

# **The relationship between labour-only procurement and Health and safety performance of construction projects**

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## **Abstract**

### **Purpose**

The purpose of this study is to investigate the influences of the characteristics of procurement strategies, in this instance labour-only, on project performance concerning health and safety (H&S), a project performance indicator.

### **Methodology**

Using non-probability purposeful and snowballing sampling methods, questionnaires were used to collect data from construction professionals in Nigeria. This was then analysed using descriptive (frequency and mean scores) and inferential statistics (Man Whitney-U and Kendall's Tau\_b tests).

### **Findings**

The findings indicate a statistically significant negative correlation between 'the level of client involvement and 'fatalities' and a positive one with 'conducting of health and safety risk assessment' and 'conducting employee surveys on health and safety attitude'. Poor hygiene is found to be the worst lagging indicator, while conducting of inspection is the most adopted leading indicator of project health and safety performance. It also emerged that there is no significant difference in the health and safety performance of projects procured through the procurement strategy in urban and rural areas.

### **Originality/value**

This is the first study that examines the influence of the characteristics of procurement strategy on project health and safety performance. Evidence in the literature shows that project delivery outcomes significantly improve if procurement is strategically used, including when it is considered early in projects. However, integrating H&S into procurement strategies has received little attention.

### **Practical Implication**

The study provides valuable insight into the complexities in H&S management due to the high level of client involvement in LoPS projects and the level of diversity in their responsibilities therein. It creates a fundamental direction for developing a detailed

framework or guidance notes for client involvement in the integration of H&S into LoPS projects.

**Keywords:** Construction safety, Labour-only contract, project delivery outcomes, procurement, project performance indicators

## 1. Introduction

The growing population globally results in infrastructure needs. Poverty and health and wellbeing issues have increased hence the need for sustainable development Goal 1 (no poverty), Goal 3 (health and wellbeing), Goal 8 (decent work), and Goal 9 (resilient infrastructure, promote sustainable industrialisation, and foster innovation). The gap between the developed countries and their developing counterparts in meeting the goals mentioned above is wide and exacerbated by Covid-19 (United Nations 2021).

In meeting these goals, the successful delivery of construction projects and their performance is pertinent. However, many construction projects fail to meet the expected performance (Rivera et al., 2017; Pekuri et al., 2020). For example, a review by Rivera et al. (2017) of construction projects in six continents shows that 98 per cent of the projects in North America and 50 per cent of projects in Europe overran their budget. Umeokafor (2018) and Gurmu (2022) posit that health and safety (H&S), a performance indicator in projects must be improved to meet the Goals above, just like other performance indicators such as cost, which is influenced by H&S on projects. The construction industry has underperformed in terms of H&S globally. For example, in Britain, the 2020/21 provisional data by the Health and Safety Executive (HSE) (2021) shows that the construction industry has reported 39 fatal injuries, and the average for 2016/17 to 2020/21 provisional data is 36 fatal injuries. Data from EU-27 countries including France, Spain, Germany, the United Kingdom, and Cyprus in 2018 show that 20 per cent (one-fifth) of the fatal accidents in the EU have occurred in the construction sector (Eurostat 2020). The H&S records of Developing Countries (DCs) are worse (Hämäläinen et al. 2017; Okonkwo 2019). For example, according to Okonkwo (2019), fatalities reported in (DCs) are three times more than in developed countries such as the United Kingdom.

Strategies to improve H&S and, by implication, construction project performance include the adoption of digital technology (Kasirossafar et al. 2012); designing out hazards in the early stages of projects (Ismail et al. 2021); improving the safety climate and culture (Williams et al. 2020); and early consideration of H&S in procurement (Umeokafor et al. 2020a & b; Samuel 2014; Smallwood and Emuze 2014). However, the appropriate procurement method, just as contract documentation, must be adopted (Wells and Hawkins 2010; Boadu et al. 2021a; and Deacon and Smallwood 2016). The current study focuses on early consideration of H&S in procurement to improve H&S practices on projects, and whether this has implications for project performance. It is established in extant literature (for example, Boadu et al. 2021b, 2022; Umeokafor 2017; Umeokafor et al. 2020a) that health and safety consideration or integration in the procurement process improves health and safety (by implication project) performance. For example, Boadu et al. (2021b) offer a treatise on this, examining the extent of H&S integration into the procurement process and its subsequent impact on H&S implementation. They found that when H&S objectives are

set and integrated into the planning stage, it has a significant impact on the extent to which it is considered in the tendering and tender evaluation stages and the inclusion of H&S into contract conditions. The procurement process is important and strategic in meeting the project performance indicators and its delivery (Umeokafor 2018). It is the basis on which the structure and contractual relationships of the project are established (Boadu et al. 2021b). The establishment of H&S requirements for the project and indicators, and the assessment of the competence of the designers and contractors are established at this stage by the client (Boadu et al. 2021b, 2022; Umeokafor et al. 2020a). In other words, the proactive measures for H&S improvement and the direction it takes occur here. As a result, there have been calls for the integration of health and safety guidance into procurement processes (HSE 2011).

Early consideration of H&S in procurement is covered in literature but not without limitations. Deacon and Smallwood (2016) investigate the relationships between design, procurement, and construction relative to H&S. Wells and Hawkins (2010) have developed detailed guidance and examples of practical measures in procurement and contract agreements to improve H&S in infrastructure construction. A strategy-based study by Mahamadu et al. (2015), examines the integration of quality, safety, and environment to modern procurement strategies in road infrastructure in Ghana. Further in Ghana, Boadu et al. (2021a) found that the extent of H&S consideration in various stages of the procurement process in public sector projects in Ghana is low. Furthermore, in the country, Donkoh et al. (2015) address the practical ways of improving construction H&S through procurement in public works. While Samuel (2014) and Sulaiman et al. (2008) investigate the prediction of potential risks, including H&S at the tendering stage through a mathematical model, Smallwood and Emuze (2014) focus on H&S in contract documents. Umeokafor et al. (2020a) examined the challenges, opportunities, and strategies for integrating H&S into labour-only procurement system (LoPS) using theoretical perspectives. Umeokafor et al. (2020b) make a case for examining health, safety and well-being (HS&W) in LoPS and propose measurable strategies for integrating it into projects procured through the route, but they are subject to empirical investigation. Benviolent and Smallwood (2016) have researched the implications of public sector procurement on construction H&S management in Zimbabwe. They found that H&S receives little attention compared to other indicators, for example, time, cost, and quality.

However, while the extant studies (including those above) contribute to the knowledge of the early consideration of H&S in procurement or contracts, they have not focussed on emerging procurement strategies such as LoPS also known as labour-only contract (Awodele et al. 2019; Financial Support Services Units 2017) as a vehicle for improving H&S. Only Umeokafor et al. (2020a & b) examine LoPS from the context of H&S but, just like other studies, have not assessed how the features of LoPS influences project H&S performance and are based on literature review. While other emerging procurement methods such as direct labour could have been examined, the motivation for focusing on LoPS includes that this is just a stepping stone to the topic; its adoption in projects is increasing (Ogunde 2011; Awodele et al. 2019) and gaining popularity (Ogunsanmi 2013). The procurement method has been established as one of the strategies for clients to save money and cope with harsh economic conditions (Awodele et al. 2019), and it enables them to have more control of the

project (Adenuga 2003; Umeokafor et al. 2020c). This is discussed in detail in the literature review. Also, the literature acknowledges the dearth of research in this area in DCs where the procurement method rampant. For example, Wells and Hawkins (2010) note the limited attention to the early consideration of H&S in procurement in DCs. Reviewing construction H&S literature in Nigeria over 36 years (1983 to 2018), Umeokafor (2018a) found that only one study has focussed on 'H&S and construction procurement' in Nigeria. In Ghana, Boadu et al. (2021a) claim that no study has fully assessed H&S consideration in public sector projects. Similarly, in South Africa, Deacon and Smallwood (2016) note that the role of procurement and how it affects H&S does not appear to have been previously considered or researched. Further, the application of radical innovations in construction projects can improve procurement and contract, by implication project performance, but alternative procurement methods (for example, Labour-only) which can facilitate and encourage the development and application of this have received little attention (Lenderink et al. 2022). One of these radical innovations is the early consideration of strategies such as the early consideration of H&S in procurement or contracting.

