

ANALYSING THE FACTORS AFFECTING THE PRODUCTIVITY OF THE CONSTRUCTION PROJECT BY USING RELATIVE IMPORTANCE INDEX METHOD

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Abstract -Construction productivity is the concept which gives us the all over growth of the construction firm. There are so many factors on which productivity depends, such as, equipment which is used at site, skills of workers, no. of hours and days they are working and the main aspect is labor force. In this research, a study was conducted to recognize the significant factors for the low productivity in Indian construction industry. The focus was on the relationship among different factors through qualitative and quantitative analysis, so as to identify the most direct factors and their root causes. How to improve it and which things are to be considered, also some analysis methods will be implied to calculate construction productivity by using Craftsman questionnaire. It also gives the idea about labour problems and how does it affect on work as the labour force is the main and soul aspect of construction productivity. Although many factors were identified through these studies, further research on the relationship between different factors was seldom carried out.

Key Words: construction productivity, labor productivity, growth, analysis methods.

1. INTRODUCTION

RII method is the analysis method of the regression analysis of the statistics very firstly this method was introduced by Hoffman in 1960 for his psychological bulletin. He used the term relative weights to calculate RII by using correlation coefficients. Nowadays this method widely used for analysis of all statistical data irrespective of the field. This method mainly dependent on respondents so the only feedback is respondent must fill up the form or should answer the questions with great level of seriousness.

In this method we collect responses from respective field experts and analyze the factors by using regression and correlation method. By that conclusions we give the ranking to the factors and in this case lower the rank lower the reason of good productivity.

The formula for RII:

$$RII = \frac{5N_1 + 4N_2 + 3N_3 + 2N_4 + 1N_5}{A * N}$$

N: Total number of options

N1: first response option

N2: second response option

N3: third response option

N4: fourth response option

N5: fifth response option

A: Total number of respondents

In this project, for the calculation Microsoft Excel is used to do the analysis based on the Likert scale of 1 to 5. In which total number of questions (only section B is 67) and total number of respondents are 69.

By using above formula, we calculate RII for each question and applied ranking method to it. Rank is given to the factor and lowest 10 factors are considered as the major factors on the site which should be recovered for increasing construction productivity.

Return Rate of the Questionnaire

■ Returned ■ Unreturned

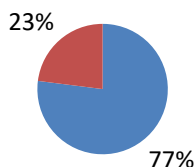


Fig -1: Figure

Questions	5 Strongly Agree (S A)	4 Agree (A N)	3 Neutral (N D)	2 Disagree (D S)	1 Strongly disagree (SD)	T o t a l	T o t a l r e s p o n s e s (A)	A * N	R a n k	R a n k
[Do you think that your Family Background is Financially Strong for business (Investment Capacity)?]	40	8 4	7 8	1 8	5	2 2 5	6 9	3 4 5	0 6 5 2 1 7 3 9 1	4 2
[Migratory Character- You Don't want to Leave your Native Place, are you Agree?]	35	1 0 8	3 0	3 4	8	2 1 5	6 9	3 4 5	0 6 2 3 1 8 8 4 1	5 5
[Do you think that your Ambition/ Motivation level about Business is High?]	10 5	1 0 0	4 5	1 0	3	2 6 3	6 9	3 4 5	0 7 6 2 3 1 8 8 4	1

[Do you think that you are Excellent in Computer Operating?]	60	1 0 4	6 6	1 0	4	2 4 4	6 9	3 4 5	0 7 0 7 2 4 6 3 8	1 3
[Do you think that your enterprise is affected by Social-Political Influences?]	40	9 2	6 3	2 2	6	2 2 3	6 9	3 4 5	0 6 4 6 3 7 6 8 1	4 7
[Do Waiting for equipment due to its being occupied happen frequently during site operation?]	25	1 0 0	6 3	2 6	5	2 1 9	6 9	3 4 5	0 6 3 4 7 8 2 6 1	5 3
[Do Waiting for equipment due to installation happen frequently on your site?]	15	9 2	6 0	2 8	9	2 0 4	6 9	3 4 5	0 5 9 1 3 0 4 3 5	6 3
[Do Waiting due to equipment's breakdown happen frequently on your site?]	30	8 8	6 3	3 0	5	2 1 6	6 9	3 4 5	0 6 2 6 0 8 6 9 6	5 4
[Do Waiting due to underestimating of materials required happen frequently on your site?]	15	9 2	5 4	4 2	4	2 0 7	6 9	3 4 5	0 4 6	6 2
[Do Waiting for inspection happen frequently on your site?]	15	9 2	6 3	3 6	4	2 1 0	6 9	3 4 5	0 6 0	5 8

