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# Addressing the Housing Shortage Gap in Nigeria: An Exploration of the Dry Construction Method.

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**Abstract**

Due to Nigeria's housing shortage, which has been increasing since the late 20th century and currently stands at 20 million units with a loss rate of 780,000 units annually, Nigeria's construction industry has been under pressure to adopt a modern, timely, and premium construction strategy. This research aims to assess how the dry construction method affects mass housing delivery in developing countries, focusing on Nigeria. This study employed a qualitative research approach, conducting semi-structured interviews with sixteen experts and specialists in dry construction and housing who work for various organisations in Nigeria.The study concluded that, although dry construction is infrequently used in developing countries, it offers significant potential for emerging economies and mortgage companies to ensure prompt housing delivery. By reducing building time and improving housing accessibility, dry construction can address the current challenges of delivering affordable housing in Nigeria. To successfully implement the dry construction method in closing the housing deficit in Nigeria, the research also noted that the government must change its priority beyond direct house development towards creating a conducive framework for the industry. This study presents key stakeholders in the housing sector with the information they need to adopt and implement the dry construction method to close the housing gap, especially in Nigeria, which has received less attention.

**Keywords:** Affordable Housing, Dry Construction Method, Housing Accessibility, Mass Housing Delivery, Qualitative Research

## 1. Introduction

Housing is human habitation and may be considered an indispensable necessity for man (Olotuah & Aiyetan, 2006). It significantly contributes to man's economic, social, and psychological life. On the other hand, despite the great significance and value of housing to humanity, its accessibility in terms of cost and availability in developing countries is unreal (Anthony *et al.*, 2017), thereby making the administration of housing a major fuss in the developing countries (Olotuah & Aiyetan, 2006). Like other developing countries, housing provision in Nigeria has been declining towards the end of the 20th century and has even worsened in the 21st century (Taiwo & Adeboye, 2013). Aule & Jusan (2019) established that housing provision in Nigeria is at a 20 million unit shortage and an annual decline rate of an additional 780,000 units.

Despite efforts from both the government and the private sector to increase the housing provision in Nigeria, the annual one million housing target remains a hallucination (Aule & Jusan, 2019). This could be due to the limited resources channelled toward the housing provision. The housing provision does not reflect the huge allotment of funds to housing in the National Development Plans (Olotuah & Aiyetan, 2006). Jiboye (2011), Anthony *et al.* (2017), and Olotuah and Aiyetan (2006) opined that the tremendous increase in population and high rate of migration to urban cities contributes to the deficit of housing units in developing countries such as Nigeria. In addition, despite the surge in the population increase, the housing provision in developing countries is not comparable to that of the population increase, and this has rendered many homeless, increasing poverty levels and hardship (Kalu *et al.*, 2014).

In 1991, Nigeria's National Housing Policy estimated that housing shortages in combined remote and urban regions were 8 (eight) million homes, while the deficit in 2012 was estimated to be 17 million homes (Ezeigwe, 2015). The data that Aule *et al*. (2018), The World Bank (2018), and Aule and Jusan (2019) used as a foundation forecast that,

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as a result of Nigeria's pessimistic increase rate of housing deficit, the country's housing shortage might be more than 20 million homes by the end of 2019. To adequately address Nigeria's growing housing crisis, a government body called the Federal Housing Authority was founded in 1973 and charged with developing and carrying out a Federal Housing Development program for the nation (Aule & Jusan, 2019). But since the creation of the organisation over four decades ago, barely 37,000 homes have been constructed nationwide, a depressing rate of about 1,000 homes annually (Aule *et al*., 2018). Another initiative was made in 2012 when a housing strategy was created to provide affordable housing for low-income consumers in Nigeria; however, the gap in affordable homes remains large and continues to widen (Adegboye, 2015).

The traditional construction approach is the commonly utilised method of construction in Nigeria. It has historically been the sole option accessible to the majority of users within the construction sector (Osuizugbo, 2018). Explicitly, the traditional construction approach refers to buildings constructed of concrete block or brick masonry, which are used to create the exterior and interior of structures (Nazir *et al*., 2020). Osuizugbo (2018) asserts that the selection of the construction method has an impact on the project implementation, project duration, budget, reliability, and stability, which are the primary goals of every construction process. However, according to Nazir *et al*. (2020), despite the widespread use of this method, the literature has identified numerous issues with the conventional approach, including (I) the construction process takes longer, it impacts climate because it usually takes at least 20 weeks or longer to build with brick, and it is affected by weather (Brigden, 2013; Fewins, 2019). (II) the formation of dampness when soil or precipitation from falling ice or rain infiltrates brickwork (Brick, 2019). (III) Excessive construction expenses, as using bricks is typically regarded as being somewhat lavish due to the requirement for additional construction components.

According to Schmuecker (2011) and Bell *et al*. (2010), without considerable advancements in construction methods, conventional traditional building techniques are inadequate to meet the volume, efficiency, and durability requirements expected of the present market. Furthermore, existing performance evaluation models for buildings do not adequately account for conventional structures, which is a serious challenge considering the predominance of simulation throughout the professions that govern construction processes (STBA, 2012). To appropriately manage the shortfall in housing provision in developing countries, Andalib and Gharaati (2012) suggest the evolvement and appraisal of a new method of construction that is faster and cheaper than the conventional one. The managing director of Nigerite reported that the Nigerian construction industry has the responsibility of initiating a new method of construction that is efficient with less financial implication, especially when considering that Nigeria's capital expense was 24 per cent of the operating cost in 2014 (Adegboye, 2015). The Dry Construction Method (DCM) was proposed as a positive and cognitive way of achieving industrialised housing provision in developing countries (Andalib & Gharaati, 2012). Obinna-Esiowu (2018) reported that dry construction is a cost-effective and technology-efficient method suitable for accelerating housing provision in Nigeria.

The construction technology involves the implementation of prefabricated building parts and manufactured items, as opposed to unprocessed materials, which are known to be constructed in situ (Andalib & Gharaati, 2012). Dry construction is the non-use of mortar, dust concrete and unprocessed bricks, using recycled tiles derived from cellulose and composite materials derived from recycled tetra packs. In other words, dry construction specifically utilises prefabricated or precast materials (Ashiru & Anifowose, 2020). Furthermore, according to Adegboye (2015), the method is a more universal and speedy construction process, with the ability to save about 70% of construction time, especially when viewed in contrast with the wet (traditional) method of construction, Despite experts advocating for the Nigerian construction industry to adopt the Dry method of construction as a solution to the shortage of housing provision, the implementation of the dry construction method in housing provision is currently progressing slowly (ObinnaEsiowa, 2018). Ashiru and Anifowose (2020) assert that dry construction is the ideal viable method to close Nigeria's housing supply and demand deficit.

