# Material Handling Equipment Identification and Selection Factors for Delivery of High-Rise Building Projects in Abia State Nigeria [1]

**Ihuoma Chijioke Ohajuru[I], Ibeawuchi Ifeanyi Echeme[II], Emmanuel Chinenye Ubani[II]**

[I] Procurement Department, Abia State Universal Basic Education Board, Umuahia, Abia State, Nigeria

[II] Department of Project Management Technology, Federal University of Technology Owerri, Imo State, Nigeria

## ABSTRACT

Assessment of materials handling equipment selection factors for successful execution of high-rise building projects in Abia State is the title of this study. The objectives are to: identify the primary material handling equipment used in the construction of high rise building projects; determine the major factors in the selection of material handling equipment for the successful implementation of high-rise building project delivery; determine the degree to which each of these factors influences the selection of material handling equipment in the successful implementation of high-rise construction projects; ascertain the degree to which these factors collectively affect the selection of material handling equipment in the successful implementation of high-rise building projects and; ascertain the most crucial factor in the selection of materials handling equipment for the effective implementation of high-rise building projects for decisive purposes. A descriptive survey research design was used, and questionnaires were used to collect data. The information gathered from 167 respondents was examined using multiple regression analysis, descriptive statistics and relative importance index. According to the findings, tower cranes and concrete pumps are the most common types of equipment in Abia State. The main considerations while choosing equipment for high-rise buildings in Abia State are job requirements, reliability, and cost. Tower cranes and concrete pumps are recommended by the study as the best material handling

[1] How to cite this paper: Ohajuru, I. C., Echeme, I. I., Ubani, E. C. (2026). Material Handling Equipment Identification and Selection Factors for Delivery of High-Rise Building Projects in Abia State Nigeria; *PM World Journal*, Vol. XV, Issue VIII, August.

equipment. For high-rise building projects to be implemented successfully, the selection of suitable material handling equipment should also take job requirements, equipment reliability, and related costs into account.

**Keywords:** materials handling equipment, high-rise building, job requirement, equipment reliability, project success

## 1.0 Introduction

High-rise or tall buildings are becoming more common due to a number of factors, including land scarcity, growing demand for commercial and residential space, economic growth, technological advancements, innovations in structural systems, the desire for aesthetics in urban settings, cultural significance, and prestige, which inspire human aspiration to build higher structures (Echeme, 2021; Proverbs, Holt & Love, 2019). Building a high-rise is a difficult engineering task that requires accuracy, safety, and the appropriate equipment. It is not just about stacking floors. The equipment used on-site must be more robust, quicker, and dependable as structures get taller. MKG (2026), claim that as they provide hoisting and lifting solutions on major construction sites in India, builders witness the above scenario on a daily basis. However, materials management is a crucial component of any building project (Mtandt, 2025). According to MKG (2026), selecting material handling equipment (MHE) for high-rise projects necessitates striking a balance between site safety, load capacity, and vertical height. Concrete pumps, construction hoists for workers and supplies, and tower cranes for heavy lifting are examples of essential materials handling equipment. Site limitations, safety compliance, project timeline speed, material type, and structural load capability are important selection criteria (MKG, 2026).

In the construction sector, having the appropriate equipment can significantly lower labor costs, increase safety, and boost project efficiency. Depending on the materials being carried, the size of the project, and the conditions at the project site, different kinds of material handling equipment are deployed. Good project management in construction must actively pursue the efficient utilization of labor, material, and equipment, and labor productivity should be a major and ongoing concern for those in charge of controlling the cost of constructed facilities. To cut costs, material handling, which includes inventory, shop fabrication, field servicing, and procurement, needs special consideration (Echeme, 2021). In recent decades, significant advancements in construction technology have been made feasible by the employment of new machinery and creative techniques. It is understandable that organizations that have failed to adapt to changing surroundings and acknowledge the influence of various technologies have been pushed out of the mainstream of building operations.

Materials management is a part of every construction job. As a result, choosing the right equipment is crucial for contemporary building projects. In order to prevent delays, breakdowns, cost reductions, and accidents involving people or other equipment on a construction project site, it makes it feasible to identify the appropriate and capable equipment to employ at a specific area of a project. When selecting equipment for high-rise building projects, extra consideration is given. On the other hand, a high-rise building is defined as a tall structure (Constructor, 2019). Accordingly, high-rises are structures that are between 75 and 491 feet (23 and 150 meters) high. Skyscrapers are structures that are higher than 492 feet (150 meters). Steel and reinforced concrete make up the structural framework of high-rise buildings (Constructor, 2019). A tall building or structure is called a high-rise ((Constructor, 2019); Echeme, 2021). Certain characteristics are present in high-rise buildings. Compared to lesser buildings, high-rise structures are higher and result in greater lateral and vertical stresses, mostly from wind stress.

Depending on the type of equipment, the type of work, and the size of the construction company, there are several considerations to take into account when choosing equipment for high-rise building projects (Constructor, 2019). Since most construction work is done by hand, there has not been much focus in the past on the important considerations when choosing materials handling equipment, particularly for high-rise building projects. The majority of construction projects in Nigeria and other developing nations have been characterized by frequent accidents, delays, higher costs, collapse, and poor craftsmanship as a result (Afolayan, 2021). Many authors' suggestions in the past have been unsuccessful because it seems that these factors are not taken into account when choosing materials handling equipment for high-rise building projects (MKG, 2026; Mtandt, 2025; Constructor, 2019). Instead, most building construction sites use manual material handling systems, which are expensive, time-consuming, and prone to accidents (Echeme, 2021).

In light of this, the study is set to identify and assess the major factors required for the selection of materials handling equipment for high-rise construction projects in order to enhance performance and economic growth of Abia State, Nigeria.

The necessity of high-rise construction projects must not be overemphasized, based on the fact that it is an indication of both urbanization and development's aesthetic values (Echeme, 2021). However, high-rise buildings are essential, particularly in areas where land is expensive or scarce. Unfortunately, due to the nature of the equipment required to move construction materials both vertically and horizontally on construction sites as well as the conventional manual handling of construction materials, the majority of these high-rise buildings may never be realized. In addition to discouraging economic growth, these have led to the loss of invested capital, lives, and property. The size of the construction company, comparable expenses, construction speed, and site safety have all been linked by past authors (MKG, 2026; Mtandt, 2025; Echeme, 2021). Others criticized the high foreign exchange rate because the majority of the equipment is imported, the lack of materials handling equipment, wind pressure, safety concerns, soil capacity, and the lack of qualified workers required to run the equipment (Afolayan, 2021; Echeme, 2021).

Therefore, identifying these equipment and assessing the critical factors that influence the selection of materials handling equipment for high-rise building projects can help determine which equipment to use to handle a given material without failure or accident, as well as guarantee project success and economic development.

