SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 9 | September 2023 - Peer Reviewed Journal

ANALYSIS ON CIVIL PROJECTS CONSTRUCTION APPROVAL AND CONCURRENT DELAY IN NIGERIA

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ABSTRACT
Prompt execution of civil engineering project has been a critical challenge due to delay in both approval and construction delays in Nigeria. In previous years, the government establishes several Communal Construction Projects (CCPs) in other to fulfill the developmental plan. Therefore, the prevalent and frequent construction approval and delay in execution is one of the critical issues that affect CCPs Nigeria. Therefore, it is fundamental to study, analyze and explore different aspects that resulted in construction and approval delays in CCPs. The purpose of this research is to investigate those factors that mitigate delays in CCPs in Nigeria and to proffer related measures to defeat this challenge. In accordance to some causal factors explored from the literature and communal annual reports, a total of 200 questionnaire surveys were distributed to CCPs practitioners and 160 of them were completed, while the results and data collected from interviews and stakeholders were also used. A list of 35 causes of delay was gathered from communal annual reports were further categorized based on the three stages of a construction project's lifetime. A factors analysis was used to evaluate quantitatively the difference in factors based on views from 200 stakeholders. The top 5 factors were identified." Weather conditions" with a relative importance index (RII) and mean score (MS) of 0.850 and 4.23 respectively, this were found to be the top cause while the factor "Claims" with RII= 0.798 and MS=3.99 was found to be the least. Furthermore, a structural equation modeling was used to assess the influence degree relationship between latent variables was also conducted. A standardized calculation shows that all these factors during bidding has positively influence bidding. The findings of this research will provide adequate measures to avert approval and delays in construction projects.
KEYWORDS: *Delay, Communal, Construction, Projects, Factor, Analysis, Structure, Modeling, Nigeria*

1. INTRODUCTION

Project management achievement is assessed by its timely delivery, budget and quality level specified in a given contract. Across the world, every construction projects delay is a challenge according to (Kwatsima 2015)(Bagaya and Song 2016). Delay' is defined as a time overrun according to the specified date in a contract (Alamri et al. 2017). (Akhund et al. 2017) also defined 'delay' as a condition where a construction project does not completed within the designed schedule. Some existing works on the one hand concluded that there are two main types of delay (Excusable and Non-excusable delay). Excusable delays include compensable and non-compensable delays while non-excusable delays are non-compensable (Kraiem, Diekmann, and Management 1987; Alaghbari et al. 2007), while others studies in the other hand mentioned four main categories of delays such as critical or non-critical, Excusable or non-excusable, Compensable or non-compensable, Concurrent or non-concurrent (Wei 2010; Fakunle and Fashina 2020). Time overrun has a significant amount in worldwide construction projects. Therefore, public projects performed between 2000 - 2013 years, 72% of them exceeded the planned project duration (Senouci, Ismail, and Eldin 2016, Assaf and Al-Hejji 2006) in large construction projects. The results revealed that 70% of the Saudi Arabian projects were completed over their planned duration and their average timeout is between 10-40%. In addition, a study was also conducted on Kenyan road construction projects where about 60% of the projects initiated are plausible to escalate in duration with a magnitude of over 50% (Atibu 2015). Elsewhere, it was found that delays in construction projects are critical in developing countries where they exceed 100% of the estimated time (Azhar, Farooqui, and Ahmed 2008) (Le-Hoai, Dai Lee, and Lee 2008). Most delay that is common to worldwide construction industry has also critically affected CCPs in Nigeria by more than 50% on average (as revealed by communal reports). Thus prevent government in achieving targeted objectives towards development. It is then necessary to conduct specific research on the causes of CCPs' delay while knowing that no study has been carried out since their existence.

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2. LITERATURE REVIEW

Construction delays have been seen as a global challenge affecting time delivery, quality and budget of a construction project. It is the most common, risky and costly problem for both private and public construction projects. As a result of this, studies have been conducted in the construction field to identify the most relevant causes to provide effective and efficient solutions. Aziz R (2016) presented the number of delays caused by different types of the construction project (Figure 1). Table 1 summarizes the findings and study area for some of the past research. To prevent the cause "underestimation of project schedule" (Al Sadi and Dawood 2021) recommended adopting an alternative bidding system instead of the lowest bidder selecting system. This alternative bidding can be an excellent performance of a detailed analysis of contractors who would otherwise be disqualified by the lowest bidder.

