

# Critical Success Factors Affecting Labour Productivity in Building Sector Projects

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**Abstract.** Labour productivity has been the topic of study since last few decades due to its great contribution in the project success and organization's growth. Various factors causing poor productivity of labour have been identified by several re-searchers worldwide. Labour productivity has been one of the least studied areas for the building sector projects within the construction industry of Pakistan. The main aim of this article is to review the previous studies since last one decade and identify the critical factors affecting labour productivity in building sector projects. To achieve the aim, a questionnaire survey based on the identified factors was carried out. The data obtained from 133 successfully returned questionnaires, was analysed by using Average Index (AI) method with the help of Statistical Package for the Social Sciences (SPSS). The findings of this research highlight 15 topmost factors affecting labour productivity including Shortage of materials at first, followed by Shortage of equipment, Lack of supervision, low wages given by employer, old and inefficient equipment, overtime, delays in salary payments, Experience of workers, rewards mechanism, reworks, height of working place, improper work planning, age of the worker, Intensity of lighting and ventilation and weather conditions respectively. The study also gives some suggestions and recommendations to overcome the labour productivity issue. This paper will help the construction stakeholders and researchers as guideline to focus on the key factors that affect the labour productivity in building sector projects, which ultimately have been reducing the project's success and hindering the organizational growth as well.

## 1 Introduction

Construction industry plays an essential role in the development of any country's economic growth, contributing to Gross Domestic Product (GDP) and a major source of employment worldwide. The success of small and medium-sized firms directly depends on labour productivity (LP), which is crucial for the construction industry [1]. It has been a topic of study for many decades because poor productivity is still a main issue in different developing

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countries. The management process in any project is supported by human resources. Employee turnover is one of the most significant causes, producing difficulty in the construction sector [2]. Labour is a fundamental input in all the projects to attain the highest level of output in terms of productivity [3] but unfortunately, they are not given the basic facilities which make them happy and satisfied with their job, which ultimately motivate them for producing better productivity. It has been discovered that when employees perform well, the organization is more likely to grow. Someone who is well-trained and eager to work because he is compensated and has a better future out-look would perform well, which ultimately results in successful completion of project [4].

Many researchers have identified the factors related with labour, management, material, tools, and finance which influence LP worldwide. [5] identified 38 different factors and categorized those factors into five main groups. [6] identified most significant factors affecting LP in building construction projects of Australia including award rates, level of skill and experience, inadequate supervision, communication problems with foreign workers and fatigue. A study conducted by [7] on construction labour productivity in Yemen, identified 52 factors and ranked them accordingly. The mapping of the identified factors is shown in Table 1.

Therefore, it is observed from the literature that this topic has been given less attention specially in building construction sector of Pakistan. It is of the great importance to highlight the critical factors which affect the LP in construction industry of Pakistan. Furthermore, the most repeated factors identified from previous studies since the year 2011 were selected for the study.

Since, every stakeholder involved in any construction project expect the successful completion of the projects along with efficient LP but, likewise other industries, this industry also faces many problems and one of the main problems is the poor LP. Hence, for enhancing productivity, it is essential to identify the most influential factors and come up with a solution to improve it [8].

Therefore, keeping in considering the above-mentioned problem, this research aims to identify the most critical factors which affect LP on building sector projects under the contractor category C-6, which has project cost limit Up to 25 million Pakistani Rupees, as per Pakistan Engineering council (PEC). This paper will help the construction industry stakeholders to be proactive and take necessary steps to enhance labour productivity.

