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Impacts of change management practices on construction project performance in Bauchi State, Nigeria

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ABSTRACT
Changes in construction projects are inevitable. As a result of changes, construction projects experience time and cost overruns, as well as non-conformance to set quality standards leading to poor performance. Despite several studies that have been conducted on project change management systems, not enough has been done to determine its impacts on project performance. The aim of this study is to assess the impacts of change management practices on the performance of construction projects in Bauchi State, Nigeria, with a view to improving construction project delivery in the area. The study opted for an explanatory research design. A questionnaire survey was conducted in which 190 questionnaires were administered to construction professionals using the purposive sampling technique. One hundred and forty-seven (147) were returned completed representing a 77% response rate. The data obtained were analysed by means of descriptive statistics, factor analysis and multiple regression analysis. Findings from the survey revealed that the extent of Change Management (CM) practices in the construction project in the study area was low. In addition, the impacts of CM practices on time and cost performance as well as on end users' satisfaction was positive and significant. Similarly, its impacts on the overall project performance were also positive and significant. The CM activities identified in this study can serve as a framework for effective CMS that can be used by construction professionals in managing changes at project level.

Keywords: Change Management, Construction, Nigeria, Project Management, Project Performance

1. INTRODUCTION
Construction project performance is measured in terms of completing a project on time, within budget, to a specified quality standard, with minimum accidents, and to the satisfaction of end-users (Toor and Ogunlana, 2010; Olateju et al., 2011). However, sometimes, as a result of changes, construction projects experience time and cost overruns as well as non-conformance to specification leading to poor performance of the projects (Abad. and Naeni, 2020; Ansari, 2019; Sun et al. 2006; Hao et al. 2008; Ibbs et al., 2001; Senaratine and Sextone, 2011). Furthermore, it has been reported that changes are inevitable at different stages of construction projects (Hwang and Low, 2012; Ansari, 2019). They are the main causes of inefficiency, delays and cost overrun in those projects (Schonbeck et al., 2020).

It is clear from the above discussions that changes can have negative impacts on project objectives. Nevertheless, it is worth noting that not all changes are detrimental; some are beneficial that increase value, reduce cost, schedule, or degree of difficulty; those changes should be encouraged (CII, 1994; Hwang and Low, 2012; Moayeri et al., 2015). Hence, before introducing change at any stage of a project, there should be clear communication of the vision, the desired changes, and the advantages that the change will bring.

Change in a construction project is defined as addition, deletion, or modification of original project scope, time, cost and quality (CII, 1994; Sun et al., 2006; Hwang and Low, 2012; Moayeri et al., 2015). To ensure successful project delivery, it is essential to employ an effective change management system (CMS) (Senaratine and Sextone, 2011, Liu et al., 2014; Abad. and Naeni, 2020). CII (1994) asserts that significant savings in overall project cost can be realised by adopting effective change management (CM). Similarly, Hwang and Low, 2012 opined that implementing effective CM in projects can result in cost and time savings and quality improvement. Whereas, if changes are not properly managed, it can lead to cost overruns and failure to meet the client's satisfaction (Liu et al., 2014; Jallow et al., 2013). Zhao et al. (2009) describe CM as one of the project management practices that resolve problems when changes occur in a project or minimise changes that may occur and disrupt the project's progress. Generally, CM seeks to forecast possible changes; identify changes that have already occurred; plan preventive measures; and coordinate changes across the entire project (Senaratine and Sextone, 2011; Hao et al., 2008).

Despite the importance of implementing effective CM in projects, previous studies (Musa et al., 2017; Hwang and Low, 2012) reported a low application of the CM system in construction projects. Generally, it has been observed that proactive CM is rarely applied in project implementation; changes are usually managed reactively (Halou et al., 2019; Serrador & Turner, 2015). This may lead to poor performance of projects. Proactive CM refers to predicting and dealing with change before it occurs (Motawa et al., 2007).

Senaratine and Sextone (2011) suggested that proactive CM practice should be employed during project implementation. These include effective briefing, value management, risk management, effective communication and feedback, and concurrent engineering. Implementation of these in construction projects will reduce required change and help in managing elective change. Thus, CM is a systematic approach that ensures successful project outcomes (Moayeri et al., 2015, Matthews et al., 2018).