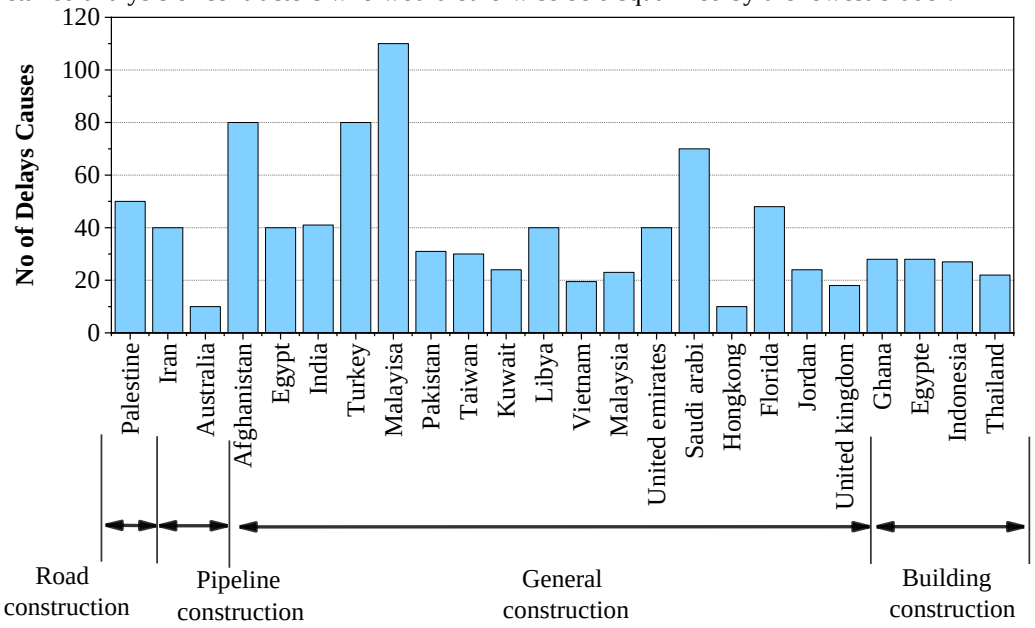

Fig.1 Classification of the number of causes from literature review (Aziz R F,A (2016)

Table 1 Identified critical causes of delay by some of the researchers in the past

Authors	Area	Findings
(Gündüz, Nielsen, and Özdemir 2013)	Turkey	(1) Inadequate experience of contractor; (2) Inefficient project planning and scheduling; (3) Poor site management and supervision; (4) Design changes; (5) Delay in delivery of materials; (6) Unreliable subcontractors; (7) Delay in testing and carrying out the inspection. (8) Unqualified workers; (9) Change of orders; (10) delay in site delivery; (11) Delay in design approval documents; (12) Delay in progress payment; (13) Slowness when making a decision; (14) Poor coordination.
(Muhwezi et al. 2014)	Uganda	(1) Consultant delays to assess changes in the scope of work; (2) contractor dishonesty in finance; (3) contractor with inadequate experience; (4) design errors by designers; and (5) consultant inadequate site investigation.
(Mpofu et al. 2017)	United Arab Emirates	(1) Unrealistic contract duration imposed by the client; (2) incomplete design at the time of tender; (3) too many scope changes and change orders; (4) inadequate planning and scheduling (by contractors); (5) poor project planning and control (by Project Managers); (6) delay in obtaining permits/approval from municipality /different government. Authorities.
(Yusuwan and Adnan 2013)	Malaysia	(1) Penury of materials/manpower/equipment; (2) slow decision making; and (3) delays by owner in contractor's payment
(Aziz and Abdel-Hakam 2016)	Egypt	(1) Owner financial problems; (2) shortage in equipment; (3) inadequate contractor experience; (4) shortage in materials; (5) equipment failure.

