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Impact of Existing Skilled Manpower Supply on Effective Project Delivery in Building Construction in South-East Nigeria

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Abstract- ***The construction sector in South-East Nigeria faces significant challenges due to inadequate skilled manpower, which affects project delivery in terms of cost, time, and quality. This study examines the impact of existing skilled manpower supply on effective project delivery in the building construction industry. Using a descriptive survey design, data were collected from 393 respondents, including trainees, contractors, and representatives from vocational training centres, through questionnaires and interviews. Relative Importance Index (RII) analysis identified shortage of apprenticeship opportunities (RII = 0.679), low turnover rate among skilled workers (RII = 0.670), and poor working conditions (RII = 0.655) as the most critical factors affecting project performance. ANOVA results revealed no significant differences in perceptions among the stakeholder groups (F(2,174) = 2.003, p = 0.139), indicating consensus on the importance of skilled manpower. Interview findings corroborated quantitative results, emphasizing that inadequate training, low wages, and manpower instability negatively impact project outcomes. Based on these findings, it is recommended that structured apprenticeship programs be strengthened, training and development initiatives enhanced, remuneration and working conditions improved, and policy support for vocational and technical education intensified. Implementing these measures will promote workforce stability, skill acquisition, and overall efficiency in project delivery.***

Index Terms- ***Skilled manpower, Project delivery, Construction industry, Apprenticeship, Workforce stability, Training programs***

I. INTRODUCTION

The construction sector is widely recognized as one of the most important drivers of economic growth, infrastructural development, and societal advancement. The building construction industry contributes significantly to national economies through employment generation, infrastructure provision, and revenue creation. Elyas and Gabriel (2017) observed that the construction sector contributes substantially to the Gross Domestic Product (GDP) of both developed and developing nations while providing employment opportunities for a large segment of the workforce. In developing countries such as Nigeria, the construction sector plays a crucial role in supporting economic development by providing essential infrastructure, including residential buildings, educational facilities, commercial centers, and healthcare institutions. Additionally, the sector serves as a major source of livelihood and contributes to government revenue through taxation and infrastructural investments.

The building construction sector is highly labour-intensive and depends largely on skilled manpower for effective project execution and delivery. Skilled manpower refers to trained and experienced construction workers such as masons, carpenters, electricians, plumbers, welders, and steel fixers who possess the technical knowledge and competence required to perform specialized construction tasks. These workers play a critical role in translating construction drawings and specifications into

physical structures. The availability, competency, and efficiency of skilled manpower significantly influence construction project success, particularly in terms of quality, cost efficiency, and timely completion (Akpan, 2017).

Effective project delivery in construction refers to the successful completion of projects within the specified time frame, budget, and required quality standards. Skilled manpower enhances construction productivity, improves workmanship quality, and ensures efficient coordination of construction activities. According to Adebayo and Ugochukwu (2021), skilled workers improve construction efficiency by executing tasks accurately, reducing errors, and minimizing the need for rework. Their technical expertise ensures compliance with construction standards and enhances overall project performance. Conversely, inadequate skilled manpower contributes to project delays, increased construction costs, and poor-quality outcomes (Adebayo, 2020).

In Nigeria, particularly in the South-East geopolitical zone comprising Abia, Anambra, Ebonyi, Enugu, and Imo States, there has been a noticeable increase in building construction activities due to rapid urbanization, population growth, and infrastructural expansion. Major cities such as Aba, Enugu, Awka, Onitsha, Owerri, and Abakaliki have experienced significant growth in residential, commercial, and institutional construction projects. This expansion has led to an increased demand for skilled construction workers to support the growing infrastructure needs. However, the supply of competent skilled manpower has not kept pace with the increasing demand, resulting in shortages of skilled workers in the construction industry (Okafor and Ilozor, 2022).

