Factors Affecting the Labour Productivity in Construction Projects of Pakistan

Ismail Abdul Rahman¹, Aftab Hameed Memon^{2,}, Abdul Qadir Memon², Mutahar Ali Shaikh² and Fida Siddiqui³*

¹University Tun Hussein Onn Malaysia, Malaysia

²Quaid-e-Awam University of Engineering, Science & Technology Nawabshah, Pakistan

³Mehran University of Engineering & Technology Jamshoro, Pakistan

Abstract. Construction projects are considered crucial in every developed and developing country from the perspective of economic and social development. Thus, it is mandatory to achieve successful completion of the project. Efficient production is one of the significant criteria in ensuring the success of projects. An efficient production, labour productivity is considered an important aspect. Labour productivity is affected by several factors which are essential to study for productivity improvements. Since in Pakistan, labour productivity is one of the least studied areas within the construction industry. Hence, this paper focused on determining the common factors which have influenced the labour productivity. A survey among the construction practitioners included 33 identified factors from literature. A total of 150 questionnaire forms were distributed, and only 54 completed data forms were received back. These forms were used to analyse statistically using frequency analysis with SPSS software and weighted average (WA) calculation with Microsoft Excel application. The results indicated 1 factor as very often occurring, and other 32 factors were reported as often occurring during construction works while WA value for significance revealed that there are seven factors which have extremely significant while other 26 factors lie in the category of very significant. Those seven dominating factors reported as extremely significant are the misuse of schedule, the increase of labourer age, weather changes, tool and equipment shortages, violation of safety precautions, working seven days per week without taking a holiday and lack of financial motivation system.

1 Introduction

Construction projects considered as a core contributor to the national economy [1] which provides the necessary infrastructure and fulfils the fundamental need of shelter [2]. Sukumar and Kumar [3] argued that construction is a prime sector which consumes a major portion in the nation's total employment and also contributes to revenue generation of any country. It is reported that in developed countries, construction industry constitutes approximately 10% of the national income [4]. Besides that, it provides an employment rate of 7 % and 8 % in Europe and the USA, respectively [1 and 5]. Comparatively, in developing countries, the economic contribution of this industry is more imperative than developed countries [6]. Hence, it has made it compulsory to achieve successful completion of the projects. The success of the projects is dependent on several elements among which one of the important elements is labour [7]. Human resources are an uncontrollable and important part in any work [8] which affect significantly on the performance of any project [7]. In South Africa, labour productivity is remarked at the lowest level in for more than 40 years as cited by [2]. This unsatisfactory level of labour productivity is a result

of several reasons. Thus, this study is focusing on studying the occurrence and significance of those prevailing reasons. However, the scope of this study was limited to the construction works of Pakistan.

2 Literature Review

Productivity is measured concerning outcome achieved against per unit time. It is an established phenomenon that in construction works consumes a significant amount of labour resource. Hence, the performance of labour has a direct effect on the construction cost. Hence, productivity in construction is often measured regarding labour productivity. In construction projects, labour productivity is observed as a complex parameter and is difficult to quantify [7]. Unfortunately, in many countries, the productivity of labour has been declined with time. A serious declination of labour productivity has been observed in Zimbabwe while in Nigeria; labour productivity growth has been unsatisfactory [9]. Thus construction production lies largely on the performance of labour. Performance of labour involved in projects is affected by several factors. Several researchers have put efforts in identifying those factors. A comprehensive list of the factors identified from literature is shown in table 1 below:

