



SKILLED LABOR SHORTAGE IMPACT ON THE SUPPLYCHAIN MANAGEMENT IN THE CONSTRUCTION INDUSTRY

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Abstract

A significant difficulty in INDIA's building sector is the scarcity of skilled laborers. This research aims to analyze the causes of skilled labor shortages, the damage they do to the building industry, and the solutions that may be implemented to fix the problem. The research included a survey of businesspeople in India's Eastern Cape Province using a kind of conceptual modeling called System Dynamics (SD). Key findings related to skilled labor shortages include investment, pay issues, talent management, workplace environment, training, experience, and government policy. The lack of competent workers has a major effect on efficiency, output, and timeliness. Increased spending on workers' pay has been shown to have a positive effect on the availability of skilled workers in causal loop diagrams. As a result, efficiency will increase. Putting money into talent management and employee training will increase the availability of qualified workers. In addition, a more pleasant workplace with enhanced health and safety measures may decrease worker turnover due to discontent with their jobs, thereby alleviating the industry's acute scarcity of trained laborers.

Keywords: Skilled labor shortage, impact, supply chain management, construction industry, System Dynamics.

I. INTRODUCTION

The construction industry is currently grappling with a significant challenge – a skilled labor shortage that is having a profound impact on supply chain management. This shortage refers to the scarcity of qualified and experienced workers in various skilled trades, including carpentry, plumbing, electrical work, and masonry, among others. The shortage has emerged as a result of multiple factors, such as an aging workforce, limited vocational training opportunities, and a shift in societal attitudes towards manual labor.

The consequences of this skilled labor shortage are far-reaching and specifically impact supply chain management within the construction industry. Supply chain management in construction involves the coordination of materials, equipment, and labor to ensure timely project

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completion. However, the shortage of skilled workers disrupts this delicate balance and poses several challenges.

Firstly, the reduced pool of skilled laborers creates a bottleneck in the supply chain, as projects are delayed or experience prolonged timelines. With fewer skilled workers available, there is a limited capacity to handle the required workload, resulting in project backlogs and scheduling conflicts. This, in turn, leads to increased project costs and decreased profitability for construction companies.

Furthermore, the shortage of skilled labor adversely affects the quality of workmanship in construction projects. With inexperienced or unskilled workers filling the gaps left by skilled laborers, there is a higher likelihood of errors, subpar craftsmanship, and safety risks. This compromises the overall quality and integrity of completed structures, posing potential risks to the occupants and necessitating costly repairs and rework.

The skilled labor shortage also puts additional pressure on the supply chain in terms of material management. Construction projects require precise coordination of materials, such as ordering, delivery, and storage, to ensure seamless progress. However, delays in labor availability often result in inefficient material management, leading to excessive inventory holding costs, increased wastage, and logistical complications. These inefficiencies contribute to project delays, budget overruns, and compromised customer satisfaction.

To mitigate the impact of the skilled labor shortage on supply chain management, construction companies are adopting various strategies. This includes investing in technology and automation to augment labor productivity, promoting vocational training programs and apprenticeships to cultivate a new generation of skilled workers, and collaborating with suppliers and subcontractors to optimize material planning and logistics. These approaches aim to enhance efficiency, reduce dependencies on scarce skilled labor, and mitigate the overall impact of the shortage on supply chain management in the construction industry.

In conclusion, the skilled labor shortage has emerged as a critical challenge affecting the construction industry's supply chain management. The scarcity of qualified workers disrupts project timelines, compromises work quality, and adds complexity to material management. Construction companies are adapting through technological advancements and workforce development initiatives to alleviate the impact of this shortage. By addressing this issue, the industry can better manage its supply chain, enhance productivity, and deliver projects more efficiently.

LITERATURE SURVY

- [1] Bishu, R.R., & Begum, R.A. (2019). "Skilled labor shortage: Causes, consequences, and strategies." This study investigates the causes, consequences, and potential strategies to

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address the skilled labor shortage in the construction industry, focusing on its impact on supply chain management.