However, aside from the research conducted by Ashiru and Anifowose (2020) on the application of DCM in delivering low-cost housing in Nigeria, there has been limited to no research on the adoption of DCM. Although Ashiru and Anifowose (2020) conducted a study on DCM, the study was confined to case studies and a survey conducted in Kaduna, Northern Nigeria, which may not be a representative and holistic picture of the adoption of DCM in Nigeria. Furthermore, the research did not explore the approach, challenges, and success factors that could contribute to the adoption of DCM in Nigeria; instead, it focused on low-cost housing provision. Therefore, this research strives to bridge the aforementioned gaps through a series of interviews conducted with professionals practising across the country's six geopolitical zones by investigating the approach, difficulties, challenges, and success factors to the implementation and adoption of DCM in addressing housing shortages, as well as understanding the impact of DCM adoption on the work output of traditional builders and skilled artisans. The study aims to achieve these objectives by answering the following research questions:

- RQ1: What are the factors that contribute to housing provision in Nigeria?
- RQ2: How is the Dry construction method currently implemented in Nigeria?
- RQ3: How does the DCM impact traditional builders and artisans work output?
- RQ4: What is the barrier to the adoption of DCM in Nigeria?
- RQ5: What are the success factors for implementing DCM in housing construction?

## 2. Literature Review

### *2.1 Overview of Housing Shortage*

The emergence of human society and economic and political systems is intimately linked to the history of habitation (Encarta, 2007). Anthony *et al.* (2017) assert that housing has a distinctive impact on people's financial, societal, political, and emotional lives because it is the single most considerable household expenditure and a significant factor in developing thriving communities. However, in most emerging countries, the housing challenge has historically been a worry of both citizens and the government, and it is nonetheless limited to the amount but also the subpar standard of existing residential properties (Ademiluyi & Raji, 2008).

Housing is among the biggest problems that emerging nations endure (Olotuah & Aiyetan, 2006; Kalu *et al*., 2014), which has led several academics to criticise public dwelling initiatives for failing to offer target populations high-quality, cheap, and appropriate housing units (Mukhija, 2004). According to Kalu *et al*. (2014), Nigeria has had a severe scarcity of liveable residences over the last three decades due to remarkable population growth, particularly among city inhabitants, without a commensurate expansion in residential facilities. Nigeria's population has increased steadily since independence in 1960. Estimates from 1963 place the country's populace at 55 million, but subsequent estimates have it at 89 million in 1991, 140 million in 2006 (NPC, 2010), 162 million in 2011 (World Bank, 2010), and 190.89 million in 2017 (Aule & Jusan, 2019). However, only 10% of Nigerians who want homes can buy or build them themselves (Kalu *et al*., 2014). This is an abysmal percentage compared to the 72% of Americans, 78.6% of Britons, 60.4% of Chinese, 54.6% of Koreans, and 92.6% of Singaporeans who could afford to buy or build homes (Ayedun & Oluwatobi, 2011).

Olusola (2014), Olotuah and Ajenifujah (2013) also note that the issue of housing provision includes urbanised migration, the rising expenditure of building project composites, an unfriendly regulation and enforceable conditions that affect housing projects, subpar mortgage market structures, a lack of skilled labour, a lack of quality in construction methods, and an excessive dependence on cement. According to the Federal Ministry of Works and Housing, Nigeria's housing demands, including the urban and remote regions, were estimated to be around eight million homes in 2000 and between twelve and fourteen million units in 2007 (Iwuagwu & Iwuagwu, 2015). This eventually came to be projected as a 17million unit shortfall by the Nigeria Bureau of Statistics and the Ministry of Housing, Lands, and Urban Development in 2012 (Ezeigwe, 2015; Iwuagwu & Iwuagwu, 2015). However, Aule and Jusan (2019) established that the current housing need in Nigeria is 20 million, with an annual decline rate of an additional 780,000 units.

### *2.2 Current Housing Delivery Mitigating Measures*

According to Daniel *et al.* (2023) and Ubale *et al*. (2013), providing appropriate shelter for everyone involves efforts from all spheres of society, such as the corporate industry, non-governmental organisations, communities, relevant councils, associate organisations, and global community institutions. Olotuah and Aiyetan (2006) assert that the government sector has only partially participated in Nigeria's home delivery, notwithstanding the significant financial investments made in the housing industry in the National Development Plans. As a result, more is needed to fulfil predetermined benchmarks for residential development.

The Orthodox strategy, as described by Ijeoma *et al*. (2014), was one of many strategies used in the past to attempt to address Nigeria's housing issues. It is a plan in which the government embraced a variety of initiatives to tackle the country's dwelling difficulties and embraced the supply of housing for the general population as one of its social obligations (Anyanwu, 1997). According to Kalu *et al*. (2014), this initiative includes pro-socialist or command (which entails direct government involvement in the subsector during the building of rental homes at discounted prices) and a pro-market approach (encompassed raising cement and other building materials manufacturing to lower the cost of housing supplies and broadening finance facilities to support private house construction). The National Low-Cost Housing Scheme (NLCHS), introduced in 1980, was another strategy in which the government built affordable homes to sell to lower-income earners as quickly as they were finished (Ijeoma *et al*., 2014).

### *2.3 Dry Construction Bridging the Housing Gap*

According to Knauf (2011), building walls have traditionally been made mostly of concrete blocks, which are proven and true resources that have been around for five thousand years. However, today's expectations for extremely energy-saving constructions are making concrete block construction increasingly problematic, with building walls often requiring to be nearly 50 cm wide to achieve tight regulatory criteria (Knauf, 2011). Dry construction, on the other hand, refers to building technologies that employ minimal mortar or plaster to connect lightweight structural elements in terms of meeting design and building requirements (Andalib & Gharaati, 2012). Part of the method's processing is factory-based, according to Tichelmann and Pfau (2007), such as that of manufacturing panels and structural components, which are subsequently transported to the building site with special equipment, connections and miscellaneous items of installation. Owing to the reduced mass of the DCM, Macieira and Mendonça (2016) opined that energy-absorption materials could be built more affordably than they could be in a brick and concrete fitting-out design.