* Corresponding author: aftabm78@hotmail.com

Table 1. Factors Affecting Labour Productivity

#	Identified factors	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[9]	[10]	[11]
1	Material shortages	1	1	1	1	1	1	1	1	1	1
2	Tool and equipment shortages	1	1	1	1	1	0	1	1	1	1
3	Weather changes	1	1	1	1	1	1	0	1	1	1
4	Lack of labour experience	0	1	1	1	1	1	0	1	1	1
5	Drawings and specifications alteration during execution	1	1	1	1	1	0	0	1	1	1
6	Rework / Repairs	1	1	1	1	1	0	0	1	1	1
7	Accidents	0	1	1	1	0	0	1	1	1	1
8	Misunderstanding between labour and superintendents	1	1	0	1	0	0	1	1	0	1
9	Payment delay	0	1	0	1	0	0	1	1	1	1
10	Labour disloyalty	1	0	0	1	0	1	0	1	1	1
11	Inspection delay	1	0	1	0	0	0	1	1	1	1
12	Working within a confined space	0	1	0	1	1	1	0	1	1	0
13	Lack of financial motivation system	1	0	0	1	1	0	0	1	1	1
14	Working overtime	0	1	0	1	0	0	1	1	1	1
15	Lack of labour supervision	0	0	0	1	0	0	1	1	1	1
16	Working 7 days per week without taking a holiday	0	1	1	0	0	0	0	1	1	1
17	Misuse of time schedule	1	0	1	0	0	0	1	1	1	0
18	Supervisors' absenteeism	1	1	1	0	0	0	0	1	0	1
19	Increase of labourer age	0	1	0	1	0	0	0	1	1	1
20	Construction method	0	1	0	1	0	0	1	1	1	0
21	Labour dissatisfaction	0	0	1	1	0	0	0	1	1	0
22	Low quality of raw materials	0	0	1	0	0	0	0	1	1	1
23	Violation of safety precautions	0	0	1	0	0	0	0	1	1	1
24	Interference	0	0	0	1	0	0	1	1	1	0
25	Lack of labour recognition programs	0	1	1	0	0	0	0	1	0	1
26	Unsuitability of materials storage location	0	0	0	0	0	0	1	1	0	1
27	Lack of competition	1	0	0	0	0	0	0	1	0	1
28	Insufficient lighting	0	0	0	1	0	0	0	1	1	0
29	Inefficiency of equipment	0	1	0	0	0	0	0	1	0	0
30	Misunderstanding among labour	1	0	0	0	0	0	0	1	0	0
31	Increasing number of labours	0	0	0	0	0	0	0	1	1	0
32	High quality of required work	0	0	0	0	0	0	0	1	0	0
33	Method of employment (using direct work system)	0	0	0	0	0	0	0	1	0	0

3 Methodology

The quantitative approach was adopted in this study to achieve the aim of the project, i.e. uncovering the underlying factors affecting labour productivity. With a total of 33 factors recognized from a review of previous works, a questionnaire was formed and distributed among the stakeholders involved in the construction industry. Questionnaire forms were sent to 150 randomly selected practitioners involved in handling construction works. The practitioners required

to mark each factor for Probability of occurrence according to the measurement scale as:

Not occur = scale 1 (0%)
 Slightly occur = scale 2 (1 – 25%)
 Moderately occur = scale 3 (25 – 50%)
 Often occur = scale 4 (50 – 75%)
 Very often occur = scale 5 (75 – 100%)

At the same time, each factor was also required to mark the level of significance to determine the importance of the factors with the measurement scale as:

* Corresponding author: aftabm78@hotmail.com

No significant= scale 1 (0%)
 Slightly significant= scale 2 (1 – 25%)
 Moderately significant= scale 3 (25 – 50%)
 Very significant= scale 4 (50 – 75%)
 Extremely significant= scale 5 (75 – 100%)

Data collected from this survey was analysed by using Average Weight (WA) to assess the level of probability of occurrence and level of severity for each factor. The same method has been adopted by many other researchers to analyse the data gathered from this questionnaire survey. Average Weight (WA) calculated using the following formula:

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

Where;

X1 = Number of respondents for scale 1
 X2 = Number of respondents for scale 2
 X3 = Number of respondents for scale 3
 X4 = Number of respondents for scale 4
 X5 = Number of respondents for scale 5

3 Data Analysis and Results

Data analysis is the process of gathering, elaborating, analysing and transforming the data into useful information. Then based on the properly analysed data, a good approach to conclusion and recommendations of the study can be decided. The main theme of this research is to identify the factors that affect labour productivity in construction. This chapter involves the results of the data obtained through a questionnaire survey.

3.1 Demographic Analysis

The demographic analysis involves all the possible detailed information about the respondent's type of organization, years of experience, concerned project cost, and respondents' qualification. Information presented in the form of charts or graphs. Figure 1 represents the type of organization of the respondents.

Fig. 1. Respondent's organization

Figure 1 shows 7 (12.96%) of 54 respondents' consultant, 25 (46.29%) are contractors, 18 (33.33%)

are clients and 4(7.40%) are others. Respondents work on different type of projects as summarized in figure 2.