your site.?)									8 6 9 5 6 5	
[Do Waiting for drawings is one of the usual things happening on your site?]	35	1 0 0	5 4 0	3 0	4	2 2 3	6 9	3 4 5	0 4 6 6 3 7 6 8 1	4 7
[Do you think that there is enough Demand for your Product?]	45	1 3 6	5 1 2	1 2	3	2 4 7	6 9	3 4 5	0 4 7 1 5 9 4 2 0 3	9
[Do you think that you are created Demand for your Product?]	45	1 2 4	6 9 6	6	3	2 4 7	6 9	3 4 5	0 4 7 1 5 9 4 2 0 3	9
[Does Rework due to design error happen frequently on your site?]	35	7 2	6 9	2 6	8	2 1 0	6 9	3 4 5	0 4 6 0 8 6 9 5 6 5	5 8
[Do you agree that Communication Facilities (Phone-Internet) provided by Government are adequate?]	15	1 3 2	5 4 6	1 6	7	2 2 4	6 9	3 4 5	0 4 6 4 9 2 7 5 3 6	4 5
[Power & Water is available in abundance]	20	1 2 8	6 0	8	9	2 2 5	6 9	3 4 5	0 4 6 5 2 1	4 2

									7 3 9 1	
[Do you agree that Transportation Facilities (Road-Railways-Airways) Provided by government are adequate?]	20	1 3 2	5 7	1 2	7	2 2 8	6 9	3 4 5	0 4 6 6 0 8 6 9 5 7	3 8
[How can you rate the performance of your labours only on the scale of 1 to 5?]	40	1 3 2	5 1	1 0	6	2 3 9	6 9	3 4 5	0 4 6 9 2 7 5 3 6 2	2 1
[Do you agree that availment of Incentives and subside & Grants from Government are adequate?]	25	1 0 8	7 2	1 4	6	2 2 5	6 9	3 4 5	0 4 6 5 2 1 7 3 9 1	4 2
[Does the manpower in your industry perform efficiently?]	35	1 0 0	7 2	1 2	7	2 2 6	6 9	3 4 5	0 4 6 5 5 0 7 2 4 6	3 9
[Do u provide any training facilities under your firm??]	60	1 0 4	5 4	1 8	4	2 4 0	6 9	3 4 5	0 4 6 9 5 6 5 2 1 7	1 7
[Does your company use any of the software's to maintain the input and outflow of materials?]	50	1 0 4	7 5	6	5	2 4 0	6 9	3 4 5	0 4 6 9 5 6 5 2	1 7

									1	
									7	
[Is the manpower on your site savvy to the different software up gradations for improving the productivity?]	25	1 1 6	7 5	8	6	2 3 0	6 9	3 4 5	0 6 6 6 6 6 7	3 6
[Does Rework due to design change happen frequently on your site?]	15	1 0 0	6 3	2 2	9	2 0 9	6 9	3 4 5	0 6 5 7 9 7 1	6 1
[Does Rework due to design omission happen frequently on your site?]	20	1 0 0	6 3	2 0	9	2 1 2	6 9	3 4 5	0 6 1 4 4 9 2 7 5	5 7
[Efforts are taken to generate awareness amongst the employees about the organization's financial position, customers' needs, quality of product/service, cost etc.]	45	1 4 0	5 1	8	4	2 4 8	6 9	3 4 5	0 7 1 8 8 4 0 5 8	6
[Do you think that There is Problem of Late repayment of Bills from your Client?]	10	1 1 2	7 5	2 0	4	2 2 1	6 9	3 4 5	0 6 4 0 5 7 9 7 1	5 2
[Do you think that you are getting adequate availability of Trained	45	1 1 2	4 2	1 8	9	2 2 6	6 9	3 4 5	0 6 5 5 0	3 9

