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ASSESSMENT OF INDIGENOUS CONSTRUCTION FIRMS' COMPETITIVENESS THROUGH CONSTRUCTABILITY PRINCIPLES IN KATSINA STATE

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ABSTRACT: *Construction firms are currently facing intense competition in the market, prompting them to seek new business strategies to gain a competitive advantage. Factors such as market fragmentation, globalization, and increased customer bargaining power have intensified this competition. A recent study evaluated the ability of local construction firms in Katsina State to compete with multinational construction firms by applying the constructability principle. This study aims to assess the ability of indigenous construction firms in Katsina State to compete with multinational firms by implementing constructability principles. The study found that professionals in indigenous construction firms possess substantial skills and knowledge and highlighted the importance of modularisation/pre-assembly design in enhancing competitiveness. However, barriers such as a lack of awareness and resistance to formal constructability programs, poor communication skills, and insufficient construction experience must be addressed for indigenous firms to implement the constructability principle and compete with multinational firms effectively.*

KEYWORDS: Constructability principle, Construction industry, Construction firms, Competitiveness.

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INTRODUCTION

The World Bank states that inadequate or failing infrastructure is a significant issue in the developing world. This includes roads, dams, water supply, sanitation, irrigation, housing, schools, bridges, etc. Infrastructure is crucial for development efforts and improved living standards (Eja et al., 2020).

The construction industry plays a vital role in the development process and impacts almost every sector of the economy. One key concept in the industry is 'constructability', which is defined as a deliberate attempt to optimize the construction process through the incorporation of knowledge and experience in the facility delivery process (O'Connor et al., 1987). However, developing nations often overlook the need to enhance their construction sector, impacting economic growth and national development (Mostapa & Monty, 2022). Assessing the resilience of the construction industry in countries like Rwanda, Egypt, and Turkey is crucial for economic progress (Ahmed & Elkhayam, 2023). Implementing strategies to address construction-related challenges is essential for successful infrastructure projects within budget and schedule constraints, emphasizing the need for innovation in construction advancement (Rozita & Ehsan, 2020). Prioritizing the improvement of the construction industry can significantly boost infrastructure and overall economic development in developing nations.

Construction works include buildings, engineering services, and systems like water supply, sanitation, electricity, telecommunications, transportation, and stormwater systems. These constructions require maintenance, rehabilitation, refurbishment, and expansion to meet emerging needs. Indigenous firms are companies that are fully owned and managed by Nigerians. However, the Nigerian Construction Industry is still dominated by foreign contractors (Lateef et al., 2024). The competitiveness of construction firms in Nigeria is influenced by various factors such as human resource management practices, marketing strategies, and company strategies. Research indicates that the preference for expatriates in the contractual process has raised competitiveness in the construction sector, with foreign expatriates outperforming indigenous construction firms in terms of time, cost, scope, quality, and satisfaction (Saheed et al., 2022).

The construction industry in developing countries, like Katsina State, faces challenges that must be addressed for sustainable infrastructure development. It is important to enhance the capacity and capabilities of local construction firms, transfer knowledge, and improve regulations to reduce the dominance of foreign contractors and encourage fair competition (Lateef et al., 2024). Focusing on constructability, integrated value management, and acquiring and managing intellectual capital can help the construction industry contribute more to economic and social development (Rozita & Ehsan, 2020). This study aims to assess the ability of indigenous construction firms in Katsina State to compete with multinational firms by implementing constructability principles.

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Objectives of the Study

1. To assess the knowledge and skills of professionals in indigenous construction firms in Katsina State.
2. To identify the key factors contributing to the competitiveness of indigenous construction firms in Katsina State.
3. To identify the obstacles that hinder the implementation of constructability principles in indigenous construction firms in Katsina State.

METHODS

Research Design: The research design is a quantitative cross-sectional survey.

Sample: A convenience non-random sampling of 95 respondents was done, including professional staff and owners of small- and medium-scale indigenous construction firms in Katsina.

Instrument for the Research

The research used a questionnaire to collect data from staff and owners of construction firms in Katsina. The questions to assess the knowledge and skills were developed by conducting a literature search to identify the knowledge and skills required for construction firms in building projects. Participants rated their knowledge using a five-point Likert scale. A mean score of 3.00 was used as the cut-off point for assessing knowledge levels. The same approach was used to develop questions related to factors affecting construction firms in building projects, factors for implementing constructability of contractors in building projects, and factors that hinder the implementation of the constructability principle.