Fig. 2. Types of the project handled by the respondent

Figure 2 shows 4 (7.4%) respondents work on commercial projects, 21 (38.9%) work on road projects, 1 (1.9%) work on road and social amenities, 1 (1.9%) of the respondents work on road and bridge projects, 7 (13%) work on residential projects, 10 (18.5%) respondents work on social amenities projects, 3 (5.6%) work on social amenities and bridges, 1 (1.9%) work on bridges, 6 (11.1%) work on other projects. These respondents are involved in different sizes of the projects concerning the cost of the project as given in figure 3.

Fig. 3. Size of the projects handled by the respondents

Figure 3 shows that 16 (29.6%) respondents are working on the projects of cost above 3000 million rupees, 5 (9.3%) are working on 1800 M-3000 M rupees cost project, 6 (11.1%) are working at projects of cost 800 M-1800 M rupees, 10 (18.5%) are working at cost of 150 M-180 M rupees, 9(16.7%) are working at 50 M – 150 M rupees cost of project, 6 (11.1%) are working at 20 M – 50 M and 2(3.7%) are working less than 20 M out of 54 respondents. The respondents participating in the data collection process are qualified

and have attained a different level of education as summarized in figure 4 below.

Fig. 4. Respondent's qualification

Fig 4 represents that 18 (33.3%) respondents are diploma holders, 29 (53.7%) are B.E holder s, 3(5.6%) are Master's holder, 4 (7.4%) are others.

3.2 Occurrence level of factors of labour productivity

Occurrence level of factors was analysed statistically with Weighted Average (WA) formula. WA value range 0 to 100 and the heightened value shows that the occurrence level is very high. The factors were ranked accordingly, and the results tabulated as in table 2.

Table 2. Occurrence level of the factors

#	Factors	WA	level
1	Violation of safety precautions	80.09	VOO
2	Weather changes	75.00	OO
3	Payment delay	73.14	OO
4	Working 7 days per week without taking a holiday	73.14	OO
5	Misuse of time schedule	72.68	OO
6	Increase of labourer age	71.29	OO
7	Insufficient lighting	70.83	OO
8	Tool and equipment shortages	68.98	OO
9	Lack of financial motivation system	68.98	OO
10	Misunderstanding between labour and superintendents	68.05	OO
11	Rework / Repairs	67.59	OO
12	Working overtime	67.12	OO
13	Accidents	66.66	OO
14	Lack of labour experience	66.20	OO
15	Drawings and specifications alteration during execution	66.20	OO
16	Inspection delay	65.74	OO
17	Low quality of raw materials	65.74	OO
18	Labour disloyalty	64.35	OO
19	High quality of required work	64.35	OO
20	Increasing number of labours	64.35	OO

21	Construction method	64.35	OO
22	Inefficiency of equipment	63.88	OO
23	Interference	62.96	OO
24	Labour dissatisfaction	62.50	OO
25	Method of employment (using direct work system)	62.50	OO
26	Misunderstanding among labour	62.03	OO
27	Lack of competition	62.03	OO
28	Lack of labour recognition programs	61.11	OO
29	Working within a confined space	60.64	OO
30	Unsuitability of materials storage location	60.64	OO
31	Supervisors' absenteeism	59.72	OO
32	Material shortages	59.25	OO
33	Lack of labour supervision	56.94	OO

The above table shows that the WA value of probability of occurrence of productivity factors occur in the range of 56 to 80 out of 1 to 5 which express that there is only 1 factor in the category of "Very often occur (VOO)", all other 32 factors fall in the group of "Often occur (OO)"

3.3 Severity level of Factors

The level of severity for each factor was also assessed using WA value, and the results presented in table 3 below.