To adequately address the main aspects of CM, there is a need to assess its impacts on the project performance (time, cost, quality, end-users" satisfaction). Halou et al. (2019) opine that the impact of CM on construction projects plays an important role in achieving the success of the project. Similarly, Senaratine and Sextone (2011) suggest that an effective CM should have considerable impacts on the project's cost, time, and quality. However, despite the fact that several studies have been conducted on project CMS, not enough has been done to determine its impacts on project performance. Thus, this study aims to assess the impacts of CM on construction project performance in Bauchi State, Nigeria, to promote successful project delivery. The study focuses on unplanned changes that occur at the project level during construction.

Based on the literature review presented in Section 2.0 of this study, it was found that previous studies (CII, 1994; CIRIA, 2001; Motawa, 2005; Hayes, 2014) have focused on the presentation and development of guidelines and models for effective CM of projects. However, they failed to investigate the impacts of CM on project performance (time, cost and quality). In addition, most of the studies on CM were carried out in developed countries which are context-specific. This study is intended to address this gap. The study is essential as it will provide an understanding of the components of CM that have significant impacts on construction project performance and guide construction professionals on an important aspect of managing changes in their projects.

Specifically, this study is set to answer the following research questions:

Q1 - What is the extent of the application of CM system/activities on construction projects in Bauchi State, Nigeria?

Q2 - What are the components of CM that have a significant influence on construction project performance in the study area?
Q3 - What are the impacts of CM practices on time, cost, quality, end users' satisfaction, and overall construction project performance in the study area?

2.0 CHANGE MANAGEMENT APPROACHES

Anyieni et al. (2013) state that CM means planning, initiating, realising, controlling, and stabilising change processes on both corporate and personal levels. Thus, formalised CM system should be used to resolve changes in projects; otherwise, it may lead to disputes among stakeholders or even failure of the project (Senaratine and Sextone, 2011).

Previous studies have proposed guidelines, models and principles for effective CM of projects. Early studies include Lewin (1951) that developed a three-step model for effective change management (planned approach to change): unfreezing current behaviour, moving to the new behaviour, and refreezing the new behaviour.

Unfreezing means that old ideas and practices need to be cast aside so that new ideas can be learned. This means getting rid of old ideas/ practices and accepting new ideas challenges.

Refreezing means that what has been learned is integrated into actual practice. Moving to the new behaviour (changing) is how new ideas and practices are learnt. Kotter (1995) developed an eight-step model for change management; these are: establishing a sense of urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision, empowering employees for broad-based action, generating short-term wins, consolidating gains and producing more change, and anchoring new approaches in the culture.

ADKAR (Awareness, Desire, Knowledge, Ability and Reinforcement)' is a practically oriented model of change, consisting of five consecutive steps (Teczke et al., 2017):

- Awareness of the need for change. The reasons for the change are described at this stage.
- Desire and willingness to change. At this stage, a decision is made to support these or other changes, which are achieved only if understood as necessary.
- Knowledge of how to change. At this stage, knowledge is formed about how exactly it is necessary and should be changed, and it also contains the knowledge and skills necessary for changes.
- Ability to implement change. The stage involves the demonstration of the applicability and attractiveness of changes and the identification of barriers that may prevent change.
- Reinforcement to support the change once it has been made. Here, special attention is paid to efforts to support change. Their stabilisation and adoption are achieved through feedback, reward, performance evaluation and corrective action.

Hayes (2014) presented a model of a CM that comprises of seven steps; recognising the need for change and starting the change process, diagnosing what needs to be changed and formulating a vision of a preferred future state, planning how to intervene to achieve the desired change, implementing plans and reviewing progress, sustaining the change, leading and managing the people issues, and learning.

The Construction Industry Institute (CII) established Project CM Research Team. The research team proposed five principles of effective CM: promote a balanced change culture, recognise change, evaluate change, implement change and continuously improve from lessons learned (CII, 1994).

Nadler (1997) has developed a management framework of twelve action steps which is helpful for managers and executives to apply at every level of hierarchy during the change process.

Moreover, Sun et al. (2006) developed a CM toolkit, which provides a standard framework and tool support for CM in construction projects. This includes a change dependency framework, a change prediction tool, a workflow tool, and a knowledge management guide. CIRIA (2001) published a best practice guide that proposes best practice guidelines for the effective management of change on projects. These include anticipate change, recognise change, evaluate change, resolve change and learn from change.

