



## VARIATION IN BUILDING CONSTRUCTION INDUSTRY: THE NIGERIAN PERSPECTIVE

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### ABSTRACT

*A variation (sometimes referred to as a variation order or change order) is a change to the scope of operation in a building contract in the form of an extension, substitution or omission from the original scope of works. The construction industry in the world and particularly in Nigeria, where construction projects suffer from variation orders, has been supported for a long time by changing orders. Such targets are usually not achieved in building projects, which hinder customer satisfaction according to Fatoye (2012). The aim of this research is to ascertain variation orders and it causes in building construction industry from Nigerian perspective, to achieve the aim of this research many objectives exists, these objectives can be summarized as (1) to investigate the factors causing variation order from the literature, (2) to extract real causes of variation order in building industry in Nigeria through literature content analysis of Nigerian origin. This study is based on a content analysis carried out on 8 major studies of Nigerian background in the subject matter. The justification for the 8 is because they represent core expectation of this study which borders on Nigerian perspective. The contents were analyzed using a benchmark of 4 to arrive at decision. This decision rule is based on the obvious that the mean of 8 is 4 which is  $8/2 = 4$ . Since we have 8 works, any factor or item that is captured by four (4) of the 8 major studies will adjudged significant, any factor below four is not significant. The study observed that out of the 12 identified owner related causes or factors of variation order from the 8 major studies of Nigerian perspective, five (5) are the core owner related causes of variation order in Nigerian building industry. They are namely in their order of significance: change of plans or scope by owner, change of schedule by owner, owner's financial problems, inadequate project objectives and replacement of materials or resources respectively.*

## **1.0 BACKGROUND TO THE STUDY**

The nature of the construction process means that variations are inevitable (Sunday, 2010). It is always important to remember the fact that there are variations in projects. It is always important to remember the fact that projects vary. A variation (sometimes referred to as a variation order or change order) is a change to the scope of operation in a building contract in the form of an extension, substitution or omission from the original scope of works. Nearly all construction projects vary from design, scope and definition to original. Whether small or large, construction projects will have to depart from the design team's original tender design, specifications, and drawings. This is likely due to technical innovation, regulatory amendments or regulation, changes in climate, geographical phenomena, non-availability of required materials, or merely due to the continued progress of the design following award of the contract. Variations can be very significant in large civil engineering projects, while they may be relatively minor on small building contracts.

Sunday (2010) also noted that, if prototypes are well designed and tested, deviations will not become the 'new standard.' In order to record success in the industry, it is necessary to ask for variation orders due to the consequences on the overall goals of the project. It's always difficult to seek to describe what counts as 'variation' according to Mohammad et al. (2010). Many contracts to develop it correspond with behaviors or practices. However, in terms of the quality, quantity and schedule of works, Ndiokubwayo and Haupt (2009) defined variation orders as the additions, omissions, alterations and substitutions. This definition is concise in that it shows that the construction process may have started on the basis of approved details but new modifications are needed.

Such modifications or alternatives to the initial designs may be due to financial considerations, human mistakes, consumer demands, environmental conditions, etc. (Hanna et al., 2002; Ismail et al., 2012; Afolabi et al., 2017). Although some of the changes may be required, they must be carefully monitored so as not to adversely affect the project objectives and goals.

Variation orders affect the progress of any construction project and can be one of the major factors that could cause failure in successfully delivering a project. During the planning stage, or even the construction stage, it is fairly impossible to execute a project without any deviation instructions. Hence it is important to define and analyze the factors that trigger orders of variation.

### **1.1 STATEMENT OF THE PROBLEM**

The construction industry in the world and particularly in Nigeria, where construction projects suffer from variation orders, has been supported for a long time by changing orders. Such targets

are usually not achieved in building projects, which hinder customer satisfaction according to Fatoye (2012). From 1994 on, only one fourth of 8000 completed projects could deliver on time and on the desired financial plan and quality of the customer (Ameh, Soyngbe and Odusami, 2010). Till now, the menace of time overrun and discrepancies between the initial cost and final cost still pervades the construction industry (Koushki, Al-Rashid and Kartam, 2005). In the final cost, the client is expected to pay more than expected. This delays the bill of quantities to be used for the approval of the project for the contractor's success of the project (Eshofonie, 2008). Building stakeholders should be aware of the unpleasant effect it has on the building industry, Mbachu and Nkado (2004) said.