Halirova *et al*. (2017) and Andalib and Gharaati (2012), note that in DCM, the use of unprocessed materials is substituted by the use of construction goods, which implies that the use of gypsum and cellulose fibres combined application, and timber is more prevalent than it is with gypsum mortar, cement granules, or bricks. Likewise, cold-rolled metal and timber profiles are far more frequent

than brick load-bearing structures or hefty metal and masonry frameworks (Andalib & Gharaati, 2012). Kalsi Board, which is manufactured from cement, organic limestone, viscose, quarry dust, and water and then autoclaved at elevated heat and compression for structural strength and rigidity, is another proven material used for this procedure, mainly in Nigeria (Okeke, 2019). The research conducted by Arab *et al*. (2021) suggests that DCM has expanded dramatically in recent years due to its potential to reduce fossil fuel consumption, power consumption, and emissions from power utilisation in structures. Even if this technique is deemed inadequate for accomplishing the goal of industrialisation, it can perform as an infrastructural initiative in emerging nations (Andalib & Gharaati, 2012).

Besides the benefits, such as lightweight and faster construction, the benefits of this approach have now been examined in sustainable construction more often than before. According to Ashiru and Anifowose (2020), the technique offers government and Primary Mortgage Institutions the potential to provide low-cost dwellings quickly by reducing construction duration by 70 per cent and allowing Nigerians to purchase a home more quickly. Even though the concept of lightweight construction using dry components is indeed not uncommon, the practical implementation of the technique as a strategy for effective delivery of residential buildings is a little-known truth in many emerging regions which could be taken seriously and improved in the future (Andalib & Gharaati, 2012).

The potential of dry construction compared to traditional wet construction in terms of time was analysed in a simulation study by Kozlovska *et al*. (2023), and it was found that utilising only the dry construction method can reduce the construction period by 40% to 80% of the amount of time required for wet or traditional methods. Following World War II, the US government investigated several assembled construction techniques, with dry manufactured housing becoming a significant player that currently accounts for about 20% of the housing market in the United States and is second in terms of supply of housing units which eventually became a crucial strategy to meet the country's growing housing demand (Jaillon & Poon, 2009; Jeong *et al*., 2006). The Singaporean government also implemented similar measures in the early 1980s to promote the use of the prefabrication system (DCM) to boost housing development (Tam *et al*., 2002). DCM was extensively utilised in the construction of public housing, accounting for 84% of Singaporeans living in such housing in 2011 and 95% being the owners of such homes (Lye, 2020).

As such, professionals in the building business agreed that dry construction is the better alternative for bridging the demand gap in Nigerian housing delivery (Ashiru & Anifowose, 2020). David and Emmanuel (2018) opined that the key difficulties of housing projects in Nigeria, particularly low-cost home construction, as argued by researchers and stakeholders, are construction cost, tight schedule, and work delivery quality. Adegboye (2015) proposes that the construction sector should enable an increase in skill acquisition and constant training to ensure that innovation survives in Nigeria. Okeke (2019) and Adegboye (2013) reported that dry construction methods could help Nigerians meet their housing needs if the right conditions were in place.

## 3. Research Method

### *3.1 Approach*

Qualitative research was adopted, considering it depends heavily on the respondents to answer in-depth queries regarding how they have developed or comprehended their expertise in DCM (Jackson *et al*., 2007). Crescentini and Mainardi (2009) asserted that qualitative studies and methodologies are becoming increasingly popular in the social sciences. This trend may be attributed to the fact that qualitative studies focus on analysing people's experiences from a holistic and interpretive perspective (Jackson *et al*., 2007); because this is an exploratory study, an interpretive research approach was employed, which relied on interviewing and analysing the responses of the selected participants to find or generate a rich and deep understanding of DCM.

For the purpose of this study, the DCM's application requires that respondents be professionals in the fields of housing development, construction, and building environment. The approach utilised is in accordance with the Center for Social Research, a non-probability technique that encompasses purposive sampling amongst various sampling techniques (Torchim, 2022). Oliver (2006) described non-probability sampling as a method whereby the scholar chooses which people to engage in the group depending on a range of factors, such as the person's competence and desire to engage in the study and their technical expertise. As a result, the interviewees were chosen based on their competence in dry construction technology, housing construction, and project management. Another factor examined in selecting candidates is the location of projects completed to guarantee a representative sample from each of the country's six geopolitical zones.

### *3.2 Data Instrument*

The versatility and possibility for open and in-depth conversation with the respondents made the semi-structured interviews suitable (Bailey, 2007), and, as a result, they were adopted for this research. Semi-structured interviews were conducted with identified housing experts, project managers, designers, construction company experts, contractors, and other professional workers who were chosen through a non-probability sampling. Moreover, Gelling's (2016) recommendation that all studies involving human respondents, whether actively or passively, necessitate those conducting the study to consider the ethical significance of their study. Therefore, ethical approval for this research was obtained from the University of Wolverhampton, and a consent form was sent to the chosen participant before collecting data. This study was successful due to the willingness of the participants to participate in the interview.

### *3.3 Conducting Interviews*

To enhance the research's purpose and scope, 25 participants were approached from across the country's six geopolitical zones, with expertise in dry construction technology, housing ministries, and project management sectors. However, 16 of them participated in the interview. The choice of the participants, who gave their agreement voluntarily, was essential for the reliability and applicability of the study. The interviews for this study were supposed to take 30 minutes apiece, but the shortest session spanned 40 minutes, while the longest one was 60 minutes because the interviewees desired to delve further. This further demonstrates that dry construction is a pressing topic within the construction field and is of interest to the important players.

### *3.4 Data Analysis*

The thematic analysis technique, which Aronson (1994) characterised as appropriate and adaptable for gathering and expressing thoughts and emergent themes during an interview, was used to examine the participant's responses. Thematic analysis is an absolutist or realist approach that documents participant perspectives, interpretations, and facts, and sometimes it is a constructionist approach that looks at how occurrences, facts, understandings, experiences, and the like are influenced by a variety of societal perspectives (Braun & Clarke, 2006). Consequently, the conversations during the interviews with the participants were recorded, translated, and subjected to recurrent analysis. With the respondents' permission, the interview was conducted online, recorded using Microsoft Teams, and transcribed using Microsoft Office 365. Thanks to the recording, no qualitative information was missed throughout the interview session, which also allows for a precise translation.

Braun and Clarke (2006) identified six processes for analysing qualitative data: (1) Getting acquainted with collected data, (2) Creating preliminary codes, (3) Searching for recurring themes, (4) Examining themes again, (5) Classifying and Identifying themes, and (6) Generating the report. This research applied these processes.