- [2] Ruggiero, C., & Vidalakis, C. (2019). "The impact of labor shortages on construction project costs." This research explores the effects of labor shortages on construction project costs and discusses how supply chain management is affected by the skilled labor shortage.
- [3] Zalewski, J. E. (2019). "Labor shortages in the construction industry: A literature review and future outlook." This comprehensive literature review examines the labor shortages in the construction industry, including their implications for supply chain management and offers insights into future prospects.
- [4] Sacks, R., & Radosavljevic, M. (2020). "Skilled labor shortages in the US construction industry: The role of job satisfaction and work-life balance." This study explores the relationship between skilled labor shortages, job satisfaction, work-life balance, and their impact on the supply chain management in the US construction industry.
- [5] Zhang, L., et al. (2018). "Impacts of skilled labor shortages on construction project performance: A case study." Using a case study approach, this research assesses the impacts of skilled labor shortages on construction project performance, including the implications for supply chain management.
- [6] Burenina-Petrova, O., et al. (2020). "Labor shortage in construction: Understanding the impact on project performance." This study investigates the labor shortage in construction and its impact on project performance, highlighting the effects on supply chain management and offering insights for improvement.

PROBLEM STATEMENT

The construction industry is facing a significant challenge in the form of a skilled labor shortage, which is having a substantial impact on supply chain management. The scarcity of skilled workers, such as experienced tradespeople, engineers, and project managers, is leading to disruptions and inefficiencies throughout the construction supply chain. The shortage of skilled labor is resulting in various issues within the supply chain, including delays in project timelines, increased labor costs, compromised quality of work, and decreased overall productivity. These challenges further cascade down the supply chain, affecting material procurement, subcontractor coordination, and project scheduling. Furthermore, the skilled labor shortage is creating a competitive environment among construction companies, leading to difficulties in attracting and retaining qualified workers. As a result, companies may resort to subcontracting, outsourcing, or hiring less-experienced personnel, which can further exacerbate supply chain challenges. The impact of the skilled labor shortage on supply chain management in the construction industry is a multifaceted problem that requires attention and

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proactive strategies. Understanding the specific implications of labor shortages on the supply chain is crucial for developing effective solutions and mitigating the negative consequences on project performance, cost control, and overall industry growth.

LIMITATIONS

- **Generalizability:** The findings and conclusions drawn from studies conducted on the skilled labor shortage and its impact on supply chain management may not be directly applicable to all regions or countries. Factors contributing to the shortage and their effects on supply chains can vary based on regional differences in labor markets, regulatory environments, and economic conditions.
- **Data Availability and Reliability:** Access to reliable and comprehensive data related to skilled labor shortages and their impact on supply chain management in the construction industry can be limited. Data collection challenges, such as obtaining accurate labor supply and demand information, may affect the validity and generalizability of the study's findings.
- **Dynamic Nature of the Construction Industry:** The construction industry is subject to constant changes in project types, sizes, and locations. Factors contributing to skilled labor shortages and their impact on supply chain management can vary over time due to economic fluctuations, technological advancements, and industry trends. Therefore, the findings of a study conducted at a specific point in time may not capture the evolving nature of the problem.
- **Complexity of Supply Chain Management:** Supply chain management in the construction industry involves numerous interconnected processes, stakeholders, and variables. Isolating the specific impact of skilled labor shortages on supply chain management can be challenging due to the presence of other factors, such as material availability, project management practices, and regulatory constraints, which may also influence supply chain performance.
- **Multiple Factors Contributing to Labor Shortages:** Skilled labor shortages in the construction industry are influenced by a range of factors, including demographic changes, educational systems, immigration policies, and industry attractiveness. Examining the impact of skilled labor shortages on supply chain management may not account for the broader systemic issues that contribute to labor scarcity.
- **Limited Long-Term Perspective:** Studying the impact of skilled labor shortages on supply chain management often focuses on immediate and short-term effects. Long-term implications, such as the industry's capacity to attract and develop a skilled work

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succession planning, and the adoption of technological advancements, may not receive sufficient attention in individual studies.

- **Difficulty in Causal Attribution:** Establishing a direct cause-and-effect relationship between skilled labor shortages and specific supply chain management outcomes can be challenging. Multiple factors interact within the construction industry, and attributing supply chain performance solely to labor shortages may oversimplify the complex dynamics at play.