The specific objectives are;

i.) To identify the primary material handling equipment used in the construction of high rise building projects.
ii.) To determine the major factors in the selection of material handling equipment for the successful implementation of high-rise building project delivery.
iii.) To determine the degree to which each of these factors influences the selection of material handling equipment in the successful implementation of high-rise construction projects.
iv.) To ascertain the degree to which these factors collectively affect the selection of material handling equipment in the successful implementation of high-rise building projects.
v.) Ascertain the most crucial factor in the selection of materials handling equipment for the effective implementation of high-rise building projects for decisive purposes.

However, the following hypotheses were formulated to assist in the realization of the study objectives are;

**$H_{01}$:** The extent to which each of these factors influences the selection of material handling equipment in the successful implementation of high-rise construction projects is not significant.

**$H_{02}$:** The extent to which these factors collectively affect the selection of material handling equipment in the successful execution of high-rise building projects is not significant.

## 2.0 Literature Review

Building a high-rise is not just about stacking floors, it is a complex engineering challenge that demands precision, safety, and the right machinery. As buildings grow taller, the equipment used onsite needs to be stronger, faster, and more reliable. According to MKG (2026), builders witness this every day while supplying hoisting and lifting solutions across top construction sites in India. Selecting material handling equipment (MHE) for high-rise projects requires balancing vertical reach, load capacity, and site safety.

Super high-rise buildings, which are at the forefront of building science and technology, are very important in today's construction industry. As posited by Wang, Zhang, Wang, Cui, Chen, and Li (2018), significant advancements have been made in building function, structural system, building services, and other elements of super high-rise buildings. However, the level of industrialization and all-encompassing benefits are still limited when it comes to the construction process due to labour-intensive work, low mechanization, lengthy construction times, high costs, and environmental pollution. Materials, machinery, method (process), and management are often the main areas of attention for construction innovation (Afolayan, 2021). In addition to significantly limiting the development of process and management innovation, equipment innovation lags behind other challenges.

However, vertical transportation and the operating environment are the two most significant concerns with the development of extremely high-rise buildings. The strategy to increasing construction efficiency is moving too many materials, parts, workers, and equipment to high altitudes. Due to the numerous construction procedures, high engineering quantity, and operational demands of the construction of extremely high-rise buildings, the standard platform operation environment is constrained and inconvenient (Echeme, 2021). Enhancing the working environment is another important way to boost construction productivity. Turnover formwork, climbing formwork, sliding formwork, lifting formwork, and jacking formwork were utilized in the construction of extremely high-rise buildings starting at the end of the 19th century. These tools provide a closed, accessible environment by combining scaffolding and formwork (Wang et al. 2018). These formworks can be equipped with a material yard, tool room, positioning boom, etc. at the same time. In order to enhance vertical transportation, tower cranes and construction hoists were added to extremely high-rise buildings in Europe toward the end of the 19th century (Mtandt, 2025). This significantly increased the vertical transportation capacity. Since then, more research has been done on the attachment, running speed, and loading capacity. These days, a tower crane can raise 100 feet with a maximum bending moment of 3200 t·m, whereas a hoist can carry a greater weight at a maximum speed of 120 m/min (Echeme, 2021; Proverbs, Holt & Love, 2009).

## 2.1. Materials Handling Equipment for High-Rise Building Projects

Some equipment and its application for high-rise construction sites have been highlighted by Sitek (2020). Cranes, self-loaders, forklifts, chain blocks, lever hoists, lifting belts (flat or circular webbing slings), trolleys, wire rope slings, lifting jacks, etc. are among them.

### a.) Cranes

Another family of material handlers that are frequently seen on construction sites are cranes. Heavy steel beams, pre-stressed concrete pieces for structures or bridges, materials and supplies to the upper stories of a high-rise, unloading vehicles, and a variety of other crucial jobsite material handling activities are all lifted and placed by them. For our objectives, we shall examine the common types of cranes that are used on construction sites.

### a.i.) All Terrain Cranes

All-terrain cranes are becoming a widely used construction equipment. According to Sitek (2020), they have the truck crane's highway travel speeds and are similar to rough terrain cranes in terms of off-road capabilities. The load is distributed by several axles, including steer drive and tag. Multi-axle steering adds mobility, while several driven axles offer traction to manage challenging jobsite conditions. Suspension choices can improve driving dynamics and boost off-road clearance, making a crane easier to transport from job to job regardless of the distance (MKG, 2026). All terrains have been slightly pushing both truck-mounted and rough terrain cranes into places that have historically been occupied by them. As claimed by Sitek (2020), capacity on these machines can reach 1,000 tons. Jib tip heights can be measured at over 600 feet and boom heights at 400 feet (plus or minus).

### a.ii.) Rough Terrain Cranes

Rough terrain cranes continue to rule the job site despite the advancements achieved by all terrain cranes. With four-wheel drive and different types of steering for maneuverability, they can withstand challenging off-road situations. They are straightforward, with a single cab from which the operator controls every function and a two-axle design.

According to Proverbs, Holt, and Love (2019), they are reasonably priced when compared to other kinds of cranes. They do not need the horsepower or drive train components because they do not have to travel at highway speeds. Another significant cost-saving measure is the two-axle setup. The fact that they must be transferred between jobs is their major disadvantage. They are excellent pick-and-carry workers once they start working. For a contractor who performs a lot of lifting on the job, they are a wise financial investment (Echeme, 2021). As part of the building process, construction is increasingly shifting toward "complete or nearly complete" components. Tilt-up panels and poured-in structures are just two examples.

However, the largest unit in normal production has a capacity of 100 tons, whereas typical units on job sites vary from 30 to 70 tons. Today, the height of the boom tip will surpass 150 feet, and the height of the jib tip will surpass 200 feet (Mtandt, 2025). Once more, the specification tables are always changing because new cranes are added to every exhibition.

**a.iii.) Truck Mounted Cranes**

Cranes installed on trucks are situated on the chassis of commercial trucks. The crane operation is powered by the vehicle engine. Although they are restricted to ratings of roughly 40 tons due to the commercial truck chassis itself, telescopic boom types carry out the same tasks as their all-terrain and truck crane family (Sitek, 2020).

These cranes are less expensive than truck or all-terrain cranes and may have stationary operator control stations. In some types, the cab swings alongside the crane. An articulating boom unit is another variety; these are often customized horizontal boom units made to load and unload the cargo of the truck. Typically, they are not utilized as all-purpose cranes.

Highway speeds are safe for truck cranes to travel at. For the carrier and crane operations, they employ specially designed carriers with independent cabins. The hydraulic boom units are made to be quickly assembled. Boom, jib, and counterweight are typically included in the smaller and mid-range models. To transport any extra counterweights or boom extensions, some of the larger units could need independent transportation procedures (Sitek, 2020).