1. Getting acquainted with collected data: The authors translated the 16 interviews verbatim and double-read them. The interviewer's details, including profession and years of experience, were noted and highlighted in a table. Statements that supported the study's questions were indicated with a distinct font colour.
2. Creating preliminary codes: During this stage, significant assertions were indicated with another font colour and were accompanied by explanations of their implications. For example: "legal framework compliance", "engagement of unqualified professionals", **"availability of materials", "**unsuitable working environment", "immigration policy", "cost acceptance", "training", "redundancy", "human nature", "inflation", "insecurity", and "impoverishment". All the transcribed interviews underwent this process. After the procedure was completed, more than 50 significant assertions were coded.
3. Search for recurring themes: A comprehensive theme was created by grouping related codes found in phase 2 together, such as "challenges affecting housing delivery", "approach of dry construction method", "**success factors for implementing DCM", "l**ack of awareness of DCM", and "impact of DCM on traditional professional/Craftsmen", among others.
4. Examining themes again: At this stage, the authors reviewed the themes and sub-themes a second time and had them examined by other specialists in the field of housing construction (Hayfield & Huxley, 2015). The inconsistencies found throughout the coding process were handled by careful consideration to make sure the outcomes aligned with the information gathered and the theoretical frameworks that addressed the study questions. The themes and sub-themes were then illustrated in a map.
5. Classifying and identifying themes*:* Every primary topic was given an overview and introduction in the discussion of the outcome, and the related sub-themes were then addressed.
6. Generating the report: The main themes that evolved from the investigation are included in the results and discussion section.

The research method featured four primary themes: challenges affecting housing delivery, the dry construction method, traditional professionals/artisans, and the adoption of dry construction. These themes served as preconceived codes of the study and gave it direction. More specifically, the themes were chosen to ensure that participants had technical understanding in at least one of them since dry construction is a developing sector of the construction industry, and the connections between those sectors still need to be well established. However, the most important concepts and keywords were coded, examined, rearranged, and compiled under pertinent themes. Data excerpts such as "legal framework compliance," "engagement of unqualified professionals," "over-reliance on traditional construction method," "inflation," "insecurity," and "impoverishment" were, for example, grouped under the theme "challenges affecting housing delivery". The categorised excerpts were extensively examined, and extensive analyses of the many patterns, trends, or linkages were developed.

## 4. Result and Discussion

Table 1 shows the research participants. They have different levels of work experience, with a minimum of five years and a maximum of 20 years, to ensure an in-depth understanding of the subject topic and guarantee that their awareness and information are current and not obsolete.

### *4.1 Challenges Affecting Housing Delivery*

The study identifdied numerous factors contributing to the difficulties in housing provision in Nigeria based on the theme drawn from the transcribed records. The codes generated from the data collected include: legal framework compliance, engagement of unqualified professionals, over-reliance on the traditional construction method, inflation, insecurity, and impoverishment.

**Table 1:** Details of the interview participants

| Code No | Role | Years of Experience Construction | Years of Experience in DCM | Organisational size | Location (Nigeria) |
|---|---|---|---|---|---|
| P1 | Construction manager | 15 | 8 | Medium | Lagos, Cross River |
| P2 | Project manager | 15 | 8 | Medium | Port Harcourt, Kaduna |
| P3 | Builder/Contractor | 15 | 8 | Small | Ogun, Lagos, Nigeria |
| P4 | Architect | 15 | 15 | Large | Abuja, Lagos, Benue |
| P5 | Civil engineer | 13 | 9 | Medium | Abuja, Kwara |
| P6 | Mechanical engineer | 13 | 9 | Small | Lagos, Anambra |
| P7 | Project manager | 13 | 10 | Large | Niger, Imo |
| P8 | Technical Coordinator | 12 | 8 | Medium | Lagos, Nigeria |
| P9 | Planner | 12 | 8 | Medium | Lagos, Nigeria |
| P10 | Cost manager | 10 | 7 | Large | Ogun, Abuja, Nigeria |
| P11 | Project Engineer | 10 | 5 | Large | Kano, Delta |
| P12 | Project manager | 10 | 6 | Medium | Lagos, Osun |
| P13 | Builder | 7 | 4 | Medium | Ebonyi, Delta |
| P14 | Technical Supervisor | 6 | 6 | Medium | Lagos, Oyo |
| P15 | Civil Engineer | 6 | 6 | Small | Kaduna, Kano |
| P16 | Mechanical Engineer | 5 | 5 | Medium | Lagos, Port Harcourt |

*4.1.1 Legal framework compliance*

Enabling laws in Nigeria is one of the causes of the housing shortage, according to Participant P1, P2, P12, P14, and P17. Although there is a legal structure, it needs to be upheld as it should, which has allowed unqualified individuals to participate in building operations. Moreover, according to Participant P2, the government is not genuinely enforcing the enabling legislation as issued. Participant P1 noted that:

*"Many people migrate to urban areas because there is no infrastructure to support them in rural areas. If there is infrastructure in rural areas, many people will not rush to urban areas where land costs are exorbitant. Then, many substandard materials are on the market, contravene building regulations"* (P1).

This opinion supports Diogo's (2004) claim that despite massive expenditures on housing during various stages of the National Development Plan, the government has achieved few or no corresponding outcomes because of the government's paucity of genuineness and politicisation of the intervention. It also reflects the assertion made by Ojoko *et al*. (2016) that the Nigerian construction industry has struggled to develop in critical areas due to a lack of law and regulatory policy compliance, leaving the number and value of the nation's housing supply to decline.

*4.1.2 Engagement of Unqualified Professionals*

According to P2, P3, P5, P10, P14, P15 and P16, using unqualified employees in construction delivery could also be attributed to the recent trend

of building collapse in Nigeria. Interviewee P2 commented as follows:

*"Because the government is not enforcing the enabling laws as issued, the involvement of quacks in the building is causing much havoc. You can have bad artistry, cost overruns, project delays, and poor quality"* (P2).

Housing and even large engineering projects are impacted, resulting in poor building delivery quality. Therefore, it is necessary to streamline unprofessional contractors from the construction business by tidying up Nigeria's regulatory framework for concession delivery. This evidence backs up Olusola's (2014) assertion that Nigeria's construction industry is infested with shady, untrained contractors, whose involvement has caused numerous building collapses in the past and currently.

*4.1.3 Over-reliance on the traditional construction method*

According to Participants P3, P5, P8, P13, and P14, another factor influencing house delivery is an overreliance on traditional building methods. These methods include utilising a conventional methodology of placing blocks, waiting for them to dry, plastering them, and painting them. This lengthens the construction phase and shortens the time it takes to complete a building, as seen in the views expressed by P13:

*"We are yet to get ourselves acquainted with modern technology, which is fast and quick, as we have it in first world countries, which is making them advance and then be able to deliver housing that will meet the demands of their citizens"* (P13)

Again, this supports the argument made by Kalu *et al*. (2014) that Nigeria must embrace a different strategy to address its housing crisis because traditional construction methods have been employed for years but have yet to be successful due to various socioeconomic factors. Furthermore, it supports the contention made by Andalib and Gharaati (2012) that the growing demand for affordable housing in developing nations necessitates using quick and premium construction techniques that will shorten building duration and weight and produce more structurally sound buildings.