Experts at Abubakar Tafawa Balewa University evaluated the questionnaire's quality. The questionnaire was piloted to assess its reliability and clarity before fieldwork began. The calculated reliability coefficient of the instrument must be over 0.5 to ensure its effectiveness. Four research assistants guided the distribution and collection of the questionnaires in the study area. The study gathered responses from 95 participants.

Data Analysis

The data was analysed using descriptive statistics and inferential methods, all with the robust support of the Statistical Package for Social Sciences (SPSS). The mean score for the study (MSCal.) was compared to the study's mean score (MSStd. = 3.0) to assess respondent agreement, a process that underscores the credibility and trustworthiness of the data analysis. The data collected were analysed using descriptive statistics such as mean and mean calibration, as well as inferential statistics such as one-sample t-test.

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RESULTS

Demographic Profiles of the Respondents

The demographic profile of the respondents revealed that the most common qualifications among the respondents were MSc (43.94%) and BSc (42.1%), with HND being the least common (14.03%). Architects comprised 42.1% of the respondents, followed by Quantity Surveyors (29.8%) and Builders (28.1%). Most respondents had over 11 years of experience in the construction industry, with the majority being client supervisors (56.1%). Table 1 provides the summary of the demographic profile of the respondents

Table 1: Demographic profile of the respondents

Qualification	Profession	Role	Experience (years)
MSc 43.94% (n= 25) BSC 42.1% (n=24) HND 14.03% (n=8)	Architects 42.1% (n=24) QS 29.8% (n=17) Builders 28.1% (n=16)	Contractors 29.8% (n=17) Consultants 14.0% (n=8) Supervisors 56.1% (n=32)	14.0% (n= 8) = 1-5 28.1% (n=16) = 6-10 57.9% (n=33) over 11

Level of Knowledge and Skills in Project Delivery

The analysis of the knowledge and skill level of contractors involved in building projects reveals that more than 80% of the 22 factors assessed were considered to have moderate knowledge by the respondents. The mean scores ranged from 2.72 to 4.28, indicating that respondents possessed not just moderate but commendable knowledge and skills required for delivering building projects in the study area. Table 2 represents the overall findings for knowledge and skill levels.

The variables were categorised into three main parts: technical, managerial, and general skill knowledge. The analysis demonstrated that the significant skills and knowledge acquired by the respondents under technical knowledge were blueprint reading and specification (mean score = 3.58), construction technology techniques (mean score = 3.44), and procurement and contract bidding (mean score = 3.30). It was observed that the average knowledge and skills of the respondents under technical aspects were moderate, with an average mean of 3.28. The respondents showed moderate knowledge and skills in managerial aspects, with the highest skills being in teamwork (mean score = 3.84), project management and leadership (mean score = 3.58), and human resources management (mean score = 3.52). They also demonstrated strong communication skills (mean score = 4.28) and moderate skills in decision making/operation (mean score = 3.56) and legal matters (mean score = 3.42).

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Table 2: Analysis on levels of knowledge and skill in project delivery

	Sum	Mean	Levels of knowledge	One sample T-test @test value=3.0	
				t	Sig. (2-tailed)
Technical Knowledge	**Av. Mean=3.28**		**Moderate**		
Trade specific technical know how	188	3.2982	Moderate	3.188	.002
Building code and regulation	188	3.2082	Moderate	2.177	.034
Blueprint reading and specification	204	3.5789	High	3.120	.073
Construction Technology	196	3.4386	Moderate	4.521	.060
Procurement and contract bidding	181	3.1754	Moderate	1.043	.301
Plant/Equipment technical know how	164	2.8772	Moderate	-.680	.499
Managerial Knowledge	**A. Mean=3.22**		**Moderate**		
Project management and leadership	204	3.5789	High	4.158	.000
Risk management	162	2.8421	Moderate	-1.197	.237
Contract and compliance management	195	3.4211	Moderate	2.455	.017
Financial management	179	3.1404	Moderate	.851	.399
Strategic and change Management	162	2.8421	Moderate	-1.197	.237
Teamwork and relationship Management	219	3.8421	High	6.382	.000
Human resources Management	195	3.5211	Moderate	3.511	.001
Business and administration	180	3.1579	Moderate	.816	.418
Marketing and Public relation Management	164	2.8772	Moderate	-.739	.463
General Knowledge	**A. Mean=3.31**		**Moderate**		
IT Computer literacy BIM	155	2.7193	Moderate	-2.404	.020
Negotiation and dispute resolution	170	2.9825	Moderate	-.142	.888
Decision making/operation research	203	3.5614	High	4.675	.000
Numeracy and problem solving	178	3.1228	Moderate	1.095	.278
Communication skills	244	4.2807	High	13.796	.000
Legal	195	3.4211	Moderate	6.382	.000
Social /Networking	180	3.1579	Moderate	1.418	.162