Large lifting tasks are handled by lattice boom truck crane types, which have great lifting capacities and hook heights. Lattice boom cranes naturally take longer to set up than hydraulic boom types. however, truck-mounted cranes should not be used on underdeveloped job sites unless there are reliable roads and work platforms since they are less nimble in tough terrain. These machines have a capacity of more than 100 tons. When equipped with a jib, certain cranes have a height of more than 200 feet (Proverbs, Holt & Love, 2019).

**a.iv.) Lattice Boom Cranes**

Both truck-mounted and crawler-mounted lattice boom cranes are available. The upper frame of truck-mounted cranes is supported by a carrier that resembles a truck and can move at highway speeds. On some of the larger units, it is typically necessary to disassemble and carry major elements of the crane individually. The mobility of the carrier and typically quicker erection time give it an edge over crawler cranes, which need to be disassembled (Sitek, 2020).

Cranes mounted on crawler bodies are driven by rails. Superior on-site mobility and lifting capabilities are produced by this design. Crawler cranes take a long time to set up and are difficult to move (Constructor, 2019). A crawler crane's modular parts must all be transported by trucks. However, crawler cranes do provide a great lot of versatility, especially for heavy lifts or long-term lifting projects, according to Sitek (2020). Crawler cranes provide a wide range of application adaptability, from pick-and-carry capabilities to heavy-duty or severe-duty applications like dragline and pile driving.

The needs of the task are usually the basis for selecting a particular crane (Zhang, Wang, and Chen, 2017). When a job calls for lengthy, high reaches, very heavy lifts, or prolonged work, a lattice crane is usually the best option. Lattice boom cranes attached on trucks or crawlers are particularly suited for carrying and lifting massive amounts of steel, building big tilt-up concrete panels, and performing extremely high and far-reaching picks (Sitek, 2020). In addition to using larger-diameter wire rope, which requires fewer pieces of line for quicker line speeds, lattice boom cranes are intrinsically stronger and more stable at longer distances than telescopic boom cranes. A 100-ton capacity lattice crane performs better than a 200-ton capacity telescopic crane because lattice cranes often provide larger capacity picks at a nominal base capacity unit (Sitek, 2020). The most recent advancement in crane technology and design is the hydraulic crawler-mounted crane. It provides even more flexibility in your lifting device selection and is offered as a telescopic or lattice boom crane placed on a crawler excavator carrier.

Ultimately, the same parameter that applies to any equipment decision determines which crane should be used for which task. Basically, Echeme (2021), claimed that the primary application factors for cranes are the weight of the load, the height at which it must be raised, and the distance at which it must be positioned. In order to achieve the necessary lift height at a specific radius, a bulky cargo may need a larger crane to accommodate its physical dimensions (Zhang et al., 2017). Proverbs et al. (2019) list additional aspects to take into account, such as the terrain and whether the crane will be operating on or off-road, pick-and-carry considerations, single or repetitive lifts, travel time and distance, and other factors. Depending on the end user, cost factors are also taken into consideration.

These amazing lifting devices are very well-liked throughout Europe and are growing in popularity in large cities. Metropolitan-capacity cranes cannot stay on the ground for long periods of time in metropolitan cities. The tower crane is very effective in this situation (Wang et al., 2018). Tower cranes have enormous lifting capability, may be built to incredible heights, and have a comparatively compact footprint. Tower cranes may now cover a large area even though they are stationary thanks to advancements in technology. On the other hand, a climbing tower crane uses a climbing attachment with hydraulic jacks that encircles the mast to raise itself. The climbing attachment, Climbing Tower Cranes-Tie-in Assembly, lifts itself up off the erected mast and inserts a new mast section (MKG, 2026).

**b.) Concrete Pump – Self Climbing**

A diesel-powered static concrete pump transports the concrete to the folding placing boom via a fixed 125 mm hose. The boom is supported by a steel column that may reach a height of 20 meters (Mtandt, 2025; Sitek, 2020). A cross base or a system of floor frames embedded in the concrete flooring support the column. As construction advances, the entire column/boom assembly can rise with the building thanks to floor frames. To cast floors at height, concrete must reach upper floors smoothly. Concrete pumps, especially boom pumps, push concrete through pipelines directly to the casting area (MKG, 2026). Pumping concrete is less likely to be negatively impacted by strong winds and is quicker than utilizing a crane and skip (Proverbs et al., 2019).

**c.) Conveyor Systems**

Portable conveyor systems are made by several manufacturers. Conveyors are not typically considered when designing a job site, but occasionally they provide the best answer to a material handling need (Mtandt, 2025; Vitrans-Conveyor System, (2025); Echeme, 2021; Sitek, 2020).

Numerous types of conveyor systems exist. Vitrans-Conveyor System, (2025) highlighted them as;

**c.i.) Aerial (Vertical) Conveyor Systems**

Materials are moved vertically between levels of a project construction site using this conveyor system. These devices are very helpful in construction projects and high-rise buildings. They are made to move goods upward without the need for personal labor or cranes.

However, Vitrans-Conveyor System (2025) listed the following advantages of aerial conveyor systems: they can lift large loads across several stories; they save space on the ground level; and they lower the danger of injury connected with manual lifting. Materials can be moved between upper and lower levels of high-rise buildings using an aerial conveyor system.

With their effective and secure vertical material movement, Aerial Conveyor Systems are a dependable option for building sites. This conveyor system can handle bulk materials like cement, gravel, and more because it is built for heavy-duty operation
.

**c.ii.) Horizontal Circulate Conveyor Systems**

The purpose of this conveyor system is to transfer items along horizontal, level surfaces. These systems are frequently utilized on building projects to swiftly and effectively move materials from one location to another. Its advantages include increasing material moving speed, decreasing physical work, and being simple to set up and run. Conveyor systems with horizontal circulation, however, can be used in: transporting building supplies, such as sand, tiles, and bricks, in locations with horizontal space.

Vitrans Horizontal Circulate Conveyor Systems are built to last and are intended for large-scale industrial applications. They are ideal for project construction sites where constant material flow is necessary since they can move heavy loads over long distances (Vitrans-Conveyor System, 2025).

c.iii.) M**ulti-Level Conveyor Systems**

These systems are comparable to aerial systems, but they have the advantage of operating on a single platform at several levels. When materials need to be moved across great distances within a building, either vertically or horizontally, these systems are usually employed.

Its advantages include: maximizing the use of available space; enabling equipment integration; and being ideal for managing a range of materials. Multi-Level Conveyor Systems, however, can be used in warehouses, factories, and distribution centers as well as large, multi-story construction sites. According to Vitrans-Conveyor System (2025), Vitrans Multi-Level Conveyor Systems offer effective vertical and horizontal movement, making them ideal for transferring bulk items between levels on large projects.

c.iv.) **Side-by-Side Conveying Systems**

By positioning two or more conveyor belts parallel to one another, this conveyor system enables effective material transportation in a variety of directions. When goods need to be transported to particular places in several zones, these systems are frequently utilized in factories, warehouses, and building sites. Among its advantages are: Enhanced adaptability in material transportation; permits the simultaneous transportation of various materials; and lessens bottlenecks on the building site. Conveyor systems that are side by side can be used to move items between various industrial locations. construction sites where several jobs necessitate moving materials at the same time. Vitrans Side-by-Side Conveying Systems guarantee effective and continuous material flow by providing configurable setups to match the unique requirements of your project.