Motawa (2005) developed a generic CM process model that consists of four stages, namely, pre-change, identification and evaluation, approval, and implementation and review. At the pre-change stage, activities and requirements that are important for effective CM are defined. These consist of the role and responsibility of the team and the process and procedure for the change management. At the identification stage, the team will identify as early as possible the potential change that may likely occur in the project and subsequently evaluate their impact on the project.

The approval and implementation stage defines the process of approving and implementing the chosen changes. Next, the approved changes need to be communicated to all team members whose work will be affected for implementation. The fourth stage is the review stage, where the changes made will be reviewed by the project team, and the lesson learned will be archived for future experience.

2.1 Theoretical framework

Based on the previous studies on CM presented above, this study synthesises these ideas and found that CMS can be grouped into five steps processes, namely promote a balanced change culture, recognise change, evaluate change, implement change and continuously improve from lessons learned as suggested by CII (1994). Thus, the five principles of effective CM proposed by CII (1994) form the basis of this study. Furthermore, it has been reported that implementing effective CM in a project can result in cost and time savings, quality improvement as well as end users' satisfaction (Senaratine and Sextone, 2011, Liu et al., 2014, Hwang and Low, 2012). This means implementation of effective CM can lead to improved project performance. However, one of the limitations of the CM framework proposed by CII (1994) is that it failed to link the components of the CM with project performance. Thus, this study is set to address this gap as explained in the conceptual framework in Section 2.2.

2.2 Conceptual framework for the impact of change management on construction projects performance

Figure 1 presents a conceptual framework for the impacts of CM on construction Projects performance in Nigeria. The framework is based on the principles of effective CM proposed by the CII research team because of its wide support in the literature and the notion that effective CM improves project performance. The framework is divided into two parts, the five principles of effective CM are the independent variables and construction project performance is the dependent variable. The line drawn from each of the principles of CM pointing to the project performance indicates a direct positive relationship between them.

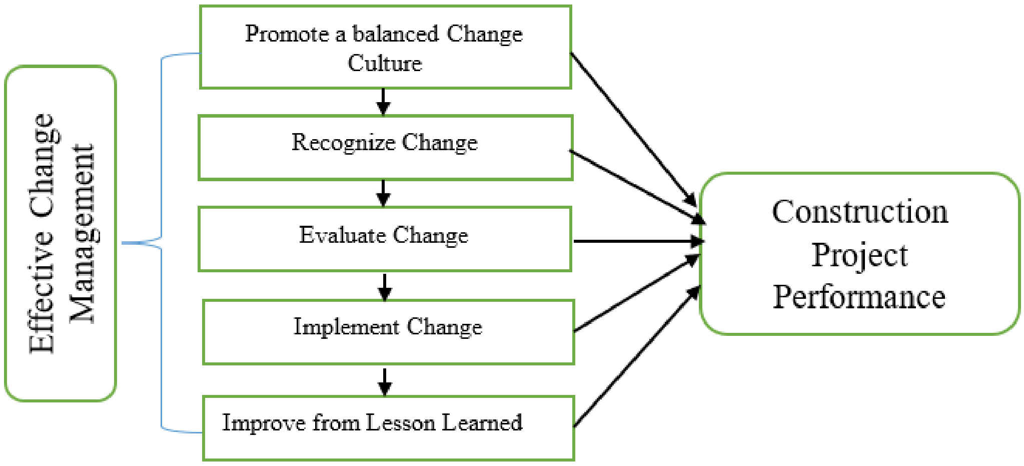

Figure 1: Conceptual Framework for the Impact of CM on Construction Projects Performance in Nigeria.

2.3 Description of the constructs

The five constructs presented in Fig. 1 have been described as follows (CII, 1994):

i) Promote a Balanced Change Culture

The first principle for effective CM is to promote a balanced change culture. At the startup of a project, a strategy should be adopted that will encourage beneficial change and discourage detrimental change so that the change will benefit the project end-users.

ii) Recognise Change

The second principle for effective CM is to recognise the change. To identify and document potential change at the earliest possible time and provide effective means of communication among the team members. The team members should understand the total number and impact of changes on the project.

iii) Evaluate Change

The third principle for effective CM is to evaluate change. Evaluate the change to determine its impact on the project objective and decide the appropriate measures to be taken. Once a necessary change is identified it impact should be evaluated and implemented immediately.

iv) Implement Change

The fourth principle for effective CM is to implement change. Following the evaluation and approval of the identified change, the team members should implement the change at an appropriate point during the project implementation. This involves monitoring and documenting the process of implementing the change.

v) Continuously Improve from Lessons Learned

The fifth principle of effective CM is to improve from lessons learned continuously. Parties to a project should take advantage of the lesson learned from the project at hand to improve future projects. This means the parties should discuss the root causes of changes and suggest possible ways for improvement. These should be documented to improve future projects.

