Critical Barriers to the Practice of Effective Cost Planning in the Ghanaian Construction Industry

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Abstract: Cost planning practices in the construction industry worldwide has gained much popularity in recent times due to economic recession and stringent measures that various procurement laws prescribe in most developed and developing countries. Nevertheless, these practices in developing countries such as Ghana are constrained with the existence of critical barriers that render them non-effective and hence, accounting for the numerous abandonment of both private and public projects. Consequently, this study was enunciated with the aim to examine the critical barriers to the practice of effective cost planning in the Ghanaian construction industry. Through an in-depth literature review and a pilot survey, questionnaires were designed and administered to quantity surveyors. Data generated from the field survey was subjected to principal component analysis. The findings of the study revealed weak cost planning knowledge base, poor cost databases and understanding, inadequate designs and planning and external conditions are the major barriers to cost planning practices in the Ghanaian construction industry. The need for this study cannot be doubted since it provides an insight for experts in the construction industry on the barriers of the practice of cost planning in the industry. The awareness of these barriers will therefore facilitate efficient and effective efforts to resolve them. A future study is thereby proposed by this study to explore effective cost planning practices in the Ghanaian construction industry that will ensure private and public stakeholders get value for their money invested.

Keywords: Critical, Barriers, Cost Planning, Ghanaian, Construction

I. INTRODUCTION

Given the importance of cost implication of projects, it has gained so much global attention of researchers, thus, cost planning activities must be noted and elaborated to enhance its effectiveness and efficiency in achieving value for money. Project execution requires huge capital investment, where project participants are much interested in project delivery within stakeholders’ goals of quality, time and cost. The need for cost management practices have become more imperative. Promoters’ investment targets are set at different stages with further progress of construction practices, whereby cost planning runs through the entire process of project construction, thus making it more important.

Construction clients have increased levels of expectations, these combined with under performances have led to growing dissatisfaction [38]. Studies have indicated that the processes for improving the industry performances are disjointed and argumentative relationship structure within projects [16]. The cost planning processes cannot be exception to this widely under performance phenomenon. Consequently, it is reported by [21], that the construction industry recorded only 2.7% industrial profitability, this low records represent the general performance perception of the industry during the recession in the year 2007. It must be noted, this is due to poor cost planning activities that have been the main practice in the construction industry since time in memorial, thus, the recession in 2007 strongly affected the industry. It was reported in China that late and eventual non-payments along with lack of security caused substantial cash flow difficulties leading to risks of insolvency of construction parties [36, 45]. There have been several studies which have indicated that cost planning practices are not effective thus cost overruns and delayed payment are perceived to be identical to the construction industry [46, 12].

In Ghana, [27] argued that, the inability of Quantity Surveyors to provide quality and reliable estimates at all times is as a results of lack of effective cost planning in the industry. Similarly, it is reported that more than ninety percent (90%) of construction contracts are procured by the traditional design-bid-build method [34] where the projects outperform badly. More so, contemporary project management adopted by some construction professionals is characterized by late delivery, exceeded budgets, reduced functionality and questionable quality where sixty percent (60%) of clients said that cost targets are not met [44]. [22], revealed that 75% of water drilling projects in Ghana completed between 1970 and 1999 exceeded the original project schedule and cost whereas 25% were completed within the budget and on time. In addition, [32] reported that a survey by non-banking financial institution indicated that cost overruns ranges between 60 to 180%. Hence, the purpose of this paper was to examine the critical barriers to the practice of effective cost planning in the GCI.

The outline of this paper is as follows. First, we introduced brief literature review and methodology implemented for the study. This was followed by a presentation of the generalized results in terms of the number of factors identified. Subsequent

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sections, then discussed specific component identified based on analysis provided prior to the final section that concluded the article, summarizing the study objectives, the research contributions and key results.

