay**

1. INTRODUCTION

Labour productivity =Output/ labour Employed. This term defined as labour productivity means, where only input of labour is considered. The "productivity means the total amount of labor involved in it (input) with the quantity of work completed (output)" (Ibrahim Mahamid, A.H., and Ghaleb, J.S. et al., 2013, Mistry and Bhatt, 2013). Construction is critical network of national economy in all over the word. Since, it traditionally employs a great section of the workforce and contributes significantly to overall revenue (Shashank et al., 2014 and Thomas and Ellis Jr. et al., 2017). Labour costs account upto 30 to 50% of total project costs in most of the countries, based on their availability (Thomas, H.R., et al., 2017, Rostami, A.and Oduoza, C.F. et al.,(2017). The productivity of construction industry has found remarkable impact on value and earning. Callegari, C., Szklo, A. et al., (2018). Due to significant impact of profitability of construction companies towards the project value and the earning of construction companies will ultimately show affect on labour productivity Therefore, El – Sayegh, S.M. et al., (2018). the construction labour force need an improvement strategy to increase the productivity. Hence, productivity improvement in the construction industry continues. Ekung, S., Lashinde, A. and Adu, E. et al., (2021). Labour productivity is the major source of construction risk, and the construction labor productivity is biggest element as compared to other construction resources, thus, it contribute directly to state income , it significantly attribute the labor productivity.

2. METHODOLOGIES:

The basic procedure of this study relies on survey questioner based on analyze factor directly affect on variation of labor productivity in construction projects. The questionnaire are collected and analysed using RII method. Aleluia, A.P. et al., (2019). Ranking factors was calculated based on relative importance index. The methodology broadly divided into 4 categories: (1). Identification of factors affecting labor productivity, to accomplish the above aim 8 factors being affecting on labor productivity and additional 5 factors interacting on construction productivity development (2). questionnaire survey, (3). data collection, (4). analysis of data using RII method.

2.1 QUESTIONNAIRE STRUCTURE:

The questionnaire made outlined sort of productivity in construction sectors. factors Affecting on labor productivity: (1). Equipment and tools control (2). Project control associated elements (3). Management and management competencies (4). Poor conversation (5). Lack of proper supervision (6). Labor related factors (7).Poor communiqué Construction productivity Development: (1). Approaches to creation productiveness development. (2). Motivation (3). Work natural (4). Human factors (5). Environmental factors Questionnaire Survey: Arantes, A. and Ferreira, L. M. D. F. et al., (2020). The review questionnaire test the cross- sectional behavioural pattern of labor productivity involved in construction project life cycle. Hwang, B., Shan, M., Phua, H. and Chi, S. et al., (2018). A Likert scale 1-5 was used in the questionnaire. It is a type of likert response scale used in survey research. Respondents Profile: This figure indicates the huge percentage of respondents that having excessive managerial titles and the profession of the respondents,swhich famous the distribution of respondents.
Identified and analyzed using RII method. Ranking factors was calculated based on relative importance index. RII (%) = ∑W / A* N RII = Relative important index
W = weighting given to each statement by the respondent and range from 1 to 5 A = Higher response integer (5) N = total no. of respondents. Factors S.No Questionnaires Responses 5 4 3 2 1 1- not important, 2– less important, 3- NUTRAL,4-important, 5– most important.RII RANK 1 1.Strength and Physical structure of Labour 2 8 0 0 0 0.84 17 2 2. Clarity of instruction and communication on the site.

4. Result and Discussion:
The result of the questionnare survey was total of 54 factors , out of this only 27 factors affecting labor productivity in the building projects have been identified and rated according to their relative importance. The ranking and perceived importance of factors classified under the project category are analyzed the Indian construction industry has concluded and ranked according to the relative importance index categorized under 7 factors, each factors respndents ranging 1 to 5 scale. The element classified the categories as follows: 1. Issues Human and Man Power. 2. Issue Related site and resource managment 3.Issue Related Workforce. 4. Delay Payment. 5. Issue Related external characterstic construction activities. 6. Issues Miscellaneous factors.7. common observation. The result of this section analyze and discussed the factor strength and physical structure of labour, shows Ranked with RII of 0.807% Scale 4 But also ranks first among the 27 factors related by the respondentswhich was recorded significantly higher, and labor education level effect Ranked (2) with RII (0.822) found to be lowest among all respndent category. However, The finding supported result obtained was (24), as considered the most major factor with significant effect on construction labor productivity.within its categories. Labour productivity plays a major role in assessing the significant effect of this resource in the construction sectorwhich reflect the success of construction projects, it means that any uplift in labor productivity will highly contribute to enhance the project effectiveness (i.e., quality, cost, revenue, and time performances) Similar result were also reported by Ibrahim Mahamid et al. (2013), and Ghaleb (2016).