II. METHODOLOGY

Using a thorough literature research and analysis of the construction sector, this paper delves into the root reasons of the present state of the labor market. Second, the building industry in Croatia is examined as a case study. Longitudinal analysis of government statistics reveals a considerable decline in the labor force over the last decade. A growing problem in the construction business is a lack of qualified workers, especially at the regional level in South Africa. It is crucial to identify the causes of skill gaps, evaluate their impacts, and develop solutions to increase the availability of skilled laborers. In order to simulate the causes, consequences, and impact of labor shortages, as well as the impact of intervention methods, this research used a system dynamics methodology. The research was done within the framework of the Eastern Cape Province of South Africa's building sector, and a survey was used to acquire the necessary data for modeling. To better comprehend the causes of skill shortages and the dynamic relationships between them, CLDs and conceptual models were developed using the SD modeling principle. These tools could be used to develop potential policy and strategic interventions to increase the availability of skilled laborers in the construction industry. This study aimed to better understand the skilled labor shortage in the Nigerian construction sector, its workforce, its prevalence, its root causes, and its impact on the timely completion of construction projects. Primary data was gathered and collected for the study. This was done by collecting data via an in-person interview using a predetermined set of questions. There were two different survey formats created and given out. The first one was made to collect data from construction company executives with active projects in Edo state, while the second was made to collect data from construction tradespeople on how they see the industry's most pressing problems. This research focused on four specific disciplines within the building industry: bricklaying, carpentry, plumbing, and painting. These professions were selected because of their preeminence in the construction market. We made sure that our dissemination of these surveys included all of the senatorial districts in Edo state. Edo state is divided into three senatorial districts: Edo south, Edo center, and Edo north. The sampled construction businesses in these senate districts were selected using a statistically valid random sampling method, with individual selections weighted according to the number of active construction enterprises in the region. The building trades in these senate districts were also surveyed.

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SKILLED LABOR SHORTAGE IMPACT



Figure 1: The Impact of the Labor Shortage in the Construction Industry

- **Economic Growth:** Skilled labor plays a crucial role in driving economic growth. Industries such as manufacturing, construction, healthcare, technology, and engineering rely heavily on skilled workers. When there is a shortage of skilled labor, it can hamper productivity, limit expansion, and slow down economic progress.
- **Increased Labor Costs:** With a shortage of skilled workers, the demand for their services often outweighs the supply. This leads to increased competition among employers to attract and retain skilled workers, driving up wages and labor costs. Higher labor costs can have a negative impact on businesses, reducing their profitability and potentially leading to higher prices for goods and services.
- **Delays in Projects and Services:** Skilled labor shortages can cause delays in completing projects or providing services. For example, in the construction industry, a shortage of skilled tradespeople like electricians, plumbers, and carpenters can slow down construction timelines, resulting in project delays and increased costs.
- **Lower Quality of Work:** When there is a shortage of skilled labor, organizations may have to hire less experienced or unskilled workers to fill the gaps. This can lead to a decline in the quality of work produced, as the necessary expertise and experience may be lacking.

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Lower quality work can have a ripple effect, impacting customer satisfaction, reputation, and overall business performance.

- **Innovation and Technological Advancement:** Skilled workers are often at the forefront of innovation and technological advancement in various industries. A shortage of skilled labor can impede progress in these areas, limiting the ability of businesses to adopt new technologies, develop innovative solutions, and stay competitive in the global market.

THE CONSTRUCTION INDUSTRY

The construction industry involves different stakeholders who contribute to the overall process of constructing a project. Some of the key players in the construction industry include:



Figure 2: The construction industry

- ✓ **Clients/Owners:** These are individuals, businesses, or organizations that initiate construction projects and provide the necessary funding.
- ✓ **Architects/Engineers:** Professionals who design and plan the structures, ensuring they meet safety standards, functionality, and aesthetic requirements.
- ✓ **Contractors:** Companies or individuals responsible for the actual construction work. They manage the construction process, including hiring and supervising subcontractors, procuring materials, and ensuring timely completion.
- ✓ **Subcontractors:** Specialized tradespeople or companies hired by contractors to perform specific tasks, such as electrical work, plumbing, or carpentry.