Based on the background established so far, the overarching aim of the current study is to advance the understanding of the influence of procurement, in this case, LoPS, on H&S performance in construction projects using Nigeria as a case study. Nigeria, as many other developing countries, has a poor H&S record worse than the developed ones, regulation with OHS is dysfunctional and complex (Umeokafor 2017). The objectives set to guide the study are to:

- Establish and assess the impact of the characteristics of LoPS on project performance in terms of Health, Safety and Wellbeing.
- Assess the H&S performance of LoPS projects.

Following this introduction is the literature review of the study, after which the study's analytical and conceptual framework is covered. After that, the methodology is presented, and the 'results, discussions and implications' are followed by the conclusion and recommendations of the study. This paper is an output of a larger study that centres on proactive measures for improving project H&S performance through procurement which has also resulted in other independent papers with the overarching objective of early consideration of H&S in construction projects. While other indicators are also important in improving the performance of projects, the focus on H&S is as a stepping-stone to address the LoPS project performance issues and an opportunity to examine one of the indicators in detail. Therefore, this should not be misconstrued as arguing or suggesting that H&S is the most important of other indicators. The current study can also serve as a framework for further research improving the LoPS project performance through the indicators.

## **2. Literature review**

### *2.1 Labour-only Procurement systems*

Akinkunmi et al. (2018) and Financial Support Services Units (2017) conceptualise LoPS as where the project owner or client provides the materials and project management but contracts the construction contractors and professional services providers for labour and equipment. In LoPS, the client's responsibility of supervision, coordination, and quality control of the project may be carried out by self, or the client employs a consultant to do it (Hardy 2013). Awodele et al. (2019) found that this procurement system is less suitable for

large projects not limited to industrial buildings and commercial buildings. Nevertheless, it is suitable for residential buildings, minor alternations or modifications, and institutional and office buildings (Awodele et al. 2019). This explains the findings in Awodele et al. (2019) that larger contractors rarely adopt LoPS, leaving this for small and medium-sized contractors. LoPS also offers mouth-watering benefits to contractors. For example, it affords a continuous cash flow for them. As the contractors focus on only the labour aspect of the project, they are likely to have more time to handle more projects when compared to those procured through the conventional methods (Awodele et al. 2018).

LoPS is gradually gaining recognition in its adoption (Ogunde 2011; Awodele et al. 2019) and is popular in DCs including Botswana, Ghana, Kenya, Uganda, South Africa, and Zimbabwe (Ogunsanmi 2013), Nigeria (Ogunde 2011), and developed countries, for example, New Zealand (Hardy 2013) and Ireland (Financial Support Services Units 2017). Fifty-eight per cent of the projects in Ogunde (2011) have adopted LoPS in Nigeria. A recent study on LoPS as a contractor survival strategy in Nigeria (Awodele et al. 2019) found that 99.9 per cent of the respondents view the LoPS as at least moderately suitable for their projects, 41.4 per cent are 'willing to use it, and 13.8 per cent 'highly willing' to adopt the LoPS.

## *2.2. Characteristics of Labour-only Procurement systems and implications for H&S*

According to Ogunsanmi (2015), the LoPS model entails robust collaboration between clients, designers, contractors, and subcontractors. This results in a high level of diversity in client responsibility. The chances of shifting H&S responsibilities among stakeholders where there is no legal backing for this or the H&S responsibilities of the parties in the projects overlapping is high. However, the impact of this on LoPS is unclear and poorly understood. Conversely, early collaboration with contractors to meet the diverse responsibilities can improve buildability and H&S, but this may depend on the client and contractor sharing the same objectives (Umeokafor et al. 2020a; Rahman and Kumaraswamy 2002). Nevertheless, this is subject to empirical verification in LoPS projects (Umeokafor et al. 2020a). Hence, this is hypothesised:

*Ho<sub>1</sub>: Diversity of responsibilities of clients in LoPS has no significant correlation with project H&S performance.*

The level of client involvement and control in LoPS projects (including in the building and design stages) is high (Akinkunmi et al. 2018); hence adequate experience, including project management, resource and material handling is needed (Umeokafor et al. 2020). Khawam and Bostain (2019) offer a treatise on how project management contribute to improving H&S in construction. The implication is that while clients with interest in H&S have more control over the project (including the building process and the parties therein) hence can influence it more, those with little interest and experience in H&S may treat it as secondary hence H&S suffers. However, subject to empirical validation hence poorly understood. As a result, these are proposed:

*Ho<sub>2</sub>: Client involvement in LoPS has no significant correlation with project H&S performance.*

*Ho<sub>3</sub>: Client control of the building process and parties in the project has no significant correlation with project H&S performance.*

Akinkunmi et al. (2018) and Ogunsanmi (2015) note the opportunities in LoPS for clients to control and monitor quality and cost. Being two of the key project performance indicators that H&S can influence, it is prudent for clients and contractors to improve H&S. However, as the quest to save cost has driven clients to expand the scope of LoPS adoption (Ogunsanmi 2013) and H&S is viewed as cost (Umeokafor 2018a), it can be argued that clients may view H&S as secondary. Nevertheless, this is subject to empirical verification in LoPS projects hence:

*Ho<sub>4</sub>: Client satisfaction on cost control and monitoring in LoPS projects, has no significant correlation with project H&S performance.*

In terms of quality, while clients can control and monitor it, engaging contractors that mainly specialise in LoPS and with evidence of extensive experience in it creates a platform for this (Awodele et al. 2018). However, when the client is not interested in H&S or has little interest in it, it may suffer, even when contractors intend to drive it. The implications of this for the H&S performance of Lops projects are poorly understood and yet to be empirically established. Therefore, this is proposed:

*Ho<sub>5</sub>: Provision for clients to monitor quality has no significant correlation with project H&S performance.*

The other two client attributes are the client influence in selecting trade (for example, contractors) and the opportunities to negotiate in LoPS projects. Again, as H&S is viewed as a cost, it may be compromised (Umeokafor 2020a). For example, when contractor selection is based on the lowest tender price H&S and work quality are compromised which can also result in project overrun (Boadu 2022). As a result, Eriksson and Westerberg (2011) recommend focusing on soft parameters such as managerial and technical competence, working together, and shared value. In terms of opportunities to negotiate, most of the LoPS projects are procured through negotiation. Ogunsanmi (2015) found that 83 per cent of LoPS projects examined adopted the negotiated tender method as against 18 per cent of projects procured through the traditional procurement method. Negotiation is an effective tool for H&S improvement, but this may be prohibited by laws in some countries as Boadu (2022) found. This could limit the participation of stakeholders not nominated by clients which may reduce commitment to innovation and H&S (Umeokafor et al. 2020). Conversely, the opportunity could provide a platform for client transparency and share H&S responsibilities and costs (Ibid). The extent to which both activities in the tendering process impact H&S in LoPS is yet to be examined hence:

*Ho<sub>6</sub>: The opportunities to negotiate in LoPS projects have no significant correlation with project H&S performance.*

*Ho<sub>7</sub>: Client influence in the selection of trade contractors has no significant correlation on project H&S performance.*

The level of flexibility in procurement comes with advantages and disadvantages. While comparing the traditional procurement, design and build, and the management

procurement path, the latter enables a higher level of flexibility to the client, for example, making changes. Authors such as Boadu (2022) argue that the complex nature of the procurement path and the iterative nature of the project, changes may result in a repetitive manifest of H&S risks which has already been addressed. This will have cost implications. LoPS has a high level of flexibility (Umeokafor et al. 2020). Clients can make changes (Akinkunmi et al. 2018) for example the original design and structure at minimal cost (Ogunsanmi 2015). While the procurement may not be designed for complex projects like the management path, there can be constant changes and it is unknown if and the extent to which it can have implications for H&S, especially because of the resulting increase in cost. Consequently, this is subjected to empirical investigation.

