

## Investigation of Technical Challenges in Quality Practices in the Installation of Electrical Conduit Wiring on Building Sites in Nigeria



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### ABSTRACT

The technical challenges in quality practices in installing electrical conduit wiring on building sites in Nigeria have been investigated. This investigation aims to assess challenges in quality management practices in electrical conduit installation on building construction sites in Nigeria. To achieve this aim, both Survey and Descriptive research designs were applied. These were necessary to elicit relevant information from the study area. A total of 185 registered electrical professionals in the building industry from four geo-political zones of Nigeria and the Federal Capital Territory were considered respondents. The Statistical Package for Social Science (SPSS) was used to analyse data obtained from the questionnaires. It was revealed that the challenges encountered in electrical conduit installations were: Poor safety and durability of installations (mean score=2.40; RII =0.51), High costs of materials (mean score=3.45; RII =0.81), Complexity in installation (mean score=3.52; RII =0.82), Incompatibility of installation with existing wiring system (mean score=2.38; RII =0.47), Non-adherence to quality standards (mean score=2.35; RII =0.46) and Unfriendly environmental factors (mean score=2.33; RII =0.45). Also, the tools employed for quality assessment by the professionals were: the flow chart (mean score=3.42; RII=0.72), check sheet (mean score=3.89; RII=0.85), fishbone diagram (mean score=2.73; R=0.64) and control chart (mean score=3.55; R=0.79). The study concludes that the installation of electrical conduits in Nigerian buildings is prone to several challenges.

### Keywords:

Conduit,  
Wiring,  
Quality,  
Management,  
Practices,  
Building,  
Construction,  
Site.

### INTRODUCTION

An electrical conduit is a tube used to protect and route electrical wiring in a building or structure. Electrical conduit may be made of metal, plastic, fiber, or fired clay. Most conduits are rigid, but flexible conduit is used for some purposes. Conduit is generally installed by electricians at the site of installation of electrical equipment. Its use, form, and installation details are often specified by wiring regulations (Obukoeroro and Uguru, 2021a). Electrical conduit provides very good protection to enclosed conductors from impact, moisture, and chemical vapors. Varying numbers, sizes, and types of conductors can be pulled into a conduit, which simplifies design and construction compared to multiple runs of cables or the expense of customized composite cable (Uguru and Obukoeroro, 2020). Wiring

systems in buildings may be subject to frequent alterations. Frequent wiring changes are made simpler and safer through the use of electrical conduit, as existing conductors can be withdrawn and new conductors installed, with little disruption along the path of the conduit. Metal conduit can be used to shield sensitive circuits from electromagnetic interference, and also can prevent emission of such interference from enclosed power cables (Obukoeroro and Uguru, 2021a). Non-metallic conduits resist corrosion and are lightweight, reducing installation labor cost.

When installed with proper sealing fittings, a conduit will not permit the flow of flammable gases and vapors, which provides protection from fire and explosion hazard in areas handling volatile substances. Some types of conduits are approved for direct encasement in

concrete. This is commonly used in commercial buildings to allow electrical and communication outlets to be installed in the middle of large open areas (Uguru and Obukoeroro, 2020). Conductors installed within conduit cannot dissipate heat as readily as those installed in open wiring, so the current capacity of each conductor must be reduced if many are installed in one conduit.

There have been numerous incidents of failure in conduit wiring systems in buildings. Owners resort to total rewiring of the building using the surface method. Sometimes, there have been complexities in the conduit installation system, electrical fires, high costs of

installation and maintenance of the conduit system. Thus, this study aims to assess challenges in quality management practices in electrical conduit installation on building construction sites in Nigeria.

## MATERIALS AND METHODS

Both Survey and Descriptive research designs were used in this study. These were necessary to elicit relevant information from the study area. 185 registered electrical professionals in the building industry from four geo-political zones of Nigeria and the Federal Capital Territory (as listed on Table 1 below) were considered as respondents.

**Table 1: Distribution of Sample Population of Registered Electrical Professional Respondents on the Building Construction Sites in the Study Area**

S/N	Professional Designation	Number
1	South-East	45
2	South-West	51
3	South-South	38
4	North Central	35
5	Federal Capital Territory	16
	<b>Total</b>	<b>185</b>

## Data Required, Method of Collection and their Sources

The research used both primary and secondary data collection methods as a tool to acquire the information relevant to the study. The primary data were obtained from oral interviews, personal observations and structured questionnaires while the secondary data was obtained from relevant literature. The following primary data were required for this study:

Challenges in Quality Management Practices in electrical conduit installation on construction sites (Obtained using responses elicited from structured questionnaires administered to the selected professionals and through personal observations at the building construction sites);

Standard quality management assessment tools in electrical conduit installation on construction sites (Obtained from existing standard quality management templates);

Strategies for effective quality management for effective electrical conduit installation on construction sites (Obtained using responses elicited from structured questionnaires administered to the selected professionals).