However, Sitek (2020) states that the Hartsfield-Jackson Airport expansion project in Atlanta demonstrated the significance of an intricate conveyor system. In that instance, the conveyor system was fixed rather than movable because the project was long enough, however some parts could be moved. Tons of materials were transported effectively and affordably as a result. However, the usage of a portable conveyor system is essential for tasks requiring the transportation of large amounts of loose materials, such as sand, gravel, mud, chips, or the like.

**d.) Other Equipment**

Earthmovers are the main use for backhoe loaders. They are excellent material handlers because they are made for loading and digging. These and other machines have recently been equipped with the tool carrier design. A highly adaptable material handler is the end product. There are numerous drive setups and a large range of sizes to select from. Even though these machines were first used on farms, they quickly developed into a significant piece of construction equipment (Echeme, 2021). According to Wang et al. (2018), this machine can have a quick coupler installed on both ends. Loader forks, material-handling arms, bale spears, and other material-handling equipment are available on the loader side, along with a variety of buckets that can be used for any purpose. To make changing buckets and/or other attachments simple and quick, install a quick coupler on the loader end (Constructor, 2019).

Nevertheless, the current market offers a wide range of lifting arm configurations. Wheel loaders and integrated tool carriers come with a wide range of attachments that can be used for the majority of material handling tasks. To make material handling on the job site simpler, quicker, and most importantly, safer, a variety of forks are available in addition to all the different buckets (Echeme, 2021; Sitek, 2020).

The category of material handling equipment undoubtedly includes skid-steer loaders and compact track loaders, commonly known as all-terrain vehicles and multi-terrain vehicles. These machines have two different configurations of lifting arms: radial arms and vertical lift arms. According to Sitek (2020), the vertical lift machines maintain the bucket or pallet fork level throughout the cycle by moving the load straight up from the ground to the top of the travel path. If the machine will be used primarily as a material handler rather than an earthmover, this arrangement is a better option. However, because the radial arm layout tends to apply more downward pressure, many ground engaging tools work more effectively with it.

For skid-steer loaders and small track loaders, a variety of buckets, hooks, raising arms, and fork attachments are available. The recent release of an all-wheel-steer variant of the skid steer has added to its already dominant jobsite appeal. Its already excellent material handling qualities should be enhanced by this choice (MKG, 2026; Mtandt, 2025; Sitek, 2010).

## 2.2 Symptoms of Bad Material Handling

Materials handling is critical as is relates to cost and efficiency of operation. In the meantime, Ubani (2012) bemoaned the fact that project managers shouldn't ignore the negative effects of material handling operations. As a result, he enumerated a few negative signs of a subpar materials handling system. These include:

i.) frequent business interruptions brought on by delays in handling and delivering materials to the point of use;
ii.) skilled labor carrying out tasks like moving, storing, and handling materials;
iii.) material damage during handling;
iv.) accumulation of work-in-progress and materials in various locations;

v.) reworking and rejection as a result of handling flaws;
vi.) a crowded area filled with supplies and scrap;
vii.) congestion in the areas for receipt, operation, and inspection;
viii.) a protracted delay for the delivery and pickup of commodities by material handling equipment.

### 2.3 Selection of Material Handling Equipment Factors

According to MKG (2026), the major selection of material handling factors includes;

a) Site Constraints: Limited, narrow, or busy sites with high wind pressure necessitate cranes with specific reach and maneuverability.
b) Load and Speed Requirements: The frequency of lifting and the weight of materials (e.g., steel vs. concrete) determine the required capacity and speed of hoists and cranes.
c) Building Height: Tall structures require specialized vertical transport, such as modular hoists.
d) Safety Features: Critical for high-rise, requiring items like emergency brakes, overload indicators, and safety interlocks.
e) Costs: Evaluation of rental or purchase costs vs. efficiency gains is crucial.

According to Vtrans-Conveyor Systems (2025), the major selection factors for material handling equipment are:

a) Type of Material: Different materials require different handling solutions. For example, heavy materials may require cranes, while lighter materials may only need wheelbarrows or forklifts.
b) Site Layout: The design and size of your construction site will dictate the type of equipment you need. Larger, multi-level sites may benefit from conveyors, while smaller, flatter sites might rely on forklifts and wheelbarrows.
c) Project Size and Duration: For larger, long-term projects, investing in high-capacity machinery like cranes or conveyor systems can increase efficiency and reduce labor costs.

In the same vein, Ubani (2012) states that when choosing material handling equipment, the following factors should be considered:

a. Nature of operations: whether handling is temporary or permanent; whether the flow is intermittent or continuous; whether the materials flow pattern is vertical or horizontal; and the type of layout.
b. The material to be handled, including its dimensions, weight, amount, and qualities, as well as its vulnerability to harm during handling.
c. The distance that the material must be transported: work station, long distance, or fixed distance
d. The initial investment, ongoing maintenance, and operation expenses.
e. Plant Facilities: floor load capacity and facility type.

Taking safety into account:

a) Engineering considerations include the size of doors and ceilings, the state of the floor, the strength of the structure, and traffic safety.
b) Equipment Reliability: use of standard components, service facilities and supplier reputation.

## 2.4 Importance of Material Handling Equipment in Construction Projects

Transporting goods is only one aspect of material handling; another is ensuring that the proper equipment is manufactured and utilized to increase productivity, efficiency, and safety on the building site. According to Vitrans-Conveyor System (2025), some of the most crucial aspects of material handling equipment in the execution of construction projects are:

i.) Enhanced Efficiency: Material handling machinery reduces the need for manual labor and enables smooth, quick material transportation. Conveyors, forklifts, and cranes are examples of equipment that significantly shortens the time needed to transfer goods, enabling construction projects to remain on schedule.

ii.) Increased Safety: When handling big and/or dangerous items, using the appropriate equipment can assist prevent or lessen accidents. The risk of injury from physical handling and lifting is decreased when the proper equipment is used.

iii.) Cost-effectiveness: Equipment and automation lessen the demand for physical labor. Consequently, this helps lower labor expenses over time. High-rise construction projects can be completed on schedule and within budget by optimizing procedures and reducing the need for labor.

iv.) Versatility: It is simple to modify the setup for particular project requirements because different kinds of equipment are made to handle different materials and duties.

v.) Improved Accuracy: Because machines handle materials more accurately, there is less chance of errors and material damage.