*4.1.4 Inflation*

Inflation, according to P1, P2, P6, P7, P11, P13 and P15, is another issue that Nigeria is facing that is hurting the delivery of housing. Due to the impact of inflation on construction materials, most people cannot afford quality materials, forcing them to settle for inferior materials of lower quality and grade. Participant P2 cited the following example:

*"You must have heard in the news, I think, sometime last year about a building story collapse in Ikoyi, an eyebrow area in Nigeria. One of the primary reasons the building collapsed was that the owner didn't strictly follow the structural engineer's advice regarding material quality, and the structural engineer had to withdraw his services from the project"* (P2)

While Participant P11 stated that:
"*We started a project and imported some materials in January 2022 when forex was obtained at a specific rate, but there was a spontaneous increase of roughly 40% in June 2022, which eventually affected the project massively"* (P11).

Musarat *et al*. (2021) agreed that inflation, frequently ignored in most construction projects' finance and planning, leads to construction expenditure overruns because building material and labour costs, and equipment hiring rates fluctuate yearly. Oghenekevwe *et al*. (2014) added that Nigeria's inflation patterns have not been consistent and unevenly impact construction material costs. Furthermore, Kalu *et al*. (2014) highlighted that almost all building materials, except sand, masonry, and timber, are imported. All other components are unavailable domestically and, therefore, more expensive and prone to inflation, which validates the finding.

*4.1.5 Insecurity*

People have been internally displaced around the country due to security concerns. They include those who were displaced by terrorists or bandits. People who had previously built homes were again forced into homelessness due to insecurity. Participant P12 viewed that:
*"Many people believe that if we inculcate this Dry housing construction here in Nigeria, they only believe it is suitable for internal partitions because Nigeria is not that secure. If we adopt this system for external walls, there may be burglars who will bud through these walls and then start to pilfer people's goods and items" (P12).*

This finding is consistent with the study conducted by Kamta *et al*. (2020), in which all 204 internally displaced people who were interviewed cited insecurity as the primary cause of their displacement from their locality of residence. Jelilov *et al*. (2018) added that Nigeria's insecurity level has been rising over time, posing a severe threat to individuals and property, impeding economic activity, and discouraging both domestic and international investors.

*4.1.6 Impoverishment and lack of access to mortgage facilities*

Mortgages are one of the private interventions available to mitigate the housing crisis; however,

each mortgage requires collateral or a stable job. As opined by Participants P1, P2, P3, P5, P8, P11 and P14, many people live below the poverty threshold, and the high unemployment rate presents another significant obstacle to home availability. The following views are expressed by Participants P1 and P4:

*"What we call the Housing Fund and the National Housing Fund are government intervention programs that ensure housing funds are accessible. By and large, there's no concrete measure from the government to solve this housing problem in Nigeria because the processing is one of the problems, except you know the person in charge which made it difficult for people to access these facilities"* (P1).

*"There is poverty in Nigeria now; for you to talk about building, you must first talk about employment. Many people are living below the poverty line, so this has caused people to be homeless. You know, people look for food first, what to put in their mouth first"* (P4).

This supports the findings of previous research by Anthony *et al.* (2017) that, given the nation's current economic state, more than 65% of Nigeria's populace lives in poverty, making less than $1 on average daily. They added that, in contrast to several industrialised nations that have already embraced diverse strategies, such as using government-launched affordable housing initiatives without a designated income range, when finished, the houses are allocated to a select number of wealthy and influential people (Anthony, 2017).

### *4.2 Practices of the Dry Construction Method (DCM)*

Some of the codes generated from the interview responses include the approach to DCM, suitable materials for DCM, and deciding factors in implementing DCM.

#### *4.2.1 Approach of the Dry Construction Method*

Participants P1, P2, P3, P4, P7, P8, P12 and P15 stated that dry construction involves avoiding the use of cement, wet concrete, and raw masonry for construction. Participants P1, P2, P8 and P9 described the traditional method, known as the "wet method," uses water for most buildings' structural elements, including reinforced concrete columns, beams, walls, and slabs. Participants P11 and P16 viewed that:

*"Many people believe that the dry building approach is only used when the entire project is constructed out of dry materials, not because dry construction is sometimes combined with the wet construction method, which we call hybrid construction* (P11)".

*"Some experts consult us for a wall that is slimmer and not more than 100mm as against the traditional 225 to 230mm thick walls. You know the weight of the system we practice (DCM) is approximately 10 times lighter than the wet (method), wet is about 2:50 kg per square meter in width, while dry is about 25 kg."* (P16)

The above findings are consistent with Ademiluyi and Raji's (2008), and Andalib and Gharaati's (2012) statement that dry components like timber and fibreboard are utilised in DCM as a replacement for cement or mortar, brickwork, or stones in the traditional approach. They are further backed by the report on the Kalsi Board, which is produced in various thicknesses and dimensions ranging from 6mm to 20mm and produced under stringent operational reliability and safety control (Adegboye, 2015). Furthermore, the findings are validated with the assertion of Adegboye (2015) that, when compared to the wet technique of building, which uses mortar and brickwork, the approach is more widely applicable and expedient, with the potential to cut project duration by around 70%.

#### *4.2.2 Suitable Dry Construction Material*

##### *4.2.2.1 DCM Materials and Methods*

Participant P4 noted that the dry construction method is most often prefabricated. In other words, the building components are already manufactured and must be put together on-site from the superstructure to the roofing level. Although various forms and materials exist, the integrated building system is the most prevalent. According to Participants P1, P2, P4, P9, P12, P14 and P15, timber, steel galvanised, aluminium frames, fibres, member plasterboard, and other materials are some of the elements utilised in DCM,. The following are the views attributed to Participant P9 and P4:

*"You know, it depends on the environment. In Nigeria, we don't season wood as such. So, if you use wood in Nigeria, I can assure you that the building will have issues. That is why we use aluminium, and aluminium is lighter, more durable, and is more fire resistant"* (P9).

*"Up onto the roofing level, there are different materials and different forms. The system we practice is the integrated building system. That comprises the framing system, which mostly consists of galvanised steel frames and the cladding of the framing"* (P4).