&Skilled Labor?]									7	
									2	
									4	
									6	
[Do you think that you are getting adequate Information about Technical Know-how & Quality control Techniques of Machinery for your business?]	45	1 0 8	6 3	1 2	6	2 3 4	6 9	3 4 5	0 6 7 8 2 6 0 8 7	2 9
[Do you think that you are Aware about different Types of Analysis?]	55	1 0 4	6 9	8	5	2 4 1	6 9	3 4 5	0 6 9 8 5 5 0 7 2	1 6
[Do the manpower working in your firm subject themselves to periodic technical up gradation?]	35	1 1 2	6 9	1 4	4	2 3 4	6 9	3 4 5	0 6 7 8 2 6 0 8 7	2 9
[Does your organisation need to hire labours from outside the city?]	35	1 3 2	4 8	1 4	6	2 3 5	6 9	3 4 5	0 6 8 1 1 5 9 4 2	2 5
[Is the work on your site usually delayed due to disputes between the labours?]	35	4 4	7 8	3 2	9	1 9 8	6 9	3 4 5	0 5 7 3 9 1 3 0 4	6 4
[Idling due to labor's lack of enthusiasm is an issue on your site?]	30	9 6	5 4	2 4	9	2 1 3	6 9	3 4 5	0 6 1 7 3	5 6

								9	1	3	
[Are you satisfied with the output obtained from the workers?]	50	1 2 4	5 1 4	1 4	4	2 4 3	6 9	3 4 5	0 7 0 4 3 4 7 8 3	1 4	
[Does your work gets delayed due to the inspection delays from the authorities?]	30	9 6	7 2	2 0	5	2 2 3	6 9	3 4 5	0 6 4 6 3 7 6 8 1	4 7	
[How can you rate the educational qualification of your employees?]	50	9 2	6 6	1 8	5	2 3 1	6 9	3 4 5	0 6 6 9 5 6 5 2 2	3 4	
[Do you include motivational policies in your organisation to improve labour productivity?]	50	1 1 6	5 4	1 6	4	2 4 0	6 9	3 4 5	0 6 9 5 6 5 2 1 7	1 7	
[Does your organisation undertake periodic training sessions?]	35	8 8	7 5	2 0	5	2 2 3	6 9	3 4 5	0 6 4 6 3 7 6 8 1	4 7	
[Is alcohol strictly prohibited on your work?]	80	1 0 8	4 5	1 2	5	2 5 0	6 9	3 4 5	0 7 2 4 6 3 7 6	5	

									8		
[How will you rate the living conditions of labours on your site?]	50	1 0 4	6 6	1 6	3	2 3 9	6 9	3 4 5	0 4 6 9 2 7 5 3 6 2	2 1	
[How will you rate the safety system on your site?]	75	1 2 0	4 5	1 0	4	2 5 4	6 9	3 4 5	0 7 3 6 2 3 1 8 8	3	
[Does your employee go against the rules and regulations?]	30	6 0	6 3	3 0	12	1 9 5	6 9	3 4 5	0 5 6 5 2 1 7 3 9	6 5	
[Are the employees paid sufficiently?]	85	1 1 6	4 2	8	5	2 5 6	6 9	3 4 5	0 7 4 2 0 2 8 9 9	2	
[Do the employees receive any performance bonus?]	45	1 3 6	5 4	8	4	2 4 7	6 9	3 4 5	0 7 1 5 9 4 2 0 3	9	
[The work needs to be redone due to the damage after the work was complete?]	35	9 2	6 9	2 0	6	2 2 2	6 9	3 4 5	0 6 4 3 4 7 8 2 6	5 1	