Factors Facilitating Competitiveness of Indigenous Construction in Katsina State

In Table 3, a mean cut-off point of 3.00 was used to assess the importance of variables identified by the respondents. The findings revealed that all factors assessed were important in influencing the competitiveness of contractors in delivering building projects. The top-ranked factors were:

1. Study and consideration of modularization and pre-assembly design to facilitate operation (MS = 3.96).

2. To avoid interference between project teams (MS = 3.86).

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3. Discussion and documentation within the project execution plan of all project team members (MS = 3.72).

4. Dictating design and procurement schedules by construction sequences (MS = 3.70

Table 3: Drivers influencing construction firms' competitiveness in building projects

Potential drivers influencing construction firms' competitiveness	Sum	Mean	Ranking
Discussion and documentation within the project execution plan of all project team members.	212.00	3.7193	3
Taking consideration of constructability issue of the project by teams/stakeholder from the outset of the project and through all its phases.	211.00	3.7018	4
Avoidance interference between design and construction.	211.00	3.7018	4
Taking consideration method type in executing project.	186.00	3.2632	13
Master project schedule and the construction completion date.	171.00	3.0000	15
Discussion and analysing in depth of construction methods as early as possible.	210.00	3.6842	7
To avoid interference between projects teams	220.00	3.8596	2
Dictating design and procurement schedules by construction sequences.	211.00	3.7018	4
Use of technology in design and procurement phase.	193.00	3.3860	10
Use of technology in field operation phase.	209.00	3.6667	8
Standardization of project elements.	193.00	3.3860	10
Simplification and configuration of project technical specification.	202.00	3.5439	9
Study and consideration of modularization and pre-assembly design to facilitate operation.	226.00	3.9649	1
Consideration of accessibility of construction personnel materials and equipment.	187.00	3.2807	12
Consideration of adverse weather conditions.	178.00	3.1228	14

Factors That Hinder the Implementing Constructability of Indigenous Construction Firms in Katsina State

The data analysis findings, presented in Table 4, indicate that respondents in the study area agreed on seven inhibiting factors. The mean scores for the respondents ranged from 3.1228 to 4.4386, with low standard deviation values ranging from 1.2783 to 0.85131. Based on the respondents' assessments, it was concluded that they agreed with all the identified inhibiting factors in the study area. The factors with the highest mean scores were lack of materials (MS = 4.44), poor communication skills (MS = 3.86), and lack of construction experience (MS = 3.85).

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Furthermore, a non-parametric test using the Kruskal-Wallis test was conducted to investigate if there were differences in the perception ratings of inhibiting factors among the respondents based on their years of experience in the construction industry. As shown in Table 4, 14 barriers demonstrated significant differences in respondent perception based on years of experience, with values below 0.05, while only two barriers indicated insignificant differences. Therefore, there is a significant difference in the perceptions of the respondents on the level of agreement on inhibiting factors based on years of experience within the study are

Table 4: Factors that hinder the implementation constructability principle

Variables	Descriptive test		Kruskal-Wallis Test	
	Mean	Std. Dev.	Chi-square	Sig.level
Lack of awareness and resistance to formal constructability programmed	4.4386	.50063	23.113	0.000
Perception that constructability delays project schedule	3.7193	.45334	36.537	0.000
Lack of genuine commitment	3.5614	1.05251	17.238	0.000
Lack of construction experience	3.8596	.98992	18.757	0.000
Lack of team building or partnering	3.7193	.70088	56.000	0.000
Disregard of constructability in selecting contractors and consultants	3.5789	.90529	16.223	0.000
Contracting difficulties in defining constructability scope.	3.1228	1.13500	19.227	0.000
Lack of financial incentives for designer	3.5614	1.05251	49.257	0.000
Lack of mutual respect between designer and contractors	3.2807	1.27831	36.950	0.000
Perception of increase designers' liability	3.5614	.90667	24.645	0.000
Construction input is requested too late to be of value	3.1228	.84664	3.928	0.140
Incomplete specification and budgetary limitation	3.4386	.73235	27.945	0.000
Reluctance of field person to offer preconstruction advice	3.1404	.63916	3.081	0.214
Poor timeliness of input	3.1579	.84069	16.857	0.000
Poor communication skills	3.8596	.98992	23.677	0.000
Lack of involvement in tool and equipment development	3.234	.76532	22.21	0.000

DISCUSSION

This study assessed the competitiveness of construction firms in Katsina State, Nigeria by evaluating the constructability aspect. To achieve a comprehensive understanding of the variables, thorough literature reviews were carried out, forming an integral part of the questionnaire utilized in the data collection process for the study.

