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Effectiveness of Internal Firm Factors in Driving Mechanisation for Improved Project Performance in Abuja, Nigeria

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Abstract

Mechanisation is increasingly adopted in the Nigerian construction industry to improve productivity, operational efficiency and project delivery. However, the internal organisational conditions that practitioners consider necessary for the effective use of mechanised systems remain insufficiently documented, particularly in Abuja. This study assessed the perceived importance of internal firm factors that support effective construction mechanisation in Abuja, Nigeria. A descriptive cross-sectional survey was conducted among construction professionals drawn from 52 active building construction firms, yielding 228 valid questionnaires. Mean score analysis and the Relative Importance Index (RII) were used to rank organisational management, operations and maintenance, and safety management factors. Operations and maintenance practices were ranked most highly, particularly the use of experienced operators with effective site supervision (RII = 0.887) and regular maintenance of mechanised equipment (RII = 0.880). Safety management was similarly rated very highly, led by the availability and mandatory use of personal protective equipment (RII = 0.885) and emergency-response systems (RII = 0.876). Organisational management factors, including investment in equipment acquisition and appropriate procurement strategies, were also rated very important. The narrow spread of the ratings indicates that these dimensions should be treated as complementary internal priorities rather than sharply separated drivers. Accordingly, the study identifies practitioners' perceived priorities for effective mechanisation; it does not estimate direct causal effects on objective project-performance outcomes.

Keywords: Mechanisation, Construction Management, Internal Organisational Factors, Equipment Management, Abuja, Nigeria.

Introduction

The construction industry is a vital contributor to socio-economic development because it provides the physical infrastructure required for productive and social activity. In Nigeria, the sector contributed approximately ₦6.5 trillion to gross domestic product in 2024, representing about 4% of GDP, while construction activity in the Federal Capital Territory (FCT), Abuja, remains substantial because of continuing urbanisation, public infrastructure investment and private-sector development (Adewumi et al., 2025; Kanu et al., 2025). Despite this contribution, building projects continue to face cost overruns, delays, low productivity and occupational safety challenges (Aka et al., 2023; Olatunde et al., 2026). Mechanisation, understood as the application of construction equipment and machinery to supplement or replace manual effort, is widely promoted as one means of improving the speed, consistency and efficiency of construction operations (Idoro, 2012). Previous studies also associate mechanised production with improvements in accuracy, productivity and occupational health and safety when equipment is appropriately selected and managed (Babatunde et al., 2019; Kamaruddin et al., 2016). The continued expansion of the construction-equipment market further underscores the practical relevance of understanding the conditions required for effective equipment use in Nigeria (Agusto Store, 2025).

Nevertheless, access to machinery alone does not guarantee effective mechanised delivery. Construction firms may face internal constraints relating to finance, procurement, operator competence, maintenance capacity, planning and safety management that can weaken equipment utilisation and reduce the expected benefits of mechanisation. For example, Olubajo (2024) reports continuing limitations in equipment acquisition and maintenance capability among construction firms in Abuja, while Idoro (2011) shows that mechanisation can introduce additional occupational risks where appropriate safety-management practices are absent. These observations suggest that the practical value of mechanisation is shaped not only by the availability of plant and equipment but also by the organisational capability to select, operate, maintain and control those resources effectively.

Within this study, the relevant internal firm factors are organised into three dimensions: organisational management, operations and maintenance, and safety management. Organisational management covers strategic planning, resource allocation, procurement decisions, leadership commitment and the integration of mechanisation into project planning. Operations and maintenance encompass equipment utilisation, operator competence, training, maintenance support and technology-enabled equipment management. Safety management includes safety culture, supervision, personal protective equipment, emergency response and risk-control procedures for mechanised operations. Conceptually, these dimensions represent complementary organisational conditions that may enable firms to realise the potential value of mechanised construction.