Furthermore, variation order raised on certain construction projects is responsible for project abandonment, lawsuits and the incorrect branding of such contractors as 'late or slow' (Amu, Adeoye and Faluyi, 2005; Pourrostan and Ismail, 2011); Some clients don't even want to pay for consultants' variants. However, the variation order in project construction ultimately lead to high waste created by the construction project (Afolabi et al., 2017). The losses result in lost time, exhaustion of limited funds, unaccounted human labor to break and rework new modifications and building materials created by the demolition. In the end, the variation order on building contracts have repercussions, though clients and consultants may not be aware of the tremendous impact on the achievement of the project delivery goals. Therefore, it is the intention of the researchers to review variation orders' influence in construction project delivery.

## **1.2 RESEARCH OBJECTIVE**

The aim of this research is to ascertain variation orders and it causes in building construction industry from Nigerian perspective. To achieve the aim of this research many objectives exists, these objectives can be summarized as below:

1. To investigate the factors causing variation order from the literature.
2. To extract real causes of variation order in building industry in Nigeria through literature content analysis of Nigerian origin.
3. To propose recommendations to decrease the variation orders to minimum as much as possible

## **2.0 LITERATURE REVIEW**

### **2.1 VARIATIONS AND VARIATION ORDERS' DEFINITION**

Olsen et al. (2012) and Nachatar et al. (2010) defined variation as any modification to the works as detailed or described in the contract documents. Another meaning by PWD 203/203A (Rev. 2007) Condition of Contract, clause 24.2 as the word variation implies, is a change in the contract document which necessitates the alteration or adjustment of the nature, quality or quantity of the works as defined or referred to therein and affects the amount of the contract. Fong (2004) and Mohammad et al. (2010) describe variation for contract purposes as the alteration or modification of the concept, condition and quantity of works displayed in the Contract Drawings, Quantity Drawings and/or Specification. Which also involves including, omitting or changing any work, modifying the type or specification or any of the products or goods to be used for the Works, and removing from the Site any job, material or goods to be

done or delivered to the site, whether the job, material or goods are not in compliance with the Contract. Memon et al. (2014), Fisk (1997), and O'Brien (1998) defined variation as any divergence from a well-defined framework and timeline decided upon. Hegazy et al. (2001) claimed differently that this is a modification in every adjustment to the contractual instructions provided to the contractor by the agent of the owner or owner. In a different context, Wambeke et al. (2011) defined variation as the difference between what was expected and what actually occurred (in terms of either the starting time or the length of the tasks). In addition to the term variation, it is necessary to define another generic term which is known by order of variation in construction projects. Fisk (1997) and O'Brien (1998) have defined the order of variation as the formal document used to change the original contractual arrangement and become part of the documentation of the project. Prof. Vincent Powell-Smith represented variation order as an instruction from the engineer to make a change to the works as defined in the contract documents, it is commonplace for a variation to be issued simply as instruction from the engineer; it is obvious from the content and it is a variation. Halwatura & Ranasinghe (2013) stated that a variation order is the formal document used by the client or the client's representative to modify the original contractual agreement provided to the contractor and becomes part of the project's documents. Desai et al. (2015) defined change order as a document describing the scope of the change and its impact on both cost and / or time. (Memon et al., 2014) also defined the variation order as an addendum to the terms of the contract and is signed by all contracting parties. Memon et al. (2014) introduced another description of the variation order, as the contracting parties' signed arrangement, which constitutes an extension, omission or alteration of the contract contracts, specifies the price and time shift and defines the essence of the work involved. Alsuliman et al. (2012) described variation orders as any change that may arise on the basis that is different from the contract accepted and signed. Variability is another concept that Rilett (1998) describes as the variation associated with a design of the part or end result in construction projects. Howell et al. (2004) focused on the variability in work-flow between what should be done and what has already been done. They emphasized the reduction of variation in order to improve performance and combine it with higher productivity results in the planning. Another description (Koskela, 2000) in terms of random variance in processing times or inputs arrival.

