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Limitations in Current Construction Practices of Public Sector Building Projects in Sindh

[1]*Jazib Bashir Shaikh, [2]Dr. Nafees Ahmed Memon, [3]Anees Ahmed Vighio, [4]Aftab Hameed Memon, [5]Zubair Ahmed

[1,2,3,5]Department of Civil Engineering, Mehran University of Engineering & Technology, Jamshoro, Sindh 76020, Pakistan
[4]Department of Civil Engineering, Quaid-e-Awam University of Engineering & Technology, Nawabshah, Sindh 67480, Pakistan
*Corresponding Author E-mail: jaybeeshk@gmail.com

Abstract **- Undivided attention is being driven by construction productivity in today's era. The main and the foremost concern of any organization is its construction productivity. The discovery of factors impacting construction productivity has been the subject of much research. For a very long time, research has sought to identify the key elements influencing building productivity in various nations. Continuous work in this approach has led academics to identify a wide range of factors. While the subject of this paper is however has been limited to Sindh province of Pakistan only. The construction industry of Pakistan is swelling with each passing day thus construction productivity is of the major concern. This paper aims at exposing the key weakness in current construction practices being employed in various building projects of Sindh. For this purpose, 135 questionnaires, after a rich literature survey, were distributed among the industry experts and the obtained results were analyzed and then ranked in Statistical Packages for Social Sciences (SPSS). It was revealed through the results that 10 factors chiefly influence the construction productivity which are shortage of unskilled labor, payment delay, less salary, insufficient modern tools, delay in delivery of material at site, material shortage and quality, labor absenteeism, equipment breakdown, experience of contractor and construction technology. At the end of the study, it is recommended that a framework maybe developed based upon the factors given above to improve the construction productivity of the building projects of Sindh.**

Keywords: Construction productivity, Construction Industry, Pakistan, Weaknesses, Public Sector.

I. INTRODUCTION

The construction of buildings employs a sizable section of the labor force. Therefore, the profitability of the majority of building construction projects depends significantly on construction productivity. Following the devastating earthquake in 2005 and the flood in 2010, the construction industry in Pakistan saw significant development; its GDP share climbed from 1.69% in 2003-2004 to 2.38% in 2012-2013[1]. Reconstruction in impacted regions and rising housing demand among people are the main forces for the strengthening of building. Building construction is the industry's pioneer sector and has had rapid expansion over the past few decades, contributing significantly to socioeconomic development. Numerous opportunities for both skilled and unskilled labor have been created in Pakistan as a result of the country's growing need for construction workers[2].

In the literature, productivity is defined in a variety of ways. It is frequently referred to as the output to input ratio. Performance ratios are typically calculated in the construction industry by dividing actual productivity by baseline/expected productivity, where baseline/expected productivity can be calculated by figuring out the work hours and quantities installed on days when no changes or rework, disruptions, or bad weather were reported[3][4].

In order to enhance the safety and social circumstances of construction labor, improving LP, theories involving employees have discovered several metrics on physical efficiency, such as heart rate, relative heart rate, and calorie count. However, there isn't a strong focus on LP assessment utilising human performance-related indicators. [5]

Due to the environment's dynamic character, businesses are currently confronting several difficulties. Researchers disagree about whether "workplace stress" is a result of experiences at work or other outside causes, though. It is well acknowledged that employees who are under stress will perform worse at work regardless of the cause. [6]

One of Pakistan's leading businesses, "the building industry," which significantly contributes to the country's economy and GDP development, depends heavily on laborers. Every part of a project must be taken care of in a construction sector like Pakistan's since any construction project must be finished while taking a few factors into consideration, such as cost, quality, and time. One of the key elements influencing project outcome is construction productivity.[7]

In the local construction industries of Pakistan, issues are created by workers related to their punctuality, wages, and

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salaries, less or complete unavailability of required facilities etc, hindering the smooth progress of work causing hindrances in the progress of work and ultimately the productivity. With the help of questionnaires and interviews, several other factors can be found that effect the construction productivity of Public Sector Building Projects of Sindh, which will be conducted from diverse range of people in public sector building projects of Sindh. For this approach, Interviews were conducted from Construction Industry experts of Sindh and then the questionnaire survey was conducted. Interviews from experts were also the part of research.