It has been found that the respondents acquired significant skills and knowledge in technical aspects such as blueprint reading, specifications, and construction technology techniques.

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Additionally, the respondents demonstrated moderate knowledge and skills in managerial aspects, with particular emphasis on teamwork, project management, and leadership. Moreover, the respondents exhibited a strong grasp of general skills and knowledge, with notable strengths in communication and decision making or operation areas. Prior research highlights the importance of workforce performance factors such as motivation, education, and skill level in boosting productivity (Soo et al., 2023). It also underscores the significance of leadership skill frameworks for construction managers, focusing on communication, planning, flexibility, risk-taking, and process orientation (Fadumo et al., 2023). Additionally, there are studies which emphasize the essential skills required for construction management, including supervision, communication, motivation, and leadership at different management levels (John, 2006). Furthermore, the link between leadership skills of project managers in the pre-construction phase and the success of sustainable construction projects has been explored, emphasizing communication, planning, team building, and conflict management skills (Aryani & Noorul, 2022). Overall, these studies stress the diverse nature of skills and knowledge necessary for success in the construction industry, covering technical, managerial, and general competencies.

Through the analysis of the second objective, it is abundantly clear that all factors play a crucial role in enhancing the competitiveness of contractors for project delivery in building projects within the study area. Furthermore, the top-ranked factors for improving construction firms' competitiveness through constructability in building projects include the consideration of modularization/pre-assembly design to facilitate smooth operations and mitigate interference between project teams. Previous studies emphasize the significance of constructability in improving productivity within the UK Construction Industry Kevin, (Kinser, 2022), advocating for early contractor involvement in the design stage to enhance project performance (Yuvarajan et al., 2023). Additionally, there are research works which highlight the importance of addressing conflicts between project design and execution to ensure quality and cost-effectiveness in construction projects (José et al., 2024). These findings collectively underscore the critical role of constructability strategies, such as modularization, in driving competitiveness and success in construction projects.

Delving into the analysis of the third objective, it is evident that all variables have been identified as inhibiting factors for contractors to improve their competitiveness through constructability in building projects within the study area. Notably, the respondents highlighted key barriers, including a lack of awareness and resistance to formal constructability programs, deficient communication skills, and inadequate construction experience and expertise. Previous studies emphasize the importance of overcoming obstacles such as a lack of awareness and resistance to formal constructability programs (Mubarak, Al-alawi et al., 2015), deficient communication skills (Karel & Nývlt, 2023), and inadequate construction experience and expertise (Mubarak et al., 2015). These barriers hinder the effective implementation of constructability concepts, leading to increased project time and cost, poor relationships, and project waste. Identifying and addressing these key barriers is crucial for enhancing the presence of contractors in the early stages of planning and design, ultimately improving project efficiency and outcomes. By recognizing and mitigating these challenges, construction industry professionals can work towards optimizing resources, reducing disputes, and minimizing delays in construction projects.

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RECOMMENDATIONS

Based on the study's findings, the following recommendations are suggested:

1. Contractors need to have good communication skills and ensure a practical teamwork management framework is implemented for successful building project delivery.

2. Contractors should highlight the crucial role of the construction manager in preventing interference between project teams. This responsibility ensures a smooth project flow and successful construction project delivery.

3. Stakeholders in the construction industry, especially contractors, should create awareness about the need to improve contractors' competitiveness through constructability in building projects. This approach not only enhances project efficiency but also opens new opportunities, thus making the stakeholders feel optimistic and inspired about the future of the industry.

CONCLUSION

This study found that construction industry professionals in Katsina State have acquired significant technical skills and knowledge, moderate managerial skills, and good general skills. Communication skills, dissemination, and teamwork management are crucial for firms to improve their competitiveness. The main barriers were the lack of awareness and resistance to formal constructability programs, poor communication skills, and lack of construction experience and expertise. Therefore, construction firm professionals should have good communication skills and ensure effective teamwork management. Stakeholders, especially contractors and policymakers, should improve awareness about the importance of constructability programs.

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