



**3<sup>rd</sup>**

**INTERNATIONAL CONFERENCE  
ON THE ENVIRONMENT**

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**BOOK OF ABSTRACTS**

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**THEME:**

**CHALLENGES OF THE AFRICAN BUILT ENVIRONMENT:  
A SEARCH FOR SUSTAINABLE SOLUTION**

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CHUKWUEMEKA ODUMEGWU OJUKWU UNIVERSITY,  
ULI CAMPUS

**DATE:** 20-22 NOVEMBER 2019.



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## A BRIEF HISTORY OF THE UNIVERSITY

The Chukwuemeka Odumegwu Ojukwu University (formerly Anambra State University) was established to play the leading role in the intellectual, technological and social advancement of Anambra State. It was envisaged to be an internationally acclaimed center of excellence for scientific and technological innovation which would provide suitable manpower to address local, national and global challenges appropriately.

This University started in 2000 as Anambra State University of Science and Technology. The University has the main campus at Uli in the former site of Ekwenugo Okeke Polytechnic and the second campus at Igbariam in the former site of the College of Agriculture. The University became a conventional University in 2006 and the name was then changed to Anambra State University. The law was changed in 2014 to effect the name change to Chukwuemeka Odumegwu Ojukwu University. The new name was in recognition of the memory of the late Odumegwu Ojukwu and his contributions to the struggle for the wellbeing of the Anambra people.

The current structure of the University reflects the geographical diversity of Anambra State. The Uli Campus in Anambra South has the Faculties of Basic Medical Sciences, Engineering, Environmental Sciences, Natural Sciences, Physical Sciences and Education. The Igbariam Campus in Anambra North has the faculties of Agriculture, Arts, Social Sciences, Law, Pharmacy and Management Sciences while the Faculty of Medicine has facilities at the University Teaching Hospital, Amaku-Awka in Anambra Central. There are therefore 13 Faculties which host 55 academic Departments in the University. The University has a vibrant student organization.

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## **19FES16 – INFLUENCE OF COST CONTROL PRACTICES ON THE PERFORMANCE OF BUILDING PROJECTS IN ABUJA-FCT, NIGERIA**

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The Nigerian Construction Industry (NCI) is facing numerous cost-related challenges that have driven building project costs up by 61.84%. Such challenges include increasing complexity of buildings and the specialist skills required for building design, construction, operation and maintenance. Entirely new problems are thus created for Project Cost Control (PCC), compounded by the use of old tools to manage project cost. There is need for cost control methods that will assist project team members in identifying objectives, choosing cost control priorities and setting up a feedback system. This situation necessitates an evaluation of existing PCC practices in order to establish the level of application of best practices in the construction process. The aim of this study is to assess the influence of cost control practices on the performance of building projects as a means of recommending improvements in the cost control process on construction sites. This research will be limited to the Federal Capital Territory Abuja, which as the capital city of Nigeria, has numerous on-going construction activities. Results of literature review have shown that the quantitative paradigm (which has a positivist epistemological leaning) has been applied most frequently as the research paradigm that can assist in providing answers to the research questions on PCC. The sample for this study will be drawn from Contractors QS, Consultants QS and other QSs such as those working with directly Clients. The data realized will be analysed in relation to the research objectives using Mean Item, Relative Importance Index and Pearson correlation; the result of such analysis will be presented using tables and charts.