*Ho<sub>8</sub>: The level of flexibility, e.g. client's ability to make changes to the project, has no significant correlation with project H&S performance.*

In terms of the risk of confrontation, LoPS has more propensity for it. Ogunsanmi (2015) found that LoPS has more claims than the traditional procurement method, 64 per cent against 44 per cent. This is expected as fragmented procurement systems like LoPS are characterised by 'them and us' attitudes, a common source of disputes. Umeokafor et al. (2020) demonstrate the implications of conflict and dispute in integrating H&S into LoPS. This is mainly because the roles and responsibilities in construction contracts can be unclear and the contract ambiguous. In support, Wills and Hawkins (2010) are instructive on vague and generalised references to H&S in construction contracts. Scholars proffer solutions such as benchmarking and definitions of H&S in contracts (Umeokafor et al. 2020). However, it is unknown if the high propensity of confrontation in LoPS has implications for H&S performance hence the hypothesis below.

*Ho<sub>9</sub>: The high risk of confrontation, e.g. claims and disputes, has no significant correlation with project H&S performance.*

Time is one of the key project performance indicators. However, construction projects overrunning budget or time is commonplace. However, the findings of Ogunsanmi (2015) and Fagbenle (2010) found that projects procured through the traditional method overran schedule more than the LoPS ones. Shorter construction time means a reduced time on construction sites which may result in less recorded fatalities, injuries, and ill health (Umeokafor et al. 2020a) and other project such as sustainability. Given the importance of time in project delivery, this is examined below:

*Ho<sub>10</sub>: The shorter duration of LoPS projects, compared to other procurement systems, has no significant correlation with project H&S performance.*

In summary, while all the above links the characteristics of LoPS to H&S, suggesting that they will have implications for the performance of LoPS projects, they are indicative and require empirical investigation. This warrants a study as the current one, an explanation for Umeokafor et al.'s (2020) calls for further research on the integration of H&S into LoPS.

### *2.3 Labour-only procurement systems and Health and Safety in the Nigeria context*

## Health and Safety

In furtherance to the points about this in the introduction, there is little or unreliable data on H&S (Diugwu et al 2012) hence its true extent is unknown, and decisions or improvement efforts are not robust, resulting in little changes. The dysfunctional and complex regulatory systems result in numerous regulatory models in the country (Umeokafor 2017). For example, one of the states, Lagos has its local legislation and regulator; geographical locations in the country make a difference in H&S, for example, in terms of awareness level and performance (Umeokafor 2018b). The governmental attitude toward H&S in the country is poor. For example, the Labour Safety Health and Welfare Bill of 2012 aimed at address such limitations and was signed by the Senate in 2012 but is yet to receive presidential assent (Umeokafor et al. 2022) as of 2023.

## Labour-only procurement systems

Studies record the adoption of many procurement routes including the traditional method, design and build variants, management contracting, construction management and Public Private Partnership (Udoette et al. 2022; Bimbola et al. 2020). The traditional one remains the most adopted one (Ibid). LoPS in Nigeria is no different from other countries and shares the same characteristics. The Public Procurement Act 2007 in Nigeria does not provide its legal and institutional framework in the country. Examining 32 LoPS projects in Nigeria, Akinkunmi et al. (2018) found a 2 per cent cost saving overall. Given the harsh economic conditions in many countries including Nigeria and the 4.87 per cent saving in educational projects procured through other routes in Nigeria found in Aghimien et al. (2017), it can be argued that the saving LoPS provides is significant. According to Ogunsanmi (2013), the poor economic climate of Nigeria contributes to the increased adoption of LoPS.

### *2.4. Characteristics of Labour-only Procurement systems and geographic locations*

Differences between the urban and rural construction sites and their performances are covered in the literature. For example, issues of traffic disruptions in high-urban cities and construction activities exacerbate this (Kim and Kim 2010) but this is likely to be less in rural cities. The same applies to noise levels (Ng 2000). Other authors such as Umeokafor (2018b) found differences in project performance indicators such as H&S due to the geographic location of the projects. The high demand for labour and materials in urban areas due to the high level of socioeconomic activities and population means that the cost of construction therein may differ from that in rural ones. The chances of getting more competent workers as a result may be higher in urban cities than the rural ones.

Procurement is established as pivotal in improving project performance (Davis 2014). But to what extent does the location of projects impact the manifestation of the characteristics of LoPS in projects? For example, there are likely more experienced clients in urban cities because of the high volume and number of projects therein than in rural ones. Given the high level of client involvement and control in LoPS projects, it is imperative to establish if the location of LoPS projects has implications for its characteristics. The current research will answer this question hence the hypothesis:

*Ho<sub>11</sub>: There is no significant statistical difference in the characteristics of LoPS projects in urban and rural areas.*



## *2.5. H&S performance in LoPS projects: The influence of locations, urban and rural areas*

While the H&S in construction is undebatable poor, there is no consensus in the literature on the influence of geographic location on its performance in projects. For example, focusing on the Philippines, although mainly based on urban projects, Demeterio et al. (2019) found that locality and safety practices are dependent and concluded that there is a difference between the safety practices in the projects in the cities examined because of the locality. Further, in Nigeria, Umeokafor (2018b) found differences in H&S practices in urban and rural projects. In the country (and many developing countries), highly urbanised states such as Lagos, Abuja, and Rivers have a higher level of H&S awareness and standards compared to others like Enugu. For example, because Rivers is a major oil-producing state with a history of hazardous activities associated with it including the environmental ones, there is more attention on H&S hence better results when compared to others.

Conversely, studies show that project location does not influence its H&S. For example, William et al. (2019) found that in Ghana the respondents' regions of residence do not influence their H&S awareness. Given the above and the influence of procurement in H&S in projects established so far in this paper, there is the need to examine if the H&S in LoPS projects differ based on locations. Currently, it is unknown if project scope or location impacts H&S performance in LoPS projects hence Ho<sub>12</sub>.

*Ho<sub>12</sub>: There is no significant statistical difference between LoPS projects in urban and rural areas in terms of H&S performance.*

## *2.6. H&S measurement indicators*

H&S performance is measured in three main ways, lagging indicators – fatalities, hospitalisation, hygiene and ill health, leading indicators – organising H&S training/audit/inspection, conducting risk assessment/employees survey on attitude towards H&S and compliance with H&S standards (Sinelnikov et al. 2015) and a combination of both – hybrid (Umeokafor and Windapo 2019). While 'leading' in leading indicators are described with upstream, heading, positive and predictive (Hinze et al. 2013), 'indicators' are captured with words, metrics, index, and measures (Zwetsloot et al., 2020). Irrespective of the terms used to describe leading indicators, their characteristics are consistent (Sinelnikov et al., 2015). Zwetsloot et al., (2020) argue that leading indicators can be objective or subjective. Examples include measuring the effectiveness of H&S audit, H&S training, safety culture and climate (Sinelnikov et al. 2015). Others are H&S inspections, conducting risk assessments, compliance with health and safety standards and conducting employee surveys on attitudes towards H&S (Umeokafor and Windapo 2015). Indicators establish a causal relationship in H&S performance and show the performance of organisations toward motivating improvement. Indicators can be process-driven (Sinelnikov et al., 2015). When supported by management, Sinelnikov et al. (2015) found that indicators easily enable the identification of corrective and preventive actions. By implication, indicators highlight management efforts toward improving H&S (Umeokafor and Windapo 2019).

However, indicators have limitations. For example, adoption may be barred by organisational culture issues (of which one is the lack of support for safety) and individual elements (not limited to knowledge to interpret data) (Sinelnikov et al., 2015). The ability of indicators to hinder creativity in benchmarking tailored towards the organisation's needs is also acknowledged in Zwetsloot et al. (2020). Issues with standardisation of parameters are also noted in Zwetsloot et al., (2020) and dependence on management is recognised in Sinelnikov et al. (2015). The subjective nature of some of the indicators presents the risk of bias and inconsistency. For example, H&S inspections on sites may comprise of different indicators on sites, and H&S training can vary from in-house to accredited ones and even be delivered by external bodies.