**Table 1.** Mapping of the factors affecting labour productivity.

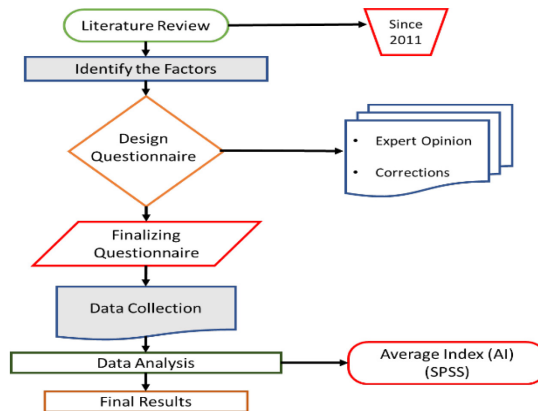
Factors	[1]	[5]	[9]	[6]	[4]	[10]	[3]	[11]	[12]	[8]	[13]	[14]	[7]	[15]	[16]	[17]	[18]	[19]	[20]
Shortage of material		√	√	√		√		√		√	√	√	√		√				
Reworks		√	√	√		√	√			√		√			√		√		
Lack of supervision		√	√	√			√			√		√	√		√	√		√	
Weather conditions		√	√	√					√	√	√				√	√	√	√	
Experience of workers	√	√	√	√		√	√	√	√	√			√		√		√		
Shortage of equipment		√		√						√	√	√			√	√	√		
Overtime		√	√				√			√		√	√			√			
Age of worker			√	√		√	√		√	√			√				√		

Factors	[1]	[5]	[9]	[6]	[4]	[10]	[3]	[11]	[12]	[8]	[13]	[14]	[7]	[15]	[16]	[17]	[18]	[19]	[20]
Delays in salary payments		√				√				√		√			√	√	√		
Low wages given by employer		√											√			√			
Old and inefficient equipment		√							√	√									
Reward mechanism		√	√	√		√			√				√						
Improper planning		√						√								√		√	
Intensity of lighting, ventilation				√				√	√	√									
Height of working place		√	√	√					√										

The above table shows the mapping of the factors which were identified from the literature review. The most occurring factors are mentioned in the table.

## 2 Methodology

To achieve the aim, the following methodology shown in Figure 1. was adopted.



**Fig. 1.** Methodology flow chart.

A detailed literature review was carried out from the studies conducted since 2011 and the factors affecting LP were identified, the mapping of the factors is shown in Table 1. To achieve the aim of the study, a quantitative approach was used. For that, a questionnaire was designed based on the identified factors and that questionnaire was finalized after getting experts opinion with minor corrections. The 5-point Likert’s scale was used where 1 represents “don’t affect”, 2 represents “somehow affect”, 3 represents “moderately affect”, 4 represents “highly affect” and 5 represents “very highly affect”. The questionnaire was distributed among the respondents working in building sector projects, having experience more than 5 years.

The questionnaire was distributed in building sector projects of Sindh including the districts Karachi, Hyderabad, Sukkur, Jamshoro and Khairpur Mir's. The targeted population was the professionals working under contractors including Project Managers, Deputy Project Managers, Construction Managers, Site Engineers, and Site Supervisors. To obtain the sample size, Equation (1) suggested by [7] was used.

$$n = \frac{m}{1 + \{(m-1)/N\}} \tag{1}$$

Where n is sample size of limited, m is sample size of unlimited, and N is available population. The m in (1) is estimated by (2).

$$m = \frac{x^2 \times p \times (1-p)}{e^2} \tag{2}$$

While the data was collected from the respondents working in the ongoing projects of 202 active firms under C-6 category. Therefore, taking N=202 and m=385, the required sample size is obtained by Eq. (1)

$$n = \frac{385}{1 + \left(\frac{385 - 1}{202}\right)} = 132.7 \approx 133$$

Therefore, the required sample size obtained is 133.

For the data analysis, the average index method is effectively used to discover the components using ranking analysis [21]. This study also used Average Index (AI) method to analyse the collected data by using Statistical Package for the Social Sciences (SPSS). The mean is calculated by (3):

$$AI = \frac{\sum(1X1+2X2+3X3+4X4+5X5)}{\sum(X1+X2+X3+X4+X5)} \tag{3}$$

Where, x1, x2, x3, x4 and x5 represent number of respondents for scale 1,2,3,4 and 5.

This research has used Cronbach's alpha to check the stability of the data. This test has been used by previous studies to check the internal consistency of the data [22]. The study conducted by [23] suggests that the Alpha value ranges from 0-1, the value greater than 0.70 is said to be in acceptable limits.

