Factors Affecting Construction Labor Productivity of Admin Workers and Subcontractor Workers

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Abstract- ***Labor productivity in construction is a critical determinant of project success, impacting timelines, costs, and quality. This study examines the critical factors influencing construction labor productivity within the different construction organization in the Philippines. By analyzing perceptions of Project Managers, Project Engineers, and Contractors, the research identifies key productivity determinants and differences in viewpoints among these stakeholders. The findings aim to enhance project performance through targeted strategies for productivity improvement. The findings provide actionable insights for improving labor management strategies in construction projects, ultimately enhancing overall efficiency and project outcomes. Professionals working at different levels, including project managers, site engineers, architects, and others, were invited to take part in an online survey in order to accomplish this objective.***

Indexed Terms- Admin Workers, Contractors, Labor Productivity Subcontractor Workers

I. INTRODUCTION

The construction industry is a critical sector in both global and local economies, significantly impacting labor productivity, particularly among administrative and subcontractor workers. Internationally, various studies have highlighted the multifaceted factors influencing labor productivity in construction, including economic conditions, labor relations, and technological advancements. For instance, the interplay between structural changes in economies and labor productivity has been documented, indicating that shifts in employment sectors can lead to variations in productivity levels across different regions (Laurente, 2022).

Moreover, the global trend towards subcontracting has introduced complexities in managing labor productivity, as subcontractors often face distinct challenges compared to direct employees, including job insecurity and varying levels of supervision (Hamouda & Abu-Shaaban, 2015). In the context of the Philippines, the construction sector is particularly vital, contributing significantly to the nation's economic growth. Local studies have identified specific factors affecting labor productivity among construction workers, such as the impact of the COVID-19 pandemic, which has disrupted workflows and exacerbated existing challenges in labor management (Quezon & Ibanez, 2021; Quezon & Ibanez, 2021). Research indicates that health and safety concerns, alongside material shortages and workforce management issues, have severely hampered productivity during this period (Quezon & Ibanez, 2021).

The Philippine construction industry is characterized by a high reliance on subcontractors, who often encounter unique obstacles that can hinder their productivity, such as inadequate training and lack of incentives (Mahamid, 2020). Additionally, the socio-economic landscape in the Philippines, including the educational background of workers and the quality of training programs, plays a crucial role in shaping productivity outcomes. Studies have shown that the quality of education and vocational training directly correlates with the efficiency and effectiveness of

labor in construction projects (Valdez & García, 2017).

As the country continues to navigate the complexities of labor productivity, understanding these local and international dynamics becomes essential for developing strategies that enhance the performance of both administrative and subcontractor workers in the construction industry.

II. LITERATURE REVIEW

This review of related literature examines the factors influencing construction labor productivity, specifically focusing on the differences between regular administrative workers and subcontractor workers ("pakyawan") in the Philippine context. The review will explore various studies that have investigated the impact of factors such as worker skill, management practices, external conditions, and technological integration on construction labor productivity. It will also analyze how these factors have been studied within the Philippine construction industry, with a particular emphasis on the perspectives of project managers, project engineers, and contractors. The goal is to provide a comprehensive understanding of the current research landscape and identify key areas for further investigation.

A. Related Studies – Foreign

Construction Labor Productivity

The productivity of labor in the construction industry is a critical factor influencing project success and overall economic performance. Numerous studies have explored various dimensions of construction labor productivity, identifying key factors that contribute to or hinder efficiency among workers. This literature review synthesizes findings from several relevant studies to provide a comprehensive understanding of the factors affecting construction labor productivity.

One significant aspect influencing labor productivity is the skill level of workers. Luo et al. emphasize that skilled construction workers tend to receive better compensation, which in turn motivates them to perform at higher productivity levels Luo et al. (2019). This is particularly relevant in labor-intensive sectors where manual tasks can be easily automated or replaced by machinery.

The disparity in remuneration between skilled and unskilled labor highlights the importance of investing in workforce training and development to enhance productivity (Kim & Shin, 2012). Moreover, the presence of a skilled workforce is crucial, as it directly correlates with the efficiency and quality of work performed on-site (Silva et al., 2013). Management practices also play a pivotal role in shaping labor productivity. Khan and Ajmal argue that effective management strategies, including motivation and engagement of the labor force, are essential for improving productivity outcomes (Khan & Ajmal, 2015).

They highlight that motivated workers are more likely to contribute positively to project performance, emphasizing the need for management to foster a supportive work environment. This is echoed by Mahamid, who identifies managerial factors, such as communication and cooperation among construction parties, as critical determinants of productivity (Mahamid, 2013). The alignment of management practices with labor needs can lead to significant improvements in efficiency and project success. Another important factor is the impact of external conditions, including safety and health considerations. The construction industry is known for its hazardous working environments, which can adversely affect worker productivity (Hatoum et al., 2021). Silva et al. highlight the importance of establishing a positive safety climate on construction sites, noting that workers who feel safe are more likely to perform efficiently (Silva et al., 2013). Furthermore, the COVID-19 pandemic has introduced additional challenges, such as workforce shortages and the need for new safety protocols, which have further complicated productivity dynamics in the construction sector (Tan & Abdul-Samad, 2022; Nnaji et al., 2022). Additionally, the integration of technology into construction processes has been shown to enhance productivity.

Chen discusses how innovative practices, such as modular construction and the adoption of blockchain technology, can streamline operations and improve efficiency (Chen, 2023). The automation of planning

processes and the use of information modeling can also optimize labor resource allocation, leading to better productivity outcomes (Yurgaytis & Kamolov, 2021). As the construction industry continues to evolve, embracing technological advancements will be crucial for addressing longstanding productivity issues.

In conclusion, construction labor productivity is influenced by a multifaceted interplay of factors, including worker skill levels, management practices, safety conditions, and technological integration. Addressing these factors holistically can lead to significant improvements in productivity, ultimately enhancing project performance and the economic viability of the construction sector.

Factors Affecting Productivity

Research highlights several key factors affecting construction labor productivity. These include technical, managerial, and external factors, such as workforce competence, project planning and scheduling, site conditions, and communication among stakeholders (Thomas et al., 2013). Constraints such as lack of materials, unclear task instructions, and poor supervision are commonly cited productivity barriers (Alinaitwe et al., 2007). Similarly, socio-psychological aspects like worker morale and relationships among team members also play a role in productivity (Chan et al., 2004).