II. CONCEPT OF CONSTRUCTION COST PLANNING

Cost planning covers all aspects of cost control processes undertaken during the design stage of a project in order to deliver a structure which fulfils the client’s goal of attaining a building which is within the budget, at the desired quality and delivered within the agreed time [17]. [35], argued that for a developer to know right from the early stage of a project, what the anticipated final cost of the total development may be, including the cost of land, legal issues, demolitions, buildings, professionals, furniture, connections, tax, financing and management. Building cost is only one of these items, but the quantity surveyor or cost manager should include all costs in the cost plan or estimate of final cost. A clear understanding of cost and budget targets by the cost planner is important to enable him to advice the developer about possible future overruns and proactively provide alternative solutions [18].

Notwithstanding the above definitions of cost planning, one can also argue that cost planning involves refining the initial cost estimate and generating a project cash flow, based on additional information generated along the project, such as the schedule of payments for the main material suppliers and subcontractors, which should be based on production plans. In addition to cost estimating, this process relies heavily on feedback from the cost control process. Plans have to be changed whenever necessary and situations that need special attention must be highlighted duly.

According to [30], in cost planning, elemental cost plan is one of the most effective tools that the quantity surveyor uses to assist with the planning and design process. [30] further indicates that the theory behind the analysis of building costs per element is that the total cost is a sum of the cost of individual: so-called elements such as walls, roofs, foundations, etc. However, [18], states that a complete system of cost planning must comprise on cost planning and control during the design process as well as the construction procurement stage. During the design stage, the system includes finalizing the brief, investigating solutions and developing the design [18].

Cost planning as a cost management technique for construction projects operates by means of cost plans. However, effective cost plans are developed by employing specific cost plan models. The [7], endorsed a model for cost plans. This model includes ten sections and 68 elements. These ten sections are: Primary elements; Special installations; Alterations; External works and services; Training; Preliminaries; Contractor’s fee; Contingency allowances; Escalation and Value added tax. The primary elements of the structure of a building are the following: foundations, ground floor construction, structural frame, independent structural components, external envelope, roofs, internal divisions, partition floor finishes, internal wall finishes, ceilings and soffits, fittings, electrical installation, internal plumbing, fire services, balustrading and miscellaneous items [7].

[26] contends that, to place the client in a position where strategic budgeting can be performed based on sound knowledge of all influences, effective cost planning and advice must be adhered to. Accordingly, cost planning process should add to a more comprehensive understanding of all benefits and associated costs. Cost managers (cost planners) should consequently understand that they need to work with clients (investors) from the very inception of a project, even earlier, and then throughout the process to ensure the best results. This does not mean that a cost planner or cost manager is a “cost cutter” [18]. Cost planning is one of the major areas of cost management that needs special attention in the construction industry.

III. RESEARCH METHOD

In achieving the aim, the research adopted a mixed methodology approach, thus, qualitative and quantitative paradigms were the underpinning philosophies considered. The qualitative approach involved the use of both literature review and semi structured questions among top quantity surveyors. The reasons for the usage of the interview was to triangulate literature review findings in order to improve and expand the depth of the results. This was done by elaborating and exploring the experience of the practitioners in relation to the phenomena under consideration. This helped in achieving eighteen barriers (18) (see Table I) thus, some of these factors were consistent with literature while others were not, meaning that they might be peculiar to conditions pertaining to cost planning practices in the construction industry of developing countries such as Ghana.