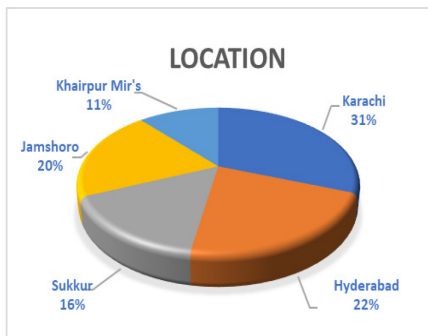
### 3 Results and Discussions

Due to limitations of the study, the respondents were selected from ongoing projects in the major districts of Province Sindh, Pakistan. 180 questionnaires were distributed among respondents who were working on different building projects of province Sindh under the contractor category C-6. The data was collected from the major districts including Karachi, Hyderabad, Sukkur, Jamshoro and Khairpur Mir's with 41, 29, 21, 27 and 15 number of respondents respectively. Figure 2 shows the respondent percentage as per the location of the projects. 155 questionnaires were received back and after discarding 12 incomplete questionnaires, 143 questionnaires were filled completely. Out of the 133 considered respondents, 33 respondents were working as Project Manager, 20 were working as Deputy Project Managers, 29 were engaged as Construction Managers, 33 were working as Site Engineers and remaining 18 were Site Supervisors, the result is shown in Figure 3.

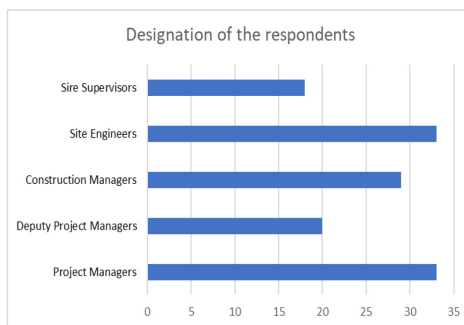
The respondents having experience more than five years in building sector projects were targeted for data collection because respondents experience plays a vital role in any research. 18% of the respondents were having experience between 6-10 years, 23% of the respondents with 11-15 years of experience, 26% of the respondents were having experience between 16-

20 years and 33% of the respondents were with experience of more than 20 years of building sector projects.

The Cronbach’s Alpha test was also performed for the above data set as a reliability analysis and the following Table 2 shows the results of Cronbach’s Alpha.



**Fig. 2.** Location of projects.



**Fig. 3.** Designation of respondents.

The result shows that the value of the Cronbach’s Alpha is 0.82 which shows that the obtained value is in acceptable limits. The value greater than 0.70 is said to be in acceptable limits [22]. As a result, the data is reliable, and further analysis can be performed.

**Table 2.** Reliability Statistics.

Cronbach's Alpha	N of Items
.822	40

After that, analysis of data was done on SPSS, the ranking of the top 15 factors with their respective score is shown in Table 3.

**Table 3.** Ranking of the factors affecting labour productivity.

Factors Affecting Labour productivity	Rank	Mean	Std. Deviation
Shortage of Material	1	4.012	1.170
Shortage of Equipment	2	3.975	1.065
Lack of supervision	3	3.939	1.220
Low wages given by employer	4	3.865	1.119
Old and inefficient equipment	5	3.853	1.031
Overtime	6	3.841	1.231
Delays in salary payments	7	3.731	1.186
Experience of workers	8	3.682	1.174
Reward mechanism	9	3.609	1.152
Reworks	10	3.390	1.224
Height of working place	11	3.365	1.232
Improper work planning	12	3.292	1.337
Age of worker	13	3.219	1.154
Intensity of lighting and ventilation	14	3.122	1.081
Weather conditions	15	3.073	1.141

The findings of this study show that, Shortage of material is ranked as the topmost factor affecting LP with a mean score of 4.01. Material availability plays a major role in the flow of tasks performed in any project. Shortage of material at a certain stage of work affects the productivity of the labour. This is consistent with the findings of [5]. Shortage of Equipment with a mean score of 3.97 was ranked second among all 40 factors. The findings highlight that equipment shortage severely affects the productivity of the labour which ultimately affects the project's success, hence, negatively affects the productivity of the labour. This is also significant with the findings of [6]. The factors including Lack of supervision, Low wages given by employer and old and inefficient equipment were ranked third, fourth and fifth respectively. Whereas the factors, Intensity of lighting and ventilation and Weather conditions with mean scores 3.12 and 3.07 respectively, were at last rank among those fifteen topmost critical factors affecting labour productivity.

## 4 Conclusion

It is concluded that there are various issues which need great attention by the construction industry stakeholders. It has been identified that due to lack of attention given by the contractors of C-6 category, labour productivity has been seriously affected by the identified factors. Due to financial instability and lack of management skill of the mentioned category, various problems are being faced by the labours which affect their productivity.