2.4 Construction project performance

Project performance can be measured and assessed using several performance indicators. The common indicators used are time, cost and quality, known as the iron triangle (Sibiya, 2015; Mostafavi, 2017).). Other indicators such as the absence of conflicts, safety, and end users' satisfaction are also employed to measure the project performance (Toor and Ogunlana, 2010; Sibiya, 2015). However, Pinto and Slevin (1987) argued that a project is said to be successful if it is completed on time, within budget, to set a quality standard, achieves all project goals, and end-users are satisfied with the project. Therefore, this study employs four criteria to measure construction project performance: cost, time, quality, and end users' satisfaction because the literature mentioned these criteria as performance measures.

3.0 METHODOLOGY

The research was carried out in Bauchi state, North-East Nigeria. This study area was chosen because of the high concentration of construction activities in the state. The study opted for an explanatory research design to explain the impacts of CM on construction project performance. A questionnaire survey was employed as a method of data collection. According to Sekaran and Bougie (2009) questionnaire is widely used by researchers as a means of data collection because it can collect data fairly and easily. This data collection method was used by similar studies (Hwang and Low 2012; Musa et al., 2017). Initially, an intensive literature review was carried out to identify activities involved in the CM process. The principles of effective CM proposed by the CII (1994) research team have been adopted for this study because of their wide support in the literature. The Nineteen CM activities presented in Table 2 were also derived from CII (1994).

The list of the CM activities was presented to six experts (construction professionals) with at least 15 years of working experience in relevant fields for validation. Subsequently, after effecting all the observations made by the experts, the variables (the list of CM activities) were used to develop the preliminary questionnaire for the study.

The questionnaire was adapted from CII (1994) and consisted of sections A, B, and C using closed-ended questions. Section A asked for the respondents' demographic data, including the respondents' highest academic qualification, professional affiliation, and years of experience in the construction industry. Section B and C cover information related to practices of CM at the project level (At a project level, change may be defined as any addition, deletion, or modification of original project scope, time, cost and quality).

Section B elicited information from the respondents on the extent to which they applied the CM system at the project level in their previous projects using a five-point Likert Scale; where 1 represents very low, 2= low, 3= moderate, 4= *and 5= very high.* Finally, section C collected information from respondents on the performance of their recently completed projects with respect to time/schedule, cost/budget, quality and client/ end user's satisfaction in which CM has been applied. The five-point Likert Scale was used in similar studies (Hwang and Low 2012; Mbabazi et al., 2016).

The target population for this study was experienced construction professionals (architects, quantity surveyors, and building technologist/ builders) that were domiciled in the study area. The total population was found to be 213, as obtained from respondents' professional bodies. (Nigerian Institute of Architects, Nigerian Institute of Quantity Surveyors,, Nigeria institute of Builders). They were chosen as the study population because they are the core building procurement professionals who are mostly engaged in the administration of CM.

The appropriate sample size for this study was 140 using Krejcie and Morgan, (1970) Table. However, 190 questionnaires were administered to the respondents to take care of the non-return ones. Because there is no sampling frame for construction professionals that implement formalised CM in their project, the study adopted the purposive sampling technique in selecting the sample; this enabled the researchers to access the available respondents that implement CM in their projects (that met specified requirements). (Saunders, Lewis & Thornhill, 2012).

The data collected were screened to address the issues of normality, missing data, and outliers, as suggested by Hair et al. (2009). Subsequently. The data were analysed using factor analysis and multiple regression analysis. Unit of analysis was CM activities at a project level. The factor analysis was carried out on the nineteen CMS activities in order to reduce the variables into a smaller set of factors/ components based on the interrelationship among the variables (Pallant, 2013).

Hair et al. (2009) and Cohen et al. (2003) suggest that multiple regression analysis can be used to assess the impact of independent variables in predicting dependent variables. Thus, in this study, multiple regression analysis was employed to determine the impact of CMS on construction project performance. The project performance criteria (time, cost, quality and end satisfaction) were used as dependent variables, and the seven factors were independent variables using the SPSS program. The regression method in SPSS was employed to calculate seven-factor scores for each respondent. These factor scores formed the data set for the multiple regression analysis. Internal consistency of the responses was measured using the Cronbach Alpha reliability test. The Cronbach Alpha value was found to be 0.76, which according to Pallant (2013), is satisfactory.