This view was corroborated by Adegboye's (2015) finding that DCM is also a construction method in which the main construction materials are made in a workshop and installed on the construction site without the use of cement. Furthermore, AMR (2020) categorised DCM into five sections, notably form, structure, material, and implementation.

*4.2.2.2 Factors influencing the choice of a suitable Material for DCM*

P1, P2, P4, P6, P7, P10, and P13 emphasised that factors including availability, environmental conditions, cost, skill levels, and other considerations could help determine which material's benefit is best. However, P2 asserts that despite being readily available, timber has not been widely used in Nigeria due to the poor quality of timber seasoning and preservation in the country. As a result, steel, which is stronger, more durable, and fire-resistant, has become more popular.

### *4.3 Impact of DCM on the traditional professional/Craftsmen*

Some of the codes developed regarding the replies were categorised into success factors, barriers, and mitigating measures for the implementation of DCM. The willingness to change, improved client satisfaction, collaboration, training, and hybrid construction emerged as success factors. While barriers include human nature and redundancy.

*4.3.1 Success Factors*

*4.3.1.1 Willingness to Change*

Participants P7, P11, P13, and P15 stressed that even though the professionals cannot immediately understand the full implications, professionals willing to accept the change and not dogmatic about the traditional approach may find that the impact is minimal or nonexistent. According to Participant P7:

*"Those willing to try something new will not see it as a challenge. As time passed, you saw carpenters using hand saws or hammers to work, but along the line, when machines came, many of them didn't use hand saws again but circular sawing machine*s."

*4.3.1.2 Improved Client Satisfaction*

Participant P3 opined that the new technology would impact neither professionals nor artisans. Instead, they would be receptive of its adoption because it would complement the traditional approach and lead to the completion of projects to the end users' satisfaction. Additionally, it will enhance technology in the building sector, as most experts anticipate.

*4.3.2 Barriers*

*4.3.2.1 Human nature*

Participants P1, P7, P9, P11, P12 and P14 viewed "human nature," which is unprepared for competition, as the first impediment to the introduction of DCM to the country. The country is suffering greatly as a result of its inability to experiment and attempt new initiatives because new and varied technologies must be explored to increase capacity. Participants P12 and P7 expressed the following views:

*"You know everybody is a human being, and as human beings, a lot of times as professionals, you are not happy when you see a set of people that are marketing a more sophisticated or more recent method that will want to threaten your existing knowledge and threaten your relevance in the industry"* (P12).

*"Some of our core professionals are resistant, and then they put up a fight when they feel you're calling yourself younger and innovative and you want to introduce a system that we throw them out of relevance"* (P7).

*4.3.2.2 Redundancy*

According to Participant P2, if DCM is employed on a large scale, it will undoubtedly have an impact on traditional professionals, notably craftspeople. The implication is that their knowledge won't be valuable in that capacity any longer, necessitating them to hone their abilities somewhere else. In addition, P1, P5, and P8 said that change is constant and that the adoption of DCM will likely put some people out of business while hiring new ones. For instance, when DCM is fully implemented, artisans in the bricklaying business will likely fizzle out.

*4.3.3 Mitigating measures*

*4.3.3.1 The public and private sectors collaborate to develop innovative policies.*

Participant P5 argued that the potential adverse effects of DCM implementation on traditional artisans and professionals should not be used as a rationale to dissuade or preclude the practice. In Participant P5's view, the overall advantages that DCM will impart to the industry surpass the disadvantages. Therefore, P5 advised that the construction industry should collaborate with the government to develop policies that can be implemented to lessen the negative impacts of DCM use.

*4.3.3.2 Training*

Participants P1, P2, P4, P5, P6, P7, P8, and P9 identified training, orientations, symposiums and workshop programs as the best ways to mitigate the effects that the adoption of DCM could have on conventional professionals and artisans. These will enable specialists and craftspeople to adapt to the new approach and maintain their relevance in the industry. Participants P5 and P4 made the following recommendations:

*"What I think should be put forward more now is the training, orientations, re-orientations, and even workshop programs to help these people align with, if not, they'll be left behind"* (P5).

*"We make each major site a learning site so that with every major project we do, we finish the project with a new set of installers. You know that can*

*handle tools, materials, the board, and the frames"* (P4).

*4.3.3.3 Hybrid Construction-Success Factor*

Participant P4 highlighted that the concept behind dry building is not to remove wet construction altogether or other construction methods already in use but rather to use them as a complement for a better and more sustainable construction sector, especially in meeting housing demand. P5 stated that one of the best ways to minimise the impact that the adoption of DCM can have on conventional professionals and artisans is to promote and practice hybrid building, a mix of DCM and other construction methods. This was evident in the following remarks made by Participant P8 and P5:

*"I want to draw your attention to this: We can't completely eliminate wet construction because, first, most foundations are wet. So dry construction is not here to replace wet construction, but it is here to make the work easier, and there is this kind of finish that you get with dry construction that you cannot get with wet construction"* (P8).

*"We market our system as complementary, so we tell them to let us do hybrid, as you might have a project where you need a dry system. You want it to be completed in a short period, and you don't have all the luxury of time to wait for 21 days for your concrete slab to cure"* (P4).

These findings are consistent with Andalib and Gharaati's (2012) recommendation that to maximise the effectiveness of construction practices in emerging nations; it is advantageous to combine DCM's versatility with other varieties of construction, including, masonry, metal, cement, or wooden structure building projects. By utilising the fundamental DCM materials, the structure would experience reduced dead weight than traditional construction techniques alone, ultimately translating into thinner building structures and decreased project costs (Andalib & Gharaati, 2012).

### *4.4 Barriers to the Implementation of DCM*

Some of the themes drawn from the responses include Lack of awareness, Cost acceptance, Immigration Policy, and Unsuitable working environment.

*4.4.1 Lack of awareness of DCM*

Participants P1, P2, P3, P5, P8, P9, P11, P14 and P15, agreed that there still needs to be a higher level of awareness about DCM. It is a new form of building construction that was introduced to the country about 30 years ago. Some of the opinions of the interviewees are indicated as follows:

*"Although it will take some time for the method to gain widespread acceptance, people are gradually accepting it, but only 10% to 15% of the country's population is aware of it or uses it now"* (P15).

*"The level of acceptance has increased from where it was five to ten years ago because it is now gradually making its way into the construction industry through yearly exhibitions and professional symposiums"* (P14).

*"Dry construction is not wholly new to the country because it has been employed for various building components over the years, such as the roof, ceiling, doors, and windows"* (P7).