In contrast, there are lagging indicators, negative performance measures, or retrospective indicators where injuries, ill health, and near misses are measured (Oswald et al 2018; Umeokafor and Windapo 2019). The standardised parameters adopted here are strengths of the indicator (Sinelnikov et al. 2015). Nevertheless, the limitations include that they can be easily manipulated the reportability and recordability is also questionable (Oswald et al 2018). Further, countries or industries with unreliable or little data are disadvantaged. Lagging indicators focus on negative measures and biases, the data it provides as the efforts to improve H&S are overlooked (Xu et al. 2021). Consequently, Umeokafor and Windapo (2019) adopt both H&S leading and lagging performance indicators in that both complement the limitations of each other, and the strengths increase. The indicators in the current study are shown in Figure 1.

### **3. Analytical and conceptual framework**

Figure 1 illustrates the analytical and conceptual framework of the study. Drawing on the background established so far, it indicates the links between the characteristics of LoPS and the H&S performance of the projects. The indicators for characteristics of LoPS and project health and safety performance are detailed in it. The measures of the characteristics of LoPS are explained in section 2.2 resulting in the hypotheses tested. The lagging indicators and the leading ones are discussed in section 2.6 with examples and sources of all used in the current study.



Figure 1: Analytical and conceptual framework for the study. Measure of the characteristics of LoPS and the Lagging and Leading indicators used in the study.

#### 4. Research Methodology

The ontological position of positivism is that the nature of reality is one truth; and epistemologically, the focus can be on observable and measurable facts, and causal explanations and predictions as a contribution (Saunders et al. 2019; Umeokafor 2015). The analysis methods are typically quantitative, and the data collection instruments are highly structured and enable measurement (Saunders et al. 2019). Further, existing theories may be used to develop hypotheses and tested when positivism is the philosophical position (Ibid). In the current research, the characteristics of the research objectives and background established so far including hypotheses proposed entailed that a positivist underpinned methodology is adopted hence the use of questionnaire survey. The hypotheses tested were covered in the literature review. Also, the objectives require 'establishing and assessing the impact of the characteristics of LoPS on project performance in terms of Health, Safety and Wellbeing' and assessing H&S performance of LoPS projects.

##### 4.1 Research approach and strategy

In the current research, the deductive approach to theory development was adopted to test of the hypotheses/theories. While this approach can be adopted in qualitative research (Umeokafor 2017), it is mainly associated with quantitative ones (Saunders et al. 2019).

Some of the characteristics of quantitative research include that it is designed to examine relationships between variables measured numerically and analysed with statistical techniques, and the data collection methods highly structured (Ibid). These are consistent with the current research, for example, the hypotheses tested are measured numerically and statistical analytical methods were adopted.

In terms of the research strategy, a statistical survey was adopted which is associated with quantitative research. In the strategy, questionnaires, structured interviews, or structured observations are mainly adopted (Saunders et al. 2019). Questionnaires were adopted as data collection instrument in the current study.

#### *4.2 Data collection instrument*

The literature review informed the design of the questionnaire which contained the criterion for the reported projects in the research in that they must be recent project (within two years) where LoPS was used. The respondents were asked to complete the questionnaires based on only the chosen project to ensure consistency. Ethical issues and considerations (including how the data will be used and disposed, opting out options and anonymity) were made clear to them. LoPS was then defined, and the structure of the operation explained. This ensured that the respondents had some understanding of the procurement examined and the criterion for participation in the research and eligible projects. The information provided some context to the respondents.

In the questionnaire, the profile of the respondents was identified, covering their years of experience, highest academic qualification, designation in the organisation in which they work, and the scope of operation of the organisation. However, in the case of academics who also hold industry roles, they indicated the industry designation in which they completed the project, for example, a civil engineer. The characteristics of the projects were also identified in the questionnaire covering the state in which the project was conducted and whether it was in an urban or rural area, the type of project (for example, private buildings and commercial buildings), and the number of workers in the project. The measures of the characteristics of LoPS in the various projects, the lagging (e.g., fatalities, hospitalisation, minor injuries and ill-health) and leading indicators were also measured. This is consistent with Umeokafor and Windapo (2019) that adopt leading and lagging indicators in measuring the performance of construction projects in terms of H&S. For the 'measure of the characteristics of LoPS', a scale of 1 (very low) to 5 (very high) was used. For the leading and lagging indicators, the respondents indicated their extent of occurrence, which were measured on a scale of 1 (never) to 5 (very frequently).

#### *4.3 Sampling and data collection*

The questionnaire was piloted on five experts (Architects and Project Managers) and revised (based on the feedback/comments from them) before use. Informed consent was obtained from all respondents including those in the pilot study. While a list of professionals from professional institutions or registered contractors with professional institutions exists (Awodele et al. 2019), they are not comprehensive (Idoro 2011a; Umeokafor and Windapo 2019). Also, there is no comprehensive list of projects in Nigeria (Idoro 2011a; Umeokafor and Windapo 2019), just as there is none for labour-only procured projects in Nigeria (Awodele et al. 2019). Consequently, two investigations into LoPS (Awodele et al. 2019;

Akinkunmi et al. 2018) adopted snowballing sampling. Previous studies have conducted a preliminary survey of contractors or projects (for example, Ibem et al. 2011, 2018; Idoro 2011a; Umeokafor and Windapo 2019) and used as population. Because of the epistemological position of the research where what constitutes a knowledge claim must come from LoPS projects within the past two years (current or completed), non-probability purposeful and snowballing sampling techniques were adopted. The population target was professionals who worked on LoPS projects and the sample frame was Architects, Builders, Civil Engineers, H&S practitioners, Project Managers, Quantity Surveyors, and Construction Managers who held procurement and/or health and safety duties in LoPS projects within two years in four geopolitical zones (South-South, South-East, North-Central, and South-West). Two geopolitical zones (North-West and North-East) were excluded because of the insecurity in them.

Using a previous preliminary survey of 400 contracting and consulting companies, the purposeful and snowballing sampling methods were applied in the current study. The population was used as a stepping-stone to commence the survey, and purposeful and snowballing sampling were used to reach the difficult-to-reach (Dragan and Isaac-Maniu 2013). The snowballing begins with one or more respondents then spread to other respondents based on referral (Neuman 2014; Suri 2011).

Consequently, using non-probability purposeful and snowballing sampling, interested respondents in the preliminary survey and from the lead author's contact were approached to participate in the study. There are six geopolitical zones in Nigeria, and the projects reported in the study covered four, South-South, South-East, North-Central, and South-West. The criteria for respondents that are academics was that they must have an industry role (civil engineering, quantity surveying) alongside the academic position and complete the questionnaire based on industry professional experience on an ongoing project or completed within two years. The industry position may be on a part-time or full-time basis. There are academics in Nigeria who have industry positions alongside their academic profession. Of the 158 questionnaires distributed by hand and electronically, 94 were returned but 76 were usable, yielding a usable response rate of 48.1 per cent. Previous studies on LoPS in the country where questionnaires were distributed by hand and the snowballing sampling method adopted are based on smaller samples. For example, Awodele et al. (2019) sampled 90 and analysed 87 usable ones and Akinkunmi et al. (2018) sampled 98 by hand and 87 were returned. Understandably, the physical administration of questionnaires yields a higher response. According to Root and Blismas (2003), in construction management research, the acceptable response rate is 20 to 25 per cent. However, while our study recorded a response rate above the acceptable one, it is lower than what Awodele et al. (2019) and Akinkunmi et al. (2018) recorded. Explanations include that we sampled four geopolitical zones in the country, and the methods of questionnaire distribution were by hand and electronic whereas Awodele et al (2019) and Akinkunmi et al. (2018) distributed by hand only. Noteworthy, other construction management studies, for example, Abanda et al. (2014) used a lower response rate, of 25.7 per cent. Consequently, based on the points so far including that ours' were by hand and electrotonically, we are confident that the response rate is acceptable, especially where questionnaires distributed by hand and electronically.