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(Rachid, Toufik, and Mohammed 2019)	Algeria	(1) Slow change orders; (2) unrealistic contract duration, (3) slow variation orders in extra quantities; (4) delays in payment of performed work; and (5) ineffective planning and scheduling by contractors
(Niazi and Painting 2017)	Afghanistan	(1) Corruption; (2) delay in progress payment by owner; (3) difficulties in financing project by contractors; (4) security; (5) change the order by the owner during construction; and (6) market inflation

Many researches that have been conducted to identify causes of delays in the construction industry by providing remedial measures to avoid them, the authors also mentioned that there are uncontrollable causes of delays when they occur you become perplexed and nothing can be done at that present time. Thus, there is no measures to avoid them but some strategies to deal with them can be observed, such as collaboration with meteorological agencies and then planning the execution of some tasks of the project during times when the climate seems to be favourable (Ibadov, Kulejewski, and Technology 2019). Despite all these concerted efforts, the construction industry keeps facing the same challenges. An exploratory overview of past studies revealed that projects are unique. This has worthily attracted the authors to attach greater importance on the identification of causal factors with the aim of providing the best practice solutions to mitigate delays and improve project schedule management.

3. METHODOLOGY

The main objectives of this research work are stated as: (1. Identity factors affecting delay in CCPs in Nigeria; (2. Quantify and rank delay factors according to their importance level and mean scores; (3. Evaluate the influence relationship degree between latent variables; (4. Propose mitigation and practical measures to be undertaken to avoid any delay factors to occur in the future.

To meet the goal of this research, a questionnaire survey for collecting data from the views of stakeholders is used. This questionnaire was designed based on causal factors explored from the literature and communal annual reports. Supported by these data, are the importance of each factor which was calculated by a Relative Importance Index (RII) method. Furthermore, Factor Analysis (FA) methodology was applied to the top 5 most influencing factors causes delays in CCPs using IBM SPSS V.24. This applied methodology (FA) extracts the components on which the top 5 factors are loading. The methodology (FA) also enables the establishment of a hypothetical influential diagram and then evaluates the relationship between latent variables. This calculation uses AMOS V.24 software and is commonly known as Structural Equation Modeling (SEM), as shown in Figure 1 which illustrate the flowchart of the methodology approach used for this research work.