**Keywords:** Building construction, design, performance, project cost control

**19FES31 – INFLUENCE OF COST CONTROL PRACTICES ON THE PERFORMANCE OF BUILDING PROJECTS IN ABUJA-FCT, NIGERIA**

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**Keywords:** *Building, design, construction, project cost control, tools*

# INFLUENCE OF COST CONTROL PRACTICES ON THE PERFORMANCE OF BUILDING PROJECTS IN ABUJA-FCT, NIGERIA

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## ABSTRACT

*The Nigerian Construction Industry (NCI) is facing numerous cost-related challenges that have driven building project costs up by 61.84%. Such challenges include increasing complexity of buildings and the specialist skills required for building design, construction, operation and maintenance. Entirely new problems are thus created for Project Cost Control (PCC), compounded by the use of old tools to manage project cost. There is need for cost control methods that will assist project team members in identifying objectives, choosing cost control priorities and setting up a feedback system. The aim of this study is to assess the influence of cost control practices on the performance of building projects as a means of recommending improvements in the cost control process on construction sites. This research will be limited to the Federal Capital Territory Abuja, which as the capital city of Nigeria, has numerous on-going construction activities. Results of literature review have shown that the quantitative paradigm (which has a positivist epistemological leaning) has been applied most frequently as the research paradigm that can assist in providing answers to the research questions on PCC. This research has found that Cost estimating/budgeting and Budget Monitoring are the most frequently applied PCC practices. Conversely, construction professionals shied away from the use of S-curve for cost/time monitoring. Only 40% of the sample always conducted variance analysis, while 20% admitted to never checking deviations from budget through variance analysis. These results reveal that more work still needs to be done in the area of use of tools for PCC.*

**Key words:** Building, design, construction, project cost control, tools

## INTRODUCTION

The Nigerian construction industry is faced with numerous problems that are cost related. While building projects are becoming increasingly complex owing to the many specialist skills associated with their design, cost managers are still using old tools to manage project cost. Adjei *et al.* (2017) identified eleven challenges of project cost control grouped under (i) managers' personal characteristics, (ii) knowledge of cost control process and (iii) technology used in the practice of cost control. Over time clients have found that contract sums are exceeded by up to 61.84% (Nigerian Institute of Quantity Surveyors (NIQS), 1987). This

phenomenon has been attributed to improper estimating of project budget and time, leading Manlian and Lumbantoruan (2019) to suggest that project owners do proper calculation of cost budgets and project durations during project planning.

Although costing is not new in the construction industry, the type of costing usually employed only gives the total value of the project after it has been completed. It is obviously a distinct advantage if a client can ascertain which section of the project is in deficit while construction is ongoing. To this end, cost control methods need to assist the project team members in identifying objectives, choosing cost control priorities and setting up a feedback system. Cooray *et al.* (2018) identified project cost value reconciliation and cost forecasting as effective cost control techniques. It is necessary to evaluate existing practices to establish best practices which enhance the relationship between project objectives and cost control systems. The aim of this study is to assess the influence of cost control practices on the performance of building projects as a means of recommending improvements in the cost control process on construction sites. The specific objectives of the study includes (i) identifying cost control practices applied on building project sites, and (ii) determining the level of implementation of cost control practices. The data for this study was obtained from a very small pilot survey of construction professionals.

This research will be carried out in the Federal Capital Territory Abuja, which is the capital city of Nigeria, with an estimated population of 5 million (Federal Capital Territory Administration, 2014). Abuja hosts many on-going construction activities, and it is expected that majority of the construction firms there are aware of project cost control practices. The geographical location of Abuja in Nigeria is shown in Fig 1.



Fig. 1: Nigeria map showing location of Abuja highlighted

## **THEORETICAL/CONCEPTUAL FRAMEWORK**

The construction industry of countries all over the world is an important component of the national economy. In Lesotho for example, as in most developing countries, the construction industry is the 5<sup>th</sup> largest contributor to the country's gross domestic product. However, the performance of the construction industry in these countries is mostly below expectations because of uncontrolled cost. The aim of project cost control is usually to ensure that projects finish on time, and within budget (Olawale and Sun, 2012). The control of project cost is crucial to the economic growth of the construction industry; this makes it vital for contractors to effectively monitor post-contract cost control procedures (Sanni and Hashim, 2013). In addition, given the fact that every activity in construction has a cost implication for profits, strict control is necessary.