#### 4.4 Data analysis

Descriptive and inferential statistics were conducted with the Statistical Package for Social Science (SPSS) software. The frequency and mean scores of the characteristics of LoPS and H&S practices were calculated. The histogram test to visualise the data distribution was conducted, and it was not a normal distribution. In other words, the data did not meet the requirements for parametric tests; hence the non-parametric tests - Man Whitney-U test, and Kendall's Tau\_b test was employed. The Kendall's Tau\_b test assessed the relationship between the characteristics of LoPS on project performance concerning H&S. A positive correlation means that when one variable increases, the other does the same; negative correlation means that when one variable decreases, the other increases, and vice versa.

### 5. Results

#### 5.1 Respondents and projects demographics

Seventy-six responses have been received. The years of experience of the respondents range from 0 – 5 years (for 24 respondents), 6 – 10 years (for 20 respondents), 11 – 15 years (for 12 respondents), 16 – 21 years (for six respondents), and those with over 21 years are 14. The lowest academic qualifications are Ordinary National Diploma/Higher National Diploma and the highest, are doctorate degrees. The respondents are mainly Architects (44), four are H&S professionals, 12 are Civil Engineers, 8 are Builders, Project Managers are four, two are Quantity Surveyors, and two are academics (also Construction Managers). The projects are undertaken in four of the six geopolitical zones in Nigeria, of which 17 of them are in rural areas and 59 in urban locations. The distribution of the projects in the geopolitical zones is as follows. South-East comprises Anambra with 24 projects, Ebonyi has 16 projects, and 12 are in Enugu. Federal Capital Territory has eight projects covering the North Central; South-West is represented by Lagos (with six projects) and Ekiti with two projects. The South-South has eight projects where two are in Edo state, four in Rivers state, another two in Delta state. The projects comprise public buildings, private buildings (residential), refurbishment projects, and a few commercial buildings.

#### 5.2 Characteristics of LoPS

The measures of the characteristics of LoPS are in Table 1. All but three of the mean scores of the characteristics of LoPS (Completion of the project is shorter than when other procurement systems are used, Higher risk of confrontation, e.g. claims and disputes, and Client influence in the selection of trade contractors) are above the midpoint of 3. Overall, the respondents' views show that the level of client involvement, diversity in the responsibilities of clients, and client satisfaction in terms of cost control and monitoring are the three highest-ranked features of LoPS in the reported projects with means scores of 3.47, 3.37, and 3.37 respectively. However, the findings suggest a significant *statistical* difference in the features of the projects due to their locations (Table 1). For example, the Level of client involvement has a mean score of 3.59 in urban projects and 3.06 for the rural ones, both ranking first and third respectively. One of the second ranked characteristics overall, diversity in the responsibilities of clients, has a mean score of 3.49 for urban project and 2.94 for the rural ones.

Table 1: Extent of the manifestation of the characteristics of LoPS in urban and rural projects

The measure of the characteristics of LoPS	Urban projects	Rural projects	Overall
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	Mean	Rank	Mean	Rank	Mean	Rank
Level of client involvement	3.59	1	3.06	3	3.47	1
Diversity of the responsibilities of clients	3.49	3	2.94	4	3.37	2
Client satisfaction on cost control and monitoring	3.41	4	3.24	2	3.37	2
Client control of building process and parties on the project	3.22	6	2.71	8	3.11	5
Provision for clients to monitor quality	3.53	2	2.24	10	3.24	3
High level of flexibility, e.g. client's ability to make changes to the project.	3.26	5	2.82	6	3.16	4
Opportunities to negotiate	3.12	7	3.29	1	3.16	4
Completion of the project is shorter than when other procurement systems are used	3.03	8	2.76	7	2.97	6
Higher risk of confrontation, e.g. claims and disputes.	2.64	9	2.59	9	2.63	7
Client influence in the selection of trade contractors	2.53	10	2.88	5	2.61	8

Consequently, there is a need for a stronger statistical analysis to test the null hypothesis: *Ho<sup>11</sup>: There is no significant statistical difference in the characteristics of LoPS projects in urban and rural areas.* Hence, a group mean analysis was conducted using the Mann-Whitney U test at a significant level of 0.05 or <0.05. This is detailed in Table 2. By implication, for the null hypothesis to be accepted, the *p-value* must be greater than or equal to 0.05 else it will be rejected. The Mann-Whitney U test shows significant *statistical* differences in the characteristics of LoPS in Urban and rural areas in two measures (Diversity in the responsibilities of clients, and Provision for clients to monitor quality) (Table 2). The effect size of these measures was then further investigated in line with Sullivan and Feinn (2012) who argue that when there is a difference, the extent needs to be ascertained to gain a deeper understanding of the phenomenon. Hence, it is the main finding (ibid). A small effect size is = 20, the medium one = 50 and the large one = 80 (Cohen 1988). The formula for calculating the effect size is  $r = z / \text{square root of } N$ , where *r* is the effect size, *Z* is the *Z* score, and *N* is the number of cases which is 76. Table 2 shows that the effect size in the difference between the two characteristics of LoPS, 'Diversity of responsibilities' and 'Provision for clients to monitor quality is medium. This means that it is unlikely there is no difference in the two characteristics of LoPS in urban and rural areas in a larger sample.

Table 2: Results of Mann-Whitney U test of the manifestation of the characteristics of LoPS in urban and rural projects

The measure of the characteristics of LoPS	Mann-Whitney (U)	Asymp. Sig (2-tailed)	Z score	$r = z / \sqrt{N}$	Decision
Level of client involvement	409.5	.225	-1.212	N/A	Accept
Diversity in the responsibilities of clients	331.5	.022	-2.294	-0.263	Reject
Client satisfaction on cost control and monitoring	449.5	.482	-.704	N/A	Accept
Client control of building process and parties on the project	407.5	.227	-1.207	N/A	Accept

Provision for clients to monitor quality	192.5	.000	-3.979	-0.456	Reject
High level of flexibility, e.g. client's ability to make changes to the project.	364.5	.109	-1.603	N/A	Accept
Opportunities to negotiate	435.5	.370	-896	N/A	Accept
Completion of the project is shorter than when other procurement systems are used	408.5	.200	-1.281	N/A	Accept
Higher possibility of confrontation, e.g. claims and disputes.	485.5	.835	-.208	N/A	Accept
Client influence in the selection of trade contractors	421.5	.302	-1.031	N/A	Accept

### 5.3 Health and safety performance in LoPS projects

Currently, little (if not nothing) is known about the H&S performance of LoPS projects hence the analysis resulting in the data in Table 2. According to Demeterio et al. (2019), the geographic location of projects in developing countries determines the H&S performance of the project. Consequently, the performance of LoPS projects in urban and rural areas, respectively, are examined and detailed in Table 3. It shows that while overall, all the mean scores are below 3.0 which is good, poor hygiene is the worst H&S performance indicator in the projects (with a mean score of 2.68), followed by ill health with a mean score of 2.47. The extent to which inspections are organised ranks third with a means score of 2.13. An insightful aspect of the results is that the leading/positive indicators also have low means scores (for example, organising H&S inspections (2.13), organising H&S training (2.16) and conducting risk assessment (2.11). One of them, organising an H&S audit has a mean score of 1.79 overall with similar outcomes in urban and rural projects. These positive indicators highlight poor H&S practices and may explain the lagging indicators (Table 3).

However, these measures of H&S performance indicators have not occurred in the same way when examined comparatively in rural and urban areas (Table 3). For example, the mean score for poor hygiene in urban and rural projects are 2.54 and 3.18 respectively and for conducting employee surveys on H&S attitude it is 2.24 (Urban projects) and 2.00 (rural projects). To establish if there are significant statistical differences in the measure of H&S performance indicators of urban and rural projects, a group mean analysis using the Mann-Whitney U test was conducted at a significant level of 0.05 or <0.05 to test the null hypothesis:  $H_{012}$ : *There is no significant statistical difference between LoPS projects in urban and rural areas in terms of H&S performance.* The results are in Table 4 and shows that all *p-values* are above 0.05; hence the null hypothesis ( $H_{012}$ ) is accepted (see Table 4).