| No | Factors | Reference |
|----|---------|-----------|
| 1  | Unavailability of Cost Data | Anderson et al., 2009 |
| 2  | Low education for proper data collection at site by professionals | Becker et al., 2011 |
| 3  | Unstable prices of construction materials | Aziz, 2013; Azhar, et al., 2008 |
| 4  | Frequent changes in inflation | Aziz, (2013) |
| 5  | Unavailability of cost analysis | Ali and Kamaruzzaman, 2010 |
| 6  | Lack of proper/current indices | |
| 7  | Lack of details in designing | Tang, 2012 |
| 8  | Unwillingness to give out information | |
| 9  | Unstable market condition | Aziz, (2013) |
The second stage considered quantitative technique which was involved in the collection of primary (questionnaire) data to derive the barriers of cost planning in the Ghanaian construction industry using a sample of consulting quantity surveyors. This individual groups represent the population of Ghanaian construction consultants who are involved in cost planning activities. The questionnaire utilized closed-ended questions to explore barriers by measuring respondents’ perceptions on the level of severity of some series of Likert scale items, where: 1 = lowest (barriers); 2 = low; 3 = high; 4 = higher; and 5 = highest. Thus, the numerical representation, statistical analysis and subjective were the underlying individuals’ perceptions.

### A. Sampling Technique and Sample Size.

For the first section 20 semi-structured interview questions were administered to quantity surveyors within the Ghanaian Construction Industry with a minimum of 10 years’ practical experience or more. All were registered with the Ghana Institution of Surveyors (GhIS). The second section involved the use of closed-ended questions, which were administered to two senior associates within the consulting quantity surveyor’s firms. In all 144 questionnaires were administered to 72 firms registered with GhIS. In order to make sure that the right persons within the firms answered the questionnaire, telephone calls were subsequently made to these firms to confirm the email addresses and to find out the type of hierarchy that exist within the organization. Snowball sampling was used; initially engaging with consultants who were most visible and subsequently accessing their networks to signpost additional participants (within the catchment area who met sample inclusion criteria). This ‘snowball and purposive’ sampling process continued until a representative sample size of 80 respondents was obtained, which represented a relative high response rate of 56%.

### IV. DATA ANALYSIS

The choice of an analytical tool for the data analysis is dependent on a comprehensive review of available analytical and statistical tools. Bryman [10] opined that the need to first identify the type of variable(s) and data was to determine the appropriate analytical methods. Hence, individual responses were processed and entered into International Business Machine Statistical Package for Social Sciences (IBM SPSS) for descriptive and factor analysis (Principal component analysis). This was aimed at finding groups of related variables and thus ideal for reducing a large number of variables into a more easily understood framework [19]. Thus, the fundamental concept underlying factor analysis is the ability to statistically manipulate the empirical relationship among several variables to help reveal hypothetical constructs of the relationships [31]. Similarly, [3], opined that factor analysis is appropriate for establishing clusters of related variables and thus, ideal for reducing a large number into a more easily understood structure. It is also a way of condensing information contained in original variables, into a smaller set of dimensions (factors) with minimum information loss [14].

Following this, check for reliability that samples are adequate for factor analysis Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) was conducted [19] indicates that the sample is adequate if the value of KMO is greater than 0.5. As presented in Table II, the KMO measure of this study achieved a high value of 0.932 indicating the adequacy of the sample size for the factor analysis. The Bartlett’s test of Sphericity was also significant suggesting that the population was not an identity matrix; therefore, there exist some relationships between the variables. Bartlett’s Test for this study was highly significant (p<0.001), and therefore suggesting that factor analysis is appropriate.

| No | Factors                                                                 | Reference                  |
|----|-------------------------------------------------------------------------|----------------------------|
| 10 | Low level of research in cost planning in Ghana                         |                            |
| 11 | Poor knowledge management by professionals                               | Ly et al., 2005             |
| 12 | Late involvment of QS in planning process                               |                            |
| 13 | Poor understanding of the variables to consider in cost analysis         |                            |
| 14 | Lack of technical know how                                              |                            |
| 15 | Poor scope definition                                                   | Chung-Suk and Gibson, 2001 |
| 16 | Concept of cost planning is not well understood by organizations         |                            |
| 17 | Allowance of numerous variations during projects during project implementation |                       |
| 18 | Lack of professional training                                           |                            |