Stakeholder Perspectives on Productivity

The perceptions of project managers, project engineers, and contractors often differ due to their distinct roles and responsibilities. Project managers focus on macro-level factors like project scope, budget control, and stakeholder communication, while project engineers tend to concentrate on technical and design-specific challenges. Contractors, on the other hand, deal with labor allocation, subcontractor coordination, and on-site problem-solving (Tam et al., 2005). Studies have revealed discrepancies in stakeholder priorities, which can hinder collaborative decision-making and adversely affect productivity (Kazaz et al., 2008).

The Role of Comparative Studies

Comparative analyses of stakeholder perceptions provide insights into productivity issues by identifying gaps in understanding and communication. Such studies enable the development of targeted strategies for improving productivity, ensuring alignment between management and on-site execution (Abdulrahman et al., 2020). Exploring how project managers, project engineers, and contractors perceive productivity factors in a specific institutional setting, such as DPWH, will add to the body of knowledge and offer actionable recommendations for improving public construction projects.

Vaishant and Kansal (2014) based on relative importance index identified the top ten following factors affecting labor productivity in Chambal region, India were: (1) Classification in technical specification, (2) Labor supervision, (3) Method of construction, (4) Delay in payment, (5) Labor fatigue, (6) Lack of construction managers leadership, (7) Extents of variations/change order during execution, (8) Late arrival, early quit and frequent unscheduled break, (9) Labor skill and (10) Availability of experienced labors.

The following five factors were ranked as major impacts by Zakari et al. (1996) using the relative index ranking technique in a survey aimed at identifying the constraints on Iranian construction productivity: (1) Lack of proper tools and equipment; (2) Weather and site condition; (3) Equipment breakdown; (4) Drawing efficiency/change orders; and (5) Lack of material shortage.

Aynur Kazaz et al. (2008) also conducted a survey of 82 companies regarding the factors that influence labor productivity in Turkey. Based on the relative importance index method, they determined that the following nine factors are the most crucial to labor efficiency: (1) site management quality; (2) material management; (3) amount and payment; (4) planning; (5) supervision; (6) site layout; (7) work discipline; (8) occupational education and training; and (9) working at similar activities.

Soekiman et al (2011) investigated a number of factors influencing Indonesian labor productivity and identified the following as the most important factors include: Lack of supervision, delayed material arrival, unclear labor instructions, labor strikes, financial

issues, higher labor absenteeism, supervisors' absences, equipment lag, and design changes.

B. Related Studies – Local

In the Philippine construction industry, productivity challenges are often linked to issues like insufficient training programs, outdated equipment, and weak enforcement of labor policies (Sambare et al., 2021). Studies focusing on public works projects, such as those undertaken by the Department of Public Works and Highways (DPWH), indicate that government regulations, bureaucratic inefficiencies, and project delays significantly influence labor productivity (Florencio et al., 2019). Addressing these factors requires an integrated approach that considers the perspectives of all key stakeholders.

Grouping of Factors Affecting Labor Productivity

Herbsman and Ellis (1990) identified two major categories of influencing elements: (1) administrative and (2) technological.
Talhouni (1990) identified four categories as having an impact on building site productivity: (1) management; (2) site; (3) design; and (4) weather.
Enshassi et al (2007), conducted a survey and divided the 45 factors that affect labor productivity in building projects in Gaze Strip into ten main groups: (1) Manpower, (2) Leadership, (3) Motivational, (4) Time, (5) Material/Tools, (6) Supervision, (7) Project, (8) Safety, (9) Quality, and (10) External

Brent and Ellis (2014), divided productivity elements into four primary categories: management, labor and human resources, technology, and external influences. Based on the relative relevance index, the most important characteristics among the nearly 24 factors considered in management were the absence of labor monitoring, unrealistic Lack of leadership, communication, payment delays, and labor performance expectations and scheduling. Physical exhaustion, skill, motivation, and a lack of experienced workers are examples of human and labor variables. Twelve factors were included in the technological group and ranked on RII; the five most important factors were the degree of coordination among design disciplines, the clarity of the technical specification, the amount of variation or change order during execution, the rework, and the delay in responding to information requests. High temperatures and rain were classified as external variables.

Robles et al (2014), grouped a set of 35 factors to identify factors affecting labor productivity in Spain with respect to their relative importance. Factor explored were grouped in five different categories according to the nature of each factor namely, (1) Project, (2) Human, (3) Management, (4) Material and tools, (5) Environmental. Based on RII the five categories were ranked as: (1) Material and tools;(2) Management;(3) Human;(4) Project;(5) Environmental.

- Theoretical/Conceptual Framework

The first frame presents the input of the study, which includes the group of factors affecting labor productivity.

The second frame presents the process of the study, involving the assessment of the list of factors considered, gathering the profiles of the respondents, and analyzing the data.

The third frame presents the output of the study, which includes the top 10 Factors that need improvement to achieve the desired productivity and the action plan for each factor.

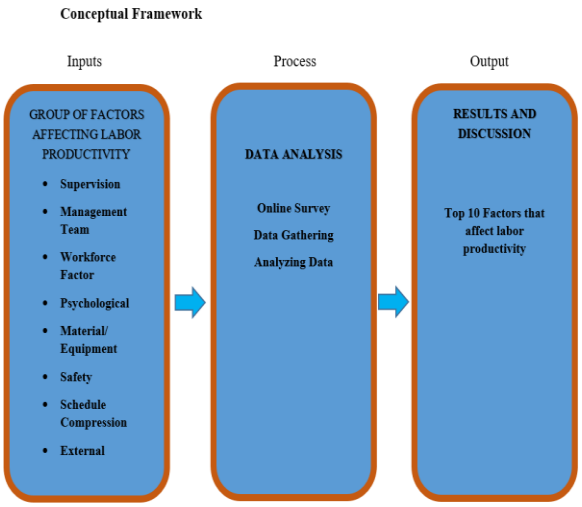


Figure 1 Conceptual Paradigm of productivity control

Figure 1 shows the conceptual model of the study on the "Factors Affecting the Construction Labor

Productivity of Admin Workers and Sub-Contractor Workers"

- Statement of the Problem

This study investigates the factors affecting construction labor productivity among administrative workers and subcontractor workers. Construction projects frequently experience delays and cost overruns, partly due to inefficiencies in labor productivity. Understanding the specific factors influencing productivity within these two distinct worker groups is crucial for improving project outcomes. This research will explore the following key areas:

1. How may the Demographic Profile of the respondents be described in terms of:

1.1 Position in Company
1.2 Experience

2. How may the project-related factor influencing productivity be described in terms of:

2.1 Project Size
2.2 Project Complexity

3. How may the productivity of a project be described in terms of: work environment and management practices, specifically focusing on:

3.1 work environment
3.2 management practices

4. Is there any relationship between compensation structures and productivity.

This study aims to identify the most significant factors influencing construction labor productivity among administrative and subcontractor workers, providing valuable insights for improving project management and enhancing overall efficiency within the construction industry.