Cost control is a process which manages the construction cost of a project using methods and techniques to ensure that contractors do not lose money on projects (Otim *et al.*, 2011). Contractors in the construction industry of developing countries usually lack an effective costing checking and monitoring system that can spot potential problems in time for corrective action to be taken. Yanfang (2012) contends that there is great potential for cost savings in a construction project, since up to 70 percent is usually spent on material acquisition and fixing. However a study by Chan and Park (2005) found that most contractors lack financial management experience. A further drawback to the control of construction cost is changes to project design. Olawale and Sun (2010) see this as the top project cost and time control issue. Furthermore in public sector projects, the bureaucracy embedded in the approval process hampers cost control efforts (Ali and Kamaruzzaman, 2010).

The purpose of cost control is to optimize the use of resources over the entire project life cycle, thereby providing maximum benefit to all project stakeholders. As a result of political and economic uncertainty, clients tend to insist on projects being designed and executed to give maximum value for money in the shortest possible time. This necessitates employment of cost estimators/quantity surveyors as early as possible during the design stage in order to advise the design team of the probable cost implications of their design decisions. As projects become more complex, clients more demanding and statutory requirements more wide-ranging, it is imperative that appropriate cost control tools are developed, refined and applied. Present day realities such as falling oil prices, rising commodity prices, restrictions on use of capital, as well as global politico-economic crisis have forced project teams to accept cost as *the* crucial element in design from the very beginning of a project.

## **The Practice of Project Cost Control**

Target costing is more common than life-cycle costing in the Nigerian construction industry (Sanni and Durodola, 2012). Over-reliance on the use of conventional costing techniques may be responsible for cost overruns and project delays experienced in many construction projects in Nigeria. This situation exists because most Nigerian local construction firms are small in size and are challenged by project delivery problems such as cost overruns, delays, disputes and litigation, poor management structure and low client satisfaction. Such firms have access to fewer resources while competing with multinational construction firms who have a greater array of resources available to them (Odediran *et al.*, 2012).

The practice of project cost control has evolved with time; cost management strategies have been developed to assist contractors in recording financial transactions, indicating level of progress achieved and identifying problems associated with projects (Hendrickson and Au, 2000). Contractors' strategies, tools and techniques for managing cost include but are not limited to the following. Cost-value reconciliation, earned value analysis, variance analysis (Potts, 2008; Staley and Jones, 2007; Olawale and Sun, 2010), cash flow forecasting (Sanni and Hashim, 2013; Potts, 2008; Staley and Jones, 2007), the plan and schedule, combination estimate and schedule (Staley and Jones, 2007), project status report, profit and loss at valuation dates or overall (Olawale and Sun, 2010) and monthly cost reports (Hendrickson and Au, 2000).

Cost control software such as Microsoft Project (Staley and Jones, 2007; Olawale and Sun, 2010) and Asta Power Project, Project Costing System (PCS), Construction Industry Software (COINS), WinQS, Microsoft Excel, and other bespoke systems are also employed in project cost control. The importance of formal control systems is not in doubt; however effective on-going daily control is important and informal activities are a vital part of this (Stretton, 2009). Contractors may employ these tools singly or in combination. However, apart from earned value, the other cost control techniques do not provide real time reporting.

The actual application of project cost control (PCC) strategies by contractors in Zimbabwe has been summarized by Chigara *et al.* (2013). The proportion of contractors that employed cost reports was (31.8%); cost estimating and budgeting (36.4%), variance analysis (54.5%); resources management (59.1%), cost value reconciliation (CVR) (31.8%) and cash flow analysis and work programmes (18.2%) and project meetings (13.6%). There is a nascent trend to automate cost control systems through the use of software such as Microsoft Project,

Microsoft Excel and other in-house systems. However paper-based use of simple software poses challenges where real-time reporting is required.