The shortage of skilled manpower has emerged as a major challenge affecting effective project delivery in the building construction sector. Many construction firms experience difficulties in recruiting qualified artisans with adequate technical training and experience. As a result, contractors often rely on unskilled or semi-skilled workers, which negatively affects construction productivity and quality (Ikechukwu and Ugochukwu, 2020). Furthermore, inadequate skilled manpower contributes to construction errors, increased material wastage, and delays in project completion (Adesina, 2018).

The competence and experience of skilled manpower are critical determinants of construction productivity and project performance. Skilled workers possess the ability to interpret construction drawings accurately, operate construction equipment efficiently, and apply appropriate construction techniques. Nwachukwu and Umeh (2017) noted that skilled manpower enhances construction efficiency and improves the durability and structural quality of buildings. In contrast, unskilled workers often lack the technical competence required to perform specialized tasks, resulting in poor workmanship and reduced project performance.

In addition, the irregular supply of skilled manpower disrupts construction schedules and increases overall project costs. Contractors are often compelled to recruit skilled workers from other regions, leading to higher labour costs and logistical challenges (Odusami and Ene, 2021). The shortage of skilled manpower in Nigeria has been attributed to several factors, including inadequate vocational training systems, poor technical education, and insufficient government support for manpower development (Uche and Okoro, 2021). These challenges have significantly affected the capacity of the construction industry to deliver projects efficiently.

Despite the recognized importance of skilled manpower in construction project delivery, there is limited empirical research examining the impact of existing skilled manpower supply on effective project delivery performance in building construction, particularly in South-East Nigeria. Understanding the relationship between skilled manpower supply and project delivery performance is essential for improving construction productivity, enhancing project outcomes, and supporting sustainable infrastructural development. Therefore, this study examines the impact of existing skilled manpower supply on effective project delivery in building construction in South-East Nigeria.

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Objective of the Study

The main objective of this study is to examine the impact of existing skilled manpower supply on effective project delivery in building construction in South-East Nigeria.

Research Question

What is the impact of existing skilled manpower supply on effective project delivery in building construction in South-East Nigeria?

II. LITERATURE REVIEW

Skilled Manpower Supply and Effective Project Delivery

The availability of skilled manpower is a fundamental factor influencing effective project delivery in the building construction sector. Skilled manpower refers to trained and competent workers who possess the technical expertise required to perform construction activities efficiently. These workers include masons, carpenters, electricians, plumbers, welders, and steel fixers whose roles are essential to the successful execution of construction projects. According to Akpan (2017), skilled manpower significantly influences construction productivity, structural durability, and overall project quality.

According to Mgbeahuru, Okolie and Nwekete (2022) ,effective project delivery involves completing construction projects within specified time, budget, and quality requirements. Skilled manpower plays a critical role in achieving these objectives by ensuring accurate and efficient execution of construction activities. Adebayo and Ugochukwu (2021) noted that skilled workers improve construction productivity by reducing errors, minimizing rework, and ensuring compliance with technical specifications. Their technical competence enables them to interpret construction drawings accurately and execute tasks in accordance with project requirements, thereby improving project performance.

Despite its importance, the shortage of skilled manpower remains a major challenge affecting construction project delivery in Nigeria. Adebayo (2020) observed that inadequate skilled manpower contributes to project delays, poor workmanship, and increased construction costs. Many construction firms face difficulties in recruiting competent artisans with adequate training and experience, forcing contractors to rely on unskilled or semi-skilled workers. This situation negatively affects construction productivity, quality, and overall project performance.

The competency and experience of skilled manpower also play a crucial role in determining construction efficiency and project outcomes. Ikechukwu and Ugochukwu (2020) emphasized that skilled workers perform construction tasks more efficiently due to their technical knowledge and experience. Their competence reduces construction errors, enhances productivity, and improves overall project delivery performance. Skilled workers are also more capable of handling complex construction tasks, ensuring project success.