- Scope and Delimitation

This study focuses on identifying and analyzing the factors that influence the productivity of administrative workers and subcontractor workers in the construction industry. The research seeks to understand these factors through the insights and perspectives of construction professionals. Specifically, it aims to explore productivity challenges and contributors as perceived by individuals who occupy key roles at both the management and operational levels within construction projects.

The scope of this study is limited to construction professionals directly involved in project execution and decision-making, including project managers, project engineers, construction managers, engineering managers, contractors, site engineers, and architects. These individuals are selected due to their critical involvement in planning, managing, and overseeing construction activities, which positions them as reliable sources of information regarding productivity trends and bottlenecks.

The study delimits itself to the assessment of factors affecting productivity within administrative and subcontractor workforces. It does not extend to other aspects of construction performance, such as equipment efficiency or material wastage, nor does it analyze productivity factors for other workforce categories like skilled laborers, foremen, or supervisors.

Geographically, the research focuses on projects within a specific region or area as determined by the researcher, and the findings may not be generalizable to all construction projects. Additionally, the study relies on self-reported data gathered through surveys and interviews, which are inherently subjective and may reflect the respondents' personal or organizational biases. Despite these limitations, the study aims to provide meaningful insights that can inform strategies to enhance labor productivity in similar construction settings.

- Significance of the Study

The construction industry plays a pivotal role in the economic growth of any nation, and labor productivity is one of its key determinants. This study aims to investigate the factors affecting the productivity of construction labor, with a specific focus on administrative workers and subcontractor workers. By comparing the perceptions of project managers, project engineers, and contractors, the research will uncover both common and divergent views on the challenges and opportunities impacting labor productivity in construction projects.

The findings from this study will be beneficial to a wide range of stakeholders. For project engineers and project managers, the research will provide valuable insights into how different labor forces—administrative and subcontractor—affect overall project performance. Understanding these factors can help them identify areas for improvement, make informed decisions, and manage teams more efficiently.

For contractors, the study will offer a better understanding of how workforce management, from administrative support to on-site subcontractors, influences project outcomes. This can lead to more effective strategies in labor allocation, training, and contract management, resulting in enhanced project delivery times and reduced costs.

The government, which often oversees the regulatory frameworks in the construction industry, will benefit from a clearer understanding of the key issues affecting construction labor productivity. This could help in formulating policies or programs aimed at boosting the sector's efficiency, reducing labor disputes, and improving overall working conditions.

Lastly, construction workers—both administrative and subcontractor workers—are direct beneficiaries of the findings. The study may highlight systemic issues that hinder their productivity or job satisfaction, prompting reforms that improve their work environment, training opportunities, and support systems. As the labor force becomes more efficient and content, it can lead to a more sustainable and robust construction industry.

In conclusion, this research will provide a comprehensive analysis of the factors influencing labor productivity from multiple perspectives, offering actionable recommendations for enhancing efficiency, reducing costs, and improving working conditions in the construction sector.

- Definition of Terms

Labor Productivity- According to Borcherding and Liou (1986), "productivity" refers to the relationship between inputs and outputs. Different industries have different inputs and outputs. Additionally, various parts of the same industry have varied definitions of productivity. One of the fundamental needs in the building sector is labor. According to Borcherding and Liou (1986), labor productivity typically links the amount of output generated to the cost of labor. Stated differently, labor productivity is defined as the quantity of goods and services produced in a given length of time by a productive factor (manpower) (Drewin, 1982).

Admin Workers- workers who are employed on a company, means paying that workers on a daily or weekly basis, depending on the agreement.

Subcontractors- An employee of a contractor is known as a subcontractor. An individual or organization that works with businesses under contract and receives payment for finishing projects is known as a contractor. Similar to contractors, subcontractors work for themselves and can assist contractors with tasks that call for extra assistance or knowledge. In the Philippines, "pakyawan" refers to those who are paid based on their accomplishments, regardless of how much time they put in, but they must complete tasks according to a program or timetable.

III. METHODS AND PROCEDURES

In order to perform the research, a combination of methods was used, including a literature review, a questionnaire survey, in-person interviews, and data analysis. A comprehensive assessment of the literature was conducted with the help of books, magazines, and articles, examining the current factors influencing labor productivity in relation to project success in the construction industry. An online survey was carried out among various construction professionals, such as contractors, project managers, project engineers, construction managers, engineering managers, site engineers, and architects, among others, who work on projects at all levels, from operational to management.

- Research Design

The researcher used the descriptive method in gathering data in determining the “Factors affecting the labor productivity of Admin Workers and Sub-Contractor workers”. Descriptive Method of Research was used by the researcher because this type of methods describes the nature of phenomenon under investigation after a survey of current trends, practices

and condition that relate to that phenomenon. Descriptive studies involve analysis of an extremely broad range of phenomena. The outcome was a thorough presentation and interpretation of statistical data derived from a survey. (Barrientos-Tan, 2006). Calderon (1993) asserts that descriptive research also addressed questions and draws interest in a particular phenomenon. Additionally, it explains and focuses on the nature and reasons for a phenomenon that was present at the time of the research.

- The Research Locale

The data gathering was conducted in the Municipality of Aliaga, Science City of Muñoz, Laur, Gabaldon, Lupao, Cabanatuan City, and the National Capital Region through online interviews via Zoom meetings and by sending questionnaires via email. The researcher selected these localities based on their own interest and the prevalence of issues concerning labor productivity between subcontractors and administrative workers in the construction industry.