Although construction mechanisation has received increasing scholarly attention in Nigeria, much of the existing literature concentrates on adoption, productivity, cost or occupational safety outcomes (Idoro, 2011; Babatunde et al., 2019). Comparatively less attention has been given to the internal organisational conditions that practitioners consider most important for effective mechanisation. In addition, a substantial part of the earlier Nigerian evidence has been generated outside Abuja, leaving a contextual need for evidence from the FCT, where public and private building activity is extensive and construction firms operate under distinctive market, regulatory and logistical conditions.

Accordingly, this study addresses the identified gap by assessing and ranking construction professionals' perceptions of the importance of internal firm factors for effective mechanisation in Abuja, Nigeria. The analysis focuses on organisational management, operations and maintenance, and safety management. Importantly, the study is designed as a descriptive prioritisation of perceived enabling conditions; it does not, within this article, estimate direct causal effects of the identified factors on objective project-performance records such as cost growth or schedule delay.

LITERATURE REVIEW

Conceptualising Mechanisation in Construction

The concept of mechanisation in the construction industry represents an important turning point from labour-based practices to technology-based operations, which seek to improve efficiency, productivity and overall project performance. Indeed, according to Kamaruddin et al. (2016), mechanisation involves the systematic use of mechanical and automatic systems in order to improve construction processes and decrease dependence on labour force. Moreover, Idoro (2012) defines mechanisation as the replacement or supplementation of human efforts by means of application of machinery in construction operations. The issue of mechanisation is especially relevant to developing countries, where the limitations of productivity and efficiency continue to hinder project delivery. The spectrum of mechanisation in construction is rather wide, including such machinery as excavators, graders, bulldozers, cranes, loaders and others, each of which serves specific purposes during particular phases of construction project execution. According to Babatunde et al. (2019), the degree of mechanisation depends on the type of construction projects, costs involved, and operation specifics. The practice of mechanisation in Nigeria has become rather progressive, especially when it comes to such aspects as earthwork, material handling and structural operations.

The global trends of adoption of mechanisation have been driven by urbanisation, infrastructure investments, and development of construction technologies. Nowadays, trends like automation, telematics and equipment digitisation are significantly improving operation efficiency and safety (Hwang et al., 2019; Awodele et al., (2024). There is a lot of evidence about the positive impact of mechanisation on the results of construction projects in terms of reduction of construction time, improvement of quality and occupational health and safety performance (Kamaruddin et al., 2016; Idoro, 2011). However, despite numerous benefits, many studies revealed the fact that effective implementation of mechanisation does not depend on the presence of machinery alone but also on organisations' ability to manage and use such resources. Thus, there is a necessity to identify internal organisational factors that may affect the level of contribution of mechanisation into construction projects' outcomes.

Project Outcomes in Construction

The output of the projects in the construction sector is an intricate matter which goes beyond the conventional assessment criteria such as time, cost and quality. Time, cost, and quality criteria are regarded as the iron triangle and they are highly important despite the fact that nowadays researchers focus on considering other criteria as well, such as sustainability, safety, stakeholders' satisfaction and environmental impact (Olatunde et al., 2026; Haq et al., 2025). Time performance implies compliance with the schedule of a project while cost performance includes compliance with budgeting. Quality performance implies compliance of project deliverables with some standards and functionalities (Haq et al., 2025). Even though the criteria mentioned above should be taken into account, safety performance is another important aspect since the risk factor is very high in the case of construction work and

especially in developing countries where the construction industry is underdeveloped and poorly regulated (Aka et al., 2023). Customer satisfaction is becoming one of the crucial criteria due to the need for satisfying customers' requirements and organisational aims (Ahmed and Garvin (2020).
Various technical, economic and organisational factors determine the outcome of the projects in the construction sector of Nigeria. According to Dosumu (2026), the success of the project not only depends on the project deliverables but also on user satisfaction, professional fulfillment and conformity to organisational aims. Habu et al. (2025) also emphasize that workforce management and training process are the factors influencing the performance of projects in Abuja. In addition, economic constraints, inefficiency of regulations and project management increase the complexity of project performance challenges (Unegbu et al., 2025). It means that there is a need to identify and analyse internal factors that affect construction strategy such as mechanisation.