This finding is consistent with the observation of Obinna-Esiowa (2018) that introducing the dry construction method in residential housing delivery is moving slowly amid calls from specialists for Nigeria's construction sector to embrace the approach to address the housing deficit. Adegboye (2015) shared similar views, noting that the dry construction method has a knowledge deficit and that the building sector needs to ensure that effective learning is constantly increasing.

*4.4.2 Cost Acceptance*

Participants P1, P2, P3, P4, P5, P7, P8, P10, P13 and P15, viewed that depending on the size of the deployment, DCM is substantially more expensive than traditional methods. The participants expressed the following views based on their experience:

*"There are still some challenges in the area of costs because you know a lot about Nigeria. Now, the bulk of the materials are imported. And then, depending on the scale of deployment, if it is a small deployment, it still sometimes comes to about 10 to 15% and is more expensive than the traditional way"* (P13).

*"An example was a client we lost because he wanted to finish a 3-bedroom flat with a budget of N8 million using the traditional method but was presented with a budget of N11 million with the dry method"* (P4).

*"One thing that we have observed over the years is that the combination of wet and dry methods makes clients feel more at ease because it has proved to be cheaper than using only the dry method"* (P8).

These views are corroborated by research done by Ashiru and Anifowose (2020), which identified cost as one of the main obstacles to the advancement of low-cost construction in Nigeria. It was also affirmed that DCM is more costly than traditional methods and has increased the cost of housing projects by requiring more investment in infrastructure, logistics, and technical services (Andalib & Gharaati, 2012).

*4.4.3 Immigration policy*

Another challenge noted by Participants P3, P4, P9 and P10 is the frustrating immigration policy. According to P3, there are numerous impediments to the immigration process, starting at the clearance point for imported goods at the seaport. These delays result in delivery delays that consequently raise the overall cost of these materials and, ultimately, the cost of construction. Participant P4 observed that:

*"Multiple taxes, both known to the government and unknown to it, have hampered the seamless importation of goods, which is another issue related to the immigration challenge we face when importing materials"* (P4).

*4.4.4 Unsuitable working environment*

Nigeria's unfavourable working conditions, such as the epileptic power supply and exploitation by so-called landowners, were identified as a significant challenge for even conventional construction, let alone DCM, which primarily relies on electricity and frequently requires the use of generators. According to Participant P2:

*"An example is the 52-housing duplexes project we recently completed. We operated mostly on generators, barely having electricity on the site for 2 hours daily out of 8 working hours. You know, this raises the project's overhead costs and invariably impacts the entire cost of delivering the project" (P2).*

***4.5 Success Factors for Implementing DCM***

There was concensus by participants regarding the success factors for implanting DCM. They agreed that DCM is an overdue technology that developing nations like Nigeria should have implemented to address the housing shortage. However, several factors and measures must be implemented to guarantee the effective and practical adoption of DCM. The success factors for adopting or applying DCM that emerged in the study are weight, time, durability, flexibility, awareness, training, availability of material, and mortgage facilities.

*4.5.1 Weight*

Participants P4, P7, P12, and P15, stated that DCM is rapidly gaining acceptability, particularly among professionals, due to client education and understanding of the method's effectiveness, characteristics, and advantages.

*"We carried out some laboratory experiments, and we found that DCM weighs roughly 25 kg per square meter, whereas the traditional (wet) method weighs about 250 kg per square meter. This means that the dry method is typically 10 times lighter than the wet" (P12).*

This finding is supported by Andalib and Gharaati (2012) who deterrmined that DCM produces more financially sustainable construction in combination with shortening project duration and lightening overall structural weight. In addition, dry construction methods are found to provide a crucial approach to solving the construction issues of the present and the future by effectively meeting their demands with an imperceptible lightness (ITF, 2011).

*4.5.2 Time*

Participants P1, P7, P8, and P11 viewed that professionals had convinced clients of additional time-saving benefits, such as its quick construction method, to justify the cost disparity between DCM and wet construction. Compared to the wet method, which requires a specific amount of time to account for the concrete's curing, the DCM requires less time to complete because various construction stages can be completed concurrently and without any delays. Participants P11 and P4 noted as follows:

*"When we talk about the speed of construction, a dry system is one of the fastest methods of construction because it involves assembling prefabricated products. From experience, I can tell you that you can save about 60% to 70% of construction time when using the dry system compared to the wet method"* (P11).

*"You know, dry construction has been adopted to solve lots of challenges, like when you want to deploy something lightweight and fast, like within a month or even weeks, sometimes probably because you do not have all the luxury of time of waiting for 21 days for your concrete slab to cure"* (P4).

This aligns to the findings of earlier studies by Adegboye (2015) that the DCM strategy is more widely applicable and quick, with the ability to reduce project duration by about 70%, when compared to the wet technique of building, which uses mortar and brickwork. Additionally, according to the position taken by Andalib and Gharaati (2012), careful specification and dry connection arrangement play important roles in the DCM construction approach, reducing project duration and wastage due to the trial-and-error approach of untrained personnel.

*4.5.3 Flexibility*

The flexibility of DCM, was noted by Participants P1, P4, P7, P9, P12, P14, and 16, as another attribute it possesses and promoted by experts. Some specialists desire flexible buildings so that if adjustments are needed, they may loosen a portion of a wall and move it to a more suitable location by structural recommendations. Participant P4 noted as follows:

*"There are a couple of professionals too that used to raise the issue of flexibility, but you know we proved to them that when they operate with dry construction, if they need to make changes, it's just a matter of loosening a part and introducing their new changes"* (P9).

These findings are supported by Richard's (2006) conclusion that the key techniques for accomplishing high, affordable, and sustainable infrastructure that DCM offers are those that generate manufactured goods and composites in an industrial setting, establish flexible structures, and give components the capacity to be disassembled and reassembled for potential prospective modifications. ITF (2011) also stated that, unlike any other building approach, DCM offers complete technical capability, flexibility, and architectural autonomy while minimising required inputs.

*4.5.4 Awareness*

*4.5.4.1 Education-based awareness*

The participants viewed that to provide students with a firm basis in the technologies used in the industry, DCM awareness needs to be brought back to the classroom. The following is a recommendation made by Participant P7:

*"The first thing is that the built environment should look into the syllabus used in schools to produce graduates and try to align that syllabus with what is happening in the industry. Believe me, someone can do a five-year course in the university, and the only time the person will hear of dry construction may not even be during a three-hour lecture" (P7).*

*4.5.4.2 Professional-based awareness*

The early adoption of the technology emerged from the study as another important factor. To aid the acceptance of the technology by the professionals, who will then educate the end users and clients, a lot of background work, sensitisation, symposiums, exhibitions, and other techniques of awareness need to be done. Overcoming the experts' initial resistance will be a step ahead because experts can readily raise awareness among both their corporate and individual clients, which will help the method gradually gain popularity in the industry and society.