II. LITERATURE REVIEW

The construction sector has various workforce-related difficulties, but one of the most significant is low construction productivity, which is drawing increasing attention. [8]One important factor in guaranteeing the success of projects is efficient manufacturing. Workforce productivity is regarded as a key factor in efficient manufacturing. Numerous elements that impact construction productivity must be studied in order to increase productivity. [9]Pakistan, a growing nation, is now witnessing expansion in its construction sector while also encountering issues with project costs, timelines, quality, and productivity.[10]

The top five factors that have a negative impact on the construction industry in Pakistan are inadequate supplies of materials and equipment on the job site, improper subcontractor selection, improper work distribution, failing to assign the right work to the right person, and labor expertise levels. [11] To identify and rank "factors impacting worker productivity" in Pakistani construction projects, another research study was conducted. According to the analysis, there are five important factors that have a negative impact on construction productivity: a lack of laborer experience, low pay, working seven days a week without a break, changing project plans and specifications while it is being carried out, and poor relations between workers and supervisors. [12] Research in 2021 concentrated on the elements impacting construction productivity in Pakistani road building projects. The analysis reveals that out of thirty (30) factors, the most crucial five (5) factors that affect construction productivity on road construction are an unskilled workforce, payment delays to workers, a lack of tools and equipment, poor communication between supervisors and workers, and financial difficulties for the owner/contractor. [13] A research was undertaken by Muhammad Irfan, a Pakistani student in 2020, in an effort to identify and rank the elements influencing worker productivity in Pakistan's construction sector. The lack of skilled labor, the owner's delayed payment to the contractor, the unrealistic scheduling and performance expectations of the workforce, the clarity of the technical requirements, and the delayed payment of wages to the workforce are identified as the most important factors affecting construction productivity. In all ranking methodologies, a skilled labor shortage continued to be the highest. [14] In this essay, the main goal was to identify the common elements that have affected construction productivity. The misuse of the schedule, the ageing of the workforce, weather changes, tool and equipment shortages, disregard for safety precautions, working seven days a week without a break, and a lack of a financial incentive system are the seven dominant factors identified as being of extremely significant importance. [9]In 2019, Ahsen Maqsoom conducted a research with the goal of analysing the economics, national environment, work environment-related psychological issues, and infrastructure that impact construction productivity in Pakistan.

It is acknowledged that poor pay, delayed payments, job instability, political upheaval, policy shifts, and employees in excellent health all affect construction productivity. [15]

Another study conducted in Pakistan examined the elements impacting construction productivity connected to workforce diversity, including motivation, technical skills, psychosocial abilities, and income. Among the workforce diversity elements impacting construction productivity, motivation and technical skill components were shown to be the most important ones. The importance of financial incentives, career development, job-specific technical abilities, a positive work environment, and effective teamwork among team members was also noted. [16] In a different research, the several causative elements that affect the productivity of technical staff in the construction sector will be identified and ranked. According to the study, the top nine factors affecting the productivity of technical personnel are management, external and owner-related, motivational, financial, working condition, welfare and comfort, lack of resources, personal, and workload factors. Management factors account for 47% of the factors affecting technical personnel's productivity. Following the management factors, working environments, human factors, and external factors are the most crucial factor groupings. [17]

In continuation to the studies mentioned above, the comprehensive work on strategies to improve construction productivity is lacking in Pakistan specially Sindh. In order to implement and increase construction productivity, it is very much necessary to study and evaluate the factors that influence the construction productivity and consequently, take measures for improving the said productivity. Hence, this drew the attention of the researchers to study the system and issues related to poor construction productivity in Pakistani construction industries. However, the focus of this paper is the public sector building projects in the province of Sindh.

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However, assessments of the factors influencing construction productivity in the construction industry have been conducted over the past ten years throughout the world. However, there is no proper documentation of construction productivity in Pakistan, so much more work needs to be done in order to identify the real factors that are more specific to our own construction environment. This study is, therefore, another step to put forth the strategies that can really be helpful in improving the productivity of labor involved in construction industry of Sindh, Pakistan.

III. RESEARCH METHODOLOGY

3.1 Data Collection and Methodology

Following the approach by authors in [08] for factors affecting construction productivity, a multi-step methodology will be adopted, as shown in Figure 1. In the initial phase, journal articles, conference proceedings, books, and reports to be attained from various scientific databases. Obtained documents will then be scanned for most influential factors in affecting construction productivity and drawbacks of poor construction productivity. After the literature mapping of all these, unstructured interviews will be conducted with the industry experts to verify their relativeness with Sindh's CI. In the next phase, factors will be assembled in a questionnaire format, consisting of factors affecting construction productivity. The perceptions of construction sector practitioners will be acquired through the questionnaire. They will be asked to rank the factors on a five-point Likert scale ranging from strongly disagree to strongly agree. Then Data Analysis will be performed using SPSS version 24 to obtain the top-most significant factors. Total 135 questionnaires were distributed among targeted respondents and 118 were considered valid for analysis. Questionnaire focused on uncovering the factors affecting construction productivity of Public Sector Building Projects of Sindh. Respondents were asked to give feedback for each reason listed in the questionnaire used the scale as X_1 = Strongly Disagree; X_2 = Disagree; X_3 = Neutral; X_4 = Agree; X_5 = Strongly Agree. Assessment of level of significance were done using on AI (Average Index) method calculated based on frequency calculated with the help of statistical software SPSS. AI value was calculated based on following formula as adopted from [16].