| TABLE II                                                                 |
|-------------------------------------------------------------------------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy.                        | .932                      |
| Bartlett's Test of Sphericity                                           | Approx. Chi-Square 3.824E3 |
| df                                                                      | 171                       |
| Sig.                                                                    | .000                      |
After the KMO sampling adequacy and Bartlett’s test of Sphericity, data was then subjected to principal component analysis (with Varimax rotation). Subsequent to principal component analysis, the communalities involved were first established. Communality describes the total amount an original variable shares with all other variables included in the analysis and is very useful in deciding which variables to finally extract (see Table III). Table III shows that the average of the communalities of the variables after extractions were greater than 0.70. The conventional rule about communality values is that; extraction values (eigenvalues) of more than 0.50 at the initial iteration indicates that the variable is significant; and should be included in the data for further analysis or otherwise removed [19].

| Table III: Communalities |
|--------------------------|
| Barriers to Cost Planning Practices | Initial | Extraction |
| Unavailability of Cost Data | 1.000 | .978 |
| Lack of keeping records of site performance | 1.000 | .925 |
| Low education for proper data collection at site by professionals | 1.000 | .975 |
| Unstable prices of construction materials | 1.000 | .988 |
| Frequent changes in inflation | 1.000 | .973 |
| Unavailability of cost analysis | 1.000 | .980 |
| Lack of proper/current indices | 1.000 | .975 |
| Lack of details in designing | 1.000 | .974 |
| Unwillingness to give out information | 1.000 | .973 |
| Unstable market condition | 1.000 | .981 |
| Low level of research in cost planning in Ghana | 1.000 | .969 |
| Poor knowledge management by professionals | 1.000 | .984 |
| Late involvement of QS in planning process | 1.000 | .976 |
| Poor understanding of the variables to consider in cost analysis | 1.000 | .993 |
| Lack of technical know how | 1.000 | .929 |
| Poor scope definition | 1.000 | .883 |
| Concept of cost planning is not well understood by organizations | 1.000 | .995 |
| Allowance of numerous variations during projects during project implementation | 1.000 | .937 |
| Lack of professional training | 1.000 | .876 |

**Extraction Method:** Principal Component Analysis

**A. Component Detection and Extraction**

In applying the latent root criterion, four (4) components were extracted, as their respective eigenvalues were greater than one (see table 3) and also from the scree plot in Figure 1 four (4) components with eigenvalues greater than 1.0 were extracted using the factor loading of 0.50 as the cut-off point. In addition, the four components extracted cumulatively explained 96.135% of the variation in the data set, which agrees with the cumulative proportion of variance criterion, which says that the extracted components should together explain at least 50% of the variation in the data set (see Table IV).

![Scree Plot](image)

**Extraction Method:** Principal Component Analysis

[33] and [15] argued that, the ability to interpret the results of principal component analysis can be improved through rotation. Thus, rotation was to achieve a simple structure from the large loading factors in absolute value for some of the variables, making it easier to identify and interpret. In addition, it is anticipated that each variable has large loadings for only a few factors, preferably one, helping to distinguish the factors from each other (see Table V). If several factors have high loadings on the same variables, it is difficult to determine how factors differ. It is worth noting that the results after factor rotation indicate the amount of variance between the variables that each factor accounts for and provide loadings of all the variables on each factor.
V. FINDINGS AND DISCUSSION

Based upon examination of inherent relationships among those variables under each component, the interpretations discussed below were inferred as representing their underlying dimensions. The total variance explained by each component extracted is as follows: The first principal component accounted for 27.88% of the total variance whilst the second component, explained 25.71%. Component 3 accounted for 23.03% and component 4 accounted for accounted for 19.52% of the variance. On this basis, component 1 was labeled as Weak Cost Planning Knowledge Base, component 2 as Poor Cost Databases and Understanding, component 3 was labelled as Inadequate designs and planning and component 4 was also labelled as Economic Fluctuation.