Firms' Internal Factors and Mechanisation Effectiveness

The effectiveness of the use of mechanisation in order to achieve better project outcomes in construction firms depends greatly on the internal organisational factors that govern the process of acquisition, use, management and maintenance of the mechanised means. Management-related factors, such as leadership commitment, strategic planning and resource allocation are among the key drivers of successful use of mechanisation in construction projects (Adeleke et al, 2018). The support from the top management is known as one of the most significant determinants of the firm's performance. Agboola et al., (2026) note that the commitment of the management facilitates better decision making, encourages innovations and allows the allocation of the resources necessary for the proper execution of projects. In the case of mechanisation, it also affects the investments, adoption and efficiency of operation. Moreover, the organisational culture of the firm may significantly influence the adoption and use of the mechanised equipment. The research conducted by Ibrahim and Tsado (2022) showed that innovation, accountability and efficient communication in the organisational culture improve firm performance, while the resistance to changes prevents successful implementation of mechanisation. The strategies used for resource allocation and procurement may be an important factor in the use of mechanisation. In Nigeria, there are numerous difficulties connected with the lack of financial resources and relatively high costs of the equipment that make the firms unable to invest in new machinery. According to Oluwaseun and Adebayo (2018), proper resource allocation allows increasing the efficiency and performance in cost management due to the availability of necessary resources at the required time. The use of the mechanised means also requires the use of skilled employees. Ola-awo et al. (2021) underline the importance of training in order to improve the utilization of the equipment and reduce inefficiencies.

Operation and Maintenance Factors

Maintenance and operation (O&M) are crucial to efficient construction management especially in mechanised operations. Effectiveness in O&M improves the reliability, availability and performance of equipment. According to Awodele et al., (2024) maintenance practices of construction organisations have significant impact on the performance of equipment. The maintenance culture is an important determinant of the performance of equipment. Proactive maintenance culture is characterized by maintenance through prevention by conducting planned checks. Reactive maintenance culture is a type of maintenance strategy whereby corrective measures are taken after the occurrence of equipment failures leading to increased costs and delay in projects (Agboola et al, 2026). However, maintenance practices in Nigeria are mostly reactive in nature and this is attributed to factors such as lack of finances,

inadequate planning and poor technical skills. Some of the main challenges that limit effective maintenance in construction companies have been pointed out by Adewole and Uberu-Ademakinwa (2026) including the absence of commitment from leadership, inadequate finances and skills.

Availability of spare parts and efficiency in supply chain is another important determinant of maintenance effectiveness. Delay in availability of spare parts will result in increase in downtime of equipment hence having adverse effects on project completion time and productivity. Kanu et al. (2025) stated that asset reliability is determined by effective maintenance planning and management of resources. Competence of operators is another important determinant as untrained operators can lead to equipment abuse hence increased wear and tear of machinery. Inadequacy of operator training is a major challenge in Nigeria construction companies leading to improper use of mechanized equipment according to Idoro (2011).

Safety Management Factors

Safety management is one of the key elements of construction operations especially within mechanised settings in which risks may be high. The construction industry in Nigeria is still facing high levels of occupational accidents and injuries due to lack of effective safety management practices (Aka et al., 2023). Mechanisation and safety have a relationship since the use of machinery can either reduce or escalate the risks depending on how the safety process is managed. Safety culture is one of the main determinants of safety performance within the construction industry. A good safety culture shows the commitment of an organisation to give priority to safety in all aspects of its operations. It was established by Agboola et al., (2026) that leadership commitment is vital in ensuring safety attitudes among workers through adherence to safety rules. Besides, workers require to undergo safety training continuously so that they gain the necessary knowledge and skills to handle machinery safely. In addition, innovative safety training such as simulation has been found to enhance safety performance through increasing awareness about the dangers involved (Hwang et al., 2019). Other important elements of safety management include safety regulation compliance and personal protective equipment. However, weak compliance with safety rules has been a big challenge within the Nigerian construction industry causing inconsistency in safety practices (Aka et al., 2023). In addition, there is need to implement safety management systems so that safety can be integrated in project planning and implementation. Idoro (2011) noted that it was important to integrate safety measures in addition to mechanisation so that maximum benefits of mechanisation can be achieved. Good safety management practices will not only reduce the rate of accidents but also improve project performance.