## 2.5 The Future of Material Handling in Construction

The emphasis has shifted to mobile and intelligent material handling equipment since 2025 and beyond. Construction organizations are adopting innovation due to increased safety rules and tighter schedules. Automation, small designs, and rental options are propelling the trend. Companies that provide complete material handling equipment solutions for construction are becoming more popular since they offer technical support, training, and maintenance in addition to equipment.

According to MKG (2026), contractors can meet the stringent safety requirements of today's business while also increasing production by renting larger machines like cranes or investing in portable material handling equipment.

Based on the literatures reviewed in this study, content analysis was done in order to determine the main factors to be considered in the choice of material handling equipment for high-rise building in Abia State Nigeria.

**Table 1 Content Analysis**

| Authors | Factors |
|---|---|
| Ubani, (2012) | Nature of operations, Material to be handled, Distance over which the material is to be moved, Installation and operation costs, Plant Facilities, Safety consideration |
| Zhang, Wang and Chen, (2017) | job requirements, bulk of the load, cost of installation and operation, equipment reliability, nature of material to be handled, and operational safety |
| Proverbs, *et al*. (2019) | the terrain and if the crane will be working on- or off-road, pick-and-carry considerations, single or repetitive lifts, travel time and distance, cost considerations,, speed of construction, and site safety |

| | |
|---|---|
| Mudgil (2025) | whether the proposed high-rise is coming within clusters or in vacinity of other buildings, wind pressure, and ground bearing pressure, |
| Tushar (2017) | inaccessibility to the site, strong wind conditions, trained operators, operational and safety features. |
| Ramdev, 2017 | soil bearing capacity, strength of the building, |
| Oppong (2022) | the nature of job, bulk of load, wind pressure, cost of hiring and maintenance, project location, strength of the building, skilled labour, and soil bearing capacity |
| Seren and Rickman (2025) | bearing capacity of the ground, atmospheric pressure, installation and disassembly costs, safety requirement, bulk of the material, reliability of equipment, and distance of material movement |
| Femi, 2023 | stability of the equipment, safe working load, and soil bearing capacity |
| Oluwatosin and Gbenga (2016) | bulky nature of the load, stability, hydraulic hose, space for movement of equipment, soil holding capacity, hoisting system, skilled operators, wind pressure, and cost of maintenance. |

Source: Literature Review (2026)

In order to identify the major factors considered in the selection of material handling equipment for high-rise building projects, the frequency of the factors as mentioned by various authors was applied. See Table 2.

**Table 2 Content Analysis Result**

| S/No. | Factors | Frequency |
|---|---|---|
| 1 | job requirements, Nature of operations, single or repetitive lifts, Material to be handled, nature of material to be handled, | 5 |
| 2 | vicinity of other buildings, | 1 |
| 3 | Distance over which the material is to be moved, distance | 2 |
| 4 | Installation and operation costs, cost of installation and operation, cost considerations, relative costs | 4 |
| 5 | Plant Facilities | 1 |
| 6 | Safety consideration, site safety, operational and safety features, operational safety. | 4 |
| 7 | Engineering factors | 1 |
| 8 | Equipment Reliability, equipment reliability, durability of the equipment, reliability of equipment | 4 |
| 9 | strength of the building | 1 |
| 10 | bulk of the load, | 1 |

| | | |
|---|---|---|
| 11 | travel time, speed of construction, | 2 |
| 12 | inaccessibility to the site | 1 |
| 13 | whether the proposed high-rise is coming within clusters | 1 |
| 14 | trained operators, | 1 |
| 15 | ground bearing pressure, the terrain, soil bearing capacity, strength of the soil | 4 |
| 16 | pick-and-carry considerations | 1 |
| 17 | wind pressure, strong wind conditions, Nature of wind, strength of wind | 4 |
| **Total number of Factors identified** | | **38** |

**Source:** Content Analysis from Table 1 (2026)

Based on the content analysis identified factors are: job requirements, Safety consideration, ground bearing pressure, wind pressure, equipment reliability and, cost of installation and operation.

### 2.6 Research Gap

The majority of the research examined in this study was unable to determine the individual and overall influence of the choice of material handling equipment for construction projects involving high-rise buildings.

In Abia State, no prior research has been able to conduct such an investigation.

However, previous studies were unable to establish a correlation between these variables and the equipment used for material handling, which would have guided appropriate selection for the effective execution of high-rise building projects.

In order to improve the delivery of high-rise building construction projects and socioeconomic growth, this study aims to bridge these gaps and give solutions that will aid in the selection of material handling equipment.

## 3.0 Research Methodology

The field survey carried out to physically examine the utilization of material handling equipment in building construction projects in Abia State and its surroundings led to the design of the study as a descriptive survey. Despite the existence of other research designs, the survey approach was chosen due to the nature of the investigation. It helped the researcher identify the limitations on the use of material handling equipment in the construction of high-rise buildings as well as the considerations to take into account when selecting a certain piece of equipment. Additionally, the survey method adopted helps the researcher determine how much the t-test, analysis of variance, and relative importance index methods can be used to analyze the information gathered via questionnaires.

The population of the study is three hundred and fifty (350). The population consist of professionals that are involved in high rise building projects, according to Echeme (2021) include; civil engineers, building consultants, estate managers, and government and private building contractors. The population size was derived from the databases of professional bodies (registered members) including their Registrar (membership arm), personnel departments and websites. For the purpose of this study, attention is focused on those in Abia State. This was done to make sure that the only people targeted were those who used material handling equipment to carry out high-rise constructions. Sampling procedure was used because it was difficult to reach every member of the study population.

In order to determine the proper sample size that accurately represents the entire population, the Taro Yamane sample size formula was used.

Thus, using the sample size formula; n = N/1+Ne2, one hundred and eighty-seven (187) participants who used material handling equipment in high-rise building projects were sampled for the study. This was done using the purposive sampling technique to ensure that only those with the requisite knowledge and experience in the research area were chosen.

## 3.1 Method of Data Collection

Both primary and secondary sources of data were used in the study. The learned journals, textbooks, relevant published and unpublished publications, the internet, etc. are examples of secondary sources of data. However, the questionnaire and conversations with certain experts in the field are essentially the primary sources of data. Nonetheless, the questionnaire was structurally developed to extract pertinent data from the participants about the impact of the elements found in the research.

### 3.2 Reliability Test of the Research Instrument

The test-retest approach was used to conduct the study's reliability test. In order to get their answers, this identical group of respondents was given the questionnaire (research instrument). The chosen group was then given the research equipment a second time after four months. Pearson correlation (r) was used to correlate the two pieces of data that were gathered from them. The research instrument is dependable for gathering data for analysis, as demonstrated by the value of $r = 0.89$.

### 3.3 Method of Data Analysis

Descriptive statistics involving frequency and percentage, multiple regression (the t-test, Analysis of Variance (ANOVA)), and the Relative Importance Index (RII) procedures were used to analyze the data collected from the target respondents. The major material handling equipment utilized in the construction of high-rise buildings was analyzed using descriptive statistics.