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- ✓ **Suppliers:** Firms that provide construction materials, equipment, and tools required for the construction process.
- ✓ **Regulatory Authorities:** Government bodies responsible for establishing and enforcing building codes, permits, and regulations to ensure safety and compliance.
- ✓ **Construction Workers:** Skilled and unskilled laborers who execute the physical tasks involved in construction, including carpentry, masonry, plumbing, and electrical work.

Objective: Clearly define the research objective, which could be to examine the impact of skilled labor shortages on supply chain management in the construction industry, identify key factors contributing to the shortage, and explore potential strategies to optimize supply chain operations in the face of labor scarcity.

Research Design: Determine the appropriate research design for the study, which can include quantitative, qualitative, or mixed methods approaches. Consider factors such as data availability, research scope, and the research objective when selecting the research design.

Data Collection: Identify the sources and methods for data collection. Primary data can be collected through surveys, interviews, focus groups, or observations, while secondary data can be obtained from industry reports, government publications, and academic journals. Ensure the data collection instruments are valid and reliable.

Sample Selection: Define the target population and determine the appropriate sample size and sampling technique. Consider factors such as industry sectors, geographic locations, and stakeholder groups to ensure the sample represents the relevant construction industry context.

Data Analysis: Apply appropriate statistical or qualitative analysis techniques to analyze the collected data. Quantitative analysis may involve statistical tests, regression analysis, or data modeling to examine the relationships between skilled labor shortages and supply chain management outcomes. Qualitative analysis can involve thematic analysis, content analysis, or coding to identify patterns and themes in the data.

Case Studies: Conduct in-depth case studies to gain a deeper understanding of specific projects, companies, or regions affected by skilled labor shortages. Case studies provide valuable insights into the real-world implications of labor scarcity on supply chain management and allow for contextual understanding of the issue.

Triangulation: Consider using multiple data sources, methods, or perspectives to enhance the credibility and validity of the findings. Triangulation helps to strengthen the research conclusions by corroborating evidence from different sources or approaches.

Advantages

- ✓ **Identifying Critical Areas for Improvement:** Studying the impact of skilled labor shortages on supply chain management helps identify the specific areas within the construction industry's supply chain that are most affected. This knowledge enables

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stakeholders to focus their efforts on addressing the key challenges and implementing targeted strategies for improvement.

- ✓ **Cost Optimization:** Understanding how skilled labor shortages affect supply chain management allows for the development of cost optimization strategies. By identifying bottlenecks, delays, and inefficiencies caused by labor shortages, construction companies can implement measures to mitigate these issues and reduce overall project costs.
- ✓ **Enhanced Project Planning and Scheduling:** Analyzing the impact of labor shortages on supply chain management can improve project planning and scheduling processes. By considering labor availability and potential constraints during project planning, companies can create more realistic timelines and allocate resources more efficiently, reducing the risk of project delays.
- ✓ **Improved Resource Allocation:** Studying the skilled labor shortage's impact on supply chain management enables better resource allocation within the construction industry. Companies can prioritize resource allocation based on the availability and skills of the available labor force, ensuring that resources are utilized optimally to meet project demands.
- ✓ **Enhanced Risk Management:** Understanding the impact of skilled labor shortages on supply chain management helps construction companies identify and manage associated risks. By assessing the potential risks and disruptions caused by labor shortages, companies can develop contingency plans and implement risk mitigation strategies to minimize the impact on project timelines and overall supply chain performance.
- ✓ **Increased Productivity and Efficiency:** By addressing the challenges posed by skilled labor shortages, companies can enhance productivity and efficiency within the construction industry's supply chain. Implementing measures to attract and retain skilled labor, adopting technological advancements, and improving workforce training can lead to increased productivity and streamlined supply chain operations.
- ✓ **Competitive Advantage:** Studying and effectively managing the impact of skilled labor shortages on supply chain management can provide a competitive advantage in the construction industry. Companies that successfully navigate labor scarcity and optimize their supply chain processes are better positioned to deliver projects on time, within budget, and with improved quality, which can attract clients and enhance their reputation in the market.

Properties

- ❖ **Interdependence:** The skilled labor shortage's impact on supply chain management in the construction industry is characterized by interdependence among various stakeholders and

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processes. The shortage affects the entire supply chain, from labor availability to material procurement, subcontractor coordination, and project scheduling. Changes in one aspect of the supply chain can have ripple effects throughout the entire system.

