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# Factors Affecting Construction Labor Productivity In Peshawar Khyber Pakhtunkhwa (KPK) Pakistan

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**ABSTRACT**

**Labor productivity is at forefront of concerns facing professionals in construction industry worldwide. Construction industries play a leading role in economic growth for countries all around the world. This study highlights the factors affecting labor productivity in the construction industry of Peshawar (Khyber-Pakhtunkhwa) Pakistan. Improvement in productivity results in saving of cost and time. This study explores various factors for improving labor productivity in construction industry of Peshawar. Questionnaire survey and practical productivity assessment was adopted to take out the effect each individual productivity factors. The relative importance index (RII) of all twenty three (23) factors affecting productivity was identified. This study also developed a comparison sheet with previous case study data conducted by authors Anu V.Thomas and J.Sudhakumar (India) which could be used by the project managers to easily sort out various factors related to productivity improvement in different regions. The major factors which sort out and outcomes of this study will help project managers to anticipate weak zones of productivity in their present projects and provide accurate strategies for improving labor productivity.**

**Keywords: Productivity, Labor, Factors, Peshawar, Pakistan**

## INTRODUCTION

Construction industry plays an important role in the development of an economy of a country. It also provides basis for the growth of other sectors in the economy, by building the physical infrastructure which provides production of goods and delivery of services. According to [10] the construction industry accounts for 6-9 percent of the Gross Domestic Product (GDP) in many countries. The construction industry of Pakistan adds 2.45 percent to the total Growth Domestic Product (GDP). It provides an extensive source of employment for the population of the country. It is facing continuous competition, cost escalation, lacking behind from schedule and decrease in profit margins. To mitigate these problems many construction companies are approaching to implement the procedures to improve construction productivity. Productivity is one of the key mechanisms to every company's success and its effectiveness in the industry. Productivity results directly into profitability and cost benefits ratio. To carry out different construction activities, productivity problems have to be faced at different stages. Loss of productivity is experienced at a time when a contractor fails to achieve its target rate of production. Labor productivity is one of the basic requirements in construction industry. Therefore labor productivity usually related to manpower in terms of labor cost or work hours to the quantity of outputs produced [11].

Labor productivity = Output/Labor Input

In construction industry productivity loss is one of greatest and severe problems in globe. In developing countries like Pakistan, construction industry is still facing Labor productivity problem. No significant research has been conducted in Peshawar (Khyber Pakhtunkhwa) Pakistan to find out various factors which affect the labor productivity in construction industry of Peshawar (Khyber Pakhtunkhwa) Pakistan.

The aim of this research study to prioritize the factors which affect productivity in labor intensive construction will enable the project team to leverage the limited resources at their disposal to improve the labor management on site, in order to improve the labor productivity efficiently. A detailed review of the literature revealed a number of factors affecting constriction labor productivity in Pakistan and all over the world. Therefore the aim was raised to identify the most notable factors through questionnaire study influencing construction labor productivity in Peshawar (Khyber Pakhtunkhwa) Pakistan. The identified factors compared with previous identified factors and the result obtained is different from that of project delay and success.

## LITERATURE REVIEW

In today's competitive market across the world, construction industry requires better productivity achievements. Extra saving and contractors profit in such industry, directly relate to achieving higher productivity [1]. The top most productivity improving elements on site that interact directly are management of materials, equipment and work force [2]. Attempted to improve work force productivity in construction industry and pointed out that failure in productivity improvement occurs when craftsmen and supervisor start addressing to workers instead of management [3].

Another more general definition of productivity is total factor productivity which is the combination of Labor, material capital, energy and equipment [4], [5]. Due to its significance in affecting cost and duration of the project, construction professionals and owners are agreed on its importance. In the last twenty years, attention towards productivity improvement has been increased. In this regard, record keeping has become the priority of the contractors to overcome its adverse effects. Usually the data of productivity is in terms of average productivity i.e. Average amount of delays, average job site conditions, average weather record etc.

A study conducted [6] the most important factor which require special attention that is health and safety on site which improves motivation and loyalty of the workers. Another study conducted [7] on the ranking of factors affecting labor productivity in Trinidad and Tobago, shows that lack of labor supervision is the top most productivity affecting factor followed by unrealistic scheduling, shortage of experienced skilled labors, lack of construction management experience, delay in request for information, delay in wages payment, poor communication on site and bad weather conditions. In a study [8] the top factors negatively affecting labor productivity are country's political situation, shortage of equipment, insufficient & outdated equipment, lack of labor experience and poor management at sites. A study conducted [9] states the top factors affecting labor productivity are over timing, clarification of technical documentation, fatigue of labor, labor payment delay, change order variation delay, poor communication between site management and manager and lack of training for labors.