The identified topmost factors need great attention to overcome the labour productivity issues at construction projects. Contractors must make sure the availability of the material within the time limitations so that the work may not be interrupted due to material shortage at site. Sufficient equipment shall be provided at site so that labour shall avoid traditional methods including hand mixing which results in wasting time as well, carrying the material at certain height on their back which lowers the efficiency of the labour to work for whole working day, working without necessary safety equipment at heights which affects their productivity due to fear of falling.

Lack of supervision is also a major problem which has been noticed at the projects handled by the mentioned contractor category. Proper supervision helps to enhance the productivity of the labour. Labour on the other hand, being key resource of project, are given less attention. The factors such as low wages given by employer, delays in salary payments, lack of reward mechanism and overtime, demotivate the labour, makes them dissatisfied from job and affect their productivity to great extent. This is of great importance that contractors should keep these basic needs required by any labour, so that labour shall be motivated and feel satisfied with the job. This will help to enhance the productivity of the labours. The study suggest that contractor should provide basic amenities at site for the labours. It is further suggested that the government should ensure that the minimum wages are given by employers to their employees or not.

Finally, it is expected that the findings of this study will offer the researchers and the stakeholders involved in the construction industry a helpful insight to focus on the key factors affecting labour productivity in the building sector.

## 5 Future Recommendations

- Due to time limitations, the study was limited to building sector projects of C-6 contractor category only, further studies may conduct the research for other categories as per Pakistan Engineering Council (PEC).

- Further studies can be carried out on each individual factor's effect on labour productivity including job satisfaction, training and improving skills, motivation, reward mechanism or monetary benefits.
- It is further recommended that more in-depth research may be conducted at the province level covering all the districts.

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## References

1. M. Hamza, S. Shahid, M. R. Bin Hainin, and M. S. Nashwan, *Construction labour productivity: review of factors identified*, International Journal of Construction Management, vol. 22, no. 3, pp. 413–425 (2019) doi: 10.1080/15623599.2019.1627503.
2. G. (Tantekin) Çelik and E. (Laptalı) Oral, *Mediating effect of job satisfaction on the organizational commitment of civil engineers and architects*, International Journal of Construction Management, vol. 0, no. 0, pp. 1–17 (2019) doi: 10.1080/15623599.2019.1602578.
3. M. H. Momade, S. Shahid, M. R. bin Hainin, M. S. Nashwan, and A. Tahir Umar, *Modelling labour productivity using SVM and RF: a comparative study on classifiers performance*, International Journal of Construction Management, vol. 22, no. 10, pp. 1924–1934 (2022) doi: 10.1080/15623599.2020.1744799.
4. I. Pancasila, S. Haryono, and B. A. Sulistyono, *Effects of work motivation and leadership toward work satisfaction and employee performance: Evidence from Indonesia*, Journal of Asian Finance, Economics and Business, vol. 7, no. 6, pp. 387–397, Jun. (2020) doi: 10.13106/jafeb.2020.vol7.no6.387.
5. D. Karthik and C. B. Kameswara Rao, *Identifying the significant factors affecting the masonry labour productivity in building construction projects in India*, International Journal of Construction Management, vol. 22, no. 3, pp. 464–472 (2022) doi: 10.1080/15623599.2019.1631978.
6. F. Nasirzadeh, M. Rostamnezhad, D. G. Carmichael, A. Khosravi, and B. Aisbett, *Labour productivity in Australian building construction projects: a roadmap for improvement*, International Journal of Construction Management (2020) doi: 10.1080/15623599.2020.1765286.
7. W. Alaghbari, A. A. Al-Sakkaf, and B. Sultan, *Factors affecting construction labour productivity in Yemen*, International Journal of Construction Management, vol. 19, no. 1, pp. 79–91, Jan. (2019) doi: 10.1080/15623599.2017.1382091.
8. I. A. Rahman, A. Hameed Memon, A. Qadir Memon, A. Shaikh, and F. Siddiqui, *Factors Affecting the Labour Productivity in Construction Projects of Pakistan*, (2019) doi: 10.1051/mateconf/2019.
9. N. Van Tam, N. Quoc Toan, D. Tuan Hai, and N. Le Dinh Quy, *Critical factors affecting construction labor productivity: A comparison between perceptions of project managers and contractors*, Cogent Business and Management, vol. 8, no. 1, (2021) doi: 10.1080/23311975.2020.1863303.