Research Gap

The critical synthesis of the literature reveals an empirical and contextual gap. Previous Nigerian studies have established the relevance of mechanisation to construction cost, productivity and occupational health and safety (Idoro, 2011; Babatunde et al., 2019), yet the internal organisational conditions that practitioners regard as necessary for effective mechanised delivery remain less systematically prioritised. This gap is important because equipment acquisition may create only limited value where firms lack the management systems, operator competence, maintenance capability or safety controls required for dependable utilisation. Furthermore, relatively limited evidence is available for Abuja despite the concentration of major building activity in the FCT.

Although recent work has examined maintenance practice and organisational performance in Abuja (Adewole & Uberu-Ademakinwa, 2026; Ibrahim & Tsado, 2022), these strands are rarely integrated around the practical management of mechanised construction. The present study therefore contributes

context-specific evidence by ranking the perceived importance of organisational management, operations and maintenance, and safety management factors. This descriptive focus is deliberately distinguished from causal performance testing: the rankings indicate practitioner priorities for effective mechanisation rather than measured changes in cost, time, quality or safety outcomes.

METHODOLOGY

The study adopted a quantitative cross-sectional survey to examine construction professionals' perceptions of the internal firm factors that support effective mechanisation in Abuja, Nigeria. Abuja was considered suitable because of its concentration of public and private building projects and the wide range of mechanised activities undertaken under different contractual and regulatory arrangements. The design enabled standardised information to be collected at a single point in time and provided an appropriate basis for descriptive comparison and prioritisation of the identified internal factors.

A descriptive survey design was used because the study sought to determine how construction professionals rated the importance of predefined organisational conditions rather than to manipulate variables experimentally. Descriptive survey research is appropriate for systematically documenting perceptions and the extent to which identified phenomena are considered important within a defined population (Kothari, 2004; Neuman (2014). The structured questionnaire ensured consistency in item wording and response categories, thereby supporting comparison across professional groups and factor dimensions.

The sampling frame comprised 52 active building construction firms registered with the building unit of the Federal Capital Development Authority (FCDA) in Abuja. All 52 eligible firms were included at the firm level because they were actively involved in building project delivery and mechanisation-related practices. Within the firms, knowledgeable construction professionals involved in planning, design, cost control and site execution were targeted using a multi-informant approach. The respondent categories included builders, architects, quantity surveyors and civil/structural engineers. Six professionals were targeted per firm, giving a potential sample of 312 respondents. This approach ensured that responses were obtained from practitioners with direct knowledge of construction operations while reducing dependence on a single informant from each organisation.

Data were collected with a structured questionnaire developed from the literature on construction mechanisation, project delivery and internal organisational drivers. The instrument contained sections on respondent characteristics and the three internal-factor dimensions examined in this article: organisational management, operations and maintenance, and safety management. Respondents rated the importance of each factor on a five-point Likert scale ranging from 1 (Not Important) to 5 (Very Important). Before full administration, the instrument was reviewed for clarity, relevance and content adequacy. Following data collection, descriptive statistics, mean score analysis and the Relative Importance Index (RII) were used to establish the relative priority of the factors. Because the analytical purpose of this article is descriptive prioritisation rather than causal estimation, the RII rankings are interpreted as perceived importance and not as direct evidence of improvement in project performance.