## RESEARCH METHOD

### Survey Questionnaire

In applied social research most of the data collection takes place using interviews and questionnaire survey [15].In preliminary study, literature collected and identified the various factors affecting labour productivity, formed a pilot questionnaire and discussed with total eleven filed experts of construction industry but received the response from only eight field experts and after minor changes a final questionnaire developed. The final questionnaire was distributed among the contractors, consultants, clients, project managers and project engineers of the building projects. The filled questionnaires had been recollected for analysis of the data. After getting the filled questionnaires the data obtained was put in excel sheet and applied Statistical Package for Social Sciences (SPSS) for further analysis. The basic method used for data analysis that is the percentage score method to sort out the factors affecting construction labor productivity.

### Sample Population

Calculation of accurate sample size is very important for getting correct and reliable data analysis. Keeping statistical power of data analysis in mind it ensures that our data is the true representation of our target population. Our target population in this study was clients, contractors, consultants and engineer. The sample was calculated by the equation [16,17 and 18].The total population of this study were 150 responses to the survey, including 58 clients, 22 consultants, 16 contractors and 54 civil engineers.

### Data Analysis

The distributed questionnaires recollected from respondents for analysis of data. The total numbers of questionnaires were 150 and received 103 feedback, only 03 were rejected due to overwriting and errors. The total number of valid responses from all the stakeholders is 100 out of 150 and percentage is 66. The total 100 numbers of questionnaires were finalized for final data analysis by using Likert scale from 1-5 having 5 represented “very high” and 1 represented “very low”. After compilation of the data, the following percentage score equation applied and calculated to find out its significance and provided the ranking of twenty three (23) numbers of factors affecting construction labor productivity [12, 13 and 14].

$$\text{Percentage Score} = \frac{\sum W}{A \times N} \times 100$$

Where

ΣW = score of respondent, A =maximum score on Likert scale, N = total respondent numbers.

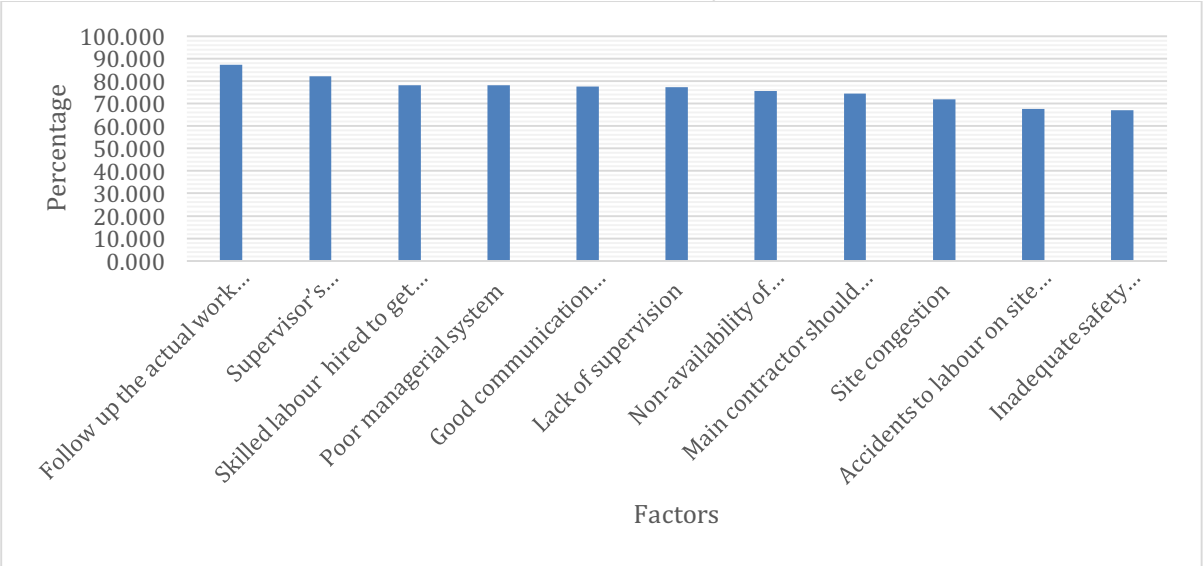
**Ranking of Productivity Factors Affecting Construction Labor Productivity based on Percentage Score Method.**