4.0 RESULTS AND DISCUSSIONS

Out of the 190 questionnaires distributed, 147 were returned completed; these represent a 77% response rate. Table 1 presents a summary of the background information of the respondents. The table indicates that, in terms of academic qualifications, 87% of the respondents possessed at least a Bachelor degree and about 50% acquired a postgraduate degree. Furthermore, in terms of working experience, about 70% have more than six years of working experience, while 30% of the respondents have more than ten years of working experience in the construction industry. Therefore, these results show that the respondents have adequate knowledge and experience to provide reliable information.

Table 1: Summary of Background Information of Respondents

Category	Classification	Frequency	Percentage
Academic qualification	ND	19	12.9
	Bsc/B.Tech	66	44.9
	M.Sc/M.Tech	55	37..4
	PhD.	7	4.8
	Total	147	100
Professional affiliation	Architect	38	25.9
	Quantity surveyors	78	53.1
	Builders	31	21.0
	Total	147	100
Years of experience (in years)	0-5	43	29.3
	6-10	60	40.8
	11-15	30	20.4
	16-20	13	8.8
	Above 20	1	0.7
	Total	147	100

4.1 Extent of application of change management system/activities on construction projects in Bauchi, Nigeria

The results in Table 2 presents the extent of application of various CM activities in construction projects by the respondents. The results show that, out of the nineteen (19) CM activities, six were moderately applied (mean score (3.08-3.38). These are; project goal was communicated to all the project team, beneficial changes were promoted, approved change had been communicated to all affected parties, the change was immediately implemented, the implementation of changes was monitored, and the changes were categorised into required and elective changes. All the remaining CM activities were either applied low (mean score

2.01-2.65) or very low (mean score 1.36-1.94). Thus, on average, there was a low application of CMS in the study area (average mean score 2.48). This result is of concern, as a low application of the activities means changes in projects are not properly managed, which may lead to cost and time overrun. This finding is supported by previous studies (Musa et al., 2017; Hwang and Low, 2012).

Table 2: Extent of Application of Change Management System in Construction Projects

Change management Activities	Mean Score	Rank
The project goal was communicated to all the project team	3.38	1
Beneficial changes were promoted	3.27	2
An approved change had been communicated to all affected parties	3.24	3
The change was immediately implemented	3.19	4
The implementation of changes was monitored	3.09	5
The changes were categorised into required and elective changes	3.08	6
A funding source for the change was determined	2.65	7
The detrimental change was discouraged	2.58	8
Responsibility for approval of changes was established	2.35	9
Corrective measures on the project were implemented	2.32	10
Risk areas where change may likely occur were identified	2.26	11
Potential changes were documented	2.25	12
Previous projects were referred for early recognition of problems	2.22	13
Root cause evaluation of change was performed	2.2	14
The time frame for change decision was determined (immediate or not)	2.09	15
Project feasibility with proposed change was re-evaluated	2.01	16
The Basis for change was identified	1.94	17
An analysis to determine the impact of change in the project performance was conducted	1.89	18
Lessons learned throughout the project lifecycle were prepared	1.36	19
Average	2.48	

4.2 Components of a change management system

Principal factors extraction with Varimax rotation was performed through the SPSS FACTORS program on the 19 activities of CM processes for a sample of 147 responses, as shown in Table 3. The results show that the activities were grouped into seven principal components/factors with eigenvalues greater than 1.000, explaining 67% of the variance as shown in Table 3. The remaining factors together accounted for 33% of the variance.

The factor grouping presented in Table 3 indicates that each variable of the seven factors belongs to only one of the factors, with the loading on each factor greater than 0.5. Thus, in general, the loadings were adequate. However, three variables (approved change had been communicated to all affected parties, responsibility for approval of changes was established, and time frame for change decision was determined) do not belong to any of the seven-factor groupings because the components/factors they belong to, have eigenvalues less than 1.000, thus were excluded from the analysis as suggested by Hair et al. (2009).

The Bartlett's Test of Sphericity was significant at $p<0.001$, which indicated that all correlations were significantly different from zero. The value of the Kaiser-Meyer-Olkin (KMO) statistic is 0.832, which according to Kaiser (Norusis, 1992), is satisfactory for factor analysis. Table 3 also presents the factor structure for principal factors extraction and varimax rotation, which shows the factor loadings, eigenvalues, percentage of variance explained and cumulative percentage of variance.