### 3.4 Decision Rule

If the p-value is less than 0.05, accept the null hypothesis (H0); if not, reject it and accept the alternative hypothesis (HA). This is due to the fact that the tests are conducted at a significance level of 5%, which is appropriate for social science research.

### 3.5 Factor Definition

The six identified factors were represented with the following acronyms in Table 3;

**Table 3. Acronyms for the Identified Factors**

| **S/No.** | **Factors** | **Symbol** |
|---|---|---|
| 1 | Job requirements | $A_1$ |
| 2 | Safety consideration | $A_2$ |
| 3 | Ground bearing capacity | $A_3$ |
| 4 | Wind pressure | $A_4$ |
| 5 | Equipment reliability | $A_5$ |
| 6 | Cost of installation and operation | $A_6$ |
| 7 | Successful Implementation of High-rise Building Projects | H |

## 4.0 Results and Discussions

A total number of one hundred and eighty-seven (187) questionnaire were administered to the respondents. One hundred and seventy-five (175) were returned and sixteen (16) were not retrieved. Out of this 175 returned, eight (8) were discarded due to improper completion of the questionnaire and other errors dictated. Therefore, one hundred and sixty-seven (167) were found to be properly filled and were used for the analyses made in this study. The 167 represents eighty-nine percent (89%) of the total sample selected which is a true representation of the population of the study.

### 4.1 Analysis of Choice of Material Handling Equipment Selection for High-rise Building Projects

The rate at which building operators use material handling equipment in the implementation of high-rise building projects in Abia State as extracted from the questionnaire were shown in Table 4.;

**Table 4. Choice of Material Handling Equipment in Abia State**

| S/No. | Material handling Equipment | Frequency of Use | Percentage |
|---|---|---|---|
| 1 | Tower Cranes | 99 | 59.3 |
| 2 | Self-loader | 2 | 1.2 |
| 3 | Forklift | 3 | 1.8 |
| 4 | Chain block | 0 | 0 |
| 5 | Conveyor systems | 0 | 0 |
| 6 | Concrete pumps | 48 | 28.7 |
| 7 | Lever hoist | 6 | 3.6 |
| 8 | Lifting belt | 0 | 0 |
| 9 | Trolley | 0 | 0 |
| 10 | Wire rope sling | 7 | 4.2 |
| 11 | Lifting jack | 2 | 1.2 |
| **Total** | | **167** | **100** |

The result in Table 4 show that most high-rise building operators normally select tower cranes and concrete pumps as the major material handling equipment in the execution of their building projects in Abia State.

## 4.2 Analysis of the Factors for the Selection of Material Handling Equipment for High-rise Building Project

The data from the questionnaire were used to test of the hypotheses formulated.

**Table 5 Coefficient for Relationship Model**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 42.018 | 3.477 | | 12.084 | .000 |
| | A1 | .468 | .077 | .449 | 5.912 | .000 |
| | A2 | .297 | .080 | .213 | 2.638 | .009 |
| | A3 | .157 | .073 | .171 | 2.149 | .033 |
| | A4 | .014 | .093 | .170 | 0.297 | .059 |
| | A5 | .340 | .082 | .337 | 3.489 | .001 |
| | A6 | .391 | .079 | .351 | 4.018 | .000 |

Dependent Variable: H

## 4.3 Analysis of the Hypotheses Formulated

The t-calculated values in Table 5 were used to test hypothesis one as shown below.

**$H_{01}$:** All the identified factors have no significant individual influence on the selection of equipment for materials handling in the implementation of high-rise building projects.

From Table 5, the t-calculated values show that all the factors are significant at different level of significance except wind pressure ($A_4$). This is because the p-values of $A_1$, $A_2$, $A_3$, $A_5$ and $A_6$ are less than 0.05 which means that they are significant. Whereas $A_4$ has a p-value more than 0.05 level of significance and this makes wind pressure not significant.
The study therefore accepts the null hypothesis ($H_{01}$) with a conclusion that all the identified factors have no significant individual influence on the selection of equipment for materials handling in the implementation of high-rise building projects.

The F calculated value in the Analysis of Variance (ANOVA) was used to test hypothesis two

**Table 6 Analysis of Variance (ANOVA)**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 299.397 | 6 | 49.899 | 3.056 | .007(a) |
| | Residual | 2612.256 | 160 | 16.327 | | |
| | Total | 2911.653 | 166 | | | |

[a]Predictors: (Constant), A6, A3, A1, A5, A4, A2
[b]Dependent Variable: H

**$H_{02}$:** The collective effect of the identified factors on the selection of equipment for materials handling in the implementation of high-rise building projects is not significant.

With the F-calculated value of 3.056, it is significant at 0.007 level of significance. This means that all the factors have collective significant influence on the selection material handling equipment for the successful implementation of high-rise building construction projects in Abia State. With respect to this, the study rejects the null hypothesis and accept the alternative hypothesis and conclude that the collective effect of the identified factors on the selection of equipment for materials handling in the implementation of high-rise building projects is significant.

In order to rank of the factors to determine the most important factor in the selection of material handling equipment for successful implementation of high-rise building construction projects, the relative importance index (RII) was adopted.

**Table 7 Relative Importance Index (RII) of the Factors**

| **Factors** | **Respondents Scores** | | | **Number of Respondents** | **∑W** | **A.N (3*167)** | **RII** | **Rank** |
|---|---|---|---|---|---|---|---|---|
| | **VI 3** | **I 2** | **NI 1** | | | | | |
| Job requirements | 104 | 63 | 0 | 167 | 438 | 501 | 0.874 | 1st |
| Safety consideration | 98 | 61 | 8 | 167 | 424 | 501 | 0.846 | 4th |
| Ground bearing capacity | 96 | 59 | 12 | 167 | 418 | 501 | 0.834 | 5th |
| Wind pressure | 32 | 43 | 92 | 167 | 274 | 501 | 0.547 | 6th |
| Equipment reliability | 97 | 70 | 0 | 167 | 431 | 501 | 0.860 | 2nd |
| Cost of installation and operation | 103 | 54 | 10 | 167 | 427 | 501 | 0.852 | 3rd |

According to the ranking in Table 7, the most crucial consideration when choosing material handling equipment for the effective execution of high-rise building construction projects in Abia

State is the job requirement. In Abia State, wind pressure is the least significant consideration in the selection of these material handling equipment, while equipment reliability ranks second. But this is unexpected. Contrary to what this study found, wind pressure is thought to have an effect on the selection of construction equipment.