- Samples and Sampling Procedure

The researcher employed purposive random sampling. Purposive sampling involves selecting a sample based on a specific purpose or objective. The researcher may wish to make particular point and chose sample with his purpose in mind. Through purposive sampling, the researchers got respondents from Aliaga, Science city of Muñoz, Laur, Gabaldon, Lupao, Cabanatuan City and National Capital Region.

- Respondents of the Study

The study's respondents are construction professionals, including contractors, project managers, project engineers, construction managers, engineering managers, site engineers, and architects, from Cabanatuan City and the National Capital Region. Random sampling, a critical process for the success of this study, was used to select all participants. This method ensures that every member of the population has an equal chance of being included in the sample.

Table 1 presents the total population, sample respondents and the percentage of the seven groups of respondents.

Table 1
Classification of Respondents

	N	n
Contractor	16	16
Project Engineer	21	21
Construction Manager	14	14
Project Manager	17	17
Engineering Manager	12	12
Site Engineer	20	20
Architect	8	8
Total	108	108

The table shows the classification of the respondents. As shown, there are 108 respondents: 16 are Contractors, 21 are Project Engineers, 14 are Construction Managers, 17 are Project Managers, 12 are Engineering Managers, 20 are Site Engineers, and 8 are Architects.

- Research Instrumentation

The research instrument used for data gathering is a questionnaire checklist sent online to respondents. It is the most appropriate tool for collecting data, as all the information the researchers want to know is already included, and the respondents provide answers based on the options given.

- Data Gathering Technique

The researcher sought the assistance of respondents to come up with analysis interpretation and conclusions of the study entitled “Factors affecting the Construction Labor Productivity of Admin Workers and Subcontractor Workers”. The researcher distributed questionnaires to the respondents, which contributed to generating insights on the topic under study. Additionally, personal interviews and observations were conducted in certain situations, particularly when some information appeared to be inaccurate.

- Data Analysis Technique

In order to facilitate the study, after a number of literature reviews and personal interviews with field professionals, a plan was formulated for collecting

field information and creating an evaluation process and numerical values. Relative Importance Index (R.I.I) method was utilized to analyze the survey results.

The researcher used the following statistical tools.

1. Relative Importance Index (RII): The RII method was employed to prioritize the criteria based on their relative significance, as the index value reflects the ranking of importance. This approach is particularly effective for analyzing questionnaires that utilize a Likert scale.

$$Relative\ Importance\ Index = \frac{\Sigma w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

In this method, w represents the weight assigned to each factor by the respondents, with values ranging from 1 to 5. For instance, n_1 corresponds to the number of respondents selecting Strongly Disagree, n_2 for Disagree, n_3 for Neutral, n_4 for Agree, and n_5 for Strongly Agree. Here, A denotes the maximum weight (5 in this study), and N signifies the total number of respondents. The Relative Importance Index is calculated on a scale from 0 to 1 (Tam and Le, 2006).

2. Frequency Distribution- is a table that organizes data into categories or class intervals, along with the corresponding frequencies for each class. The class frequency represents the number of observations that fall within a specific class interval or category. A class interval is defined by its lower and upper limits, marking the range of values within that group (Tan, 2006).

P% = F/N X 1OO
Where:
P= Percentage
F= Frequency of distribution
N= total number of respondents

3. Likert Scale- A survey scale consists of a series of response options, either numerical or descriptive, that span a spectrum of perspectives on a given subject. Typically employing a 5-point or 7-point format, this type of question, often called a satisfaction scale, measures attitudes from one extreme to another. In this study, a 5-point scale was utilized, where the numbers corresponded to "strongly disagree," "disagree," "neutral," "agree," and "strongly agree," arranged in ascending order.

Scale	Degree of Response	Verbal Interpretation
5	4.50 and above	Strongly Agree
4	3.50 – 4.49	Agree
3	2.50 – 3.49	Neutral
2	1.50 – 2.49	Disagree
1	Below 1.49	Strongly Disagree

IV. RESULT AND DISCUSSIONS

This chapter covers the presentation, analysis and interpretation of data in factors that affect the labor productivity of Admin and Subcontractor Workers and Preferred labor system.

1. Profile of the Respondents

1.1 Position in the Construction Company

Table 1 presents the respondents' profiles based on their roles within the construction company. It can be seen from the table that in majority of the respondents are Project Engineers with 21 or 19%, followed by 20 or 19% Site Engineers, 17 or 16% Project Managers, and Contractor 16 or 15%. There are also 12 or 11% Engineering Manager respondents and 8 or 7% belong to Architect respondents.

Table 1.1 Distribution of Respondents According to the Positions in the Construction Company

Position	f	%
Contractor	16	15%
Project Engineer	21	19%
Construction Manager	14	13%
Engineering Manager	12	11%
Architect	8	7%
Project Manager	17	16%
Site Engineer	20	19%
Total	108	100.00%

Table 1.2 shows the Years of Construction Experience of the respondents, it is vividly shown that in majority of the respondents belong to 41 Years above with 44 or 41% followed by 31-40 Years with 18 or 17% and 21-30 Years with 15 or 14%. There are also 11 or 10% belong to 11-15 Years, 10 or 9% belong to 16-20

Years, 7 or 6% belong to 6-10 Years and 3 or 3% belong to 1-5 Years.

Table 1.2 Distribution of Respondents According to Years of Construction Experience

Position	f	%
1-5 Years	3	3%
6-10 Years	7	6%
11-15 Years	11	10%
16-20 Years	10	9%
21-30 Years	15	14%
31-40 Years	18	17%
41 Years - above	44	41%
Total	108	100.00%