Table 3: Factor Structure for Principal Factors Extraction and Varimax Rotation on CM

NO	Item	Factor Loading	Initial Eigenvalues: Total	Percentage of variance explained	Cumulative percentage of variance explained
a)	*Factor 1: Recognising potential change*				
1	Potential changes were documented	0.865			
2	The project goal was communicated to all project team	0.821			
3	An analysis to determine the impact of change in the project performance was conducted	0.548	3.27	17.213	17.213
b)	*Factor 2: Evaluate the feasibility of the project with change*				
4	Project feasibility with proposed change was re-evaluated	0.798			
5	Basics for change was identified	0.723			
6	Previous change was referred to for early recognition of problems	0.713	2.238	11.778	29.011
c)	*Factor 3: Improving from lesson learned*				
7	Corrective measures were implemented	0.940			
8	Root cause evaluation of change was performed	0.932	2.075	10.921	39.932
d)	*Factor 4: Promoting beneficial changes*				
9	The beneficial change was promoted	0.716			
10	The change was immediately implemented	0.615			
11	The implementation of change was monitored	0.519	1.534	8.075	48.007
e)	*Factor 5: Sustaining the change*				
12	Change was divided into elective and required change	0.712			
13	Funding source of the change was determined	0.678	1.426	7.505	55.511
f)	*Factor 6: Discouraging detrimental change*				
14	The detrimental change was discouraged	0.777			
15	Lessons learned throughout the project were prepared	0.701	1.185	6.237	61.749
g)	*Factor 7: Identifying risk areas*				
16	Risk areas where change may likely occur were identified	0.814	1.03	5.421	67.17

The meanings of the factors were interpreted based on their measure variables and factor loadings as follows:

Factor 1: Recognising Potential Changes

This factor consists of 3 items, potential changes were documented, the project goal was communicated to all project teams, and an analysis to determine the impact of change in the project performance was conducted. This factor contains the highest percentage variance of 17.21%. Recognition of changes by project team members as early as possible and analysing their impacts on the project objectives can help manage the changes effectively. The finding is consistent with previous studies (CII 1994; Hayes, 2014).

Factor 2: Evaluating feasibility of the project with a proposed change

This factor contains three variables, project feasibility with proposed change was re-evaluated, the basis for the change was identified, and previous change was referred to for early recognition of problems—the factor account for 11.78% variance. Evaluating feasibility of the project with the proposed change will help decide whether to implement the changes or not. This is supported by CII (1994) and Teczke et al. (2017).

Factor 3: Improving from lesson learned

This factor consists of two variables; corrective measures on the project were implemented, and Root cause evaluation of change was performed—the factor account for 10.92% variance. Evaluating root causes of changes and reviewing lessons learned by the project team will help in improving future projects. The finding is in agreement with previous studies (Lewin, 1951; Motawa, 2005).

Factor 4: Promoting Beneficial changes

There are three variables in this factor. The beneficial change was promoted, the change was immediately implemented, and the implementation of change was monitored—the factor accounted for an 8.08% variance. Promoting beneficial changes that will add value to the project or reduce cost and schedule will facilitate the achievement of project goals and consequently benefit the project end-users. This is in agreement with CII (1994).

Factor 5: Sustaining beneficial change

This factor consists of two variables; the change was divided into elective and required change, and the funding source was determined—the factor accounts for 7.51% variance. Therefore, identifying means of implementing and sustaining desired changes are essentials to ineffective CM (Hayes, 2014).

Factor 6: Discouraging detrimental change

This factor also has two variables and account for a 6.24% variance. The variables are detrimental change discouraged, and lessons learned throughout the project were prepared. Detrimental changes can affect the project objective negatively (CII, 1994); thus, it should be discouraged.

Factor 7: Identifying risk areas

The last factor consists of only one variable, namely risk areas where change may likely occur were identified. Thus, the factor explained 5.42% of the variance. Identifying risk areas where change may likely occur will help in taking appropriate measures on time. These seven factors are essential areas of CM that all project teams should focus on. Although they may not cover all the areas of change management, they comprise important components of CMS.