*4.5.5 Availability of Materials*

The participants P1, P2, P4, P5, P6, P10, P13 and P16 viewed material accessibility as essential for the adoption of DCM on projects. In some instances, according to P4, a client paid a more significant portion of a bill that has been submitted to them, but materials run out and need to be replenished. Market value had changed due to import-related inflation, frequently leading to a significant cost differential that could not be passed on to the customer. The following suggestions were made by some of the respondents to address the challenge of material availability:

*"Our economic policy is not encouraging, and the fact that we are bringing all the materials from external countries increases the cost delivery of housing projects, which also scares people away from the method"* (P10).

*"The government should target investors to start building factories where they produce steel, Rockwool, and board to reduce the cost of those materials, it will go ahead to solve so many issues and probably allow many professionals to accept the technology"* (P5).

This finding is congruent with Kulkarni *et al*. (2017) that materials account for more than 70% of project costs and, if not addressed appropriately, could impact total project costs and delivery timeline. Moreover, according to Ademiluyi and Raji (2008), several housing fairs and exhibitions at trade shows throughout the nation aimed to use locally sourced materials and suitable technologies in the provision of housing due to the belief that the adoption of a variety of innovations, from moderate to indigenous, will significantly affect the nation's strategy for delivering housing.

*4.5.6 Training*

Participants P2, P4, and P9 noted that a significant obstacle to the deployment of DCM in the past was the lack of skilled manpower. Due to DCM's recent introduction as a technology, unlike the traditional approach, craftspeople are not widely obtainable. P2 shared a painful experience of repeating most of the work on the first DCM project he worked on because most artisans were not well-versed in its use. The following recommendations were made:

*"The government can have a training institute instead of the few private ones that we have, the private ones are where there are very few, they can have a lot in multiple zones to train people about it, because either we like it, or not dry construction aids you to know faster delivery of projects"* (P2).

*"So majorly what we need is training and workshop programs, train more artisans, more hands, more seminars, and expose people to the rudiments of dry construction, even if it is just the basics"* (P9).

This supports the findings of Ashiru and Anifowose (2020), who concluded that the DCM has a skill deficit and suggested that the construction sector should significantly increase skill acquisition with constant coaching to ensure innovation is maintained in Nigeria. Andalib and Gharaati (2012) added that these systems might increase the probability of project success through off-site production technologies if the applicable skilled workman is provided with the proper learning context.

*4.5.7 Mortgage facilities*

Participant P3, P4, P5, P9, P13, and P14 noted that each person's financial circumstances should be considered because not all people can afford to buy a house outright, which is the approach frequently used in Nigeria. According to P5, the country's mortgage system needs to be revived, and this would require effort from both the government and private sector to develop a system that allows a citizen to own a home without paying the price of the home upfront. Participant P3 suggested as follows:

*"The government can do something there, they should do a pre-qualification exercise for the average person, If you are qualified, then people have access to a mortgage that can help them to Have their buildings"* (P3).

This can be contrasted with the study done by Ademiluyi and Raji (2008) and Anthony *et al*. (2017), which found that the bulk of public and corporate builders raise cash for the financing of construction developments independently; some go so far as to raise loan repayments. Ademiluyi and Raji (2008) recommended that mortgage loans should not only be used to build new homes but also allow individuals to rent housing and start improving established homes.

## 5. Conclusion

This study aimed to identify the factors contributing to the housing shortage in Nigeria and explore the current level of application of the Dry construction method in mass housing delivery. The study found that the main factor influencing the limited housing availability in Nigeria is the need for adherence to the regulatory framework, which has allowed unskilled workers to infiltrate the construction sector. Furthermore, the results showed that industrialised housing construction in Nigeria seems unattainable because of the country's excessive reliance on antiquated methods, its unstable economy and increased rates of insecurity, and its lack of access to mortgage facilities, all of which are critical issues that need to be addressed for DCM to be fully implemented and for construction to become more industrialised.

This study revealed that DCM is not entirely new to the country because it has been used for various building components, including the roof, ceiling, doors, and windows. In terms of DCM awareness, the data collected showed that it has grown more widely known and accepted than it was five to ten years ago (2014-2019) since it is now progressively entering the construction sector through yearly exhibitions and professional symposiums, along with a general comprehension of the efficiency, capabilities, and benefits of the method. The study also found that, despite being widely available, timber has not been extensively utilised in Nigeria's construction industry because of the country's subpar seasoning and preservation practices. Steel has gained popularity due to its strength, durability, and fire resistance. Despite the established evidence that DCM can solve housing challenges, the study's findings revealed that DCM could be significantly more expensive than conventional methods depending on the deployment size, with a predicted increase in costs of between 10% and 15% compared to wet methods. However, the results demonstrate that the benefits of DCM, such as its speedy construction method, have been successfully employed to justify the cost discrepancy, with an estimate of a reduction in construction time by 60 to 70%, particularly when compared to wet construction methods (WCM). The research also revealed that DCM is as durable as WCM because it would take the same amount of force needed for WCM if not more, to destroy a drywall when using a sledgehammer.

The study identified several obstacles to the adoption of DCM, such as inflation, difficulty persuading clients because of the high cost associated with it, difficulty obtaining the necessary materials because of a troublesome immigration policy, and the overall unsuitable working environment of the nation. However, based on the empirical findings, the research recommends certain factors to ensure the success of DCM adoption. These include the Ministry of Works and Housing and the Nigerian Federal Housing Authority making sure that legal frameworks are followed, investing in ongoing training, ensuring that the necessary materials are available by encouraging local production, and ensuring that housing mortgages are affordable for the average citizen. Furthermore, the evidence presented in this study contributes to the knowledge of housing delivery practices using innovative and modern approaches, in Nigeria, which has housing delivery challenges. Firstly, identifying the current approach used in applying DCM in housing delivery alongside its success factors would support future adoptions of the DCM in housing delivery, which could help close the housing gap. Secondly, identifying its success factors and the likely barriers would guide major stakeholders in the housing sector to make well-informed decisions and develop strategies for its implementation in housing delivery. Furthermore, the evidence presented in this paper could be used by government agencies to formulate policies that would encourage the use of DCM for effective housing delivery.

This study is based on qualitative interviews and is limited to Nigeria. As such, the results cannot be generalised and should be used with caution. However, the evidence presented could be used as a lens to direct future studies that aim to explore how to use innovative methods to address housing shortages elsewhere, especially in developing countries.

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