## **2.2 TYPES OF VARIATIONS**

Nachatar et al. (2010) and Al-Dubaisi (2000) identified two types of variations that are important for legal aspects; direct and positive improvements. The differences between these two categories that direct change is easy to identify, happens when the owner orders the contractor to perform a different work of that listed in the contract and problems revolve around monetary damages whereas constructive changes is informal act, considered the ground of variation order and the claim must be written in time to be considered. CII (1990), Fisk (1988) and Cox (1997) added another to the previous two, the cardinal change which is beyond the scope of the contract and may involve multiple changes leading to changes in net scope. CII (1990) and Fisk (1988) classified further changes based on net scope effect as follows;

- (1) Additive change which add work to the scope,
- (2) Deductive change which delete work from the scope,
- (3) Rework due to shortage in quality and
- (4) Force majeure change which affects depending upon the condition of the contract.

Wambeke et al (2011) dealt with another classification of variation types. It is split into variation in start time and variability in the length of tasks. They were investigating which of the two categories affected the variation. Mohammad et al. (2010) and Ibbs et al. (2001) had a different idea, saying that variation is divided into beneficial and detrimental ones. Beneficial variations that increase efficiency, minimize expense, timetable or complexity are ideal for any project and harmful variations that need to be careful due to their adverse effect on the valuation of the project or creator. Abdel Rashid et al. (2012) have categorized modifications into instructions for reform and minor changes. Minor changes have no time- or cost-effect. Nonetheless, change orders are a must when submitted to the mechanism of the Construction Change Directives (CCD's), and the contractor is obliged to make the adjustment even though he refuses in terms of time and expense. To reach an understanding with all the sides, contractors will plan documentation such as bulletins, interviews and meetings.

### **2.3 ELEMENTS OF A VALID VARIATION ORDER**

Harbans (2002) presented three criteria for assessing the legitimacy of a variation order. Next, by way of guidance. Second, authorisation should be given to the person who unleashed such instructions. Third, guidance must make a transition, and the legal agreement must specify the transition. Fong (2000) had a different idea where he said that there are two factors summarizing the validity of a variation order: the legal nature of the proposed change and the formalities governing the change. Al-Dubaisi (2000) proposed that one of the following parties may be the spark that would inaugurate the change order; owner, developer, project manager, and contractor.

### **2.4 THE NEED OF VARIATION ORDER**

Nachatar et al. (2010) and Fisk (1997) summarized the target spent by variation orders as follows: 1. Change contract plans or specify the method and amount of payment. 2. Change contract specifications. 3. Effect agreements concerning the order of the work. 4. Establish the method of extra work payment and funds for work already stipulates in the contract. 5. Authorize an increase in extra work funds necessary to complete previously authorized change. 6. Cover adjustments to contract unit prices for overruns and under runs. 7. Effect cost reduction incentive proposal (value engineering proposals). 8. Effect payment after settlement of claims

### **2.5 COST VARIATION PROBLEM IN NIGERIA CONSTRUCTION INDUSTRY**

In Nigeria, cost variation was seen as a challenge that hampered project performance in the construction industry; Kaming (2012), in his paper described five major causes of cost variation in Nigeria's construction industry. The outcome that was gotten by ranking the identified factors shows that the top five major's causes of cost overruns are: materials price fluctuation; insufficient time; lack of experience in contracts works; and incomplete drawings. The paper concluded by recommending the contractors to plan method statement for each project that they carried out. The ugly marks of these project cost variance are evident in the copious abandoned building projects in the country. O'Brien, (2010), opined that projects are hardly ever brought to reasonably conclusion in the country at scheduled time and cost. Kumaraswamy et al. (2012) in their work examined and analyzed the variation factors of project plan and their contributions to project failure in Nigeria. The slippage of project plans with respect to budget, schedule and quality specifications are indicators of poor performance and imminent failure. The results of

their scrutiny indicate that design errors, management problems and resource delivery constraints are the significant variation factors of plan that contribute significantly to project failure in Nigeria . Their paper consequently suggested that the evaluation of design effectiveness prior to project implementation, adoption of material requirements planning principles and institution of corporate policy for periodic as well a comprehensive human resources development programmers should be adopted by players in the construction industry so as to reduce cost variation in the country. Cariappa, A. (2000). In his paper studied the effect of variation on construction cost and contract period of building projects as well as the factors responsible for variation on building projects in Nigeria. The outcome confirmed that variation generally contributed 13% to the total increase above original contract amount and 15 % increase in original contract time. It also disclosed that the factors causing variation on building projects in Nigeria are inadequate briefing, Clients' intention, inadequate pre-contract planning and unforeseen conditions, whilst finishes and substructure are the building elements that attract the highest percentage of variation on building projects in Nigeria. The paper recommended proper project analysis by Architects or Project Managers ahead of the beginning of design work as well as adequate pre – contract planning to be the solution to cot variations problem in the building industry in Nigeria.