## 4.2 Discussion of the Result

Based on the result of this study, the researcher explains them as follows;

According to Table 4, the majority of high-rise building operators in Abia State typically choose concrete pumps and tower cranes as their primary material handling equipment when carrying out their construction projects. According to Proverbs et al. (2019), this means that although contractors will often use concrete pumps in conjunction with tower cranes, tower cranes remain predominate for high-rise in-situ concrete constructions. The majority of construction contractors working on high-rise building projects in Abia State often favour tower cranes, while concrete pumps are occasionally observed, particularly during concrete in-situ construction activities. These findings depict reality.

With the exception of wind pressure, which is not statistically significant when choosing material handling equipment for the successful execution of high-rise building projects, job requirements, safety considerations, ground bearing capacity, equipment reliability, and installation and operation costs are significant at various levels of significance (see Table 5). This is surprising since it raises the question of why wind pressure, which ought to be a key impact, is not. Therefore, it suggests that there may not be enough wind pressure to cause material handling equipment installed on Abia State building sites to deform. However, unless there is a wind forecast, which is typically not applicable in our immediate environment, high-rise construction material handling equipment may be chosen without taking wind pressure into account. Therefore, there is no doubt that the right equipment will be chosen for the successful implementation of high-rise building projects in Abia State if the five important factors (job requirements, safety consideration, ground bearing capacity, equipment reliability, cost of installation and operation) are properly taken into account without wind pressure.

The selection of material handling equipment for the effective execution of high-rise building construction projects in Abia State is significantly influenced job requirements, safety considerations, ground bearing capacity, equipment reliability, installation & operation costs and wind pressure (see Table 6). This suggests that in order to select the right equipment that will help enable the effective completion of high-rise building construction, the six material handling equipment selection variables are critical. Hence, when choosing material handling equipment for a high-rise building project, contractors and stakeholders take into account the six factors that have been established.

Table 7 demonstrates that the most crucial consideration when choosing material handling equipment for the effective execution of high-rise building construction projects in Abia State is job requirements. In Abia State, wind pressure is the least significant consideration in the selection of these material handling equipment, while equipment reliability ranks second. This ranking result is consistent with the previous research, which continues to depict wind pressure as unimportant or less significant. Contrary to the findings made in this study, wind pressure is thought to play a significant role in the equipment choosing process. The reason for this is that the characteristics of wind have not been favorable to construction projects in Abia State, and as a result, it might not be considered a crucial consideration when choosing material handling equipment for the execution of high-rise building projects. However, this result is consistent with research by Zhang, *et al*. (2017) and Oppong (2022), which identify job requirements as the most important consideration when choosing material handling equipment for high-rise construction projects. However, the ranking makes it simpler to prioritize these factors for the appropriate choice of equipment that will help move materials both vertically and horizontally during the execution of building construction projects in Abia State and other states in Southeast geopolitical zone of Nigeria.

## 5. Conclusion

Based on the findings and discussions, the study concludes with the following recommendations:

**a.)** Given their efficient use in the construction of high-rise projects, tower cranes and concrete pumps ought to be chosen as the best material handling equipment in Abia State. This depends on the equipment's availability and usage. This will make it easier to handle building materials and facilitate the successful completion of high-rise building projects.

**b.)** When choosing the right material handling equipment for high-rise building projects, it is important to take into account a number of critical factors, including; job requirements, safety considerations, ground bearing capacity, equipment reliability, and installation & operating costs;

**c.)** In order to successfully execute high-rise building construction projects in Abia State, it is also necessary to take into account the overall effect of the identified factors on the selection of material handling equipment. When choosing material handling equipment, contractors and stakeholders in high-rise building projects must take into account the five important variables rather than the relative costs of the equipment.

**d.)** The following order of importance should be used to try to take into account these selection factors for material handling equipment for the successful implementation of high-rise buildings: job requirement, equipment reliability, cost of installation and operation, safety consideration, ground bearing capacity, and wind pressure.

In summary, depending on the needs of the job, tower cranes and concrete pumps should be chosen as material handling equipment for high-rise construction projects in Abia State and other Southeastern States. Reliability and the relative costs of installation and operation should also be taken into account. Wind pressure, safety, and ground bearing capability should all be examined.

**5.2 Contributions to Knowledge**

This work has added the following to the body of knowledge:

i.) Tower cranes and concrete pumps are the primary material handling equipment for the execution of high-rise building projects in Abia State, Nigeria. The most crucial consideration in the selection of material handling equipment is the job requirements.

ii.) The selection of material handling equipment for high-rise building construction projects has been found to have both individual and collective effects on the successful completion of high-rise projects.

iii.) In order to improve the delivery of high-rise building projects in Abia State, the study has been able to identify the parameters for the selection of material handling equipment.

## References

Afolayan, E.T. (2021) Effects of Materials Handling Equipment in Building Projects, A case of 5-Storey Building Project in Ibadan, *Journal of Logistics and Management Studies, 12(4*), pp. 76

Aviad, S. Asce, F & Goldenberg, M. (2017). "Soft" Considerations in Equipment Selection for Building Construction Projects. Journal of Construction Engineering and Management. 133. 749–760. 10.1061/ASCÊ0733-93642007133:10749.

Basistha, P.P (2025) Equipment Makers Bracing Up For High-rise Construction, April, www.nbmcw.org

Bhosale, S. (2025) Mast Climbers Add Value, *NBM&CW, April Edition*, www.nbmcw.org .

Building code of Hyderabad, India (2024) Professional Building Code in India, www.buildingcodeofhyderabad.gov.in , extracted on 19/5/2026.

Chen, Y., Xue, X., & Wang, Q. (2024). A digital twin-based framework for realtime interface management in large-scale infrastructure projects. *Automation in Construction*, 158 (105234). https://doi.org/10.1016/j.autcon.2023.10 5234

Dahmann, J. S., & Madni, A. M. (2016). *System of systems engineering: Innovations for the 21st century*. John Wiley & Sons. https://doi.org/10.1002/9781118994983.

Ebiringa, O.T., Nworuh, G. E., Asiegbu, B.C., & Echeme, I.I (2026) Development and Validation of an Adaptive Stakeholders' Interface Management System for University Infrastructure Projects, *European Project Management Journal*, 16, (1), February, pp. 21-35. https://doi.org/10.56889/emiy6400

Emporis standards (2024) *Standard Code for Building Works, Section 2*, www.emporisstandards.org , pp.6,

Femi, O.A. (2023) Factors Responsible for Selection of Equipment for Handling Materials in the Construction of Telecommunication Mast in Ogun State, Nigeria, *Journal of Project Management, 6(3)*, pp.75.

Gujarati, D.N. & Sangeetha, (2007): *Introduction to Discriminant Analysis; Basic Econometrics*, 4th Ed.; Tata McGraw-Hill Publishing Company, Ltd, New Delhi; pp.34.

He, Q., Wang, T., & Chan, A. P. C. (2023). Developing a holistic interface management process for large-scale infrastructure projects: A systems thinking approach. *Advanced Engineering Informatics*, 57 (102033). https://doi.org/10.1016/j.aei.2023.10203 3.