Table 3: Descriptive statistics of the H&S performance of the LoPS projects.

The measure of H&S performance indicators	Urban projects		Rural projects		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank
Poor hygiene	2.54	1	3.18	1	2.68	1
ill health	2.42	2	2.65	3	2.47	2
Organising H&S inspections	2.14	5	2.12	3	2.13	3
Organising H&S training	2.19	4	2.06	4	2.16	4
Conducting an H&S risk assessment	2.12	6	2.06	4	2.11	5



Conducting employee surveys on H&S attitude	2.24	3	2.00	5	2.18	6
Compliance with H&S standards	2.01	7	1.98	6	1.99	7
Organising H&S audit	1.76	9	1.88	7	1.79	8
Severe injuries	1.81	8	1.71	8	1.79	9
Fatalities	1.68	10	1.59	9	1.66	10

Table 4: Results of Mann-Whitney U test H&S performance of the LoPS projects

The measure of H&S performance	Mann-Whitney (U)	Asymp. Sig (2-tailed)	Z score	r = z/v N	Decision
Fatalities	492.5	0.899	-0.126	N/A	Accept
Severe injuries	491.5	0.893	-0.135	N/A	Accept
ill health	426.5	0.311	-1.013	N/A	Accept
Poor hygiene	375.5	0.101	-1.642	N/A	Accept
Organising H&S training	476.5	0.745	-0.326	N/A	Accept
Organising H&S audit	446.5	0.460	-0.739	N/A	Accept
Organising H&S inspections	500.5	0.989	-0.013	N/A	Accept
conducting an H&S risk assessment	489.5	0.874	-0.158	N/A	Accept
Conducting employee surveys on H&S attitude	439.5	0.415	-0.815	N/A	Accept
Compliance with H&S standards	416.5	0.272	-1.099	N/A	Accept

#### 5.4 Correlations between the characteristics of LoPS and health and safety performance

##### Correlation between the level of client involvement in LoPS and H&S performance.

Using Kendall's tau-b at the significant levels of 0.05 and 0.01, the null hypothesis, Ho2: Client involvement in LoPS has no significant correlation with project H&S performance, is tested. This is to determine if there is a correlation between the level of client involvement and H&S performance. The results are detailed in Table 5.

Table 5: Kendall's tau\_b correlations between the Measure of LoPs characteristics and H&S project performance indicators

Measure of LoPs Characteristics	Indicators of H&S Project Performance (Lagging and Leading) indicators									
	Lagging Indicators				Leading Indicators					
	fatalities	severe injuries	ill health	poor hygiene	Organising H&S training	Organising H&S audit	Organising H&S inspections	Conducting an H&S risk assessment	Conducting employee survey on H&S attitude	Compliance with H&S standards
The level of client involvement	-.344**	-.071	.008	.136	.047	.029	.115	.212*	.349**	.133
Diversity in the responsibility	-.235**	-.135	-0.26	.117	.116	.152	.184	.175	.264**	.098

of clients										
Client satisfaction on cost control and monitoring	.169	.000	-.069	.018	.324*	.311**	.190	.194	.181	.219*
Client control on building process & parties on the project	.031	.020	.108	.068	.405*	.314**	.328**	.229*	.431**	.347**
Provisions for clients to monitor quality	.006	.091	.046	-.13	.280*	.256**	.322**	.307*	.465**	.325**
High level of flexibility e.g. client's ability to make changes to the project	-.335**	-.280*	-.164	-.030	.030	.153	.154	.115	.002	.074
Opportunities to negotiate	-.150	-.152	-.108	.150	.133	.140	-.02	.082	.067	.231*
Reduction in project duration compared to other procurements and H&S performance	-.158	-.146	-.013	-.029	.163	.337**	.043	-.064	.034	.032
Higher risk of confrontation e.g., claims and disputes	.147	.151	.179	-.065	.135	.168	.081	-.105	-.033	.045
Client influence on the selection of trade contractors	.067	.038	.072	-.108	.141	.315**	.182	.042	.084	.206*
Corr. Coef. Is correlation coefficient (tau_b) *Correlation is significant at the 0.05 level (2-tailed) ** Correlation is significant at the 0.01 level (2-tailed) No sign before any number with one or two asterisks means a positive correlation but a negative sign (-) means a negative correlation.										

The results reveal that the p-values are above 0.01 and 0.05 in seven indicators of H&S performance (for example, severe injuries, ill health, and organising H&S training) hence accepted. However, it is within the expected ranges (0.05 and 0.01) in three indicators hence the null hypothesis is rejected. This means that there is a significant statistical correlation between 'the level of client involvement and the H&S performance indicators, 'fatalities', 'conducting H&S risk assessment' and 'conducting employees survey on H&S attitude' (Table 5). However, the latter two are positive correlations, and the first (between the level of client involvement and fatalities) is negative. It can be deduced from the findings that the more the client is involved in the project, the lower the fatalities and vice versa. Further deduction from the findings is that the more the level of client involvement, the more the conducting of H&S risk assessment, more employees survey of H&S attitude is conducted.

#### 5.4.1 Correlation between diversity in the responsibilities client in LoPS and H&S performance

Ho<sub>1</sub>: Diversity of responsibilities of clients in LoPS has no significant correlation with project H&S performance. The results of the Kendall's tau-b analysis are in Table 5. There is evidence in the table that all but two of the ten performance indicators, 'fatalities' and 'conducting employees survey on H&S attitude', have p-values within 0.05 hence rejected. The correlation with fatalities is negative, while the other is positive. By implication, there is a significant correlation between 'Diversity in the responsibilities of clients' and the H&S indicators, 'fatalities' and 'conducting employees survey on H&S attitude'. It can be deduced from these results that diverse client responsibilities bring about reduced fatalities on projects, while an increased diversity of client responsibilities result in surveying employees' attitude towards H&S.

#### *5.4.2 Correlations between client satisfaction on cost control and monitoring and H&S performance*

Ho<sub>4</sub>: Client satisfaction on cost control and monitoring in LoPS projects, has no significant correlation with project H&S performance. The result of Kendall's tau<sub>b</sub> correlations analysis in Table 5 shows that 'organising H&S training', 'organising H&S audit' and 'compliance with H&S standards' have p-values that are within the 0.01 and 0.05 range hence rejected. The other seven indicators have p-values higher than 0.01 and 0.05 hence accepted. In other words, there is a positive significant statistical relationship between 'client satisfaction on cost control and monitoring' and the three indicators. It can be deduced from the results that with organised H&S training and compliance with H&S standards, there is better client satisfaction with cost control and monitoring and vice versa. Further, it can be inferred that better client satisfaction with cost control and monitoring results in H&S inspections and vice versa.

#### *5.4.3 Correlations between client control of building process and parties in the project and H&S performance*

Ho<sub>3</sub>: Client control of the building process and parties in the project has no significant correlation with project H&S performance. This has been tested using Kendall's tau<sub>b</sub>. The results in Table 5 show that all the leading indicators have p-values less than 0.01 and 0.05 hence rejected. This means that 'Client control of the building process and parties in the project' has positive correlations with the H&S indicators, 'Organising H&S training', 'Organising H&S audit', 'Organising H&S inspections', 'conducting H&S risk assessment', 'Conducting employees survey on H&S attitude' and 'Compliance with H&S standards'. The other three H&S indicators are accepted because the p-value is above the threshold. By implication, increased client control of the building process and parties in the project brings about an increase in organising H&S training, H&S audit, H&S inspections, and conducting H&S risk assessment, employees survey on H&S attitude, and better compliance with H&S standards.