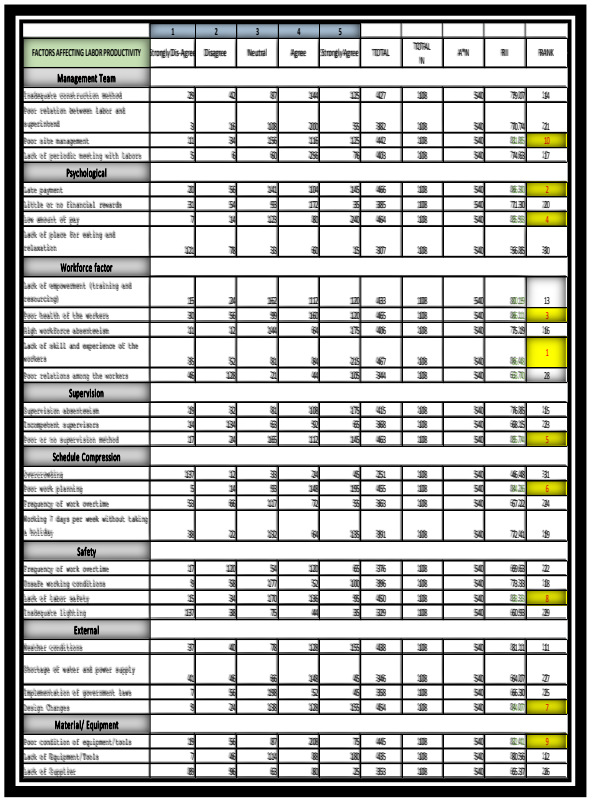
The data highlights that a significant portion of the respondents, accounting for 41%, have over 41 years above of experience in the construction industry. This group predominantly includes seasoned professionals such as project managers, engineering managers, contractors, and construction managers. Their extensive experience offers a depth of insight into the factors influencing the productivity of administrative and subcontractor workers. This suggests that the responses gathered are rooted in practical, long-term knowledge of the field, likely reflecting well-rounded and informed perspectives on challenges and improvements in productivity. Furthermore, the distribution of experience levels indicates that the survey has a broad representation, but the dominance of highly experienced professionals might mean the findings are heavily shaped by seasoned viewpoints, potentially emphasizing traditional practices and established challenges over newer trends or innovations. The focus on productivity factors by such a knowledgeable group underscores the importance of addressing these issues to enhance efficiency and project outcomes across administrative and subcontractor roles.

2. Top 10 Factors that Affect Labor Productivity

Table 2.1 shows the Top ten factors affecting labor productivity in construction

Rank	Factor	RII	Related Group
1	Lack of skill and experience of the workers	86.48	Workforce group
2	Late Payment	86.30	Psychological group
3	Poor health of the workers	86.11	Workforce group
4	Low amount of pay	85.74	Psychological group
5	Poor or no supervision method	84.81	Supervision
6	Poor work planning	83.70	Schedule compression
7	Design changes	83.52	External group
8	Lack of labor safety	83.33	Safety group
9	Poor condition of equipment/tools	83.15	Material/equipment group
10	Poor site management	82.96	Management Team

Table 2.2 presents the data of ranking based on their importance index.



FACTORS AFFECTING LABOR PRODUCTIVITY	1 Strongly/Dis-Agree	2 Disagree	3 Neutral	4 Agree	5 Strongly/Agree	TOTAL	TOTAL N	A*N	RII	RANK
Management Team										
Inadequate construction method	26	42	87	144	125	427	108	540	79.07	14
Poor relation between Labor and supervisiont	3	35	108	201	55	382	108	540	70.74	21
Poor site management	11	34	156	116	125	442	108	540	81.85	9
Lack of periodic meeting with Labors	5	9	63	256	74	405	108	540	74.63	17
Psychological										
Late payment	20	56	141	104	145	466	108	540	86.30	2
Little or no financial rewards	25	54	93	172	35	385	108	540	71.30	20
Low amount of pay	7	34	123	81	240	464	108	540	85.93	4
Lack of place for eating and relaxation	122	78	33	45	15	307	108	540	56.85	30
Workforce factor										
Lack of empowerment (training and resourcing)	35	24	165	111	120	455	108	540	84.26	13
Poor health of the workers	20	56	93	165	120	465	108	540	86.11	3
High workforce absenteeism	31	32	144	84	175	466	108	540	86.30	16
Lack of skill and experience of the workers	35	52	81	84	245	467	108	540	86.48	1
Poor relations among the workers	46	128	72	44	105	344	108	540	63.70	28
Supervision										
Supervision absenteeism	20	32	81	108	175	415	108	540	76.85	15
Incompetent supervisors	24	134	63	92	65	368	108	540	68.15	29
Poor or no supervision method	17	24	165	111	140	458	108	540	84.74	5
Schedule Compression										
Overcrowding	137	12	36	24	45	252	108	540	46.48	31
Poor work planning	5	34	99	148	195	455	108	540	84.26	6
Frequency of work overtime	59	66	207	72	55	363	108	540	67.22	24
Working 7 days per week without taking a holiday	36	32	153	64	135	391	108	540	72.41	19
Safety										
Frequency of work overtime	37	120	54	120	45	376	108	540	69.63	22
Unsafe working conditions	9	59	177	52	108	395	108	540	73.15	18
Lack of labor safety	15	34	120	136	95	450	108	540	83.33	8
Inadequate lighting	137	38	75	44	35	329	108	540	60.93	29
External										
Weather conditions	37	42	78	120	195	488	108	540	90.22	11
Shortage of water and power supply	42	42	66	148	45	346	108	540	64.07	27
Implementation of government laws	7	56	198	52	45	358	108	540	66.30	25
Design Changes	9	34	138	128	155	454	108	540	84.07	7
Material/ Equipment										
Poor condition of equipment/tools	15	56	87	208	75	445	108	540	82.41	9
Lack of Equipment/Tools	7	46	204	88	108	435	108	540	80.56	12
Lack of Supplies	89	98	63	88	35	353	108	540	65.37	26

As shown in Table 2 the data collected from the questionnaires answered by the respondents are collected and encoded in Microsoft Excel and analyzed. Based on these ranking results, 10 criteria were highlighted to have high important levels in factors that affect labor productivity.

Table 3 Distribution of Respondents According to their Preferred Labor System

Labor System	f	%
Subcontractor	74	69%
Admin	34	31%
Total	108	100%

This implies that construction professionals prefer subcontractor workers to manage the project and complete the job. In the construction industry, when a subcontractor is paid based on "per accomplishment," it means they are compensated according to the specific tasks or milestones they complete, rather than being paid a fixed amount for the entire project or on a time-based schedule (e.g., weekly or monthly). Increasing productivity is likely the most significant advantage of using a subcontractor.

V. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This study attempted to analyze and describe the top ten factors affecting labor productivity in construction between Admin workers and Subcontractor workers. The researcher were able to observe and analyze the target top 10 factor that affect labor productivity.