### 3.0 CONTENT ANALYSIS

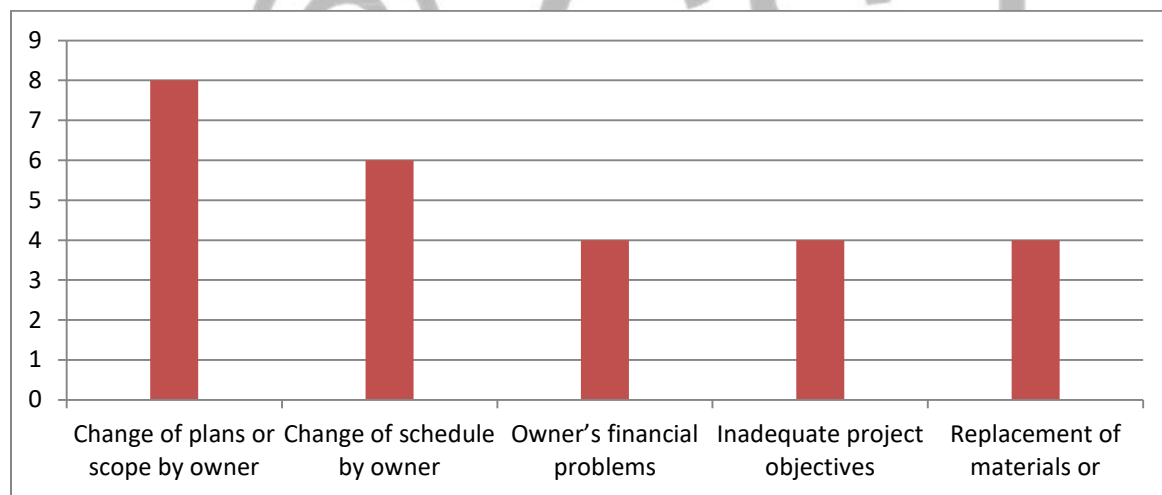
The content analysis is based on 8 major studies of Nigerian background in the subject matter. The justification for the 8 is because they represent core expectation of this study which borders on Nigerian perspective. The contents were analyzed using a benchmark of 4 to arrive at decision. This decision rule is based on the obvious that the mean of 8 is 4 which is  $8/2 = 4$ . Since we have 8 works, any factor or item that is captured by four (4) of the 8 major studies will adjudged significant, any factor below four is not significant.

#### 3.1 CAUSES OF VARIATION

**Table 1: Owner Related Factors**

Factors	Oladiran, Umeadi & Onatayo (2018)	Afolabi et al (2018)	Rasheed Ileko in & Ahmed (2015)	Nasiru et al (2015)	Bhadmus et al (2015)	Ismail et al (2012)	Sunday (2010)	Oladapo (2009)	Total	BM = $8/2 = 4$ (REMARKS)
1 Change of plans or scope by owner	✓	✓	✓	✓	✓	✓	✓	✓	8	Sig
2 Change of schedule by owner	✓	✓	✓		✓	✓	✓		6	Sig
3 Changes in owners' interests/requirements		✓						✓	2	Insig
4 Owner's financial problem	✓	✓					✓	✓	4	Sig
5 Inadequate project objectives	✓		✓		✓		✓		4	Sig

6	Replacement of materials or Procedures	✓						✓		4	Sig
7	Impediment in prompt decision making process			✓				✓	✓	3	Insig
8	Improper preliminary advice by Consultants							✓		1	Insig
9	Obstinate nature of owner					✓		✓		2	Insig
10	Change in specifications by owner.							✓	✓	2	Insig
11	Owner instructs additional works						✓			1	Insig
12	Owner instructs modification to Design						✓			1	Insig