10. R. A. Ugulu, A. Arewa, and S. Allen, *Project-specific constraints influencing productivity of tradespeople in the Nigerian construction industry*, Built Environment Project and Asset Management, vol. 10, no. 1, pp. 94–109, Feb. (2020) doi: 10.1108/BEPAM-10-2018-0124.
11. S. S. Murari and A. M. Joshi, *Factors affecting labour productivity in precast construction industry*, in Proceedings of fourth national conference on road and infrastructure, (2019) pp. 163–169.
12. D. Tuan Hai and N. Van Tam, *Analysis of Affected Factors on Construction Productivity in Vietnam*, International Journal of Civil Engineering and Technology (IJCIET), vol. 10, no. 2, pp. 854–864, (2019) [Online]. Available: <http://www.iaeme.com/IJCIET/index.asp854http://www.iaeme.com/ijciet/issues.asp?JType=IJCIET&VType=10&IType=2http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=10&IType=2http://www.iaeme.com/IJCIET/index.asp855>
13. M. Parchami Jalal and S. Shoar, *A hybrid framework to model factors affecting construction labour productivity: Case study of Iran*, Journal of Financial Management of Property and Construction, vol. 24, no. 3, pp. 630–654, Oct. (2019), doi: 10.1108/JFMPC-10-2018-0061.
14. S. Palikhe, S. Kim, and J. J. Kim, *Critical Success Factors and Dynamic Modeling of Construction Labour Productivity*, International Journal of Civil Engineering, vol. 17, no. 3, pp. 427–442, Mar. (2019) doi: 10.1007/s40999-018-0282-3.
15. A. T. Gurmu, *Identifying and prioritizing safety practices affecting construction labour productivity: An empirical study*, International Journal of Productivity and Performance Management, vol. 68, no. 8, pp. 1457–1474, Oct. (2019) doi: 10.1108/IJPPM-10-2018-0349.
16. S. Durdyev, S. Ismail, and N. Kandymov, *Structural Equation Model of the Factors Affecting Construction Labor Productivity*, J Constr Eng Manag, vol. 144, no. 4, Apr. (2018), doi: 10.1061/(asce)co.1943-7862.0001452.
17. S. Durdyev and J. Mbachu, *Key constraints to labour productivity in residential building projects: evidence from Cambodia*, International Journal of Construction Management, vol. 18, no. 5, pp. 385–393, Sep. (2018) doi: 10.1080/15623599.2017.1326301.
18. K. Golchin Rad and S. Y. Kim, *Factors Affecting Construction Labor Productivity: Iran Case Study*, Iranian Journal of Science and Technology - Transactions of Civil Engineering, vol. 42, no. 2, pp. 165–180, Jun. (2018) doi: 10.1007/s40996-018-0095-2.
19. S. Chaturvedi, J. J. Thakkar, and R. Shankar, *Labor productivity in the construction industry: An evaluation framework for causal relationships*, Benchmarking, vol. 25, no. 1, pp. 334–356, (2018) doi: 10.1108/BIJ-11-2016-0171.
20. N. Van Tam, N. L. Huong, and N. B. Ngoc, *Factors affecting labour productivity of construction worker on construction site: A case of Hanoi*, Journal of Science and Technology in Civil Engineering (STCE) - NUCE, vol. 12, no. 5, pp. 127–138, Aug. (2018) doi: 10.31814/stce.nuce2018-12(5)-13.
21. N. I. Rahmat, *Sucess Factors for Bumiputra Contractors in Malaysia: Johor State*, no. August, pp. 1–99 (2016).
22. Mohsen Tavakol and Reg Dennick, *Making sense of Cronbach's alpha*, Int J Med Educ, vol. 2, pp. 53–55, (2011).
23. J. Shin, S. Heo, H. K. Lee, R. Tyler, and I. K. Jin, *Reliability and validity of a Korean version of the tinnitus primary function questionnaire*, Am J Audiol, vol. 28, no. 2, pp. 362–368, (2019) doi: 10.1044/2018\_AJA-18-0131.