**Table 01**

| S.NO | Factor | RII | Percentage Score | Rank |
|---|---|---|---|---|
| 1 | Follow up the actual work plan / activity chart etc. | 0.872 | 87.2 | 1 |
| 2 | Supervisor's behavior/Attitude towards his crew has also an impact on labor productivity | 0.82 | 82 | 2 |
| 3 | Skilled labor hired to get more progress | 0.78 | 78 | 3 |
| 4 | Poor managerial system | 0.78 | 78 | 4 |
| 5 | Good communication amongst the client, consultants and contractor | 0.776 | 77.6 | 5 |
| 6 | Lack of supervision | 0.772 | 77.2 | 6 |
| 7 | Non-availability of material at site | 0.756 | 75.6 | 7 |
| 8 | Main contractor should execute the work himself and avoid subletting | 0.744 | 74.4 | 8 |
| 9 | Site congestion | 0.718 | 71.8 | 9 |
| 10 | Accidents to labor at site due to no proper safety | 0.676 | 67.6 | 10 |
| 11 | Inadequate safety precaution on working site | 0.67 | 67 | 11 |
| 12 | Less technical knowledge of workers | 0.636 | 63.6 | 12 |
| 13 | Labor low wages | 0.63 | 63 | 13 |
| 14 | Shortage of procurement planning | 0.626 | 62.6 | 14 |
| 15 | Design errors | 0.604 | 60.4 | 15 |
| 16 | Physical fatigue | 0.58 | 58 | 16 |
| 17 | Lack of transport facility | 0.548 | 54.8 | 17 |
| 18 | Interim demands of client regarding change in design | 0.546 | 54.6 | 18 |
| 19 | Domestic issues with labors | 0.532 | 53.2 | 19 |
| 20 | Weather condition | 0.528 | 52.8 | 20 |
| 21 | Lack of labor law implementation | 0.526 | 52.6 | 21 |
| 22 | No benefits for best working labors | 0.522 | 52.2 | 22 |
| 23 | Conflicts with natives | 0.514 | 51.4 | 23 |

Overall ranking of the top twenty three factors were such as Follow up the actual work plan / activity chart etc ranked first with RII of 0.872, Supervisor's behavior/Attitude towards his crew has also an impact on labor productivity at second rank with RII 0.82,Skilled labor hired to get more progress at third rank with RII 0.78, Poor managerial system at fourth rank with RII 0.78, Good communication amongst the client, consultants and contractor at fifth rank with RII 0.776,Lack of supervision at sixth rank with RII 0.772, Non-availability of material at site at seventh rank with RII 0.756,Main contractor should execute the work himself and avoid subletting at eight rank with RII 0.744, site congestion at ninth rank with RII 0.718, Accidents to labor at site due to no proper safety at tenth rank with RII 0.676,Inadequate safety precaution on working site at eleventh rank with RII 0.67, Less technical knowledge of workers at twelfth rank with RII 0.636,Labor low wages at thirteenth rank with RII 0.63, Shortage of procurement planning at fourteenth rank with RII 0.626, Design error at fifteenth rank with RII 0.604, Physical fatigue eat sixteenth rank with RII 0.58,Lack of transport facility at seventeenth rank with RII 0.548,Interim demands of client regarding change in design at eighteenth rank with RII 0.546, Domestic issues with labors at nineteenth rank with RII 0.532, Weather condition at twentieth rank with RII 0.528,Lack of labor law implementation at twenty first rank with RII 0.526, No benefits for best working labors at twenty second rank with RII 0.522 Conflicts with natives at twenty third rank with RII 0.514, as shown in the table 01.

**Figure: Mean weight of top Eleven Productivity Factors Affecting Construction Labor Productivity.**




**Mean weight of top eleven productivity factors**

## DESCRIPTIVE STATISTICS

The factors affecting construction labor productivity and their impact data as shown in the table 02 using Statistical Package for Social Sciences (SPSS) includes the number of respondents, maximum and minimum range of the Likert scale, Mean and Standard deviation. The correlation has been developed between the different productivity factors and showing the ranking as high, low and average impact.