#### *5.4.4 Correlations between provisions for the client to monitor quality and H&S performance*

Ho<sub>5</sub>: Provision for clients to monitor quality has no significant correlation with project H&S performance. Kendall's tau<sub>b</sub> test results are presented in Table 5, again, showing that all leading indicators have p-values below the threshold hence rejected. However, all lagging indicators have p-values above 0.05 hence accepted. The results mean that 'Provisions for clients to monitor quality' has a positive correlation with the H&S indicators 'organising H&S training', 'organising H&S audit', 'organising H&S inspections', 'conducting H&S risk assessment', 'conducting employees survey on H&S attitude' and 'compliance with H&S standards'. It can be deduced from the findings that better provisions for clients to monitor quality increases organising H&S training, H&S audit, H&S inspections, and conducting H&S risk assessment, employees survey on H&S attitude, and better compliance with H&S standards.

#### *5.4.5 Correlations between a high level of client flexibility in the project and H&S performance*

One of the features of LoPS where the client can make changes to the project, of course at

some cost in some cases, is one of its major advantages, yet a disadvantage. This is captured in the null hypothesis, Ho<sub>8</sub>: The level of flexibility, e.g. client's ability to make changes to the project, has no significant correlation with project H&S performance. Unlike the correlations in the two features of LoPS, provisions for the client to monitor quality, and client control of building process and parties in the project, the rejected hypotheses in Table 10 are all lagging indicators (fatalities and severe injuries) because the p-values are within the range, 0.05. By implication, the high level of client flexibility on the projects reported is negatively correlated with 'fatalities' and 'severe injuries'. The inverse relationship means that an increase in client flexibility in LoPS projects results in a reduction in fatalities and severe injuries and vice versa.

#### *5.4.6 Correlations between opportunities for negotiation and H&S performance*

Ho<sub>6</sub>: The opportunities to negotiate in LoPS projects have no significant correlation with project H&S performance. This null hypothesis has been tested using Kendall's tau<sub>b</sub>, showing just a correlation between 'opportunities for negotiation' and 'compliance with H&S standards' at a significance level of 0.05 (Table 5). It can be deduced from this that an increase in the opportunity for clients to negotiate with contractors is likely to improve compliance with H&S regulations in the projects examined.

#### *5.4.7 Correlations between reduction in project duration compared to other procurements and H&S performance*

Here, the implication of the shorter duration of LoPS projects when compared to projects procured through other methods is assessed using Kendall's tau<sub>b</sub> test and reported in Table 5. The null hypothesis is Ho<sub>10</sub>: The shorter duration of LoPS projects, compared to other procurement systems, has no significant correlation with project H&S performance. This holds for all but one of the H&S performance indicators, organising of H&S audits. In other words, there is a positive relationship between the shorter duration of LoPS projects compared to other procurement routes and 'organising H&S audit' at a significance level of 0.01. By implication, the shorter the duration of LoPS projects (when compared to those procured through other procurement methods), the increased chances of the organisation of H&S audits.

#### *5.4.8 Correlations between high risk of confrontation and H&S performance*

Ho<sub>9</sub>: The high risk of confrontation (e.g. claims and disputes) has no significant correlation with project H&S performance. This is the ninth null hypothesis tested, and the results are in Table 5. All the p-values are above the 0.01 and 0.05 threshold hence accepted, showing no significant correlation between the high risk of confrontation and H&S (lagging and leading) performance indicators (Table 5). It is deduced from this that the high risk of confrontation between the parties will not increase or decrease any of the 10 H&S project indicators hence does not influence them.

#### *5.4.9 Correlations between client influence on the selection of trade contractors and H&S performance*

The last result of Kendall's tau<sub>b</sub> analysis in Table 5 is for the null hypothesis, Ho7: Client influence in the selection of trade contractors has no significant correlation with the project H&S performance. Two of the ten H&S performance indicators, organising H&S audit and compliance with H&S standards, are within the threshold of 0.01 and 0.05; hence they were rejected. This means that there is a significant statistical positive relationship between client influence on the selection of trade contractors and the H&S indicators, organising H&S inspections, and compliance with H&S standards. The rest of the indicators tested are above the threshold, 0.01 and 0.05, hence agreeing with the hypothesis (Table 5). It can be deduced from the findings that with increased client influence in the selection of trade contractors, H&S inspections and compliance with H&S standards increases, improving H&S.

## **6. Discussions of findings**

### *6.1 Project and sample profile*

While the projects cover four of the six geopolitical zones in Nigeria, the major cities Lagos, Port Harcourt, and Abuja are part of this. Most construction projects take place in these Nigerian cities. The profile of the participants shows a diversity in the sample, reducing the risk of skewed perspectives. For example, the level of experience varies from new in the industry to very experienced; there are also H&S professionals and consultants with H&S responsibilities. The academic qualifications range from non-degree to doctorates and the locations are not limited to one geopolitical zone. This is important given that H&S responsibilities in the country are not limited to those with H&S designations. Also, the respondents' years of experience suggest that they have the appropriate level of experience to provide meaningful information. This is because those with many years of experience at the management level may have started from the lower ranks before rising hence can provide management and non-management perspectives.

### *6.2 Characteristics of LoPS*

The study reveals that the main characteristic of LoPS experienced in the project are the high level of client involvement. This is consistent with Akinkunmi et al. (2018) who found a high level of client's time commitment, energy, and diplomacy for successful project delivery where it has the highest mean score of 4.33. While they assess this as a demerit, in terms of H&S, our findings below suggest otherwise as will be discussed in section 6.4 where the more the client is involved, the more selected H&S practices improve. Given the nature of the procurement method, this is expected. However, this does not apply to rural projects where there are more negotiations than urban ones. The findings in Tables 1 and 2 also provide some context for better understanding the behaviours of these characteristics of LoPS which may have implications for the H&S performance. When subjected to inferential statistics (Mann-Whitney U test) to see if there is a statistically significant difference in the view of the respondents on the characteristics of the procurement method in the projects based on location, differences in the diversity of responsibilities of clients, and the provisions for clients to monitor quality were found. This suggests that if these characteristics of LoPS have implications for the H&S performance of projects, the location of projects is also a factor to consider. Demeterio et al. (2019) found that the location of projects influences construction H&S but other studies, for example, William et al. (2019), found otherwise.

### *6.3 H&S performance of LoPS projects*

Concerning the H&S performance of LoPS projects, the study reveals that poor hygiene is widespread in the projects with no significant difference in the performance between urban and rural projects. This is followed by ill health, then conducting employees survey on H&S attitude. These are discussed in detail in the next paragraph. Poor hygiene, the highest H&S indicator experienced in the project, is a concern given the current global pandemic. This finding of poor hygiene is consistent with the Mohseni et al. (2015) who found that bathrooms were unhygienic, and sewage and garbage disposal were inappropriate in about 50 per cent of large construction site they observed in Tehran, Iran. However, the extent to which this occurs in projects procured through different procurement methods are not covered in Mohseni et al. (2015). The findings of the current study also highlight the poor level of H&S in LoPS projects, given that no H&S indicators passed the midpoint of 3 for the overall mean. This is because the lower the mean scores of the lagging indicators and the higher the mean score of the leading indicators, the more likely the H&S performance will improve because the leading indicators are positive. This finding of poor H&S record in construction projects, especially in developing countries is well-reported in literature. For example, the International Labour Organisation (2017) found that between 2014 and 2016, 1385 workers were injured, and 238 lives were lost on construction sites in Nigeria. Further, Umeokafor's (2018) study of client involvement in H&S found that conducting an H&S audit is the least ranked (11th) client H&S practice (with a mean score of 2.72 overall) in the projects they examined. The 10th one is clients engaging in H&S awareness with a mean score of 2.74. They found that clients are not mainly involved in pre-construction H&S practices in the project they surveyed. While they did not specify the procurement route through which the projects were procured, they highlight the need to find robust and smart ways of getting clients involved in H&S in LoPS projects as H&S in them is dependent on their involvement.

Table 4 shows no statistically significant difference between the H&S performance of construction projects in urban and rural areas. It does not agree with Demeterio et al. (2019) who found that the location of projects influences construction H&S performance. However, the findings agree with William et al. (2019), who found that the regions of residence of the respondents do not influence their awareness of H&S. This is further discussed in the literature review section.