Furthermore, the irregular supply of skilled manpower disrupts project schedules and affects construction continuity. Okafor and Ilozor (2022) noted that labour shortages often result in project delays, increased labour costs, and reduced construction efficiency. The availability of skilled manpower ensures smooth project execution, reduces project interruptions, and enhances construction performance.

Skilled manpower also contributes significantly to construction quality and client satisfaction. According to Nwachukwu and Umeh (2017), skilled artisans ensure proper workmanship, structural integrity, and high-quality finishing, which improves building durability and client satisfaction. Poor workmanship resulting from inadequate skills leads to structural defects, increased maintenance costs, and reduced building lifespan.

Labour productivity is directly influenced by the availability of skilled manpower. Skilled workers perform construction tasks more efficiently, reducing project duration and improving construction

performance. Ezeokoli and Okolie (2020) noted that inadequate skilled manpower contributes to low labour productivity, which negatively affects project timelines and delivery efficiency.

In addition, skilled manpower enhances construction safety performance. Skilled workers possess adequate knowledge of safety procedures, hazard identification, and risk management, reducing the likelihood of construction accidents. Achuenu and Izam (2016) observed that skilled manpower improves safety compliance and minimizes project disruptions caused by accidents and unsafe practices.

Material utilization and cost efficiency are also influenced by the availability of skilled manpower. Skilled workers perform tasks accurately and efficiently, thereby minimizing material wastage and reducing construction costs. According to Adesina (2018), skilled manpower improves material utilization efficiency and enhances cost control in construction projects.

Moreover, the adoption of modern construction technologies requires skilled manpower with advanced technical competence. Ikechukwu and Ugochukwu (2020) noted that skilled workers facilitate the implementation of modern construction techniques, which improves construction productivity, efficiency, and project delivery performance.

Government policies and manpower development programs also play a vital role in improving skilled manpower supply. Uche and Okoro (2021) emphasized that vocational training, technical education, and manpower development programs enhance the availability of skilled workers and improve construction productivity. Strengthening vocational education and training systems is essential for addressing skilled manpower shortages and improving construction project delivery.

III. METHODOLOGY

Research Design

This study adopted the descriptive survey research design. This design involves the systematic collection of data to describe existing conditions and examine relationships among variables without manipulation. Creswell (2018) stated that descriptive survey design is used to collect data from a representative sample to describe population characteristics, while Fraenkel, Wallen, and Hyun (2019) noted that it allows the study of phenomena as they naturally occur. This design is appropriate for assessing the impact of skilled manpower supply on effective project delivery in the building construction sector in South-East Nigeria. The study utilized both quantitative and qualitative approaches through the use of questionnaires and interviews to obtain relevant data from respondents.

Population of the Study

The population of the study comprises vocational training centres, trainee manpower, and contractors involved in the supply and utilization of skilled manpower in South-East Nigeria. Specifically, the population includes eighteen (18) vocational training centres, six hundred and eight (608) trainee manpower, and two hundred and seventeen (217) contractors from construction companies registered with the Ministry of Works and Housing.

The total population for the study is eight hundred and forty-three (843) respondents. This population represents both the supply and demand sides of skilled manpower in the building construction sector and provides relevant data for examining its impact on effective project delivery.

Table 1 Trainees

State	Total per State	% per State
Abia	104	17.11%
Anambra	130	21.38%
Ebonyi	112	18.42%
Enugu	127	20.89%
Imo	135	22.20%
Total	608	100%

Table 2 Training Centres

State	Total per State	% per State
Abia	3	16.67%

State	Total per State	% per State
Anambra	4	22.22%
Ebonyi	4	22.22%
Enugu	3	16.67%
Imo	4	22.22%
Total	18	100%

Table 3 Contractors

State	Total per State	% per State
Abia	47	21.66%
Anambra	45	20.74%
Ebonyi	32	14.75%
Enugu	43	19.82%
Imo	50	23.05%
Total	217	100%