**Table 02**

**Descriptive Statistics Table**

**Statistical Package For Social Sciences (SPSS) and Relative Important Index (RII) For Factors Affecting Construction Labor Productivity**

| S.No | Factors | Statistical Data | | | | | Range | Remarks | RII | RII Ranking |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Maximum | Minimum | Mean | Std.Dev | N | | | | |
| 1 | Supervisor's behavior/ Attitude towards his crew has also an impact on labor productivity | 1 | 5 | 4.1 | 1.01 | 100 | 4-5 | Highest Impact | 82% | 2 |
| 2 | Domestic issues with labors | 1 | 5 | 2.66 | 1.2 | 100 | 3 | Average impact | 60% | 19 |
| 3 | Main contractor should execute the work himself and avoid subletting | 2 | 5 | 4.36 | 0.77 | 100 | 4-5 | Highest Impact | 74% | 8 |

**Table 02 Continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Follow up the actual work plan / activity chart etc | 1 | 5 | 3.95 | 1.095 | 100 | 5 | Highest Impact | 87% | 1 |
| 5 | Skilled labour hired to get more progress | 1 | 5 | 3.88 | 1.13 | 100 | 4-5 | Highest Impact | 78% | 3 |
| 6 | Good communication amongst the client, consultants and contractor | 1 | 5 | 2.63 | 1.26 | 100 | 4-5 | Highest Impact | 77% | 5 |
| 7 | Lack of labor law implementation | 1 | 5 | 3.35 | 1.29 | 100 | 1-2 | lowest Impact | 52% | 21 |
| 8 | Inadequate safety precaution on working site | 1 | 5 | 2.61 | 1.34 | 100 | 4-5 | Highest Impact | 67% | 11 |
| 9 | No benefits for best working labours | 1 | 5 | 3.9 | 1.93 | 100 | 1-2 | lowest Impact | 52% | 22 |
| 10 | Poor managerial system | 1 | 5 | 2.57 | 1.1 | 100 | 4-5 | Highest Impact | 78% | 4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | Conflicts with natives | 1 | 5 | 3.02 | 1.19 | 100 | 1-2 | lowest Impact | 51% | 23 |
| 12 | Design errors | 1 | 5 | 3.38 | 1.34 | 100 | 3 | Average impact | 60% | 15 |
| 13 | Accidents to labour at site due to no proper safety | 1 | 5 | 2.73 | 1.3 | 100 | 4-5 | Highest Impact | 67% | 10 |
| 14 | Interim demands of client regarding change in design | 1 | 5 | 3.13 | 1.11 | 100 | 2-3 | Average impact | 54% | 18 |
| 15 | Shortage of procurement planning | 1 | 5 | 3.18 | 1.17 | 100 | 4-5 | Highest Impact | 62% | 14 |

**Table 02 Continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | Less technical knowledge of workers | 1 | 5 | 2.99 | 1.2 | 100 | 4-5 | Highest Impact | 63% | 12 |
| 17 | Weather condition | 1 | 5 | 3.15 | 1.22 | 100 | 1-2 | lowest Impact | 52% | 20 |
| 18 | Labor low wages | 1 | 5 | 3.72 | 1.11 | 100 | 4-5 | Highest Impact | 63% | 13 |
| 19 | Physical fatigue | 1 | 21 | 2.9 | 2.26 | 100 | 2-3 | Average impact | 58% | 16 |
| 20 | Lack of transport facility | 1 | 5 | 2.74 | 1.33 | 100 | 2-3 | Average impact | 54% | 17 |
| 21 | Site congestion | 1 | 5 | 3.59 | 1.17 | 100 | 4-5 | Highest Impact | 71% | 9 |
| 22 | Lack of supervision | 1 | 5 | 3.86 | 1.23 | 100 | 4-5 | Highest Impact | 77% | 6 |
| 23 | Non-availability of material on site | 1 | 5 | 3.78 | 1.17 | 100 | 4-5 | Highest Impact | 75% | 7 |

## COMPARISON WITH PREVIOUS STUDIES

The final analysis of the current data shows the ranking of productivity factors for district Peshawar (Khyber Pakhtunkhwa) Pakistan. The result obtained has been compared with the previously done case study of productivity [19]. The relative importance indexes (RII) of both studies have been given for comparison to check which factor is influencing the construction labor productivity highly and which is affecting lower.