A. Component 1: Weak Cost Planning Knowledge Base

Component 1 comprises five (5) variables, which accounted for 27.88% of the total variance. These are: Low education for proper data collection at site by professionals (.812), Low level of research in cost planning in Ghana (.820), Poor knowledge management by professionals (.815) Lack of technical know-how (.829) and Lack of professional training (.811). (See Table V). The figures in the bracket indicate the loading of each variable impact on the component. This component was named as Weak Cost Planning Knowledge Base. There is increasing recognition from project clients and financiers that effective cost planning and control requires the use of highly specialized and expert cost management professionals [39]. However, the competencies of professionals involved in data collection activities in the industry have direct effects on the process. Professionals with low level of education which affects their competences poses a major challenge to data collection for cost planning in the industry. [42] argued that educational attainment of employees in construction is lower than in most other industries except for agriculture. This low level of education by construction professionals goes a long way to adversely affect cost planning activities in the industry. Also, since the 1950s, a central question in International Development has been how knowledge can best be generated, mobilized, made available, applied and adapted (knowledge management) to improve the human condition [25]. The centrality of knowledge systems to development effectiveness comprised the theme of the World Bank’s World Development Report of 1998/99. The main argument in that report was that the development of poorer countries necessitated assigning the highest priority to building “knowledge-based economies”. More so, owing to the time constraint and cultural practice of the construction industry, capturing and transferring project knowledge have not been well achieved [28]. In addition, constraints to proper cost planning is due to unforeseen technical difficulties. [1] suggests that, lack of technical experience and inadequate contractors’ experience [37] constitute the major delay factors in project crises [2].

B. Component 2: Poor Cost Databases and Understanding

The second component was labelled as Poor Cost Database and Understanding variables, accounted for 25.71per cent of total variance not explained by the first components. Four variables loaded onto the component including: unavailability of cost data; Unavailability of cost analysis; Poor understanding of the variables to consider in cost analysis; and Concept of cost planning is not well understood by organizations recording respective eigenvalues of 0.795, 0.777, 0.801 and 0.797. To accurately develop an estimate of the construction costs for a project, an estimator must be capable of mentally constructing the project and then accounting for all the activities necessary to complete it [43, 2008]. However, the availability of historical unit cost data is an important factor in developing accurate project cost estimates [5]. With this importance attached to historical cost data in estimating the cost of a project, the lack of such cost data in the construction industry, consequently impedes effective cost planning in the industry. [6] finds that even

| TABLE V Rotated Component Matrix* |
|-----------------------------------|
|                              | 1    | 2    | 3    | 4    |
| Barriers to Cost Planning Practices | Component |
| Weak knowledge base on cost planning | .812  | .820  | .815  | .829  |
| Low education for proper data collection at site by professionals | .812  |      |      |      |
| Low level of research in cost planning in Ghana | .820  |      |      |      |
| Poor knowledge management by professionals | .815  |      |      |      |
| Lack of technical know how | .829  |      |      |      |
| Lack of professional training | .811  |      |      |      |
| Poor Cost Databases and Understanding | Unavailability of cost data | .795  |      |      |      |
| Poor understanding of the variables to consider in cost analysis | .777  |      |      |      |
| Concept of cost planning is not well understood by organizations | .801  |      |      |      |
| Inadequate designs and planning | .797  |      |      |      |
| Lack of details in designing | .731  |      |      |      |
| Unwillingness to give out information | .744  |      |      |      |
| Late involvement of QS in planning process | .728  |      |      |      |
| Poor scope definition | .765  |      |      |      |
| Allowance of numerous variations during projects implementation | .670  |      |      |      |
| Unstable prices of construction materials | .990  |      |      |      |
| Frequent changes in inflation | .875  |      |      |      |
| Unsteady market condition | .883  |      |      |      |
| Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 6 iterations |

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though some state highway agencies collect and store historical cost data, but they do not have a formal and documented cost data and process for adjusting unit costs for project characteristics and market conditions. This is an evidence that keeping cost data is a problem in the construction industry. Cost analysis is one of the important tools of project management that cannot be left out on any construction project. A project gets more scientific and systematic when the project gets larger and more complex. This is because the project becomes necessary to integrate and coordinate human inputs and some of physical components within the four fundamental constraints which are scope, cost, time and quality [4]. To ensure effective cost performance on a project, cost analysis is key for effective cost planning. Hence, the lack of cost analysis troubles project development by impeding effective planning of the project cost.