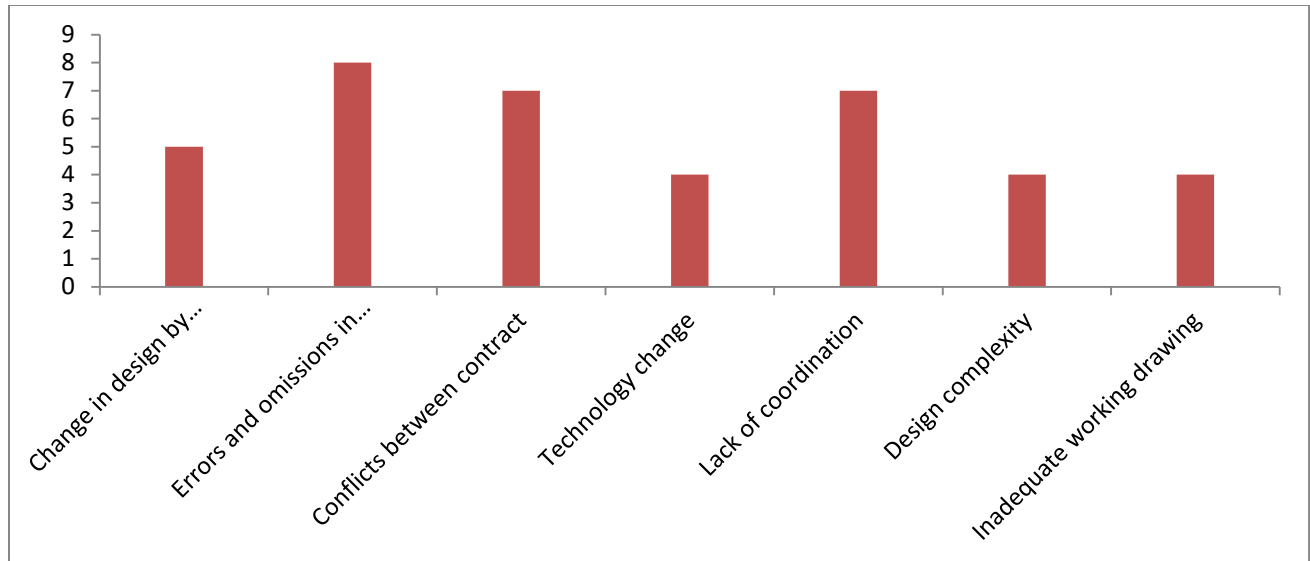
**Figure 1: Core/major Owner related factors of variation order in building industry in Nigeria.**

The table and chart above shows that the five (5) causes represented in the bar chart are the core/major owner related factors of variation order in building industry in Nigeria.

**Table 2: Consultant Related Variations/Factors**

Factors	Oladiran, Umeadi & Onatayo (2018)	Afolabi et al (2018)	Rasheed Ilekoin & Ahmed (2015)	Nasiru et al (2015)	Bhadmus et al (2015)	Ismail et al (2012)	Sunday (2010)	Oladapo (2009)	Total	BM =8/2 =4 (REMARKS)
1 Change in design by consultant	✓	✓	✓	✓		✓			5	Sig
2 Errors and omissions in design	✓	✓	✓	✓	✓	✓	✓	✓	8	Sig
3 Conflicts between contract Documents	✓	✓	✓	✓		✓	✓	✓	7	Sig
4 Improper briefing by client							✓	✓	2	Insig
5 Inadequate scope of work for contractor				✓			✓		2	Insig
6 Technology change		✓			✓	✓		✓	4	Sig
7 Lack of coordination	✓	✓	✓	✓	✓		✓	✓	7	Sig
8 Design complexity	✓				✓		✓	✓	4	Sig
9 Value engineering				✓					1	Insig
10 Insufficient time for preparation of contract documents				✓					1	Insig
11 Inadequate working drawing Details	✓	✓			✓			✓	4	Sig
12 Consultant's lack of judgment and experience	✓				✓			✓	3	Insig
13 Lack of consultant's knowledge of available materials and equipment	✓				✓			✓	3	Insig
14 Ambiguous design details		✓							1	Insig
15 Consultant's lack of required data		✓						✓	2	Insig