- Summary of Findings

The study used questionnaire checklist to present the profile of the respondents, the factors affect labor productivity using RII and through the questionnaire given to the respondents the researcher came up with the result of top 10 factors that affect labor productivity by construction professionals and voted preferred labor system. The descriptive method was used by the researchers, and the respondents were contractors, project engineers, architects, construction manager, engineering manager, project managers, and site engineer with extensive construction experience.

Top 10 Findings that affect Labor Productivity

- The lack of skill and experience of the worker factor ranked 1st among the 54 factors, having a R.I.I 86.48%.
- Late payment factor ranked 2nd among all 54 factors with R.I.I of 86.30%.
- Poor health of the worker factor ranked 3rd with 85.93% R.I.I.
- Low amount of pay factor ranked 4th.
- Poor or no supervision method with 84.67% R.I.I ranked 5th.
- Poor work planning factor ranked 6th with 83.77% R.I.I.
- Design changes factor ranked 7th
- Lack of labor safety ranked 8th with 83.33% R.I.I.
- Poor condition of equipment/tools ranked 9th with 83.01 R.I.I.
- Poor site management ranked 10th with 82.96% R.I.I.

Preferred Labor System

Sub-Contracting with 68.52% votes among Construction Professionals

Conclusions

Based on the summary of findings, the following conclusions were presented:

1. The respondents, all of whom are construction professionals, understand the significance of labor productivity and actively cooperated in the study.

2. A fundamental understanding of labor productivity during the execution of construction projects can result in substantial savings in both time and money. The construction industry involves high investments and significant risks due to the complexity and long duration of projects. However, major challenges such as cost overruns and delays often stem from low labor productivity. Currently, all potential factors affecting labor productivity in construction have been identified, and their impact has been ranked using the Relative Importance Index (RII) method. Effective management of these factors can lead to notable improvements in labor productivity.

3. Subcontractors in the construction industry offer a distinct advantage over administrative workers due to their payment structure and productivity-focused approach. Unlike admin workers who are paid a fixed daily or monthly salary regardless of output, subcontractors are compensated based on the completion of specific tasks or projects. This accomplishment-based payment system incentivizes subcontractors to work efficiently and deliver quality results within set timelines, often leading to cost savings and faster project completion for construction firms. Additionally, subcontractors bring specialized expertise and tools, reducing the need for extensive in-house training or equipment investment. By contrast, administrative workers, while essential for operational management, may not directly contribute to the progress of construction tasks, making their costs less flexible and harder to align with project-specific demands.

- Recommendations

Construction tasks are often costly and tend to lead to disputes and claims, which can negatively impact the progress of construction projects. To achieve successful project completion, it is essential for construction organizations to foster an environment conducive to efficient project implementation. Identifying the weaknesses in specific tasks is crucial for addressing and overcoming them effectively. Below are recommendations considered vital for enhancing labor productivity in the construction industry.

1. The lack of skill and experience among construction workers often disrupts the progress of work, leading to delays and inefficiencies in project execution. In the construction industry, specialization and expertise are crucial in defining a worker as skilled. Employing workers without the appropriate training or experience for specific tasks can compromise the quality of work and hinder productivity. To address this issue, it is essential for the Human Resource Department or hiring managers to adopt a more strategic approach when recruiting employees. Workers should be selected based on their specific capabilities and areas of specialization. For example, steelmen should be assigned to handle rebar works, masons should focus on tasks such as concrete hollow block (CHB) laying and plastering, while carpenters should be responsible for formwork construction. This targeted hiring approach not only ensures that each task is performed by a qualified professional but also enhances overall project efficiency and quality.
2. Late payments to construction laborers can significantly affect both individual workers and the overall project performance. When workers do not receive their wages on time, it creates financial stress, which can lower their morale and diminish their commitment to the job. This not only affects their productivity but may also lead to delays, as laborers might choose to leave the project in search of more reliable opportunities. Additionally, late payments disrupt trust and can cause tension between the workforce and management, ultimately impacting the quality and timeline of the construction project. Smooth financial flow is essential for the successful execution of any project. Timely payments to laborers serve as a strong motivational factor, fostering job satisfaction and encouraging better productivity.
3. Excessive working hours often cause worker fatigue, leading to diminished concentration and a direct decline in productivity. For continuous tasks, such as slab concrete pouring where interruptions are not feasible due to the setting process, it is essential to establish a manpower rotation or replacement schedule to sustain efficiency and prevent worker exhaustion. Poor health among construction workers significantly impacts labor productivity, as it directly affects their physical and mental capabilities. Prolonged working hours can lead to worker fatigue, reducing their focus and efficiency on the job. When workers are physically drained, their ability to perform tasks accurately and safely diminishes, which not only slows down the pace of work but also increases the likelihood of errors and accidents. This, in turn, disrupts project timelines and escalates costs. To mitigate these issues, it is crucial to implement a well-structured schedule for workforce management. Activities requiring continuous effort, such as pouring slab concrete, must have contingency plans, including the rotation or replacement of crew members to prevent exhaustion. Proper scheduling ensures that

workers maintain optimal performance levels, even during demanding tasks.