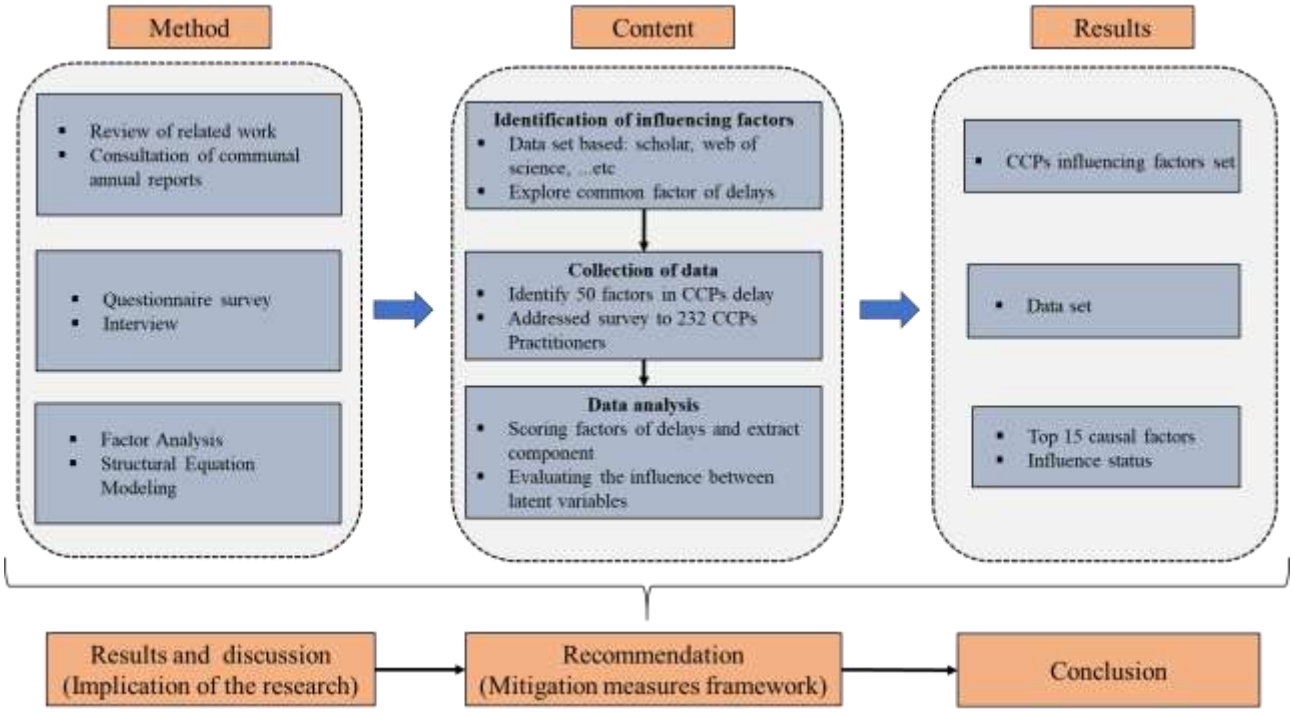

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Figure 1 Research Flowchart of the proposed methodology approach

3.1 Factors that delay CCPs in Nigeria

A number of 50 common causes of delay were gathered through literature and communal reports and divided into three major phases of a construction project lifetime, they are: (1) factors before bidding; (2) factors during bidding; and (3) factors after bidding (during construction) (Alsuliman 2019). Table 2 summarizes the common delay factors based on these five-point Likert scale, (1) very low, (2) low, (3) medium, (4) high, and (5) very high contributing to delay, respondents were asked to specify, within their perception and experience, to which scale a factor is corresponded (Doloi and management 2013) (Mahamid and Innovation 2013)(Larsen et al. 2016).

Table 2 Common causes of delay in CCPs in Nigeria

No.	Phases	Causes of delay	References
1.	Before bidding	Disputes for having a site	(Aziz and Abdel-Hakam 2016), (Marzouk and El-Rasas 2014), (Niazi and Painting 2017), (Alsuliman 2019),
2.		Unqualified communal council members	Author
3.		Delay by communal council in selection of priority projects	Author
4.		Owner delay in submitting priority projects for financing	Author
5.		Delay in pre-project study by owner	(Faridi, El-Sayegh, and Economics 2006), (Alsuliman 2019)
6.		Unqualified design engineers	(Aziz and Abdel-Hakam 2016), (Alsuliman 2019), (Hsu, Aurisicchio, and Angeloudis 2017),
7.		Owner's lack of accuracy project technical specification	(Aziz and Abdel-Hakam 2016), (Marzouk and El-Rasas 2014), (Alsuliman 2019)
8.		Owner's underestimation of project cost and time	(Alsuliman 2019), (Aziz and Abdel-Hakam 2016),
9.		Provision of one national responsible department for communal finances	Author
10.		Provision of one national reanalysis and approval office for project quantities	Author

3.2 Factor Analysis

Factor analysis is a statistical technique which is aimed towards identifying the correlations between and among variables to bind them into one underlying factor driving their values (Wang and Yuan 2011; Deng et al. 2014). Two main conditions needed to be considered in determining whether a data set is suitable for factor analysis method or not (Pallant 2020), they are: 1) sample size 2) strength of the relationship between the variables: The correlation matrix ≥ 0.3; Bartlett's test of Sphericity $p < 0.05$ and Kaiser-Mayer- Olkin index $KMO \geq 0.50$.

3.3 Structural Equation Modeling

A structural equation modeling (SEM) is defined as a multivariate technique used to statistically analyze the structural relationship between measured variables and latent construct (Lee 2007).The use of SEM in this paper is to assess the influence relationship degree between latent variables. Therefore, this method considers a factor causing delay as a variable.

4.0. RESULTS AND DISCUSSIONS

This section presents the results obtained from the analysis and their interpretation. The results from sections one and two which included respondents' profiles and projects general information (location, delay level and state) respectively on a questionnaire survey is also presented in figure 2; results from section three are first presented in Figure 3, and finalized by factors analysis results in Table 4, while the results from an SEM are observed and interpreted in the end.