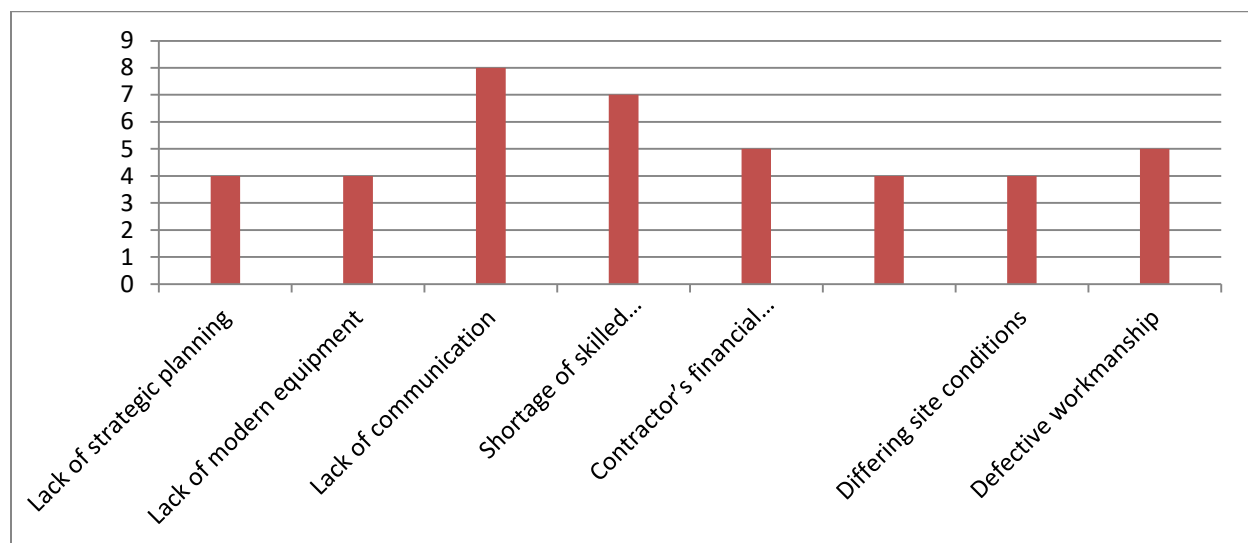
**Figure 2: Core/major consultant related factors of variation order in building industry in Nigeria.**

The table and chart above shows that the seven (7) causes represented in the bar chart out of the fifteen (15) identified factors by content, are the core/major consultant related factors of variation order in building industry in Nigeria.

**Table 3: Contractor Related Variations/Factors**

Factors	Oladiran, Umeadi & Onatayo (2018)	Afolabi et al (2018)	Rasheed Ilekoim & Ahmed (2015)	Nasiru et al (2015)	Bhadmus et al (2015)	Ismail et al (2012)	Sunday (2010)	Oladapo (2009)	Total	BM =8/2 =4 (REMARKS)
1	Complex design and technology						✓	✓	2	Insig
2	Lack of strategic planning	✓		✓		✓	✓		4	Sig
3	Contractor's lack of required data					✓			1	Insig
4	Lack of contractor's involvement in Design					✓	✓		2	Insig
5	Lack of modern equipment	✓		✓		✓		✓	4	Sig
6	Unfamiliarity with local conditions			✓					1	Insig
7	Lack of a specialized construction Manager			✓					1	Insig
8	Fast track construction		✓						1	Insig
9	Poor procurement process		✓	✓					2	Insig

10	Lack of communication	✓	✓	✓	✓	✓	✓	✓	✓	8	Sig
11	Contractor's lack of judgment and Experience	✓			✓		✓			3	Insig
12	Shortage of skilled manpower	✓	✓		✓	✓	✓	✓	✓	7	Sig
13	Contractor's financial difficulties	✓		✓	✓		✓		✓	5	Sig
14	Contractor's desired profitability	✓	✓	✓	✓					4	Sig
15	Differing site conditions	✓		✓			✓		✓	4	Sig
16	Defective workmanship	✓	✓		✓	✓		✓		5	Sig
17	Procurement delay		✓		✓					2	Insig
18	Poor site management and Supervision			✓		✓				2	Insig
19	Unsuitable management structure and style of contractor			✓		✓				2	Insig
20	Poor project management by Contractor		✓				✓			2	Insig
21	The contractor misuses variations Instructions		✓				✓			2	Insig