This population is as sourced from the 2025 records of the industrial Training Fund (ITF) South-East Zonal Office and from ministry of works and housing of each state in south East Nigeria

3.5 Sample and Sampling Techniques

The total sample size for this study was 393 respondents, which included 236 trainees selected from a population of 608, 139 Contractors from Construction companies registered with ministry of works and housing selected from a population of 217, and 18 representatives from training centres

The sample size for the study was determined using Cochran's formula for estimating proportions, which is appropriate when the population is known and finite. Cochran's formula for an infinite population is expressed as:

$$n_0 = \frac{Z^2 p(1-p)}{e^2}$$

Where:

no = initial sample size for an infinite population

Z = z-score corresponding to the desired confidence level (1.96 for 95% confidence level)

p = estimated proportion

e =margin of error (0.05 or 5% was used for this study)

Substituting the values:

$$n_0 = \frac{1.96^2 \times 0.5(1-0.5)}{0.05^2} = \frac{3.8416 \times 0.2}{0.0025}$$

Since the populations of trainees, training centres, and builders are finite, the finite population correction formula was applied:

$$n = \frac{n_0}{1+\frac{n_0-1}{N}}$$

Where N is the population size.

3.3.1 Trainees (N=608)

$$n = \frac{384.16}{1+\frac{384.16-1}{608}} = \frac{384.16}{1+0.6301} = \frac{384.16}{1.6301}$$

Trainees =236

3.3.2 Training Centres (N=18)

$$n = \frac{384.16}{1+\frac{384.16-1}{18}} = \frac{384.16}{1+21.2867} = \frac{384.1}{22.286}$$

Training centers =18

3.3.3 Contractors (N=217)

$$n = \frac{384.16}{1+\frac{384.16-1}{217}} = \frac{384.16}{1+1.7662} = \frac{384.16}{2.7662}$$

Contractors = 139

Table 4 Summary of Sample Sizes

Population Group	Population Size(N)	Sample Size(n)
Trainees	608	236
Training Centres	1818	
Contractors	217	139
Total		393

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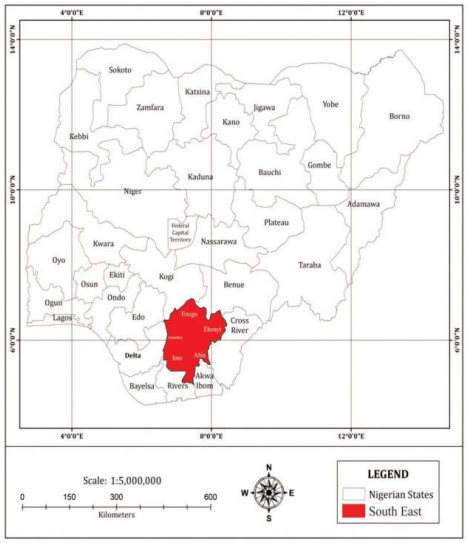

Figure 1. Map of Nigeria showing the study area(South East States).
(Source: Office of the Surveyor General Ebonyi State, 2026).

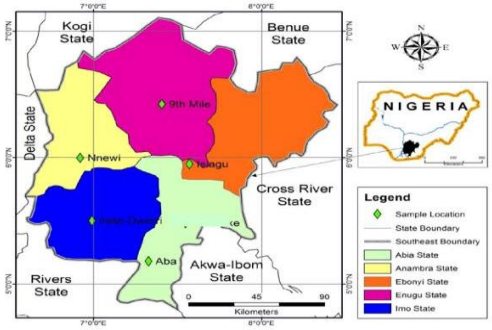

Figure 2. Map of South East States, Nigeria showing the study area.
(Source: Office of the Surveyor General Ebonyi State, 2026).