Table 3. Severity level of the factors

#	Factors	WA	level
1	Misuse of time schedule	79.62	ES
2	Increase of labourer age	77.77	ES
3	Weather changes	77.31	ES
4	Tool and equipment shortages	76.38	ES
5	Violation of safety precautions	76.38	ES
6	Working 7 days per week without taking a holiday	75.92	ES
7	Lack of financial motivation system	75.46	ES
8	Accidents	73.14	VS
9	Insufficient lighting	73.14	VS
10	Inspection delay	72.68	VS
11	Labour dissatisfaction	72.68	VS
12	Labour disloyalty	72.22	VS
13	High quality of required work	72.22	VS
14	Construction method	72.22	VS
15	Lack of labour experience	71.75	VS
16	Rework / Repairs	71.29	VS
17	Unsuitability of materials storage location	70.83	VS
18	Interference	69.90	VS
19	Working overtime	68.05	VS

20	Payment delay	67.59	VS
21	Misunderstanding between labour and superintendents	67.12	VS
22	Lack of labour recognition programs	67.12	VS
23	Lack of labour supervision	66.66	VS
24	Lack of competition	66.66	VS
25	Material shortages	65.27	VS
26	Drawings and specifications alteration during execution	65.27	VS
27	Inefficiency of equipment	65.27	VS
28	Working within a confined space	65.27	VS
29	Supervisors' absenteeism	64.35	VS
30	Method of employment (using direct work system)	64.35	VS
31	Misunderstanding among labour	63.88	VS
32	Increasing number of labours	60.18	VS
33	Low quality of raw materials	56.48	VS

Table 2 showed it is clear that based on WA value of the factors, 7 of 33 factors marked as "Extremely significant (ES)" while other 26 factors marked as "Very significant (VS)" factors.

4 Conclusion

This study was carried out quantitatively aiming to uncover the factors of labour productivity in construction projects of Pakistan. It involved survey with a questionnaire consisting of 33 factors in getting the perception of the stakeholders regarding occurrence and severity level of the factors with a 5-point measurement scale. Gathered 54 questionnaire forms were analysed with frequency analysis and weighted average (WA). The results indicated 1 factor as very often occurring and other 32 factors while from perspective of severity level 7 factors reported as extremely significant are extremely significant are misuse of time schedule, increase of labourer age, weather changes, tool and equipment shortages, violation of safety precautions, working 7 days per week without taking a holiday and lack of financial motivation system

The researchers are very much thankful to Universiti Tun Hussein Onn Malaysia for supporting this research work primarily regarding financial support to meet the registration fees of the conference.

References

1. A. Soekiman, K.S. Pribadi, B.W. Soemardi, R.D. Wirahadikusumah. Factors Relating to Labor Productivity Affecting the Project Schedule Performance in Indonesia. *Procedia Engineering* **14** (2011) 865–873
2. B. Chigara and T. Moyo. Factors Affecting Labor Productivity on Building Projects in Zimbabwe. *International Journal of Architecture, Engineering and Construction* **3**, **1** (2014) 57-65
3. D. Sukumar and V.R. Kumar. A Study of Various Factors Affecting Labour Productivity and Methods to Improve It. *International Journal of Scientific & Engineering Research* **7**, **4** (2016)
4. H.M. Alinaitwe, J.A. Mwakali and B. Hansson. Factors affecting the productivity of building craftsmen - studies of Uganda, *Journal of Civil Engineering and Management* **13**, **3** (2007) 169-176
5. M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A.A.A. Ali. Factors affecting construction labour productivity for Malaysian residential projects. *Structural Survey* **23**, **1** (2005) 42-54
6. N.Z. Muhammad, A. Sani, A. Muhammad, S. Balubaid, E.E. Ituma, and J.H. Suleiman. Evaluation of factors affecting labour productivity in construction industry: a case study. *Jurnal Teknologi* **77**, **12** (2015) 87-91
7. B.G. Hicksona and L.A. Ellis. Factors affecting Construction Labour Productivity in Trinidad and Tobago. *The Journal of the Association of Professional Engineers of Trinidad and Tobago* **42**, **1** (2014) 4-11
8. A. Kazaz and S. Ulubeyli. Drivers of Productivity Among Construction Workers: A Study in a Developing Country, *Building and Environment* **42**, **5** (2007) 2132–2140.
9. A. Enshassi, S. Mohamed, Z.A. Mustafa, and P.E. Mayer. Factors affecting labour productivity in building projects in the Gaza strip, *Journal of Civil Engineering and Management*, **13**, **4** (2007) 245-254
10. B. H. Shah. Factors Affecting Construction Labor Productivity on Building Projects in Pakistan. Master thesis, National University of Sciences & Technology
11. T.G.S.R. Gopal and K. Murali. Analysis of factors affecting labour productivity in construction. *International Journal of Recent Scientific Research* **7**, **6** (2016) 1744-11747