4.3 Impact of CM practice on construction project performance

Multiple regression analysis was carried out to determine the impact of CM practice on the construction project performance. The project performance criteria (time, cost, quality and end satisfaction) were used as dependent variables, against the sixteen (16) CMS activities as the independent variables using the SPSS REGRESSION program. Sixteen-factor scores for each respondent were calculated using the regression method in SPSS. These factor scores formed the data set for the multiple regression analysis. Table 4 presents the results of the regression analysis.

Table 4: Summary of Impact of CMS on construction project performance

Model	R	R Square	Adjusted R Square	P
Time	0.817[a]	0.668	0.647	0.001
Cost	0.777[a]	0.603	0.578	0.001
Quality	0.449[a]	0.202	0.151	0.001
Satisfaction	0.613[a]	0.375	0.335	0.001
Overall	0.693[a]	0.480	0.447	0.001

The results in Table 4 show that for time performance, R2 = 0.67, P= 0.01, suggesting that CMS's impact on construction time performance is moderate and significant ($P<0.05$).

For cost performance of construction projects, the results show that $R^2 = 0.60$, P= 0.01, suggesting that CMS's impact on cost performance is also moderate and significant ($P<0.05$). This implied that despite the low practice of CM in the study area, it relatively reduced the time and cost overrun of construction projects. The results for the impact of CMS on the quality performance of construction projects show that $R^2 = 0.20$, P= 0.01, suggesting that the impact of CMS on quality performance is very low but significant ($P<0.05$). The result is surprising, but a possible reason for the low impact of CMS on quality performance is that most of the changes on the construction projects in the study area may not be related to change in the quality of the project; in addition, measuring quality may be difficult. The table also reveals that the impact of CMS on end users' satisfaction is low but significant ($R^2 = 0.38$, P= 0.01). Generally, low application of CMS will lead to low impact on end users' satisfaction.

Finally, the results indicate that the impact of CMS on the overall project performance is low but significant ($R^2= 0.48$, P= 0.01) and explained a 48% variance of construction project performance. This implied that CM practices by the respondents need to be improved; otherwise, the projects handled by them may suffer cost and time overrun. The results are in line with the findings of Hwang and Low (2012), who assert that overall project performance could be improved by practising CM.

5.0 CONCLUSION

Changes in construction projects are considered as inevitable. Previous studies on CM focused on developing models and guidelines rather than assessing its impact on projects performance. To adequately address the main aspects of CM, there is a need to assess its impacts on the project performance. The impact of CM on construction projects plays an important role in achieving project success. This study was conducted to determine the impacts of CM practices on construction project performance in Bauchi state, Nigeria.

Despite there is an agreement among researchers that implementation of project CM improve performance, it was found that projects in the study area do not realise the full benefits of CMS due to low implementation. Generally, projects in which effective CM has not been implemented will incur high change in costs and delays compared to those in which formal CMS has been applied. In addition, the low implementation of CMS in the study area indicates that the construction professionals in the area seem to be unfamiliar with CMS or rather unaware of the benefits of CM practices.

Moreover, the results also indicated that the overall impact of CM practices on construction project performance in the study area was low, with an R^2 value of 0.48, suggesting that CMS explained a 48% variance of the overall construction project performance. Although the impact of CM on overall project performance was found to be positive and significant, it varies among the performance criteria. The impacts on time and cost performance are high than on quality and end users' satisfaction.

The study identified 19 CM activities for effective CM practice in construction projects. Factor analysis was carried out on the 19 CM activities; the results produced seven principal components that defined the underlying structure of the variables. The components were interpreted based on their factor loadings as follows: identifying risk areas where changes may likely occur, recognising potential changes, evaluating the feasibility of the project with a proposed change, promoting beneficial changes, sustaining beneficial change, discouraging detrimental change and improving from lesson learned. These components should be understood and applied by construction professionals during project implementation.

In terms of practical application, the seven components provide a framework for effective CMS that can be used by construction professionals in managing changes in their projects. This will assist in reducing the effects of detrimental changes in construction projects. In addition, the application of these components in project implementation can result in cost and time savings and quality improvement.

Generally, the CM activities identified in this study can help project managers and team members improve construction project management practices, leading to project success. However, to improve the practice of CM among construction professionals in Nigeria, there is a need to organise regular workshops and conferences to train professionals on ways of effective implementation of CMS in construction projects. In addition, to equip potential construction professionals with the knowledge of effective CMS, academic institutions such as Universities and Polytechnics should incorporate CMS in their undergraduate and postgraduate curriculum. Finally, further studies should be conducted to identify the impact of CM at each phase of the project life cycle.

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