As an additional scale-quality diagnostic, internal consistency was assessed using Cronbach's alpha for the retained indicators representing the three internal-factor dimensions. The coefficients were 0.942 for organisational management, 0.938 for operations and maintenance, and 0.947 for safety management. All values exceed the commonly accepted minimum of 0.70, indicating strong internal consistency (Bujang et al., 2018). These reliability coefficients relate to the retained measurement indicators after scale screening, whereas the RII tables report the complete set of factors rated for descriptive prioritisation.

$$RII = \frac{\sum W}{A \times N}$$

where W represents the weight assigned to each factor by respondents, A denotes the highest possible weight on the Likert scale (5 in this study), and N represents the number of valid responses. RII values range from 0 to 1, with values closer to 1 indicating greater perceived importance. The RII results were used to rank the factors within each internal dimension, while mean scores provided a complementary indication of central tendency. Given the descriptive purpose of the analysis, small differences in RII are interpreted cautiously and are not treated as evidence of statistically significant differences between factors.

RESULTS

A total of 312 questionnaires were distributed to construction professionals working on active building projects in Abuja. Of these, 243 were returned, representing a response rate of approximately 78%. Following data screening and cleaning, 228 questionnaires were retained for analysis, while 15 were excluded because of incomplete responses and data inconsistencies. The final sample therefore provided the basis for the descriptive and reliability analyses reported in this article.