$$AI = \frac{\sum\left(1X_1 + 2X_2 + 3X_3 + 4X_4 + 5X_5\right)}{\sum\left(X_1 + X_2 + X_3 + X_4 + X_5\right)} \qquad \text{(eq. 1)}$$

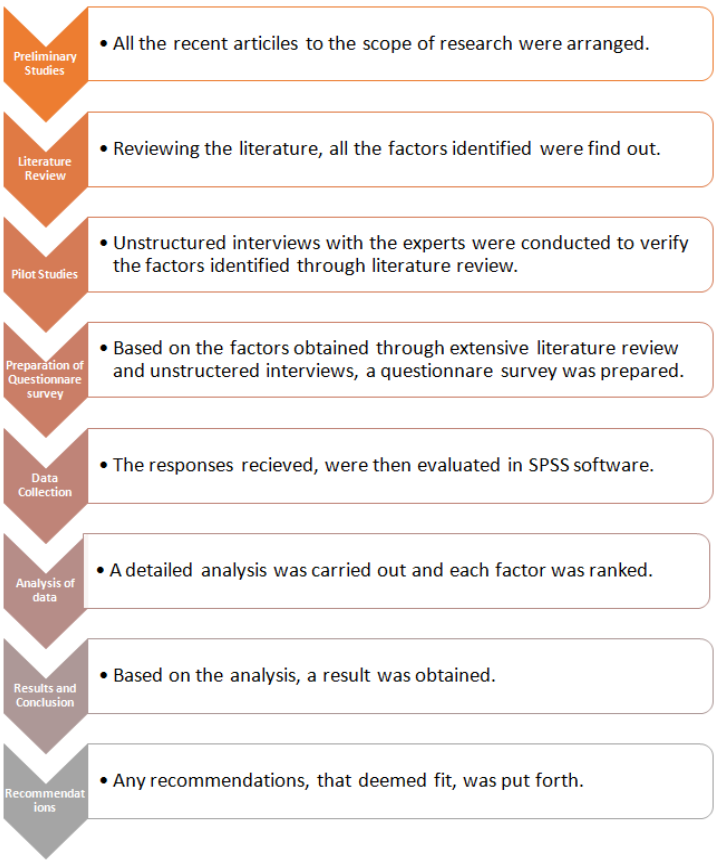

Figure 1: Research Methodology

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IV. RESULTS AND DISCUSSION

4.1 Literature Review and Mapping

After a detailed literature review, 28 factors affecting construction productivity of Public Sector Building Projects of Sindh in general were put up. Then, unstructured interviews were conducted with Construction Industry Experts, having working experience of more than 10 years. Table 4.1showed the result of unstructured interview, total 28 factors of construction productivity were brought down, out of which 21 factors that effected the construction productivity in public sector building projects of Sindh were analyzed:

Table 4.1: Unstructured Interviews

Sr. No.	Factors Affecting Construction Productivity	Yes	No
1.	Shortage Of Skilled Labor	**13**	-
2.	Payment Delay by Owner to Contractor / Delay in Wages Payment to Labors	**12**	1
3.	Unrealistic Scheduling & Expectation of Labor Performance / Inadequate Planning & Scheduling	**8**	5
4.	Motivation Of Labors / Incentive Scheme	**8**	5
5.	Lack Of Suitable Rest Area at Site	4	9
6.	Labor Strike / Labor Absenteeism	**11**	2
7.	Weather / Natural Disasters	**13**	-
8.	Health	6	7
9.	Communication Problem	**9**	4
10.	Delay In the Delivery of Material at Site	**13**	-
11.	Equipment Breakdown, Process Break Down	**12**	1
12.	Shortage Of Material / Poor Quality of Materials	**12**	1
13.	Poor Site Management	6	7
14.	Poor financial control on site/Financial Status of Owner	**9**	4
15.	Lack Of Experience/Training of Contractor	**12**	1
16.	Frequent Changes in Design/Drawing/Rework	7	6
17.	Mode Of Financing, Bonds and Payments	7	6
18.	Mistakes And Errors in Design/Drawing	**12**	1
19.	Complicated Design/Clarity of Technical Specs	**8**	5
20.	Incompetency / Involvement of Subcontractors	**10**	3
21.	Incomplete Design/Drawing	**12**	1
22.	Accidents on Site / Site Safety	**11**	2
23.	Insufficient Numbers of Modern Equipment/Tools	**10**	3
24.	Supervision	6	7
25.	Construction Tech.& Methods / Procurement Methods	**11**	2
26.	Less Salary / Job Security	**8**	5
27.	Working Overtime	**10**	3
28.	Unsuitability of Storage Location	6	7