Factors	S.No	Questionnaires	Responses					RII	RANK
			5	4	3	2	1		
ISSUES HUMAN/MAN POWER	1	1.Strength and Physical structure of Labour (Energyleveloflabourduring construction	6	16	5	0	0	0.807	24
	2	2. Clarity of instruction and communication on the site(you're trying to sort through issues like these and attempting to find the guilty party	12	11	3	1	0	0.851	4
	3	3.Labor education level effect(WELL EXPERIENCE IN WORK OR NEW FOR JOB)t	7	16	3	1	0	0.822	2
	4	4.Shortage of skilled construction workers(Experience labour less available)	4	12	9	1	1	0.723	15

The result of this section analyze and discussed the factor, quality check or accepted to unwanted resources to distract products quality shows Ranked with RII of 0.76 % Scale 4,5 But also ranks first among the 27 factors related by the respondentswhich was recorded significantly higher, and unavailability of equipment spare parts Ranked (1) with RII (0.874) found to be lowest among all respondent category. However, The finding supported result obtained was (46), as considered major factor with significant effect in construction labour productivity within its category. For Improving labor productivity the effective and efficient conversion of resources into marketable products must have primary concern for any profit-oriented institutions because it determines business values and earnings . Similar result were also reported by Prabhu et al. (2010). and Ambika (2013).

Factors	**S.No**	**Questionnaires**	**Responents**					**RII**	**RANK**
			5	**4**	**3**	**2**	**1**		
ISSUES RELATED SITE AND RESOURCE MANAGEMENT	1	1.Coordination of subcontractors(complex and highly serviced buildings)	7	15	4	1	0	0.81	12
	2	2 Quality checkref-red or accepted to nwanted resources to distract products quality	10	10	2	3	0	0.76	46
	3	3.Communication breakdown(works lead to conflicts and misunderstandings)	7	13	6	1	0	0.79	19
	4	4.Lack of experts for repairs of equipment(need for expensive repairs due to negligence)	10	11	6	0	0	0.83	5
	5	5.Inefficient equipment management(delays due to management and inefficiencies due to antiquated work method)	6	7	13	0	0	0.82	13
	6	6.Unavailability of equipment spare parts(spare parts available right away allows you to meet)	15	7	5	0	0	0.874	1
	7	7.Financial problem(Financial situations that people commonly report as stressful or troubling)	9	12	6	0	0	0.82	16
	8	8.Inadequate transportation facilities for workers(transport sector which include inadequate roads/highways facility)	6	15	5	0	0	0.79	40

The result of this section analyze and discussed the factor, Morality/ Effects of alcohol and drugs indicators of potential problems shows Ranked with RII of 0.793 % Scale 4, But also ranks first among the 27 factors related by the respondentswhich was recorded significantly higher, and lack of commitment and support of the extent that managers can offer flexibility in schedules Ranked (5) with RII (0.83) found to be lowest among all respondent category. However, The finding supported result obtained was (39), as considered major factor with significant effect in construction labor productivity. Similar result were also reported by Ekung et al. (2020) and lashinde (2021).

ISSUES RELATED WORKFORCE	1	1.Quality Experience and Training(education tour and video conference)	8	16	3	0	0	0.83	17
	2	2. Frequent change in Labors (workers are more favourable to work a certain number of hours at a given wage rate) available on outward to the right means.	8	15	4	0	0	0.83	19
	3	3.Morality(e.g. alcohol influence /Effects of alcohol and drugs and indicators of potential problems)	7	12	8	0	0	0.793	39
	4	4.Disturbance in work(road traffic,market,)interrupted by traffic flow	9	14	3	1	0	0.83	6
Factors	**S.No 5**	5.Poor access within construction site(condition of road on construction site using site routes can move around safely)	**Respondents**					**RII**	**RANK**
			5	**4**	**3**	**2**	**1**		
			6	**17**	**3**	**1**	**0**	**0.80**	**20**
	6	6.Inadequate risk management(time, effort and cost invested in the project are wasted and project objectives have meet requirement)	8	15	4	0	0	0.83	7

	7	7.Unrealistic expectations/Bad forecasting(forcast updated)	6	13	7	1	0	0.78	25
	8	8. Lack of commitment/support(To the extent that managers can offer some flexibility in schedules.)	5	16	6	0	0	0.83	5
	9	Labours losses confidence level engg/owner misbehaviour	12	9	6	0	0	.85	7

The result of this section analyze and discussed the factor, Slow owner payment shows Ranked with RII of 0.76 % Scale 4 also rank 1st among the 27 factors related to the respondents was recorded significantly higher, and Wrong payment Ranked (18) with RII (0.83) found to be lowest among all respondent category. However, The finding supported result obtained was (38), as considered major factor with significant effect on construction labor productivity. Similar result were also reported by Arantes et al. A. Ferreria (2020).