4. Low pay in the construction industry can significantly hinder labor productivity. When workers feel underpaid, their motivation to perform tasks efficiently and effectively decreases. This lack of motivation can lead to slower progress, reduced attention to detail, and lower overall work quality. Additionally, insufficient compensation may result in higher turnover rates as workers seek better-paying opportunities elsewhere, further disrupting project timelines and increasing costs associated with training new hires. In contrast, fair and competitive wages contribute to job satisfaction, loyalty, and a sense of value among workers, which collectively enhance productivity and project outcomes. When workers receive fair and appropriate compensation, it has a positive psychological effect, boosting their motivation and morale. Monetary rewards not only align workers' efforts with organizational objectives but also foster a sense of fulfillment and satisfaction. This, in turn, leads to higher levels of efficiency and improved performance in their tasks.
5. Supervision plays a critical role in construction projects, directly influencing their success and efficiency. Whether the construction site is small or large, the project's progress relies heavily on how effectively the Project Manager or the person in charge oversees operations. Supervision ensures that both the quality and quantity of work align with the project goals throughout the workday. Poor or inadequate supervision can significantly hinder labor productivity. Without clear guidance, workers may face confusion, leading to delays, errors, and rework. This lack of direction often results in wasted resources, increased costs, and failure to meet deadlines. Moreover, it can lower worker morale and motivation, further impacting overall productivity. On the other hand, consistent and effective supervision ensures that daily tasks are completed as planned, aligning with the project schedule and fostering an environment of accountability and efficiency.
6. Poor work planning significantly affects construction workers and overall labor productivity. When work is poorly planned, it can result in inadequate business support, inaccurate cost and time estimates, and ineffective scope control. These issues often lead to delays, resource wastage, and increased project costs, putting additional pressure on workers and potentially reducing morale and efficiency. To mitigate these challenges, it is essential to invest time before the project begins to clearly define objectives, establish the scope, outline assumptions, assess potential risks, allocate budgets, set realistic timelines, and determine a comprehensive approach. Proper planning ensures that all stakeholders have a shared understanding of the project requirements and creates a solid foundation for smooth execution, ultimately improving productivity and reducing the likelihood of costly errors or delays.
7. Design changes or variations in construction projects can significantly impact construction workers and overall labor productivity. When design alterations occur during a project, workers often experience interruptions in their workflow, leading to inefficiencies and delays. These changes can necessitate adjustments to construction schedules, rework of completed tasks, or even the acquisition of new materials and equipment, all of which disrupt the rhythm of work. Such interruptions not only affect the pace of labor but also have a psychological impact on workers, reducing their morale and increasing stress levels as they navigate shifting instructions and expectations. Additionally, frequent design changes can lead to confusion among workers, especially if communication between teams is unclear or inconsistent. This can result in errors, further delays, and an overall decline in productivity. For construction managers, design changes demand additional time and effort to coordinate new plans, allocate resources, and ensure compliance with updated specifications, which can strain project timelines and budgets. To mitigate these impacts, it is essential to establish a robust design process during the initial stages of the project, minimizing the need for changes later. When variations are unavoidable, clear communication and effective planning are crucial to ensure that workers can adapt efficiently without significant disruptions to productivity. In construction, where success often hinges on precision and coordination, addressing the

challenges posed by design changes is vital for maintaining high labor productivity and achieving project goals.

8. The lack of labor safety in the construction industry significantly impacts both workers' well-being and overall labor productivity. Unsafe working conditions can lead to workplace injuries, illnesses, or even fatalities, which not only cause physical and emotional distress but also disrupt project timelines. When workers feel unsafe, their focus and efficiency decline, resulting in lower productivity levels. Additionally, frequent accidents or hazardous conditions often lead to increased absenteeism, higher employee turnover, and legal or financial liabilities for construction firms. These issues ultimately slow down project progress, escalate costs, and tarnish the reputation of the organizations involved. Prioritizing labor safety is essential for maintaining a productive and motivated workforce. Construction workers are the backbone of the industry, and neglecting their safety undermines the efficiency and quality of construction projects. While addressing safety concerns may require upfront investment in training, protective equipment, and regular inspections, these measures help prevent accidents, improve worker morale, and boost productivity in the long run. Ensuring safe working environments not only safeguards human lives but also contributes to smoother, more cost-effective project execution.
9. Poor condition of equipment and tools can have a significant impact on construction workers and overall labor productivity. When construction equipment is not properly maintained or tools are outdated, workers may experience delays and inefficiencies due to frequent breakdowns, malfunctions, or even safety hazards. This leads to increased downtime as workers wait for repairs, which directly reduces the time spent on productive tasks. Additionally, the physical strain on workers can be higher when they are forced to use faulty or inadequate tools, which can lead to fatigue, injuries, and low morale. The resulting inefficiency not only affects the pace of the project but can also increase operational costs, as more resources are spent on repairs and maintenance instead of progressing with the work. Properly maintained equipment and tools, on the other hand, can enhance productivity by reducing downtime, improving safety, and ensuring tasks are completed efficiently.

10. Poor site conditions have a significant impact on construction workers and labor productivity. When construction sites are poorly maintained or not adequately prepared, it can create a range of challenges for workers. Difficult terrain, inadequate access, and cluttered workspaces can impede movement, slow down work, and cause physical strain on laborers. Moreover, substandard conditions can lead to unsafe working environments, increasing the risk of accidents and injuries, which not only affect workers' health but also cause project delays. When workers face hazards or must navigate through disorganized spaces, their efficiency declines, leading to productivity losses. Consequently, effective site management, including regular planning and task delegation, becomes crucial. A well-organized site improves both worker morale and productivity by ensuring smooth workflows, reducing accidents, and fostering a safer environment.

Hiring subcontractors and effective subcontractor management increases output and improves the quality of the work being done This enables contractors to expand their business, boost earnings, and potentially take on larger and more complex projects. Subcontractor management isn’t about just hiring an extra set of hands: it’s about ensuring that specific outcomes for a project are achieved.

REFERENCES

[1] Almamlook, R., Bzizi, M., Al-Kbisbeh, M., Ali, T., & Almajiri, E. (2020). Factors affecting labor productivity in the construction industry. American Journal of Environmental Science and Engineering, 4(2), 24. https://doi.org/10.11648/j.ajese.20200402.13

[2] Anees, M., Saqib, M., & Memon, D. (2016). 5 identification of factors affecting construction productivity in pakistan industry. Sir Syed University Research Journal of Engineering & Technology, 1(1), 5. https://doi.org/10.33317/ssurj.v1i1.50

[3] Banez, P., Co, C., Falconitin, K., Balaria, F., & Fronda, J. (2019). Factors affecting laborers' productivity in the construction companies. International Journal of Advanced Engineering Management and Science, 5(5), 335-338. https://doi.org/10.22161/ijaems.5.5.6

[4] Gerges, M., Ahiakwo, O., Aziz, R., Kapogiannis, G., Saïdani, M., & Saraireh, D. (2016). Investigating and ranking labor factors productivity in egyptian construction industry. International Journal of Architecture Engineering and Construction. https://doi.org/10.7492/ijaec.2016.005

[5] Ghoddousi, P. and Hosseini, M. (2012). A survey of the factors affecting the productivity of construction projects in iran. Technological and Economic Development of Economy, 18(1), 99-116. https://doi.org/10.3846/20294913.2012.661203