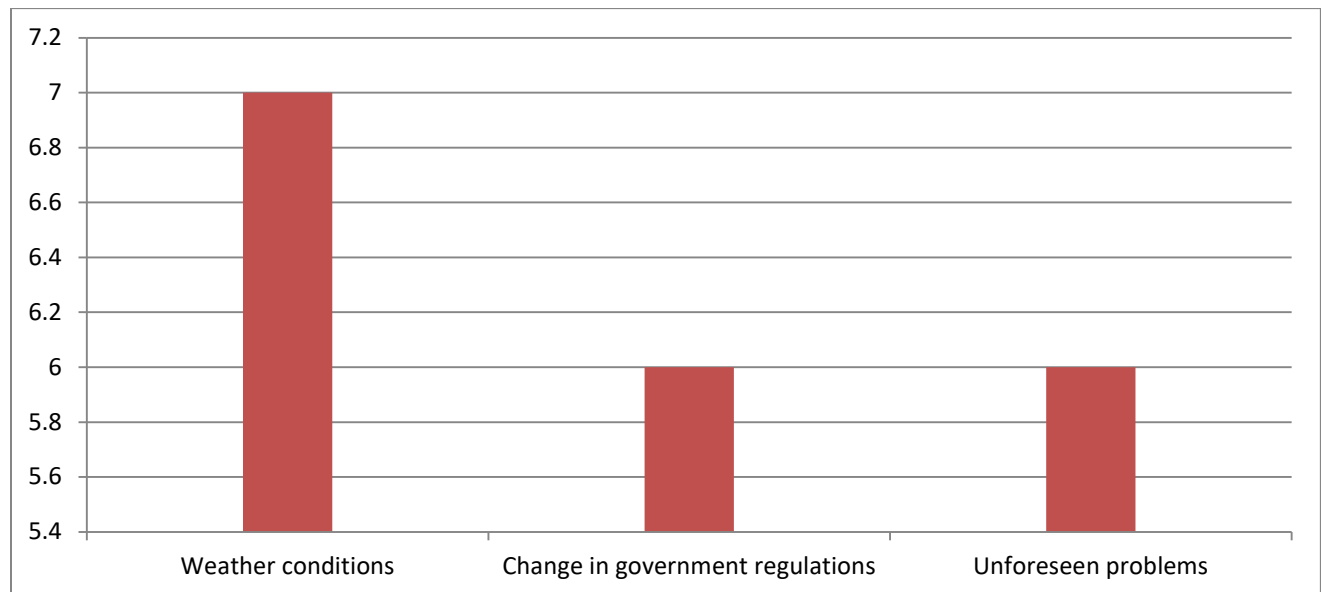
**Figure 3: Core/major contractor related factors of variation order in building industry in Nigeria**

The table and chart above shows that the eight (8) causes represented in the bar chart out of the twenty one (21) identified factors by content, are the core/major contractor related factors of variation order in building industry in Nigeria

**Table 4: Other Variations/Factors**

Factors	Oladiran, Umeadi & Onatayo (2018)	Afolabi et al (2018)	Rasheed Ileko in & Ahmed (2015)	Nasiru et al (2015)	Bhadmus et al (2015)	Ismail et al (2012)	Sunday (2010)	Oladapo (2009)	Total	BM =8/2 =4 (REMARKS)
1	Weather conditions	✓	✓	✓		✓	✓	✓	7	Sig
2	Force majeure					✓		✓	2	Insig
3	Safety considerations		✓		✓	✓			3	Insig
4	Political pressure				✓		✓		2	Insig
5	Change in government regulations	✓		✓	✓	✓		✓	6	Sig
6	Change in economic conditions		✓			✓			2	Insig
7	Socio-cultural factor	✓		✓		✓			3	Insig
8	Unforeseen problems	✓		✓		✓	✓	✓	6	Sig
9	Change of decision-making Authority				✓				2	Insig
10	Financial and Decision Management	✓				✓			2	Insig
11	Project construction complexity			✓		✓			2	Insig
12	Client-initiated variations			✓		✓			2	Insig
13	Site restrictions			✓		✓			2	Insig
14	Construction errors at job site	✓		✓					2	Insig
15	Delays in secure site, equipment or Materials		✓			✓			2	Insig
16	Long waiting time for approval of Drawings	✓					✓		2	Insig
17	Insufficient site investigation prior to design		✓			✓			2	Insig
18	inadequate project change management		✓			✓			2	Insig
19	No availability	✓				✓			2	Insig

	of engineering licensing for engineers									
20	Building codes	✓		✓					2	Insig
21	vendor change		✓						1	Insig



**Figure 4: Core/major other related factors of variation order in building industry in Nigeria**

The table and chart above shows that the three (3) causes represented in the bar chart out of the twenty one (21) identified factors by content, are the core/major other related factors of variation order in building industry in Nigeria.