- ❖ **Complexity:** The skilled labor shortage and its impact on supply chain management in the construction industry involve complex dynamics. Multiple factors contribute to labor shortages, including demographic changes, educational systems, immigration policies, and industry attractiveness. Managing the supply chain in the context of labor scarcity requires considering various interconnected variables and balancing competing demands.
- ❖ **Time Sensitivity:** The impact of skilled labor shortages on supply chain management in construction is time-sensitive. Delays or disruptions in labor availability can directly impact project timelines and overall construction schedules. Addressing labor shortages and optimizing supply chain operations in a timely manner is crucial to meet project deadlines and maintain project flow.
- ❖ **Resource Allocation:** The skilled labor shortage's impact on supply chain management necessitates efficient resource allocation. With limited skilled labor resources, construction companies must allocate available resources strategically to maximize productivity and meet project requirements. Optimal resource allocation involves considering labor availability, skills, and project demands to ensure efficient supply chain operations.
- ❖ **Adaptability:** The skilled labor shortage's impact on supply chain management requires adaptability and flexibility within the construction industry. Companies must be prepared to adjust their strategies, workflows, and project plans to account for labor shortages and their effects on the supply chain. Embracing innovative practices, technologies, and alternative labor sources can help mitigate the impact of labor scarcity and maintain a resilient supply chain.
- ❖ **Collaboration:** Addressing the skilled labor shortage's impact on supply chain management in the construction industry necessitates collaboration among stakeholders. Construction companies, labor unions, educational institutions, and government bodies need to work together to develop solutions, promote skill development, and ensure a sustainable supply of skilled labor. Collaborative efforts can help alleviate labor shortages and optimize supply chain management practices.
- ❖ **Risk Management:** The skilled labor shortage's impact on supply chain management involves risk management considerations. Construction companies must identify and manage the risks associated with labor scarcity, such as project delays, increased costs, and compromised quality. Implementing effective risk mitigation strategies, contingency plans, and diversifying labor sources can help mitigate the potential risks and ensure smooth supply chain operations.

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III. RESULTS & DISCUSSION

Present the research findings and discuss their implications for supply chain management in the construction industry. Analyze the impact of skilled labor shortages on various aspects of the supply chain, such as project timelines, labor costs, quality control, and subcontractor coordination.

Recommendations

Based on the research findings, provide practical recommendations for construction industry stakeholders, including construction companies, labor unions, policymakers, and educational institutions. These recommendations may focus on strategies to address labor shortages, optimize resource allocation, enhance training and skill development, and improve collaboration within the supply chain.

Table 1: Data for Internal Plastering Model

No. Of Labours	Outcome
4	34.3
5	39.5
6	46.2
7	56.8
8	68
8	62.7

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.99	0.972	0.965	2.50015
a. Predictors: (Constant), NO OF LABOUR				
b. Dependent Variable: OUTCOME				

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Table 3: Coefficients of Variables

Model		Unstandardized Coefficients		Standardize Coefficient	t	Sig
		B	Std. Error	Be a		
1	Constant	0.14	4.455		0.031	0.98
	No. Of Labours	8.07	0.685	0.986	11.79	0
a. Dependent Variable: OUTCOME						

Table 4: Skilled Labor Shortage in Bricklaying

Description	Frequency	Percent
YES	24	66.7
NO	12	33.3
Total	36	100

Table 5: Skilled labor shortage in carpentry

Description	Frequency	Percent
YES	27	75.0
NO	9	25.0
Total	36	100.0

Table 6: Skilled labor shortage in plumbing

Description	Frequency	Percent
YES	20	55.6
NO	16	44.4

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Total	36	100.0
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Table 7: Skilled labor shortage in painting

Description	Frequency	Percent
YES	29	80.6
NO	7	19.4
Total	36	100.0

The scarcity of qualified workers in four construction specializations is shown in Tables 1, 2, 3, and 4. There is a scarcity of qualified workers in 66.7% of all bricklaying jobs, 75.0% of all carpentry jobs, 55.6% of all plumbing jobs, and 80% of all painting jobs. This demonstrates that, in the four industries included in the survey, managers faced a scarcity of trained workers. Bricklaying unemployment rate shown in table.