There is very little difference amongst developing countries such as Zimbabwe, Uganda and Nigeria in relation to the PCC tools most commonly employed. In Uganda PCC tools include work programmes, reports, project budget and inspection of works, among others, (Otim *et al.*, 2011.). In Nigeria, (Sanni and Durodola, 2012) noted that project budget was the most frequently used tool followed by monitoring of labour and material cost respectively.

### **Related Works on Cost Control Practices in Construction Projects**

This section brings together recent research works that are related to the application of cost control practices on construction projects in construction management literature. The main findings of each study are summarized and presented along with some selected demographic details. Such details include the location where the study was carried out. The works are arranged according to year, in descending order, starting from the most recent study.

**Table 1: Summary of research findings in project cost control**

| <b>Source</b>  | <b>Study area</b> | <b>Research focus</b>   | <b>Summary of findings</b>   |
|--|-------------------|---|--|
| Manlian & Hendra (2019)  | Malaysia          | Indicator of cost budgeting cost control and analysis of project cost management with EVA method. | Research advises project owners to properly calculate cost budget and project duration. of in accordance with planning. An evaluation is needed when problems arise over availability of equipments, materials and manpower. |
| Annor-Asubonteng, Tengan, Asigri & Kuebutornye (2018)                  | Ghana             | Important factors influencing cost management practices among indigenous construction firms.      | Indigenous firms are encouraged to manage disagreement between project team members through frequent project implementation meetings.  |
| Salem, Bakr and Sayad (2018)   | Egypt             | Sustainable residential buildings can be profitable by using ‘Life Cycle Method Approach’.        | Capital requirements of sustainable housing projects could be the same as or lower than for traditional buildings.   |
| Kang, Jin, Hyun & Park (2018)  | Cambodia          | Perceptions of important CM functions for the Cambodian construction industry.                    | Safety management is the most important CM function. Developing countries can prioritize CM functions to develop training programs, laws, and regulations.   |
| Cooray, Somathilake, Wickramasinghe, Dissanayake, & Dissanayake (2018) | Sri Lanka         | Impact of cost control methods related to project delivery.                                       | Project cost value reconciliation and the forecasting are the tools with most significant impact on project delivery process.  |

| Source  | Study area | Research focus   | Summary of findings   |
|---|------------|--|---|
| Li (2018)   | China      | Current situation of construction projects cost management.  | Identifying a firm's cost management characteristics and finding a cost management model suitable for its characteristics are important for every construction company.   |
| Fagbenle, Joshua, Afolabi, Ojelabi, Fagbenle, Fagbenle & Akomolafe (2018) | Nigeria    | Factors affecting cost management practice of construction firms.  | Prevailing factors affecting construction cost management practice are poor leadership, inappropriate management, inefficient resources deployment, excessive wastage of materials, complex payment mechanisms, theft of materials and variation during construction works. |
| Adjei, Aigbavboa & Thwala (2017)  |            | Current challenges of project cost control practice.   | 11 challenges grouped under managers' personal characteristics, knowledge of cost control process and technology for cost control.  |
| Abobakr (2017)  |            | General cost management and control practices in pre-contract and post-contract stages.  | cost control and management systems should allow detection of additional expenditure as early as possible so that appropriate actions can identified in a shorter time period.  |
| Ernest, Theophilus & Edward (2017)  | Ghana      | Extent of application of cost planning practices.  | Knowledge of cost planning practices is appreciable but its application is egregious.   |
| Radhakrishnan & Selvan (2017)   | India      | Project cost management practices adopted by contractors.  | There is a significant difference between Socio-Economic status of building contractors and Cost Management Techniques adopted in their business.   |
| Harb (2016)   |            | Cost estimating techniques, reaction to risks and uncertainties, cost control techniques, Building Information Modelling (BIM) technologies. | 50% of sample has cost and duration overruns. BIM technologies not used in estimating construction costs. Most respondents do not apply Earned Value Management (EVM) technique in cost control process.  |
| Smith (2016)  |            | Need for global professional standards in the project cost management field.   | Collaboration between the project cost management profession and their representative associations is the key for the global development of the profession.   |
| Lefa, Monyane & Emuze (2015)  | Lesotho    | Cost related problems and mitigation techniques in Lesotho   | There is a gap in construction cost control know-how and practice.  |
| Omotayo & Kulatunga (2015)  | Nigeria    | Post-contract cost control based on kaizen costing.  | Paper created a research framework that focused on research philosophical stands, approaches and strategy related to the research onion model.  |
| Okoye, Ngwu & Ugochukwu (2015)  | Nigeria    | Management challenges facing construction.   | Management of Time (Scheduling) (0.932), Quality (0.932), Cost (0.924), and Safety (0.922) were the top management challenges facing construction practice in Nigeria   |