#### 4.0 CONCLUSIONS

The study is an in-depth content analysis which used eight (8) major works of indigenous origin on the subject matter. A lot of studies has been carried out in the past and till now on the subject of variation order in construction industry in Nigeria. These studies has similar findings and thus the researcher in trying to find out the real and core causes of variation order from the Nigerian perspective, did not see the need to carry out further cross-sectional study since there has been strong saturation in that aspect, but rather used major studies from Nigerian authors to arrive at the core causes. This gives a satisfactory findings for anybody in need of the outcome of this study. However the study concludes that.

1. There are significant variation order causes of Nigerian or indigenous origin, which are peculiar with the Nigerian building and construction environment and which may likely not be found in other environments or countries.
2. Out of the 12 identified owner related causes or factors of variation order from the 8 major studies of Nigerian perspective, five (5) are the core owner related causes of variation order in Nigerian building industry. They are namely in their order of significance: change of plans or scope by owner, change of schedule by owner, owner's

financial problems, inadequate project objectives and replacement of materials or resources respectively.

3. Out of the 15 identified consultant related causes or factors of variation order from the 8 major studies of Nigerian perspective, seven (7) are the core consultant related causes of variation order in Nigerian building industry. It reveals that errors and omissions in design, lack of coordination, conflicts between contract, change in design by consultants, technology change, design complexity and inadequate working drawing are the major factors arising from consultants involvement leading to variation order in building industry in Nigeria.
4. Out of the 21 identified contractors related causes or factors of variation order from the 8 major studies of Nigerian perspective, eight (8) are the core contractors related causes of variation order in Nigerian building industry. They are namely in their order of significance: Lack of communication, shortage of skilled manpower, contractor's financial difficulties, defective workmanship, lack of strategic planning, lack of modern equipment, contractor's desired profitability and differing site conditions respectively.
5. In other variations which borders on environmental factors, natural factors and project related factors etc, out of 21 identified factors in this regard, only three are the core other related factors of variation orders affecting building industry in Nigeria. They are thus- weather conditions, change in government regulations and unforeseen problems.

#### **4.1 RECOMMENDATIONS**

The study recommends that

1. Owners are recommended to determine project duration by experts or their consultants because they are more familiar with the duration of the implementation of the project and thus avoid a change in the schedule. Also owners are recommended not to change the original drawings, because any change in the original drawings require a new effort in the preparation of new drawings.
2. Project owners are advised to request everything they need in the contract from the beginning and avoid any requirements after implementation of works and develop a clear vision for projects. Also criteria for the selection of contractor according to the nature of the project and to have a good reputation and great experience should be developed.
3. Project consultants are to provide more details in drawings. Also, train contractors on certain types of drawings especially that complex ones. Also, consultants should explain on site the complex details to the contractor. In the same light, consultants are to provide complete and detailed drawings (architectural, civil, electric, and mechanical).
4. Consultants to the project are to get the approval of all stakeholders or specialized departments before implementation. Also, keep in touch with other parties (such as water, electricity, communication, etc.) to avoid conflicts. Furthermore are to search and explore the equipment and materials that are available in the country and how to deal with it.
5. It is imperative for consultants to choose engineers who with high efficiency to perform the work meticulously to avoid any error in the future and review and audit the design by several engineers. And also to re-design the project according to the request from the owner, so that the contractor must get variation (cost and time) for additional work which happens from re-design.

6. Project contractors are encouraged to search for and hire new skilled crew. Also, the general contractor must provide all documents (i.e. certificates) and experience for the staff and get approval on all subcontractors. Contractors also are encouraged that before studying the tender and pricing, they must make site visit of the site to see all obstacles and take into account in the bid (financially and chronologically). Contractors are recommended to use qualified workers, engineers, and project manager with good experience to avoid any problems at work.
7. Importantly, contractors are encouraged to take into consideration the days when work stop due to the bad weather and take approval to stop work from consultant on the site. As well, make up for the days when work stop over time or work in holidays to avoid change in schedule especially in road projects. Furthermore, they are to be financially prepared before entering the tender, have strong financial aspects and cash flow during the project. Also, buy approved original materials with any price.
8. Contractors are encouraged to purchase the whole quantity of certain material in ordinary situations to avoid shortage of material due to closure. But, contractors can't be forced to buy the whole quantity if prices differs dramatically from the contract price unless it is mentioned in the contract that owner doesn't bear the increment in prices.

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