The above mentioned 21 factors were then set up in a questionnaire, which contained 2 parts. The first part of the questionnaire contained the introductory questions about the responder; however, the second part of the questionnaire contained the above mentioned 21 factors that effected the construction productivity in public sector building projects of Sindh, ranked on a Likert's scale from 1-5,

Where:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

135 questionnaires in total were distributed among industry experts, out of which 118 were returned and were found valid for analysis. The results obtained were then analyzed in SPSS software, which yielded following results:

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Table 4.2: SPSS Results

Descriptive Statistics					
S. No.	**Factors**	**N**	**Mean**	**S.D**	**Rank**
1.	Shortage Of Skilled Labor	118	4.2458	.76165	**1st**
2.	Payment Delay by Owner to Contractor / Delay in Wages Payment to Labors	118	3.9153	.83283	**2nd**
3.	Less Salary / Job Security	118	3.7458	1.07962	**3rd**
4.	Insufficient Numbers of Modern Equipment/Tools	118	3.6864	1.17451	**4th**
5.	Delay In the Delivery of Material at Site	118	3.6271	1.04429	**5th**
6.	Shortage Of Material / Poor Quality of Materials	118	3.6017	1.26180	**6th**
7.	Labor Strike / Labor Absenteeism	118	3.5763	1.14285	**7th**
8.	Equipment Breakdown, Process Break Down	118	3.5508	1.19541	**8th**
9.	Lack Of Experience/Training of Contractor	118	3.5424	1.35649	**9th**
10.	Construction Tech.& Methods / Procurement Methods	118	3.5169	1.25223	**10th**
11.	Working Overtime	118	3.4237	1.20119	--
12.	Weather / Natural Disasters	118	3.3644	1.07549	--
13.	Unrealistic Scheduling & Expectation of Labor Performance / Inadequate Planning & Scheduling	118	3.3305	1.19868	--
14.	Motivation Of Labors / Incentive Scheme	118	3.3220	1.23953	--
15.	Financial Status	118	3.3136	1.23135	--
16.	Complicated Design/Clarity of Technical Specs	118	3.2627	1.22250	--
17.	Incompetency / Involvement of Subcontractors	118	3.2288	1.27038	--
18.	Mistakes And Errors in Design/Drawing	118	3.2203	1.18492	--
19.	Accidents on Site / Site Safety	118	3.2034	1.29799	--
20.	Incomplete Design/Drawing	118	3.1271	1.20218	--
21.	Communication Problem	118	3.0763	1.21358	--

The first factor "Shortage of Skilled Labor" was supported by the authors [11] [12] [13] [14] [16]. The second factor "Payment Delay by Owner to Contractor / Delay in Wages Payment to Labors" was validated by [13] [14] [15] [16]. Less Salary / Job Security was favored by [12] [9] [15] [16]. The research carried out by [11] [13] [9] suggest that the "Insufficient Numbers of Modern Equipment/Tools" effect the construction productivity. Also, "Delay in the Delivery of Material at Site" affected the construction productivity as reviewed by [16] [9].

The fifth factor "Shortage of Material / Poor Quality of Materials" was supported by the authors [11] [12]. The seventh factor "Labor Strike / Labor Absenteeism" was validated by [12] [16]. Equipment Breakdown, Process Break Down was favored by [11] [9]. The research carried out by [12] [15] suggest that the "Lack of Experience/Training of Contractor" effect the construction productivity. The 10th ranked factor "Construction Tech. & Methods / Procurement Methods" affected the construction productivity as reviewed by [14] [16].

V. CONCLUSION

Being one of the most influenced countries of Asia, Pakistan is still lagging in the construction region. This study unfolded and investigated the various undiscovered areas of construction productivity by incorporating a vast literature review, followed by interviews and questionnaire surveys. The interviews were conducted from Construction industry experts having a vast experience of the said field. The study then reached to produce 10 major weaknesses in current construction practices of public sector building project in Sindh, which are: shortage of unskilled labor, payment delay, less salary, insufficient modern tools, delay in delivery of material at site, material shortage and quality, labor absenteeism, equipment breakdown, experience of contractor and construction technology.

The study through the results recommends that, there is an utter need of an efficient framework that could help in improving and overcoming the weaknesses in current construction practices of public sector building projects of Sindh. In this regard, the Construction industry experts need to put joint efforts. A framework, once developed, can chiefly help in the development and elevation of public sector building projects of Sindh, which in turn would help in country's improved GDP.

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