IV. RESULTS

Results presented in Table 5 indicate that shortage of apprenticeship opportunities reduces skill acquisition (RII = 0.679; Rank 1), followed by low turnover rate among skilled workers reducing manpower stability (RII = 0.670; Rank 2) and poor working conditions (RII = 0.655; Rank 3), highlighting the importance of structured training, workforce retention, and safe working environments. Lack of training and development programs (RII = 0.650; Rank 4) and low wages (RII = 0.641; Rank 5) were also rated highly, emphasizing the role of professional development and financial incentives in ensuring effective project delivery.

Mid-ranked factors include weak enforcement of certification and licensing (RII = 0.627; Rank 6), poor career growth opportunities (RII = 0.614; Rank 7), and outdated construction equipment (RII = 0.605; Rank 8), indicating moderate challenges in regulatory compliance, career

Table 5: RII Analysis of Impact of Existing Skilled Manpower Supply on Effective Project Delivery in the Construction Industry.

SN	Items	SA	A	N	D	SD	∑f	∑fx	RII	Ranking
1.	Shortage of apprenticeship opportunities reduces skill acquisition.	134	123	78	40	18	393	1335	0.679	1st
2.	Low turnover rate among skilled workers reduces manpower stability.	130	121	79	39	24	393	1310	0.670	2nd
3.	Poor working conditions reduce retention.	124	120	82	42	25	393	1278	0.655	3rd
4.	Lack of training and development programs limits skills growth.	122	118	80	44	29	393	1270	0.650	4th
5.	Low wages discourage skilled workers from staying in the industry.	118	114	82	44	35	393	1253	0.641	5th
6.	Weak enforcement of certification and licensing lowers worker quality.	113	109	86	46	39	393	1221	0.627	6th
7.	Poor career growth opportunities discourage workers.	109	104	90	46	44	393	1193	0.614	7th

8.	Outdated construction equipment discourages skilled workers.	105	102	92	48	36	393	1178	0.605	8th
9.	Limited use of modern construction technologies affects productivity.	103	101	94	48	36	393	1156	0.595	9th
10.	Unstable construction project schedules reduce job security.	101	99	97	50	46	393	1140	0.587	10th
11.	Inadequate recruitment processes reduce manpower quality.	96	96	102	50	49	393	1111	0.571	11th
12.	Lack of mentorship from experienced workers limits skills transfer.	91	96	98	50	58	393	1102	0.568	12th
13.	Migration of skilled workers to other regions affects supply.	87	91	98	52	65	393	1072	0.551	13th
14.	Limited funding for vocational and technical education affects skills supply.	83	91	102	52	65	393	1042	0.536	14th
15.	Lack of government support affects skilled labour availability.	78	87	102	55	71	393	1019	0.520	15th

progression, and technological support. Lower-ranked factors include limited use of modern construction technologies (RII = 0.595; Rank 9), unstable construction project schedules (RII = 0.587; Rank 10), inadequate recruitment processes (RII = 0.571; Rank 11), and lack of mentorship from experienced workers (RII = 0.568; Rank 12).

The least-rated concerns were migration of skilled workers (RII = 0.551; Rank 13), limited funding for vocational and technical education (RII = 0.536; Rank 14), and lack of government support (RII = 0.520; Rank 15), reflecting systemic and institutional weaknesses that may hinder the sustained supply of skilled manpower necessary for effective project delivery in the construction industry.

Table 6: ANOVA Mean Ratings on Level of Perception on the Impact of Existing Skilled Manpower Supply on Effective Project Delivery among Artisans, Registered Builders, and Training Centers

The result of data analysis presented in Table 6 reveals that there is no significant difference in the level of perception on the impact of existing skilled manpower supply on effective project delivery among artisans, contractors and training centers in the South-East. This is because the grand mean of F-ratio (2, 174) is 2.003 and P-value (.139) is greater than the stipulated 0.05 level of significance. Therefore the null hypothesis which states that there is no significant difference in the level of perception on the impact of existing skilled manpower supply on effective project delivery among artisans, registered builders, and training centers in the South-East is accepted.