The primary research instrument used in this study was a structured questionnaire. Section A of the questionnaire was used to elicit information of bio-data and other demographic characteristics of the

respondents while section B was used to obtain information on challenges in quality management practices, quality management assessment tools and measures for managing quality management practices in the study area. Most of the questions in the research instrument entailed ranking some identified variables on a five (5) point likert scale that assessed either frequency of use, significance of the factor and availability of inputs. The reliability of each of the Likert questions were tested using Cronbach's alpha in the SPSS package. All the questions had an average Cronbach's alpha of 0.805 and indicated a high level of internal consistency. This research was carried out using quantitative analysis to assess data obtained on challenges in quality management practices in electrical installation on approved building construction sites Nigeria. SPSS (Statistical Package for Social Science) was used to analyse data obtained from the questionnaires. This research adopted exploratory data analysis, which focuses on what the data itself suggests. According to Cohen *et al.* (2007) this format is usually descriptive and relies on frequencies, percentages, and graphical representations.

## RESULTS AND DISCUSSION

Table 2 shows the existing challenges in quality management practices in electrical conduit installation on building construction sites in Nigeria:

**Table 2: Existing Challenges in Quality Management Practices in Electrical Conduit Installation on Building Construction Sites in Nigeria (N=185)**

S/N	Predictor	Mean Likert Score	Relative Importance Index (RII)	Rank (R)
1	Poor safety and durability of installations	2.40	0.51	3
2	High costs of materials	3.45	0.81	2
3	Complexity in installation	3.52	0.82	1
4	Incompatibility of installation with existing wiring system	2.38	0.47	4
5	Non-adherence to quality standards	2.35	0.46	5
6	Unfriendly environmental factors	2.33	0.45	6

Criterion Likert Score = 2.50

Table 3 shows the standard quality management assessment tools in electrical conduit installation on building construction sites in Nigeria.

**Table 3: Standard Quality Management Assessment Tools in Electrical Conduit Installation on Building Construction Sites in Nigeria (N=185)**

S/N	Predictor	Mean Likert Score	Relative Importance Index (RII)	Rank (R)
1	Flow chart	3.42	0.72	2
2	Check sheet	3.89	0.85	1
3	Fishbone diagram	2.73	0.64	4
4	Control chart	3.55	0.79	3

Criterion Likert Score = 2.50

### Discussion

Research has shown that about 64% of the electrical and other building materials used for buildings' electrical and structural works in Nigeria fell into the substandard range. It has also been revealed that high cost of electrical materials is one of the major factors leading to the utilization of substandard materials in building wiring Okieke *et al.*, (2023). Also, the deceitful actions of some electrical and civil engineering personnel, is responsible for the construction of buildings with compromised materials Okieke *et al.*, (2023). However, the results of this paper aligned with these challenges mentioned by previous research.

From Table 3 above, the challenges encountered in electrical conduit installations were Poor safety and durability of installations (mean score=2.40; RII =0.51), High costs of materials (mean score=3.45; RII =0.81), Complexity in installation (mean score=3.52; RII =0.82), Incompatibility of installation with existing wiring system (mean score=2.38; RII =0.47), Non-adherence to quality standards (mean score=2.35; RII =0.46) and Unfriendly environmental factors (mean score=2.33; RII =0.45). The greatest challenge was Complexity in installation (R=1) and was closely followed by High costs of materials (R=2). The least challenge was Unfriendly environmental factors (R=6). This is in line with Puno Energia (n.d) that complexity in electrical installation is a common factor. High cost

of conduit materials has also made the electrical personnel resort to cheaper, non-durable materials.

As shown on Table 3, the tools employed for quality assessment by the professionals were: the flow chart (mean score=3.42; RII=0.72), check sheet (mean score=3.89; RII=0.85), fishbone diagram (mean score=2.73; R=0.64) and control chart (mean score=3.55; R=0.79). However, the most employed tool was the check sheet (mean score=3.89; R=0.85). The least employed tool was the fishbone diagram, though all the tools had very good relative importance values.

### CONCLUSION

The installation of electrical conduits is prone to a number of challenges in Nigeria. The most prominent ones among them are complexities in design and high costs of materials. Proper preparation which includes careful identification and analysis of the specific data or information of the project were not usually considered.

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