[6] Gündüz, M. and Abu-Hijleh, A. (2020). Assessment of human productivity drivers for construction labor through importance rating and risk mapping. Sustainability, 12(20), 8614. https://doi.org/10.3390/su12208614

[7] Mahamid, I. (2013). Contractors perspective toward factors affecting labor productivity in building construction. Engineering Construction & Architectural Management, 20(5), 446-460. https://doi.org/10.1108/ecam-08-2011-0074

[8] Mahamid, I. (2020). Study of relationship between rework and labor productivity in building construction projects. rdlc, 30-41. https://doi.org/10.7764/rdlc.19.1.30-41

[9] Mahamid, I. (2022). Relationship between delay and productivity in construction projects. International Journal of Advanced and Applied Sciences, 9(2),160-166. https://doi.org/10.21833/ijaas.2022.02.018

[10] Naoum, S. (2016). Factors influencing labor productivity on construction sites. International Journal of Productivity and Performance Management, 65(3), 401-421. https://doi.org/10.1108/ijppm-03-2015-0045

[11] Quezon, E. and Ibanez, A. (2021). Effect of covid-19 pandemic in construction labor productivity: a quantitative and qualitative data analysis. https://doi.org/10.31224/osf.io/s7zm4

[12] Wong, J., Rashidi, A., & Arashpour, M. (2020). Evaluating the impact of building information modeling on the labor productivity of construction projects in malaysia. Buildings, 10(4), 66. https://doi.org/10.3390/buildings10040066

[13] Almamlook, R., Bzizi, M., Al-Kbisbeh, M., Ali, T., & Almajiri, E. (2020). Factors affecting labor productivity in the construction industry. American Journal of Environmental Science and Engineering, 4(2), 24. https://doi.org/10.11648/j.ajese.20200402.13

[14] Anees, M., Saqib, M., & Memon, D. (2016). 5 identification of factors affecting construction productivity in pakistan industry. Sir Syed University Research Journal of Engineering & Technology, 1(1), 5. https://doi.org/10.33317/ssurj.v1i1.50

[15] Banez, P., Co, C., Falconitin, K., Balaria, F., & Fronda, J. (2019). Factors affecting laborers' productivity in the construction companies. International Journal of Advanced Engineering Management and Science, 5(5), 335-338. https://doi.org/10.22161/ijaems.5.5.6

[16] Chen, C. (2023). Operations strategy for a construction supply chain: modular integrated construction and blockchain adoption. International Transactions in Operational Research, 31(6), 3999-4024. https://doi.org/10.1111/itor.13367

[17] Gerges, M., Ahiakwo, O., Aziz, R., Kapogiannis, G., Saïdani, M., & Saraireh, D. (2016). Investigating and ranking labor factors productivity in egyptian construction industry. International Journal of Architecture Engineering and Construction. https://doi.org/10.7492/ijaec.2016.005

[18] Ghoddousi, P. and Hosseini, M. (2012). A survey of the factors affecting the productivity of construction projects in iran. Technological and Economic Development of Economy, 18(1), 99-116. https://doi.org/10.3846/20294913.2012.661203

[19] Gündüz, M. and Abu-Hijleh, A. (2020). Assessment of human productivity drivers for construction labor through importance rating and

risk mapping. Sustainability, 12(20), 8614. https://doi.org/10.3390/su12208614

[20] Hatoum, M., Ali, F., Nassereddine, H., & Sarvari, H. (2021). Analysis of covid-19 concerns raised by the construction workforce and development of mitigation practices. Frontiers in Built Environment, 7. https://doi.org/10.3389/fbuil.2021.688495

[21] Khan, A. and Ajmal, S. (2015). Role of management in motivating labor to improve labor productivity. Journal of Advanced Management Science, 179-185. https://doi.org/10.12720/joams.3.3.179-185

[22] Kim, G. and Shin, Y. (2012). Comparison of the factors improving construction productivity between korean and chinese laborers in korea. Applied Mechanics and Materials, 256-259, 3016-3019. https://doi.org/10.4028/www.scientific.net/amm.256-259.3016

[23] Luo, M., Fan, H., & Liu, G. (2019). Measuring regional differences of construction productive efficiency in china. Engineering Construction & Architectural Management, 27(4), 952-974. https://doi.org/10.1108/ecam-04-2019-0195

[24] Mahamid, I. (2013). Contractors perspective toward factors affecting labor productivity in building construction. Engineering Construction & Architectural Management, 20(5), 446-460. https://doi.org/10.1108/ecam-08-2011-0074

[25] Mahamid, I. (2013). Contractors perspective toward factors affecting labor productivity in building construction. Engineering Construction & Architectural Management, 20(5), 446-460. https://doi.org/10.1108/ecam-08-2011-0074

[26] Mahamid, I. (2020). Study of relationship between rework and labor productivity in building construction projects. rdlc, 30-41. https://doi.org/10.7764/rdlc.19.1.30-41

[27] Mahamid, I. (2022). Relationship between delay and productivity in construction projects. International Journal of Advanced and Applied Sciences, 9(2), 160-166. https://doi.org/10.21833/ijaas.2022.02.018

[28] Naoum, S. (2016). Factors influencing labor productivity on construction sites. International Journal of Productivity and Performance Management, 65(3), 401-421. https://doi.org/10.1108/ijppm-03-2015-0045

[29] JNnaji, C., Jin, Z., & Karakhan, A. (2022). Safety and health management response to covid-19 in the construction industry: a perspective of fieldworkers. Process Safety and Environmental Protection, 159, 477-488. https://doi.org/10.1016/j.psep.2022.01.002

[30] Quezon, E. and Ibanez, A. (2021). Effect of covid-19 pandemic in construction labor productivity: a quantitative and qualitative data analysis.. https://doi.org/10.31224/osf.io/s7zm4

[31] JNnaji, C., Jin, Z., & Karakhan, A. (2022). Safety and health management response to covid-19 in the construction industry: a perspective of fieldworkers. Process Safety and Environmental Protection, 159, 477-488. https://doi.org/10.1016/j.psep.2022.01.002

[32] Silva, S., Araújo, A., Costa, D., & Meliá, J. (2013). Safety climates in construction industry: understanding the role of construction sites and workgroups. Open Journal of Safety Science and Technology, 03(04), 80-86. https://doi.org/10.4236/ojsst.2013.34010