Sources of Variable	Sum of Squares	DF	Mean Square	F-Ratio	p-value	Remark
Between Groups	1.795	2	.897	2.003	.139	Not significant
Within Groups	65.865	174.448				
Total	67.660	176				

Discussion of Findings

Impact of Existing Skilled Manpower Supply on Project Delivery

The findings revealed that the shortage of apprenticeship opportunities is the most critical factor affecting effective project delivery in the construction industry in South-East Nigeria (RII = 0.679). This suggests that limited structured training restricts skill acquisition, workforce renewal, and productivity, thereby negatively affecting project delivery. This

finding supports Ebekozien, Aigbavboa, and Thwala (2024) and Olomolaiye et al. (2018), who reported that weak apprenticeship and informal training systems reduce construction performance, although Fajana (2021) emphasized that structured apprenticeship improves skill development and project outcomes.

Manpower stability and working conditions were also identified as major factors, with low turnover rates (RII = 0.670) and poor working conditions (RII = 0.655) ranked second and third, respectively. These factors affect worker retention, productivity, and project continuity. In addition, lack of training programs (RII = 0.650) and low wages (RII = 0.641) were found to reduce worker motivation and efficiency. These findings agree with Akomah, Badu, and Kissi (2020) and Elegbede and Akinbile (2024), who noted that poor remuneration, inadequate training, and unfavourable working conditions negatively affect labour productivity and project performance.

Moderately ranked factors such as weak enforcement of certification (RII = 0.627), limited career growth opportunities (RII = 0.614), and outdated equipment (RII = 0.605) indicate institutional and technological limitations affecting manpower effectiveness. This supports Durdyev and Ismail (2020), who noted that weak regulatory systems and obsolete equipment reduce construction efficiency.

Lower ranked factors including limited use of modern technologies (RII = 0.595), unstable project schedules (RII = 0.587), inadequate recruitment (RII = 0.571), lack of mentorship (RII = 0.568), migration of skilled workers (RII = 0.551), limited funding for vocational education (RII = 0.536), and lack of government support (RII = 0.520) reflect broader institutional and managerial challenges. Egbe and Aigbavboa (2023) noted that inadequate policy support and funding pose long-term risks to skilled manpower sustainability.

The ANOVA result showed no significant difference in the perceptions of artisans, registered builders, and training centres ($F(2,174) = 2.003$, $p = 0.139 > 0.05$), indicating agreement among stakeholders on the importance of skilled manpower in project delivery. Interview findings also confirmed that inadequate training, low wages, and manpower instability negatively affect project cost, quality, and completion time.

The interview findings supported the quantitative results, indicating that inadequate training, low wages, and manpower instability negatively affect project cost, quality, and completion time. Contractors noted that low wages increase labour turnover, leading to project delays, while training centre representatives reported that inadequate technical training contributes to construction errors and increased rework. Trainees also indicated that outdated training limits their ability to adapt to modern construction methods, thereby reducing productivity and work quality. These findings highlight the importance of manpower quality, stability, and effective training in achieving successful project delivery.

V. RECOMMENDATIONS

1.Government agencies, construction firms, and vocational institutions should establish structured apprenticeship systems to improve skill acquisition, workforce renewal, and productivity.
2. Increased funding, modernization, and capacity building of vocational training centres are essential to produce competent and industry-ready skilled manpower.
3. Construction companies should provide safe work environments and competitive wages to enhance worker retention, motivation, and efficiency.
4. Regulatory bodies must ensure compliance with construction standards and professional licensing requirements to maintain workforce quality and professionalism.
5 Training programs should incorporate contemporary construction techniques and equipment to enhance productivity, reduce errors, and improve project efficiency.
6. Policymakers should prioritize manpower development initiatives and implement supportive policies, including incentives, to sustain the supply of skilled labour in the construction industry

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