[Have any accidents occurred on your site despite the safety measures?]	20	7 2	6 3	2 8	12	1 9 5	6 9	3 4 5	0 5 6 5 2 1 7 3 9	6 5
[Do the government laws affect the work?]	35	1 0 0	6 3	2 0	6	2 2 4	6 9	3 4 5	0 . 6 4 9 2 7 5 3 6	4 5
[Is the work on your site affected due to lack of equipment and tool?]	25	8 4	6 0	3 6	5	2 1 0	6 9	3 4 5	0 . 6 0 8 6 9 5 6 5	5 8
[Is proper machinery and tools provided to the labours?]	60	1 1 6	5 7	1 2	3	2 4 8	6 9	3 4 5	0 . 7 1 8 8 4 0 5 8	6
[Do the employees get leave facilities if they are working far from their native?]	25	1 4 4	6 0	6	5	2 4 0	6 9	3 4 5	0 . 6 9 5 6 5 2 1 7	1 7
[Does your organisation celebrate the festivals?]	50	1 3 6	4 8	1 0	4	2 4 8	6 9	3 4 5	0 . 7 1 8 8 4 0 5 8	6
[Are the market demand	35	1 0	7 5	1 8	3	2 3	6 9	3 4	0 . 7 1 8 8 4	3 4

low and the production rate high in Pune?]		0				1		5	6 6 9 5 6 5 2 2	
[Are the employees in your firm involved in the major decisions undertaken in the the firm?]	20	1 0 8	8 4	1 4	3	2 2 9	6 9	3 4 5	0 . 6 6 3 7 6 8 1 2	3 7
[Are the employees in your firm having flexible work timings?]	25	1 4 4	4 8	1 6	4	2 3 7	6 9	3 4 5	0 . 6 8 6 9 5 6 5 2	2 3
[Are the employees in your firm paid incentives and bonuses in due of extra work or extraordinary work done by them?]	65	1 3 2	4 8	4	5	2 5 4	6 9	3 4 5	0 . 7 3 6 2 3 1 8 8	3
[Organization's HR executives are fully aware of the business needs and strategies]	50	1 2 8	5 7	6	5	2 4 6	6 9	3 4 5	0 . 7 1 3 0 4 3 4 8	1 2
[The organization's human resource requirements are systematically ascertained and an appropriate plan is formulated for satisfying the requirements]	35	1 2 8	5 1	1 4	6	2 3 4	6 9	3 4 5	0 . 6 7 8 2 6 0 8 7	2 9

[The organization has a structured policy for management of attrition and turnover]	35	1 2 8	5 7	1 2	5	2 3 7	6 9	3 4 5	0 6 8 9 5 6 5 2	2 3
[The organization conducts exit interviews]	35	1 1 2	5 4	1 8	7	2 2 6	6 9	3 4 5	0 6 5 5 5 0 7 2 4 6	3 9
[Organization has the practice of carrying employee attitude/employee satisfaction surveys]	30	1 2 4	6 9	6	6	2 3 5	6 9	3 4 5	0 6 8 1 1 5 9 4 2	2 5
[There is provision for negotiation, administration and interpretation of written agreement between employees and management]	40	1 2 8	6 6	2	6	2 4 2	6 9	3 4 5	0 7 0 1 4 4 9 2 8	1 5
[The organization has been managing change by integrating the HR issues with the business strategies and the strategic change process]	30	1 2 4	6 0	1 4	5	2 3 3	6 9	3 4 5	0 6 7 5 3 6 2 3 2	3 2
[Please assign importance (on a scale of 1-5) to the following approaches in the context of your organization's labour	25	1 2 0	6 9	1 4	4	2 3 2	6 9	3 4 5	0 6 7 2 4 6 3 7	3 3

relation's strategy union Acceptances union avoidance union substitution union suppression]									7	
[Please assign importance (on a scale of 1-5) to the following approaches that reflect the attitude of management and employees of your organization in the context of grievance procedure Labour contract (Legalistic) Human Relations Open-culture Mixed]	50	100	60	22	3	235	69	345	068115942	25
[Please indicate the focus of job design for each of the items on a scale of 1(not at all applicable) to 5(fully applicable): Individually enriched Self-managing teams Cross-functional teams]	10	156	51	14	4	235	69	345	068115942	25

CONCLUSIONS

From the analysis method of Relative Importance Index Method It is concluded the following results as per mentioned in objectives. I got 69 responses from the construction industry professionals by that analysis is done using statistical method of regression and correlation.

Some of the root causes of the low construction productivity are as below which are the critical factors too:

1. Workers go against the rules and regulations.
2. Low safety measures at construction site.
3. Delay in solvation of labour disputes.