Nevertheless, there are some possible explanations for the contradictions in the findings. The studies above (Idoro 2011b; Demetrio et al. 2019; William et al. 2019) have not examined LoPS projects solely but projects procured through other or various procurement routes. This will have implications for the type and size of projects, for example, infrastructure vs. buildings examined. Demeterio et al. (2019) have examined mainly projects in highly urbanised areas. Also, the projects in LoPS are less likely to be examined by large contractors. All these have implications for the findings.

### *6.4 Correlations between the characteristics of LoPS and project health, safety, and wellbeing performance*

The study reveals several correlations between characteristics of LoPS and H&S performance indicators of the projects reported. Correlations does not mean causation.

Rather, a positive correlation means that when one variable increases, the other does the same; negative correlation means that when one variable decreases, the other increases, and vice versa.

The level of client involvement in LoPS projects which can be high or moderate (Akinkunmi et al. 2018), usually requires them to coordinate, control, and manage the project and resources, which means that knowledge and experience in project and resource management and H&S are required. Clients in LoPS may lack one or more of them (Umeokafor et al. 2020). However, their collaboration with the designers and contractors may alleviate these, resulting in value-added savings (Akinkunmi et al., 2018). The negative correlation between the level of client involvement in LoPS projects and fatalities indicates that the higher the level of client involvement in LoPS projects, the lower the fatalities. This suggests that in LoPs, clients or their representatives need to be more involved to keep fatalities low. This is consistent with Umeokafor et al. (2020a) who propose strategies for integrating H&S into LoPS procurement projects, but they are heavily dependent on high client involvement in the project from start to finish. However, while it is noteworthy that Umeokafor et al. (2020a) is based on a literature review hence subject to empirical investigation, it can be argued that the current study validates their findings to some extent. Nevertheless, this becomes complex when other findings of the current study are considered. For example, the higher the level of client involvement in the projects, the higher H&S risk assessment, and employees survey on their attitude towards H&S are conducted respectively. Also, there is usually a high or moderate level of diversity of client responsibilities (Akinkunmi et al. 2018; Umeokafor et al. 2020a) which may contribute to the level of involvement, the current study found that the higher the level of diversity of client responsibilities, the lower the fatalities in LoPS projects and vice versa. If this is the case, to what extent should clients be involved in the project so that lower fatalities and increase the conducting of risk assessment and employees survey of H&S attitudes will be recorded in the project? Nevertheless, these findings can be concluded as inconclusive (hence the need for further studies, which is detailed in the conclusion section).

Furthermore, the difference in the direction of the correlation in the leading and lagging indicators in the diversity of client responsibilities suggests that LoPS results in complexity in the H&S performance of projects. While further research is required, as a result, the difference in the findings may also be explained by the complications due to the adoption of lagging and leading indicators because of unreliable H&S data in developing countries, as Idoro (2011b) points out. This same argument may apply to the complex or inconclusive findings in the level of client involvement and H&S indicators in the preceding paragraph.

One of the benefits of leading indicators is that they enable the good H&S practices of organisations to be assessed in determining H&S performance (Hinze et al., 2013; Idoro 2011b; Sinelnikov et al. 2015). Consequently, it is interesting to find that there are correlations between eight characteristics of LoPS and at least one leading indicator of which two (Provisions for the client to monitor quality, and client control of the building process and the parties in the project) are positively correlated with all the leading indicators, namely, H&S training, H&S audit, and H&S inspections; conducting H&S risk assessment, and survey on employees H&S attitude, and compliance with H&S standards.

## **7. Implications for practice and research**

The study provides valuable insight into the complexities in H&S management due to the high level of client involvement in LoPS projects and the level of diversity in their responsibilities therein. It creates a fundamental direction for developing a detailed framework or guidance notes for client involvement in the integration of H&S into LoPS projects. The findings enable clients, academics and policymakers to better understand the relevant dynamics of H&S and the procurement systems in the LoPS project for informed decisions on project performance improvement. It contributes to the project performance indicators body of knowledge in LoPS projects by examining H&S, providing a framework for examining other indicators. This research broadens researchers' horizons of H&S management in LoPS procurement and the performance of H&S in such projects. The results of the current study build on the proposition of an existing study (Umeokafor et al. 2020a) on the strategies for integrating H&S into LoPS-procured projects and validate them to some extent. In particular, the strategies that are dependent on higher client involvement in LoPS and the findings of the current study show that the more clients are involved in LoPS, the more selected H&S practices (H&S risk assessment and employees survey on their attitude towards H&S) are conducted respectively.

## **8. Conclusions and Recommendations**

The study has established and assessed the impact of the characteristics of LoPS on project H&S performance. It also assesses the H&S performance of LoPS projects, comparing them in terms of locations, urban and rural areas. The study provides remarkable results on the H&S performance of LoPS projects which is the first of such insight. It reveals that the client's involvement in LoPS projects can have positive and negative implications for H&S in LoPS projects, and this is dependent on the determinant of involvement, for example, the diversity of client responsibility and the level of involvement in the project. These two characteristics are likely to result in complexity in H&S performance improvement, as the study reveals. There is no statistically significant difference in the H&S performance of rural and urban projects procured through LoPS. However, there are correlations between eight characteristics of LoPS and at least one leading indicator of which two (Provisions for the client to monitor quality, and client control of the building process and the parties in the project) are positively correlated with all the leading indicators, namely H&S training, H&S audit, and H&S inspections; conducting H&S risk assessment, and survey on employees H&S attitude, and compliance with H&S standards.

In conclusion, the characteristics of the procurement methods, in this case, LoPS, are not adequately considered in H&S hence the negative results in the study. To improve H&S in construction projects, the procurement methods through which they are procured must be considered. Emphasis must be on the characteristics of the procurement methods and how they influence the integration and management of H&S in them. Further attention should also be given to the complexity of H&S management due to the procurement system, in this case, LoPS. Further, to strategically integrate H&S into LoPS projects, it is imperative to develop a detailed framework or guidance notes for client involvement in them. The study must focus on addressing the complexity of H&S management in LoPS projects because of the level of client involvement and the level of diversity in their responsibilities. There is a



need to improve client knowledge of H&S which legislative requirements can facilitate. Considering the strategic role of clients in the design and construction processes of LoPS projects, the characteristics of the project, and the motivation for adopting them, a grassroots approach to involving clients in H&S improvement in the projects is imperative. This should be in the forefront of policymaking and one of the major objectives of the construction industry.

Drawing on the findings and discussions of the study, the following are recommended. The findings demonstrate that leading indicators in LoPS projects are poor, evidence of weak and non-adoption of H&S practices. The findings also evidence that better provisions for clients to monitor quality increase leading indicators and H&S practices (organising H&S training, H&S audits, H&S inspections, conducting H&S risk assessment, employee surveys on H&S attitude, and better compliance with H&S standards). As a result, there should be strategies/provisions for clients to monitor quality; they can be integrated into quality management procedures/processes. This will require the clients to have the relevant skills and knowledge of clients for this hence should be provided. This is for the attention of academics and policymakers. The inconclusive findings regarding the level of client involvement and diversity of their responsibilities and implications for H&S in the projects call for further studies on the strategies for integrating H&S into LoPS. Such studies should provide a detailed step-by-step guide on ensuring adequate client involvement through, among many, a collaboration with contractors to achieve improved H&S performance in the projects. The development of these strategies may be based on interviews and surveys and validated or tested on LoPS projects. Using interview or focus group interviews, further studies can also seek to provide a deeper understanding of how the characteristics of LoPS influences H&S. One major limitation of the current study is the sampling method. The snowball sampling results in a risk of sample bias as it relies heavily on referrals from participants identified. As a result, a further study can survey the LoPS projects to identify the exact population size and use non-probability sampling to address the research question of this study. Further, another limitation is that the current study focused on just one project performance indicator, H&S, whereas successful project delivery is also dependent on others, such as cost, sustainability, quality, and time. While the current study is a stepping-stone to improving the performance of LoPS projects through H&S, it is recommended that it is used as a framework for addressing the same issues through other indicators such as cost, sustainability, quality, and time.

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