H	1	1.Unrealistic time and lower pay as per rule(risk of lower earnings for employees and the potential advantage of lower structure)	4	17	5	0	0	0.77	36
	2	2.Slow owner payment(Increasing your prices is a concept that scares many business owners)	4	14	9	0	0	0.76	38
DDd	3	3.Wrong payment schedule(making payment of wages to their workers at regular intervals and wages were not uniform)	10	12	5	0	0	0.83	18

The result of this section analyze and discussed the factor, Issue related to external characterstics construction activities under category overtime shows Ranked with RII of 0.725 % Scale 4 also ranks first in all 27 factors related to the respondents which was recorded significantly higher, and Implitation of government laws Ranked (3) with RII (0.85) found to be lowest among all respondent category. However, The finding supported result obtained was (51), as considered major factor with significant effect on construction labor productivity. Similar result were also reported by Siraj, N.B. et al. (2019).

1	**1. Order variation(size of product varies) how many variations of an individual product are available.**	**11**	**8**	**7**	**1**	**0**	**0.84**	**4**
2	2.variation in the drawing(During projects schedule change required)	4	14	4	5	0	0.785	37
3	3.Overtime(labours not work after shift time over)	5	10	9	3	0	0.725	51
5	4.Development and Research(based on existing economic impact of existing and on-going learning losses)	4	15	6	2	0	0.755	48
6	5.Change in design or add new work(you can encourage everyone to adapt to and embrace your new way of working)	5	17	5	0	0	0.8	27
	6.Inaccurate engineering estimate(effects of inaccurate cost estimation)	10	11	5	0	1	.81	23
	7.Topography of area(hilly, sea, sandy area)	6	14	7	0	0	0.79	34
	8.Implitation of govt laws(guidline of coivid19 rule)	9	16	2	0	0	0.85	3

The result of this section analyze and discussed the factor, No of accidents reported on previous projects shows Ranked with RII of 0.37 % Scale 1 also ranks 1st among the 27 factors related to the respondents which was recorded significantly higher, and Types of skills required to effective increase in productivity Ranked (3) with RII (0.85) found to be lowest among all respondent category. However, The finding supported result obtained was (54), as considered most important factor with significant effect on construction labor productivity. Similar result were also reported by Rostami et al. and oduoza (2017).

Factors	**S.No**	**Questionnaires**	**Responses**					**RII**	**RANK**
			5	**4**	**3**	**2**	**1**		
	1	1.How do you monitor quality of your project	20	5	2	0	0	0.78	22

COMMON Observation	2	2.How many of your previous project completed in time/cost effective	13	9	3	1	1	0..837	15
	3	3.No of accidents reported on previous projects	0	0	3	4	20	0.37	54
	4	4.HOW MUCH BUDGET SPENT ON SAFTEY OF PROJECT	10	9	8	0	0	.82	28
	5	5.TYPES OF SKILL REQUIRED TO EFFECTIVE INCREASE IN PRODUCTIVITY	12	9	6	1	0	0.85	3

5. CONCLUSION:

In this study, result summarize the data and identify the major cause of possible factor affect the labour productivity in construction industry. This study subjected to analyze all possible factors through a structured questionnaire by using RII method. The finding of this study determine the most significant crucial factor which concerned the construction labour productivity under construction project is strength and physical structure of labour. To improve the managerial experience and skills as well as keep management activities, enhance quality and prevent incorrect productions. Contractors should create workshops and training. on the other hand contractors should provide strong assitance and support regarding the continual training of their laboures. And other results obtained that " shortage of skilled labour, clarity of instruction and contractor on site, leadership and efficiency in site managment, geneder diversity in workforce, quality check and acceptance of unwanted resources, financial problems, indequate transportation. To overcome the effects of such factors over construction companies, it is important to focused on these high ranked factors, it will not only make more competitive and also increasing values and more survival growth rate of companies. In conclusion , it is believed that to bring the outcome of this research, lean techniques could implement in order to influence labour productivity and also help contractors and construction managers for maintaince of labour forces.

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