4. Late and waiting due to equipment installation.
5. Underestimation of required raw material.
6. Due to lack of proper and non-scheduled inspections of work progress.
7. Due to reworks and design omissions.
8. Due to low motivations and enthusiasm between workers and employees.
9. Delay in payments in staffs.
10. And sometimes social political issues may cause on site which reduces construction productivity.

SOLUTION FOR OVERCOMING THE CRITICAL FACTORS TO INCREASE CONSTRUCTION PRODUCTIVITY.

Firstly for all the workers and staff appropriate training sessions should be arranged, by which they can understand the methodology of work and also rules at the site which should be followed by them.

For all the employees all the safety measures should be provide as it may run towards hazardous accidents.

For welfare and wellness of the employees human resource department should plan active games and speech to make there bonding better day by day.

Equipment's and all instruments should be checked and repaired before starting of work as it may cause delay in work and results in low productivity.

All type of estimations are done properly before starting of actual execution.

After starting of work scheduling should be done properly and monitoring of all work and progress should be noticed on daily basis.

Things like bonus, holidays, welfare, payments, paid leaves, promotions should be maintained properly which must be in favour of workforce by which there mental state will always positive towards work and by that they can work in progressive manner for the construction.

REFERENCES

- 1 Construction productivity by Mr. James D. Whiteside, II, PE
- 2 Construction productivity and productuvuty rates: developing countries by C R Guntuk and E Koehn
- 3 Productivity analysis of small construction projects in India by Yogendra Kumar, Gadde Harish Kumar, Satish Myneni and C.V.N. Sai Charan

- 4 Labour productivity in the building industry by Lund University, Sweden
- 5 Factors affecting labour productivity in the construction industry by Paul Chan
- 6 Study on labours productivity management in construction industry by Dharani K Chennai, India
- 7 Construction labour productivity and its improvement by Mr. C. Thiyagu and Mr. M. Dheenadhyalan
- 8 Labour productivity in construction by Mr. S. G.Vekaria,Bardoli, Gujrat,India
- 9 Factors affecting construction labour productivity: an Indian case study by Anu V. Thomas and J. Sudhakumar
- 10 Onsite labour productivity in construction industry in and around Chennai by P. Dayakar and P. JothiKrishnan.
- 11 Lema N. M.,1995. Construction of labour productivity modeling. University of Dar elsalaam.
- 12 Lowe John, 1987. The measurement of productivity in the construction industry. Construction Management and Economics, vol.29, issue 5, pp. 101-113.
- 13 STUDY OF THE MEASUREMENT OF LABOR PRODUCTIVITY IN THE PALESTINIAN CONSTRUCTION INDUSTRY: THE GAZA STRIP Eng. Zeyad Ahmed Abo Mostafa
- 14 Construction productivity by Mr. James D. Whiteside, II, PE
- 15 Construction productivity and productuvuty rates: developing countries by C R Guntuk and E Koehn
- 16 Productivity analysis of small construction projects in India by Yogendra Kumar, Gadde Harish Kumar, Satish Myneni and C.V.N. Sai Charan
- 17 Labour productivity in the building industry by Lund University, Sweden
- 18 Factors affecting labour productivity in the construction industry by Paul Chan
- 19 Study on labours productivity management in construction industry by Dharani K Chennai, India
- 20 Construction labour productivity and its improvement by Mr. C. Thiyagu and Mr. M. Dheenadhyalan
- 21 Labour productivity in construction by Mr. S. G.Vekaria,Bardoli, Gujrat,India
- 22 Factors affecting construction labour productivity: an Indian case study by Anu V. Thomas and J. Sudhakumar

- 23 Onsite labour productivity in construction industry in and around Chennai by P. Dayakar and P. JothiKrishnan.
- 24 Lema N. M.,1995. Construction of labour productivity modeling. University of Dar elsalaam.
- 25 Lowe John, 1987. The measurement of productivity in he construction industry. Construction Management and Economics, vol.29, issue 5, pp. 101-113.
- 26 STUDY OF THE MEASUREMENT OF LABOR PRODUCTIVITY IN THE PALESTINIAN CONSTRUCTION INDUSTRY: THE GAZA STRIP Eng. Zeyad Ahmed Abo Mostafa