International Conference on Fire Safety (2017) *Building for Fire and Life Safety*, A lead paper presented at the 37th Annual International Conference on Fire Safety, www.firesafetyconference.in pp. 45

Madni, A. M., & Sievers, M. (2024). System of systems integration: Key challenges and future directions. *Systems Engineering*, 27(1), pp. 3-19, https://doi.org/10.1002/sys.21692

Massachusetts (1978), United States General Laws for High-Rise Civil Projects, www.massachusetts.gov.us pp.98

MKG (2026) Top Types of Construction Equipment Used for High-Rise Building Projects, Retrieved from: https://mkgworld.in/blogs/top-types-of-construction-equipment-used-for-high-rise-building/, on 24/4/2026

Mtandt (2025) Material Handling Equipment: Smarter Construction Solutions in 2025, Retrieved on 26/4/2026 from https://www.mtandt.com/blogs/material-handling-equipment-in-construction-gide-2025.

Mudgil**,** A. (2025) Tower Cranes Lifting Higher, Head Sales, Tower Cranes, Action Construction Equipment, *NBM&CW, April Edition*, www.nbmcw.org.

National Building Code (1996) The Nigeria Building Code (Part 4), *Journal of Building Construction, 2(1)*, pp.47.

Nworuh, G.E. (2009) *Fundamentals of Applied Quantitative Techniques for Management Decision*, Bon Associates – HRDC, Nigeria, pp. 90.

Oluwatosin, E.R. & Gbenga, K.P. (2016) problem of lifting of construction materials in high-rise building projects in the Southwest, Nigeria, *International Journal of Scientific Research, IV (II)*, pp.102.

Proverbs, D.G, Holt, G.D, & Love, P.E.D. (2019) Logistics of materials handling methods in high rise in-situ construction, *International Journal of Physical Distribution & Logistics Management,* Vol. 29 No. 10, pp. 659-675. https://doi.org/10.1108/09600039910300037

Ramdev, P.V. (2017) Better Coordination Needed for High-Rise Material Handling Equipment, MD, Everest Engineering, *NBM&CW, April Edition*, www.nbmcw.org.

Seren, K. and Rickman, Y. (2025) Variables Influencing the Choice of Material Handling Equipment in Tower Construction Project: Case of Istanbul Carnival Tower, *Journal of Project Management XI (IV)*, pp. 89.

Sitek, G. (2020) Material Handling Demands Safety First, September 28, www.constructionequipment.com/materials-handling

The constructor, (2019) Is Construction Technologically Stagnant?" in Lange *Construction Industry*, Lexington Books, pp. 83. www.theconstructor,org/structural-eng

Tushar, M. (2017) Tower Cranes Lifting Higher, Managing Director, ElectroMech Material Handling Systems (I) Pvt. Ltd., NBM*&CW, April Edition*, www.nbmcw.org.

Ubani, E.C. (2012) Production and Operations Management- Concepts, Strategy and Applications, Material Handling Systems, First Edition, Ultimate Publishing Company, Owerri, pp.76.

Vitrans-Conveyor Systems (2025) 8 Types of Material Handling Equipment Used in Construction, Retrieved on 29/4/2026 from; https://www.vitrans-conveyor.com/2025/02/24/8-types-of-material-handling-equipment-used-in-construction/

Wang, H., Zhang, K., Wang, K., Cui, J., Chen, B., Li, D. (2018), Significant Progress in Construction Equipment of Super High-Rise Building, Council on Tall Buildings and Urban Habitat, *International Journal of High-rise Buildings 7 (3),* pp.87

Wang, H., Ren, Z. P., Chen, B., (2017). "Application of the auto-lifting & rotating platform with cranes group in Chengdu Greenland Tower." Construction Technology, 46(13), 14-17

Zhang, K., Wang, H., Chen, B. (2017). "Design of the auto-lifting & rotating platform with cranes group." Construction Technology, 46(13), 1-4

## About the Authors

**Ihuoma Chijioke Ohajuru**

Abia State, Nigeria

**Ihuoma Chijioke Ohajuru** is the Head of Procurement at Abia State Universal Basic Education Board, Umuahia; an Agency charged with the primary responsibility of management of the entire Basic Education Sub-sector in Abia State. He led the management of the entire procurement process of the Abia SUBEB in the implementation of the UBE year 2020 to 2025 projects for qualitative basic education delivery. With over 26 years of experience in educational planning and management, Ihuoma Chijioke Ohajuru, prior to his current role, has served as a Director Planning Research and Statistics where he led the team for the production of the Ministry's Education Sector Plan (ESP) 2024-2034 to guide the transformation of the entire Abia State Basic and Secondary Education System and production of the year 2024-2027 Abia State Medium Term Basic Education Strategic Plan (ASMTBESP).

He served also as Technical Lead for the securing of the Global Partnership for Education (GPE) System Transformation Grant for Abia State Foundational Learning by production of Abia State Theory of Change Document for holistic Basic Educational Reform for Foundational Literacy and Numeracy. He has also served as Abia State Technical lead and Coordinator for the conduct of National Personnel Audit year 2022 in the State for the updating of Abia State Basic Education Data as well as served as the Abia State Digital Annual Census Committee year 2025 for basic education data collection, collation and dissemination.

Has bachelor of Technology degree in Project Management at Federal University of Technology Owerri (FUTO) and is currently studying as a master's degree student at Federal University of Technology Owerri. He is also a key resource personnel in educational planning and management for ensuring improved educational outcome in the state and nation at large. He can be reached at ihuomaohajuru@gmail.com

**Ibeawuchi Ifeanyi Echeme, PhD**

Owerri, Nigeria

**Ibeawuchi Ifeanyi Echeme** is a lecturer in the department of Project Management Technology, Federal University of Technology, Owerri. Echeme has a B.Tech, MSc, and PhD in Project Management Technology and has published more than Sixty (60) articles in both international and national reputable journals. Dr. Echeme has published a textbook on Project Time, Cost and Quality Management. He is a Chartered member of Chartered Institute of Project Managers Nigeria (CIPMN), Chartered member, Association of Practicing Project Managers of Nigeria (APPMON), Certified Project Director (CPD) and a member of International Project Management Professionals (IPMP). Dr. Echeme has presented papers in conferences and workshops within and outside Nigeria. He can be contacted through; ibeecheme@yahoo.com

**Emmanuel C. Ubani, PhD**

**Owerri, Nigeria**

**Prof. Emmanuel C. Ubani** holds BSc. and MEng in Industrial Engineering; PhD in Project Management Technology. Former Head, Department of Project Management Technology, and former Associate Dean, School of Management Technology, Federal University of Technology Owerri. He is a member of Nigeria Society of Engineers (MNSE), Fellow Institute of Industrial Administration (FIIA). He has published widely in both International and local Journals.