| Source                              | Study area | Research focus  | Summary of findings   |
|-------------------------------------|------------|---|---|
| Keng & Adzman (2015)                | Malaysia   | Problems in the practices of cost control in construction projects.         | Design changes, labour shortage, inaccurate quantity-take off, lack of cost information, expertise, and knowledge are major problems of cost control practices. |
| Chigara, Moyo & Mudzengerere (2013) | Zimbabwe   | Cost management strategies employed by contractors on building projects.    | Majorly, contractors' efforts to manage projects costs are centered on management of project resources.   |
| Lalitha & Malkanthi (no date)       | Sri Lanka  | Significant factors causing time and cost overrun in construction projects. | Identified main causes of construction time and cost overruns. Grouped mitigating measures into Preventive, Predictive, Corrective and Organizational measures. |

### 3.0 MATERIALS AND METHODS

Bryman (2006) opined that of the three key paradigms in research; the qualitative, quantitative and mixed paradigms, only pragmatism positivism justifies the collective use of both qualitative and quantitative approaches in a single research. Although pragmatism positivism approach offers new dimensions in carrying out research by drawing on the inherent strengths of the two methods embedded in it (Adeneye & Oyewobi, 2016), evidence from literature (for example Fagbenle et al., 2018; Radhakrishnan and Selvan, 2017; Harb, 2016) suggests that for studies of an exploratory nature such as this, a quantitative positivist paradigm is sufficient.

Research population for this paper consists of built environment professionals in Abuja. Although emphasis was laid on quantity surveyors, other construction professionals were included in the survey. According to Bhatacherjee (2012), sampling frame is an accessible section of a target population (usually a list with contact information) from where a sample can be drawn. The pilot sample for the research reported in this paper was drawn randomly from construction professionals known to the researcher in Abuja. The data gathered was carefully analyzed using Mean Item score and Relative Importance Index; the results were presented using tables and charts.

### RESULTS AND DISCUSSION

The pilot sample from which data was collected for this paper was made up of an architect, an engineer, a builder and two quantity surveyors. Four of the sample had bachelor degrees while one respondent had a masters' degree. Eighty percent of the sample worked in the

public sector. All five of the respondents were male; forty percent had more than 25 years of experience in the construction industry. These results are presented in Table 2.