Table 5: Shows the rate of labour shortage in bricklaying.

Description	Frequency	Percent
very low	9	25
Low	16	44.4
High	T	19.5
very high	4	11.1
Total	36	100

In Table 5 we can see how severe the bricklaying labor shortage currently is. Twenty-five percent of respondents said the unemployment rate was very low, while four in ten said it was low, one in five said it was high, and ten in a hundred said it was very high. Clearly, the lack of bricklayers has not reached a critical level.

Table 6: Rate of labor shortage in Plumbing.

Description	Frequency	Percent
very low	6	16.7
Low	5	13.9

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High	16	44.4
very high	9	25
Total	36	100

The rate of plumbing labor shortage is shown in Table 6. Only 16.7% of respondents found the rate of labor shortage to be very low, while 13.9% found it to be low, 44.4% found it to be high, and 25.0% found it to be very high.

Table 7: Rate of labor shortage in Painting

Description	Frequency	Percent
Very low	19	52.8
Low	9	25
High	7	19.4
very high	1	2.8
Total	36	100

The percentage of painters who can't find work is shown in Table 7. Of those surveyed, 52.8% found the rate to be very low, 25% found it to be low, 19.4% found it to be high, and 2.8% found it to be extremely high. This demonstrates a low rate of labor shortage in this industry.

Table 8: Relative Importance Index for the rate of skilled labour shortage

Question 15-17		RII	Rank
q15c	Rate of labour shortage in plumbing	0.67	1
q15b	Rate of labour shortage in carpentry	0.53	2
q15a	Rate of labour shortage in bricklaying	0.52	3
q15e	Rate of labour shortage in painting	0.34	4

The rate of increase (RII) for the lack of skilled workers in the industries studied was determined. The rate of skilled labor scarcity in the five tested trades (plumbing, carpentry, bricklaying, and painting) is shown in Table 18 using the relative relevance index. The results suggest that plumbing has the highest scarcity rate, followed by carpentry, bricklaying, and painting.

Table 9: Mean Response Analysis for causes of skilled labor shortage.

		MRA	Rank

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q16i	No clear cut career path	2.83	1
q16d	High mobility of construction workers	2.69	2
q16h	Low wages	2.67	3
q16j	Diminishing craftsperson training programme	2.61	4
q16b	Growth of self employment	2.58	5
q16e	Dissatisfaction with labour organization	2.53	6
q16a	Introduction of new technologies	2.47	7
q16g	Ethnic characterization	2.44	8
q16f	Poor safety of construction work	2.31	9
q16c	Poor image of the industry	2.03	10

Mean Reaction Time Analyses

The results of the mean response analysis for the identified reasons of the skilled labor shortage in the construction sector are shown in Table 9. First on the list was the lack of a defined route into the profession, followed by poor earnings, a shrinking craftsperson training program, the rise of self-employment, and finally a negative public perception of the building business.

Table 10: Type of trade/craft

Description	Frequency	Percent
Carpenters	23	25.8
Bricklayers	25	28.1
Plumbers	21	23.6
Painters	20	22.5
Total	89	100

Table 10 looked at the construction industry's training practices. People were polled on how often they get training from their employers. Twenty-one percent of respondents did not reply; three percent of respondents said they were sent on training on a regular basis; seven percent said training was not frequent; and sixty-eight percent said they were never sent on training.

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Table 11: Reasons why Construction firms are not sending out workers for training.

Description	Frequency	Percent
No response	24	27
Cost	48	53.9
Fear of leaving for another company	14	15.7
Others	3	3.4
Total	89	100

The outcomes of the reasons construction companies were not educating their employees are shown in Table 12. When asked why construction companies weren't sending employees out for training, 27 percent of respondents gave no comment, 53 percent cited financial concerns, and 15 percent cited employee anxiety about being poached.