A total of 200 questionnaires were distributed to communal construction project practitioners and 150 were completed and returned. This represents 69%. The sample size was found to be consistent according to the range of 20% to 30% response rate standard for construction industry questionnaire surveys (Yusuwan and Adnan 2013). On the other hand, despite that 49 of them did not respond to

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the questionnaires. Different categories of respondents such as owners, consultants, engineers, contractors, and subcontractors participated in the survey.

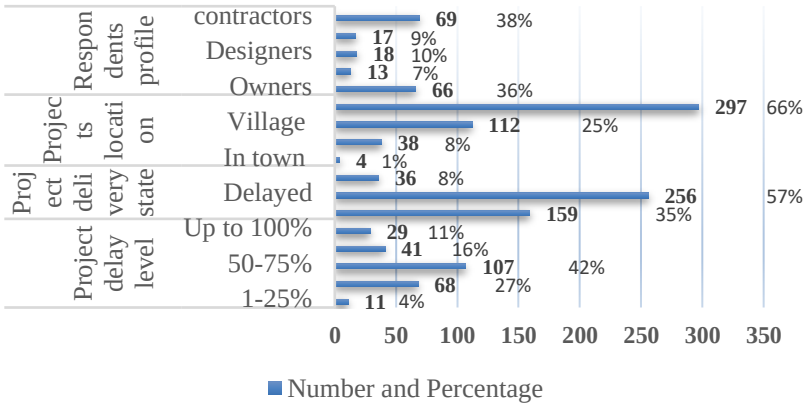

Figure 2 shows the distribution of respondents profile; projects location, delivery state and delay level

The status of the 250 projects experienced during the three years is revealed as follows: (1) According to the location, some are located in towns; semi towns; villages; and others are remoted. (2). According to the projects' delivery state, some were executed within time; others were delayed; while some were abandoned.(3) According to the project's delay level, some projects presented a delay levelled from 1-25%; 25-50%; 50-75%; 75-100% and others are delayed up to 100% according to their planned time. Figure 2 shows the distribution of questionnaire respondents' profiles, project location, project delivery state, and project delay level.

4.1 Top 3 causes of delay based on their importance and mean

According to their importance level, the factors that cause CCPs delay were ranked from the highest to the fifteenth as shown in figure 3. Therefore, "weather conditions" is ranked the first with *RII= 0.850* and *MS=4.23* while "claims after publication of tender analysis results" ranked the fifteenth with *RII= 0.798*and *MS=3.99*. The results reveal that amongst the top 3 factors.

Table 3 Ranking of 3 top causes of delay in CCPs in Nigeria

Classification	ID	Cause of delay	Rank
Before bidding	FBB1	Disputes for having a Site	6
	FBB2	Owner's underestimation of project cost and time	7
	FBB3	Unqualified design engineers	10
	FBB4	Insufficient duration for project study	14
During bidding	FDB1	Focus on financial analysis and award to the lowest bidder	4
	FDB2	Award to a contractor with the projects beyond his financial potentiality	5
	FDB3	Contractors ignorance to visit site before submit tenders	8
	FDB4	Mismatch of drawings and quantities to be executed	9
	FDB5	Award to the defaulting contractor	13
	FDB6	Clams after publication of tenders analysis results	15
After bidding	FAB1	Weather conditions	1

4.2 Results from Factor Analysis

The applicability of the factor analysis method for data analysis in this paper is in agreement with the results in Table 3. Therefore, *KMO= 0.830,* which is greater than *0.7*; the probability level is very significant ($p \leq 0.001$), less than *0.05*; the degree of freedom is positive *df =105*; the approximate chi-square $\chi 2$ is significant ($\chi 2 = 3533.476$). Furthermore, most of values in the variables correlation matrix are shown to be larger than *0.3*.

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Table 4 KMO and Bartlett's Test results

Test	Results	Value
Kaiser-Meyer-Olkin	Measure of Sampling Adequacy.	0.830
Bartlett's Test of Sphericity	Approx. Chi-Square	3533.476
	Df	105
	Sig.	0.001

The standard deviations of all factors are greater than zero (positive), which justifies the significant of the factors according to their data set. The extraction communalities of all factors are greater than *0.50*, consequently all factors are retained for analysis. The Cronbach's Alpha equals *to 0.783; 0.722; 0.713* for components *1; 2; 3*, respectively, which are greater than *0.7* and are ranged between *0-1*. Therefore, the five-point Likert Scales are reliable. The Eigen values results are all greater than *1.0*, which prove that the number of factors in this paper is optimal. A three-component extracted solution was created. The standard cumulative guideline is normally *60%* according to the latent root criteria (Deng et al. 2014). The outcomes of the research show anormality cumulative of *80.974 %*, larger than *60%*.