**Table 2: Results of demographic analysis**

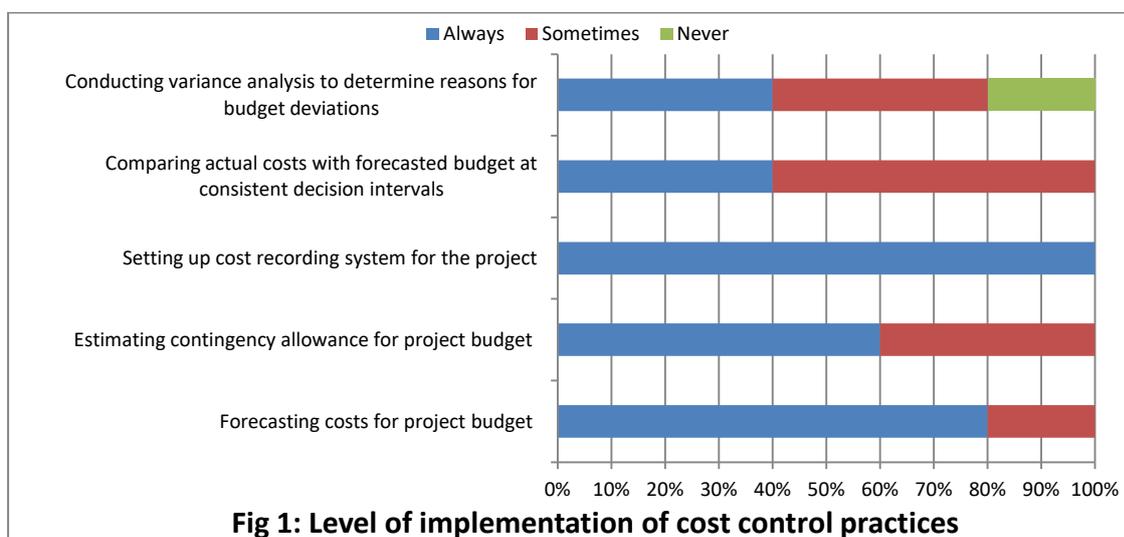
| Parameter                   | Frequency | %   | Parameter                               | Frequency | %   |
|-----------------------------|-----------|-----|---|-----------|-----|
| <b>Profession</b>           |           |     | <b>Employer</b>                         |           |     |
| Architect                   | 1         | 20  | Consulting firms                        | 0         | 0   |
| Builder                     | 1         | 20  | Contractor                              | 0         | 0   |
| Engineer                    | 1         | 20  | Client organization                     | 0         | 0   |
| Estate Surveyor             | 0         | 0   | Ministries, Department, Agencies (MDAs) | 4         | 80  |
| Quantity Surveyor           | 2         | 40  | Academic institutions                   | 0         | 0   |
| Town Planner                | 0         | 0   | Others                                  | 1         | 20  |
| Other (specify)             | 0         | 0   | Total                                   | 5         | 100 |
| Total                       | 5         | 100 |   |           |     |
| <b>Education</b>            |           |     | <b>Experience</b>                       |           |     |
|                             |           |     | Less than 5 yrs                         | 0         | 0   |
| OND/NCE                     | 0         | 0   | 5 yrs – 15 yrs                          | 3         | 60  |
| HND/B.Sc                    | 4         | 80  | 16 yrs – 25 yrs                         | 0         | 0   |
| M.Sc                        | 1         | 20  | More than 25 yrs                        | 2         | 40  |
| Ph.D                        | 0         | 0   | Total                                   | 5         | 100 |
| Other (specify)             | 0         | 0   |   |           |     |
| Total                       | 5         | 100 |   |           |     |
| <b>Gender</b>               |           |     | <b>Type of works handled</b>            |           |     |
| Female                      | 0         | 0   | Building                                | 3         | 60  |
| Male                        | 5         | 100 | Civil engineering                       | 1         | 20  |
| Total                       | 5         | 100 | Building and Civil engineering          | 1         | 20  |
|                             |           |     | Others                                  | 0         | 0   |
| <b>Size of organisation</b> |           |     | Total                                   | 5         | 100 |
| Less than 50                | 1         | 20  |   |           |     |
| 50 - 250                    | 0         | 0   |   |           |     |
| More than 250               | 4         | 80  |   |           |     |
| Total                       | 5         | 100 |   |           |     |

Five cost control practices were ranked as being the most frequently applied in construction projects. These were Cost estimating and budgeting (Mean Score (MS) = 4.60, ranked 1<sup>st</sup>); Budget Monitoring (MS = 4.40, ranked 2<sup>nd</sup>); Cost Forecasting techniques, Cost Reports and Cost Value Reconciliation (CVR) (all with MS = 4.20, ranked 3<sup>rd</sup>). However, the three least applied practices were Cash-flow analysis and work programmes, Monte Carlo simulation of project costs and Use of S-curve for cost/time monitoring. These practices had Means Scores of 3.80, 3.80 and 3.40 respectively (see Table 3). These findings agree with the assertion by Chigara et al. (2013) and Fagbenle et al. (2018) that managers prefer to use simpler tools that they have greater familiarity with, rather than more complex tools that may however give better and more accurate results.