**Table 03**
**Comparison of Anu V. Thomas and J. Sudhakumar (authors) case study with current research study**

| S.NO | Anu V.Thomas and J.Sudhakumar (authors) Case Study Factors | Anu V. Thomas & J.Sudhakumar (RII) | Current Study (RII) |
|---|---|---|---|
| 1 | Follow up the actual work plan / activity chart etc. | 0.329 | 0.872 |
| 2 | Supervisor's behavior/Attitude towards his crew has also an impact on labor productivity | 0.291 | 0.82 |
| 3 | Skilled labor hired to get more progress | 0.315 | 0.78 |
| 4 | Poor managerial system | 0.329 | 0.78 |
| 5 | Good communication amongst the client, consultants and contractor | 0.286 | 0.776 |
| 6 | Lack of supervision | 0.306 | 0.772 |
| 7 | Non-availability of material at site | 0.442 | 0.756 |
| 8 | Main contractor should execute the work himself and avoid subletting | 0.329 | 0.744 |
| 9 | Site congestion | 0.252 | 0.718 |
| 10 | Accidents to labor at site due to no proper safety | 0.303 | 0.676 |
| 11 | Inadequate safety precaution on working site | 0.297 | 0.67 |
| 12 | Less technical knowledge of workers | 0.291 | 0.636 |
| 13 | Labor low wages | 0.31 | 0.63 |
| 14 | Shortage of procurement planning | 0.329 | 0.626 |
| 15 | Design errors | 0.325 | 0.604 |
| 16 | Physical fatigue | 0.258 | 0.58 |
| 17 | Lack of transport facility | 0.249 | 0.548 |
| 18 | Interim demands of client regarding change in design | 0.362 | 0.546 |

**Table 03 Continued**

| | | | |
|---|---|---|---|
| 19 | Domestic issues with labors | 0.295 | 0.532 |
| 20 | Weather condition | 0.34 | 0.528 |
| 21 | Lack of labor law implementation | 0.285 | 0.526 |
| 22 | No benefits for best working labors | 0.266 | 0.522 |
| 23 | Conflicts with natives | 0.271 | 0.514 |

## CONCLUSION

The results obtained by data analysis from comparison of authors Anu V. Thomas and J.Sudhakumar case study data and current research study ranking of the factors along with its weightage were ranked as follows:

1. Follow up the actual work plan / activity chart etc. 87%
2. Supervisor's behavior towards his crew & its impact on labor productivity 82%
3. Skilled labor hired to get more progress 78%
4. Poor managerial system 78%
5. Good communication amongst the client, consultants and contractor 77%
6. Lack of supervision 77%
7. Non-availability of material at site 75%
8. Main contractor should execute the work himself and avoid subletting 74%
9. Site congestion 71%
10. Accidents to labor at site due to poor safety 67%
11. Inadequate safety precaution on working site 67%

| | |
|---|---|
| 12. Less technical knowledge of workers | 63% |
| 13. Labor low wages | 63% |
| 14. Shortage of procurement planning | 62% |
| 15. Design errors | 60% |
| 16. Physical fatigue | 58% |
| 17. Lack of transport facility | 54% |
| 18. Interim demands of client regarding change in design | 54% |
| 19. Domestic issues with labors | 53% |
| 20. Weather condition | 52% |
| 21. Lack of labor law implementation | 52% |
| 22. No benefits for best working labors | 52% |
| 23. Conflicts with natives | 51% |

From this current study a checklist has been provided on base of factors with have highest impact on construction productivity which will be used by the project managers at the start of the project to predict different productivity levels of certain factors. They will be able to overcome those factors at the initial stage of the project. The main contribution of this research is to develop the labor management and productivity system in the construction industry of Pakistan. The checklist prepared will be helpful to guide project managers to overcome productivity problems early at the initial stages of the project. The main factors affecting the labor productivity were defined and ranked by consultants and contractors. The detail of each factor was discussed in the literature review during the stage of development of this study some of its results will be better if it will be done in different way.

The correlation of the different respondent answer is very small. For future study, it will be better to achieve more accurate results to conduct the detail research in each province separately and at the end comparison of results among them should be applied to find the actual results from it. It will be time consuming but will be more beneficial in their results. Another method which will provide good result is to arrange survey for individual category and the feedback of factors affecting productivity will be compared. The priority of focus group in the survey will be to keep lower class that is facing the factors affecting productivity. The results obtained from different regions will be compared to check the correlation.

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