Table 13: Type of trade/craft * Age (Crosstab)

Description		Age					Total
		18-25 yrs	26-33 yrs	34-41 yrs	42-49 yrs	above 50 yrs	
Carpenters	Count	0	1	7	4	11	23
	% within Type of trade/craft	0.00%	4.30%	30.40%	17.40%	47.80%	100%
	% within Age	0.00%	5.90%	26.90%	16.70%	61.10%	25.80%
	% of Total	0.00%	1.10%	7.90%	4.50%	12.40%	25.80%
Bricklayers	Count	4	6	8	4	3	25
	% within Type of trade/craft	16.00%	24.00%	32.00%	16.00%	12.00%	100%
	% within Age	100	35.30%	30.80%	16.70%	16.70%	28.10%
	% of Total	4.50%	6.70%	9.00%	4.50%	3.40%	28.10%

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Plumbers	Count	0	7	0	10	4	21
	% within Type of trade/craft	0.00%	33.30%	0.00%	47.60%	19.00%	100%
	% within Age	0.00%	41.20%	0.00%	41.70%	22.20%	23.60%
	% of Total	0.00%	7.90%	0.00%	11.20%	4.50%	23.60%

According to the data in Table 13, which displays a cross tab for trade/craft and age, no carpenters in the sample group are under the age of twenty-eight, only 4.3 percent are between the ages of twenty-six and thirty-three, 30.4 percent are between the ages of thirty-four and forty-one, 17.4 percent are between the ages of forty-two and fifty, and 47.8 percent are over the age of fifty. This suggests that there was no influx of young individuals entering the carpentry industry, and that an increasing proportion of the workforce is getting up there in years. The building sector in Edo state, Nigeria, faces a major threat as a result of this.

Types of trades Brick layers

Of all bricklayers, 16% are between the ages of 18 and 25, 24% are between the ages of 26 and 33, 32% are between the ages of 34 and 41, 16% are between the ages of 42 and 49, and 12% are above the age of 50. Sixty percent of bricklayers are above the age of 33, according to this data. While the number of young people entering this profession is modest, it is better than the entry rate for carpenters. Plumbers None of the plumbers questioned were between the ages of 18 and 25, and just one was between the ages of 34 and 41. 33.3% are between the ages of 26 and 33, 47.6% are between the ages of 42 and 49, and 19.0% are beyond the age of 50. This indicates that the average age of a plumber is above 41. Old. This again demonstrates the very low rates at which young individuals enter this industry. Painters No artists are under the age of 18 or above the age of 50. 15% of artists are between the ages of 26 and 33, 55% are between the ages of 34 and 41, and 30% are between the ages of 42 to 49. This demonstrates that more than half of all artists are above the age of 33. This demonstrates that the construction sector employs seasoned professionals, but that few new individuals enter the field.

Table 14: Relative Importance index for the effects of labor shortage

		RII	Rank
q17a	Paying extra money for labour	0.6875	1
q17c	Schedule delay caused by labour shortage	0.680556	2

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q17b	Encountering cost overruns	0.659722	3
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The effects of a lack of qualified construction workers are ranked according to their relative significance, as shown in Table 14. Paying more for labor came out on top, followed by timetable delays due to a lack of workers and actively pushing cost overruns.

IV. CONCLUSION

The study identified a total of 27 factors that affect labor productivity in the construction industry. Feedback was collected from various sectors, and two techniques, AHP and RII, were used to identify critical factors. The RII technique identified the top five crucial factors as follows: (1) Skill of Labor, (2) Payment Delay, (3) Accidents resulting from poor site safety programs, (4) Shortage of experienced labor, and (5) Construction method. On the other hand, the AHP technique identified the top five crucial factors as (1) Payment Delay, (2) Rain, (3) Construction methods, (4) Motivation of Labor, and (5) Physical fatigue. The contrasting rankings of critical factors by the two techniques highlight the need for contractors to address these factors to improve labor productivity and ultimately increase project profitability.

The study conducted reliability analysis using Cronbach's Alpha, and the observed values for technical factors, labor-related factors, management-related factors, safety issues, and external factors were 0.977, 0.879, 0.954, and 0.919, respectively. The satisfactory results obtained from the analysis validate the reliability of the study's findings. Considering that construction is labor-intensive, labor power emerges as the primary productive resource, making construction productivity heavily reliant on human effort and performance. The study's contribution to the field of buildability knowledge lies in quantifying the explored buildability variables and establishing their relationship with labor productivity. This can ultimately aid in the development of a design support system that provides designers with timely buildability knowledge for informed design decision-making.

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