**Table 3: Application of cost control practices**

| ID   | Cost control practices                          | Mean Score | SD   | RII  | Rank |
|------|---|------------|------|------|------|
| 2.1  | Budget Monitoring                               | 4.40       | 0.55 | 0.88 | 2    |
| 2.2  | Cash-flow analysis and work programmes          | 3.80       | 0.45 | 0.76 | 16   |
| 2.3  | Contract Variance – Unit Costing                | 4.00       | 0.00 | 0.80 | 11   |
| 2.4  | Controlling of Sub-contracts costs              | 4.00       | 0.71 | 0.80 | 9    |
| 2.5  | Controlling Overheads and Indirect Costs        | 4.00       | 0.00 | 0.80 | 11   |
| 2.6  | Cost estimating and budgeting                   | 4.60       | 0.55 | 0.92 | 1    |
| 2.7  | Cost Forecasting techniques                     | 4.20       | 0.84 | 0.84 | 3    |
| 2.8  | Cost Reports                                    | 4.20       | 0.84 | 0.84 | 3    |
| 2.9  | Cost Value Reconciliation (CVR)                 | 4.20       | 0.84 | 0.84 | 3    |
| 2.1  | Earned value analysis (EVA)                     | 4.20       | 0.45 | 0.84 | 6    |
| 2.11 | Control of material, equipment and labour costs | 3.80       | 0.84 | 0.76 | 15   |
| 2.12 | Monte Carlo simulation of project costs         | 3.80       | 0.45 | 0.76 | 16   |
| 2.13 | Resources management related strategy           | 3.80       | 1.10 | 0.76 | 13   |
| 2.14 | Schedule Monitoring                             | 3.80       | 1.10 | 0.76 | 13   |
| 2.15 | Use of S-curve for cost/time monitoring         | 3.40       | 0.89 | 0.68 | 18   |
| 2.16 | Use of software for cost control                | 4.00       | 1.41 | 0.80 | 7    |
| 2.17 | Variance analysis                               | 4.00       | 1.22 | 0.80 | 8    |
| 2.18 | Work Breakdown Structure (WBS)                  | 4.00       | 0.71 | 0.80 | 9    |

Level of implementation of cost control practices was analysed and presented as a stacked bar chart in Fig 1. Setting up a cost recording system for projects was the only cost control practice that was always implemented by respondents.



**Fig 1: Level of implementation of cost control practices**

This was followed by the forecasting of costs and estimation of contingency allowances (which were always carried out by 80% and 60% of the sample respectively). Only 2 respondents always conducted variance analysis, while one respondent admitted to never checking deviations from budget through variance analysis. The results obtained in this research were similar to that of Chigara et al. (2013), who also found that only 54.5% of a sample of contractors in Zimbabwe employed variance analysis.

## CONCLUSION AND RECOMMENDATION

Reviews of the methodological approach of previous studies of project cost control (PCC) have shown that the quantitative paradigm (which has a positivist epistemological leaning) has been applied most frequently in PCC research. This research has found that Cost estimating/budgeting and Budget Monitoring are the most frequently applied PCC practices. Conversely, construction professionals shied away from the use of S-curve for cost/time monitoring, thus agreeing with Chigara et al. (2013) and Fagbenle et al. (2018) that managers prefer to use simpler tools that they have greater familiarity with. Only 40% of the sample always conducted variance analysis, while 20% admitted to never checking deviations from budget through variance analysis. These results reveal that more work still needs to be done in the area of use of tools for PCC.

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