4.3 SEM Analysis, Results and Interpretation

By setting up the hypothetical model, this study selected the three components extracted from a factor analysis method. Thus, the model will consider factors before bidding*(FBB)*, factors during bidding*(FDB)*, and factors after bidding *(FAB)* as latent variables and their respective causal factors as measured variables. Therefore, factors before bidding are believed to positively influence factors during bidding and factors after bidding. Factors during bidding are positively influence factors after bidding to cause delay in CCPs in Nigeria. However, Figure 3 presents the hypothetical relationship model between latent variables based on the following three hypotheses.

H1: *FBB* positively influences *FDB* to cause delay in CCPs in Nigeria
H2: *FBB* positively influences *FAA* to cause delay in CCPs in Nigeria
H3: *FDB* positively influences *FAA* to cause delay in CCPs in Nigeria

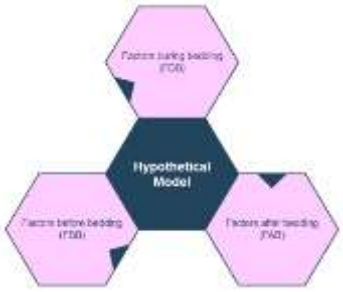

Figure 4 Hypothetical model

According to the hypothetical model, the measurement model was constructed and it includes the latent variables, their respective observed variables that will be used to measure the latent variables. The measurement model is tested later on the dataset using several goodness-of-fit indices. An examination of our model fit was conducted by performing a Confirmatory Factor Analysis (CFA). Table 5 shows the results after the model goodness-of-fit assessment.

Table 5 Fit indices of the measurement model

Fit indices	**Recommended**	**Measured model**
Chi-square $(\chi)^2$		183.119
Df		87
P	<0.05	0.001
$\chi 2/df$	<3	2.104
CFI	>0.9	0.999
TLI	>0.9	0.915
RMSEA	<0.05	0.028

Note: CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root-mean square error of approximation; *df* = degree of freedom; *p* = significant value; ($\chi 2/df$) = normality Chi-square.

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5. RECOMMENDATIONS

From the hypothesis three (H3) it is found to be supported by the estimate calculated results. However, factors affecting during the bidding stage of a construction project lifetime positively influence the factors that often appear during construction. This can be justified by the fact that the ignorance of contractors to visit a site before they submit their tenders and the mismatch between drawings and quantities to be executed significantly influence the difficulty in supplying materials and rework due to error. Additionally, contracts awarded to the lowest and non-potentiality financial bidder will lead to the employment of unqualified and new graduate engineers with no experience. This is found to have a greater negative impact on the progress of a project within its planned schedule. Moreso, the same results also show that factors during and after bidding are negatively influenced by the factors before bidding. Thus, the underestimation of project cost and time by the owner do not justify his latest payment during construction. Moreover, the later payment by the owner to the contractor is not emanated from the owner's project underestimation of the project budget but may be to his cause. Unexpectedly, the mismatching of drawings and quantities to be executed should positively be influenced by the existence of unqualified design engineers, and what is unsupported by the results. This requires further research for being validated.

To perform CCPs according to their specified duration in a contract, can prevent negative impacts, this paper therefore proposes some recommendations that stakeholders can take up. Furthermore, project awards should not only be based on the contractor's financial tender but also on several indices as well as their technical tenders.