C. Component 3: Inadequate Designs and Planning

This component accounted for 23.03 per cent total variance not explained by the former three components. It encompasses four variables: lack of details in designing (0.731); Unwillingness to give out information (0.744); late involvement of QS in planning process (0.728); Poor scope definition (0.765) and Allowance of numerous variations during projects implementation (0.670). The component’s variables have the inherent barrier as inadequate designs and planning. Usually, many potential applications of planning require planners to produce plans of high quality, according to a metric like cost that make span, net benefit, etc. [23]. Nevertheless, due to lack of detailed representations emanating from professional inexperience, standardized designs needed to update cost plans are shallow [40]. This could be due to lack of cooperation from consultants who have the necessary data needed to inform better cost plans. In addition, if the design presented is inadequate this pose bad cost on the client expenses, thus upscale the construction processes.

D. Component 4: External Conditions

Component 4, whose variables External Conditions accounted for 19.52 per cent total variance with three variables loaded onto it: unstable prices of construction materials (.900), frequent changes in inflation (.875) and unsteady market condition (.883). Unfortunately, project cost overrun and scope creep are common on infrastructure and construction projects [39]. A global survey of the sector spanning twenty countries and five continents found that substantial cost escalation on construction and infrastructure projects is the rule rather than the exception [20]. Consequently, the survey found average cost escalations of 45% for rail projects, 34% for tunnels and bridges and 20% for roads. They further found that 90% of construction projects had under-estimated costs and that cost overruns of 50-100% were common. This postulation agrees with [9] and [8] on the effect of inflation and changes of prices of construction materials which have accounted for variation and cost overruns with its effect on effective cost planning practices. All these are attributed to the changes in prices of materials emerged from frequent changes in inflation, thus [24] argued that Sub-Saharan Africa countries such as Ghana need to examine inflation dynamics that leads various inflation changes. In addition, inflation rate in Ghana has been on the rise since October 2007 [42]. This component confirmed the current economic condition in the GCI and other developing countries where prices of construction materials keep on increasing.

VI. CONCLUSION

Cost planning practices in construction has become prominent in the construction processes and as such inevitable. The growing concern among stakeholders who are dissatisfied with monetary aspect of the process, are looking for a more innovative way that will spearhead effective regime which will be devoid of excessive cost hat is mostly estimated around 50 percent of the actual estimated. Although, effective cost planning regime is important there is the need for examination of critical barriers to the practices of cost planning in the construction industry which is the basis for which this can be done. Hence, the focus of this research was to examine the critical barriers to effective cost planning practices.

This study reveals four main critical barriers to the cost planning process in the construction industry by utilising principal component analysis as the main statistical tool. These four barriers included: weak cost planning knowledge base, poor cost databases and understanding, inadequate designs and planning and external conditions.

In the light of these findings and the growing awareness of achieving value for money, government should create a more conducive economic environment where change in prices of commodities are subjected to standardization and regulation. In addition, it is suggested that construction professionals should be aware of growing trend of professionalism where client are interested in spending within the investment portfolio that they have targeted. To this extent, institutions within the built environment fraternity especially Ghana Institution of Surveyors should create more avenues for cost planning learning processes for their members through continuous professional development platforms as a way of updating their knowledge.

Notwithstanding the knowledge this study brings to bear, the limitation of the study is on the sample size and geographical focus. Undoubtedly, four barriers established could be use broadly within most developing countries with similar features like the Ghanaian Construction Industry, but further studies will need to be done to confirm such. It is also recommended that further studies should concentrate on
critical factors outlining parameters for measuring effective cost planning practices.

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