Respondent Profile

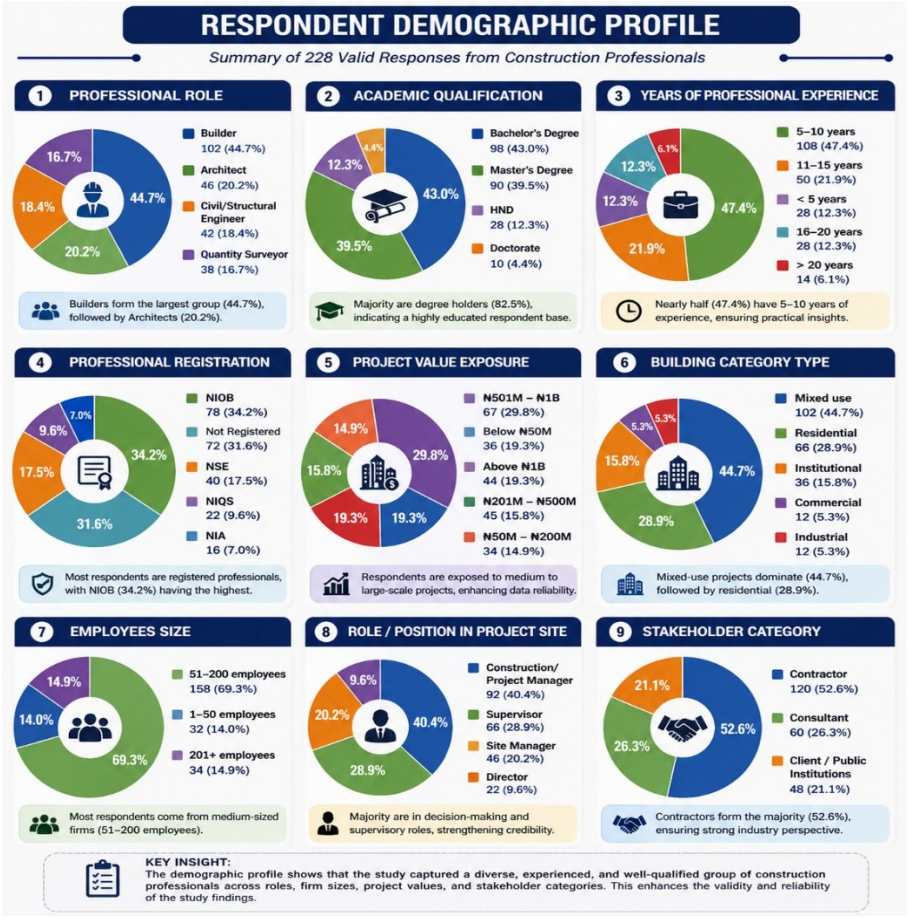


Figure 1: Respondent Demographic Profile

The respondents represented the principal professional disciplines involved in building project delivery. Builders constituted 44.7% of the sample, followed by architects (20.2%), civil/structural engineers (18.4%) and quantity surveyors (16.7%). Educationally, 43.0% held bachelor's degrees and 39.5% held master's degrees, while smaller proportions held Higher National Diplomas (12.3%) and doctoral degrees (4.4%). In terms of experience, 47.4% had 5-10 years of professional practice and 21.9% had 11-15 years, indicating that the sample was dominated by practitioners with substantial exposure to construction project delivery. Professional registration was also represented across relevant bodies, although 31.6% reported no current professional registration.

Respondents were also exposed to varied project and organisational contexts. The largest project-value category was ₦501 million to ₦1 billion (29.8%), while mixed-use (44.7%) and residential (28.9%) developments were the most frequently represented building types. Most respondents worked in medium-sized firms with 51-200 employees. Construction/project managers (40.4%) and supervisors (28.9%) formed the largest role categories, indicating strong representation of personnel involved in operational decision-making. The stakeholder distribution comprised contractors (52.6%), consultants (26.3%) and client representatives (21.1%), providing perspectives from the principal parties involved in building project delivery.

Analysis of Firms' Internal Factors

The perceived importance of firms' internal factors was assessed across three dimensions: organisational management, operations and maintenance, and safety management. Relative Importance Index (RII) values and mean scores were used to establish the priority attached to each factor by the construction professionals. The results therefore indicate perceived importance for effective mechanisation rather than causal effects on measured project-performance outcomes.

Table 1: Organisational Management Factors

DRIVING FACTORS	RII	Rank	Remarks
Investment in equipment acquisition and upgrade	0.840	1	Very Important
Procurement strategy for plant and equipment (buying/renting/leasing)	0.836	2	Very Important
Proper selection/matching of equipment for activities	0.834	3	Very Important
Integration of mechanisation into project planning and scheduling	0.832	4	Very Important
Performance monitoring and audits of mechanised systems	0.820	5	Very Important
Sourcing, accessibility and adequate funds	0.818	6	Very Important
Inculcating an organisational culture that supports mechanisation	0.816	7	Very Important
Management commitment to the mechanisation strategy	0.814	8	Very Important
Developing a sustainable, cost-effective approach	0.814	8	Very Important

The organisational management factors were consistently rated very important, with RII values ranging from 0.814 to 0.840. Investment in equipment acquisition and upgrading ranked first (RII = 0.840), followed by procurement strategy for plant and equipment (RII = 0.836), proper matching of equipment to construction activities (RII = 0.834), and integration of mechanisation into project planning and scheduling (RII = 0.832). Performance monitoring and audits (RII = 0.820), access to adequate funds (RII = 0.818), organisational culture supportive of mechanisation (RII = 0.816), management commitment (RII = 0.814), and sustainable cost-effective approaches (RII = 0.814) also remained

within the very-important range. The narrow spread of the scores indicates broad agreement that effective mechanisation requires a package of mutually reinforcing managerial practices rather than reliance on one isolated organisational intervention.

Table 2: Operations & Maintenance Factors

DRIVING FACTORS	RII	Rank	Remarks
Use of experienced operators and effective site supervision	0.887	1	Very Important
Regular maintenance of mechanised equipment	0.880	2	Very Important
Provision of adequate training for equipment operators	0.876	3	Very Important
Frequent training and development in the use of mechanised equipment	0.873	4	Very Important
Availability of skilled and certified equipment operators	0.861	5	Very Important
Effective communication and knowledge-sharing platforms	0.855	6	Very Important
Availability of in-house maintenance support facilities	0.845	7	Very Important
Technology integration for equipment and site management	0.837	8	Very Important