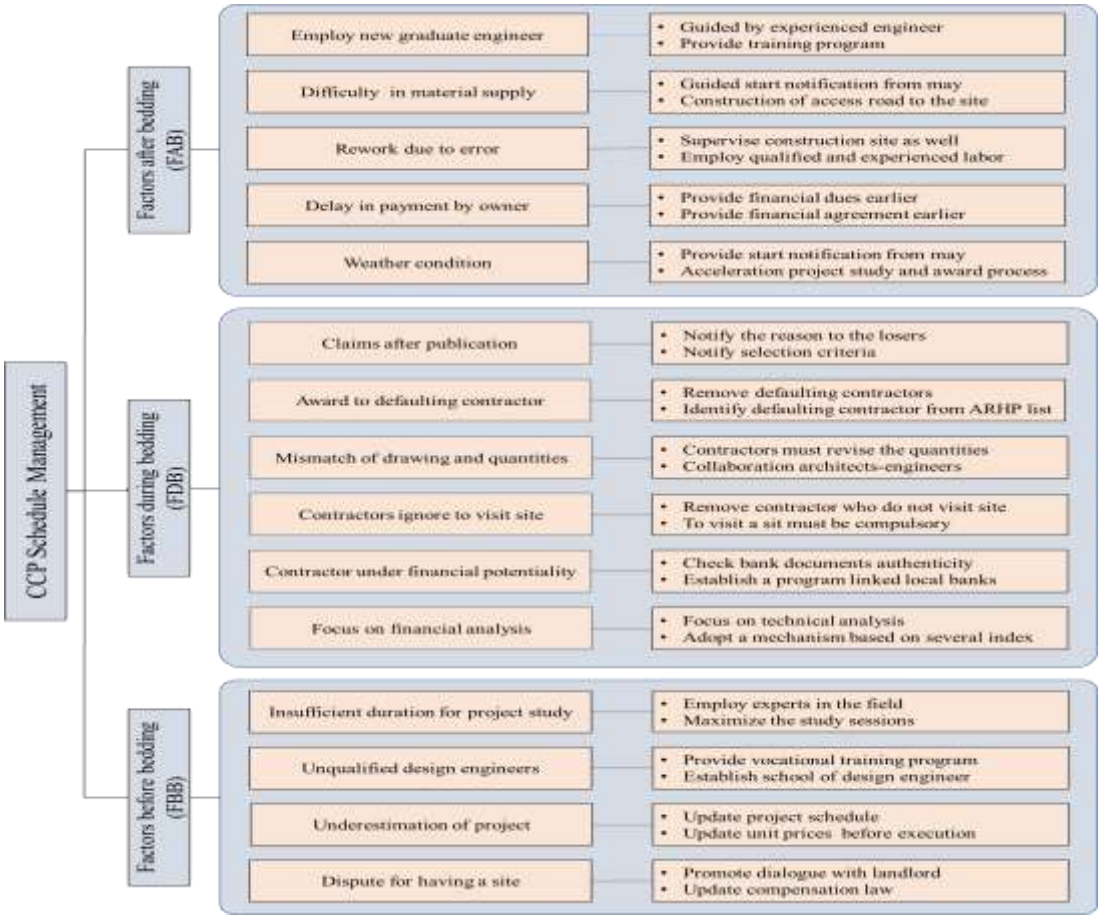

Figure 5 CCPs schedule management framework

6.0 CONCLUSION

It can be concluded that the barriers and factors that retards CCPs delay can be summarily concluded by stating them as: (1) Delays in achieving the project's objectives according to the planned schedule are considered one of the main sources of conflicts among stakeholders in construction industry. Thus this paper is aimed towards identifying the factors that affect delay in Nigeria communal construction projects (CCPs) to delay and proposes related measures to overcome this challenge. The weather condition is ranked as the

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first then delay in payment by the owner, rework due to errors, focus on financial analysis and award to the lowest bidder; award to a contractor with projects beyond his financial potential; disputes in the construction site before submit tenders; mismatch of drawings and quantities to be executed; unqualified design engineers; difficulty in material supply; employment of new graduate engineers with no experience; contract awarded to the defaulting contractor; insufficient duration for project study; claims after publication of tender analysis results.

Thus, contractors needed to visit the site before they submit their tender; if they failed to do this, they will perceive difficulties ŧ during the delivery of materials to the site. Proper resizing of the project to match the drawings with respect to the quantities that will be executed and the employment of qualified labor will avert construction rework. It is my believe that this concept research work will go a long way in solving an impending problems related to contract, award, approval and delay.

Data availability statement

The corresponding author will provide all the data used in this study upon reasonable request.

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