Operations and maintenance factors received the highest overall pattern of ratings, with individual RII values ranging from 0.837 to 0.887. The use of experienced operators and effective site supervision was the highest-ranked factor (RII = 0.887), followed by regular maintenance of mechanised equipment (RII = 0.880) and adequate training for equipment operators (RII = 0.876). Frequent training and development (RII = 0.873) and the availability of skilled and certified operators (RII = 0.861) further emphasised the perceived importance of human and technical capability. Communication and knowledge sharing (RII = 0.855), in-house maintenance support (RII = 0.845), and technology integration for equipment and site management (RII = 0.837) were also rated very important. Taken together, the rankings show that respondents regarded competent operation, supervision and equipment care as central conditions for effective mechanised construction.

Table 3: Safety Management Factors

DRIVING FACTORS	RII	Rank	Remarks
Availability and mandatory use of personal protective equipment (PPE)	0.885	1	Very Important
Availability of emergency response systems for machine-related accidents	0.876	2	Very Important
Effective supervision during mechanised construction operations	0.873	3	Very Important
Periodic safety drills and awareness training on mechanisation risks	0.867	4	Very Important
Provision of safety-related tools and technologies (e.g., sensors, alarms)	0.865	5	Very Important
Effective site layout planning for safe equipment movement and operation	0.863	6	Very Important
Implementation of machine-specific safety protocols and procedures	0.862	7	Very Important
Proper load management and compliance with equipment capacity limits	0.860	8	Very Important
Clear demarcation of equipment operation zones on construction sites	0.857	9	Very Important
Regular safety audits, meetings, and enforcement of safety culture	0.846	10	Very Important
Implementation of risk management systems for mechanised operations	0.828	11	Very Important

Safety management factors were likewise rated consistently very important, with RII values ranging from 0.828 to 0.885. The availability and mandatory use of personal protective equipment (PPE) ranked first (RII = 0.885), followed by emergency-response systems for machine-related accidents (RII = 0.876) and effective supervision during mechanised operations (RII = 0.873). Periodic safety drills and awareness training (RII = 0.867), safety-related tools and technologies (RII = 0.865), site-layout planning for safe equipment movement (RII = 0.863), and machine-specific safety protocols (RII = 0.862) were also highly rated. Although risk-management systems recorded the lowest score within this dimension (RII = 0.828), the value remained within the very-important category. The overall pattern therefore reflects strong practitioner consensus that safety controls are integral to responsible mechanised operations.

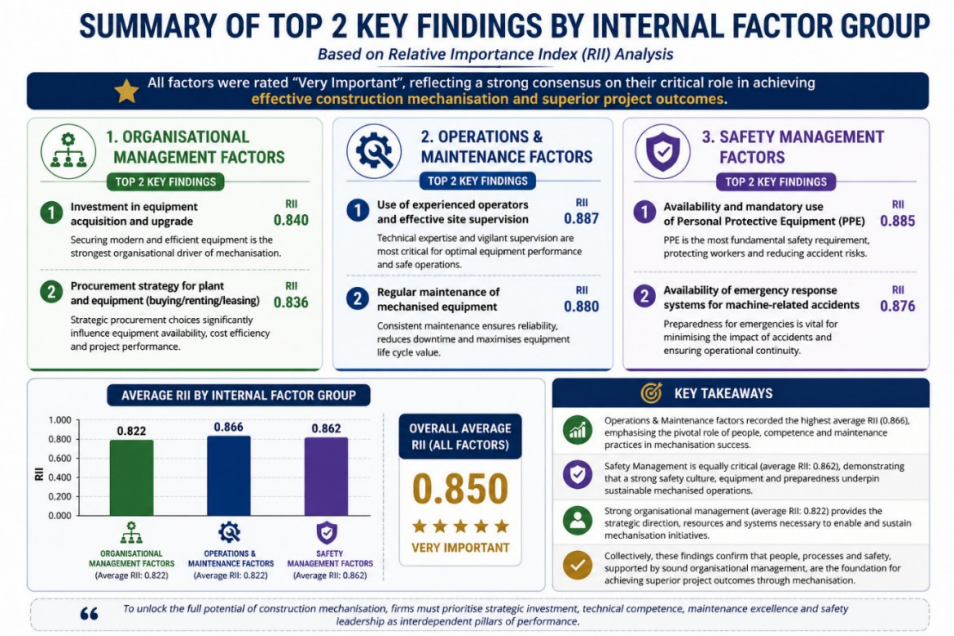


Figure 2: Summary of Top-Ranked Internal Firm Factors Based on RII

Across the three dimensions, operations and maintenance ranked marginally ahead of safety management, while organisational management also remained strongly rated. However, the generally high and closely clustered RII values limit the usefulness of treating adjacent rank positions as large practical differences. The rankings are therefore best interpreted as a prioritisation guide showing a set of complementary organisational, operational and safety capabilities that should be strengthened together.

DISCUSSION OF FINDINGS

The findings show that construction professionals in Abuja attach very high importance to all three internal dimensions, with operations and maintenance receiving the strongest overall pattern of ratings and safety management following very closely. The prominence of experienced operators, site supervision and regular maintenance suggests that practitioners regard day-to-day technical capability as essential to obtaining dependable value from mechanised resources. This interpretation is consistent with Kamaruddin et al. (2016) and Idoro (2011), who emphasise that mechanisation benefits are contingent on competent equipment use and appropriate operational controls. The equally strong ratings

assigned to PPE, emergency-response arrangements and safety supervision further indicate that respondents do not view mechanisation as purely a productivity intervention; rather, it must be accompanied by safeguards that manage the additional hazards associated with plant-intensive work (Aka et al., 2023). Viewed through the resource-based perspective, the pattern supports the proposition that machinery is valuable when complemented by organisational routines and capabilities that enable effective deployment (Barney, 1991).

Organisational management factors were ranked somewhat below the operational and safety dimensions, but every item remained within the very-important category. In particular, investment in equipment acquisition and upgrading, plant procurement strategy, equipment-activity matching and integration of mechanisation into planning were strongly endorsed. These findings accord with Adeleke et al., (2018) and Oluwaseun and Adebayo (2018), who stress the importance of management capability and resource allocation in construction delivery. Nevertheless, the narrow spread of RII values both within and across the three dimensions cautions against interpreting the rankings as evidence that one dimension can substitute for another. A more defensible practical interpretation is that operational competence, safety systems and management support constitute interdependent priorities: operational practices may be more immediately visible on site, while managerial systems provide the resources and coordination that sustain them. Thus, the findings should therefore be interpreted within the analytical boundary of the study. The questionnaire captured practitioners' ratings of the importance of internal factors, and the RII analysis establishes relative perceived priority; it does not demonstrate that a higher-rated factor directly caused lower cost growth, shorter delays, higher quality or improved safety outcomes on the sampled projects. Future studies can strengthen causal and predictive inference by linking these organisational ratings to objective project records or by testing the relationships through appropriate regression or structural modelling.

CONCLUSION

The study concludes that construction professionals in Abuja perceive operations and maintenance, safety management, and organisational management as highly important and mutually reinforcing conditions for effective construction mechanisation. Operations and maintenance received the strongest overall pattern of ratings, particularly for experienced operators, effective supervision, systematic maintenance and continuous training, while safety management was almost equally prominent through PPE provision, emergency preparedness and operational supervision. Organisational management, especially investment planning, procurement strategy and equipment-activity matching, provides the institutional support within which these site-level capabilities can be sustained. Accordingly, construction firms should combine operator development, preventive maintenance and robust safety systems with disciplined equipment planning and procurement rather than treating machinery acquisition as a stand-alone solution. Because the study is based on perceived importance ratings, these conclusions identify management priorities for effective mechanisation and should not be interpreted as direct estimates of causal improvement in objective project-performance outcomes. Future research should connect the identified priorities to longitudinal or project-record measures of cost, time, quality and safety performance.

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