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

Ernest Kissi¹, Theophilus Adjei-Kumi², and Edward. Badu³

Abstract
Cost planning practices in the construction industry worldwide has gained much popularity in recent times due to economy 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 its application non-effective. This has accounted for the numerous number of abandonment of both private and public projects. Consequently, this study was enunciated with the aim to identify 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 were 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 economic fluctuation 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 stakeholder’s get value for their money invested.

Keywords: critical, barriers, cost planning, Ghanaian, construction

Introduction
Given that, cost implication of projects have become much an interested area receiving global attention of research, thus, cost planning activities must be noted and elaborated to enhance its efficient and effectiveness in achieving value for money. Projects execution requires huge capital investment, where project participants are much interested in project delivery within stakeholder’s goals of quality, time and cost. The need for cost management practices become more imperative. Promoters’ investment targets are set at different stages with further progress of construction practice, whereby cost planning runs through the entire process of project construction, thus making it more simultaneously.

Construction clients have increased level of expectations although, under performance are normally experience leading to high level of dissatisfaction. (Santos et al., 2000). Studies have indicated that major obstacles for improving the industry performance are fragmented process and confrontational relationship structure in the industry (Egan, 2004) which cost planning processes cannot be exception to this widely under performance

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phenomena. Consequently, it is reported by Folwell et al. (2012) the construction industry recorded only 2.7% industry profitability, this low recording represents the general perception of the industry during the economy 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 in time memorial. It was reported in China that late and non-payments along with lack of security caused substantial cash flow difficulties leading to risks of insolvency of construction parties (Ramachandra and Rotimi, 2015; Wu et al., 2008). It is further reported that lack of effective cost planning practices have resulted in a cost overrun and delayed payment in the construction industry (Yates, 2003; Chan and Suen, 2005).

In Ghana, Laryea (2010) reiterated that, the inability of Quantity Surveyors to provide quality and reliable estimates at all times is as a result 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 (Obeng-Ayirebi, 2002) where the project 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 (Williams, 1999). Frimpong, et al. (2001) 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. Nicco-Annan (2006) also reported that a survey by non-banking financial institution indicated that cost overruns ranges between 60 to 180%. Hence, the purpose of this paper is to identify the critical barriers to the practice of effective cost planning in the GCI.

The outline of this paper is as follows. Firstly, we introduced brief literature review and methodology implemented for the study. This is followed by a presentation of the generalized results in terms of the number of factors identified. Subsequent sections, then discuss specific component identified prior to the final section that concludes the article, summarizing the study objectives, the research contributions and key results.

**Concept of Construction Cost Planning**

Cost planning covers all aspects of cost control processes undertake 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 (Eliufoo, 2000). Ramabodu, (2014) 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 cost planning need to instituted (cost includes: land, legal issues, demolitions, buildings, professionals, furniture, connections, tax, financing and management). 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 (Ferry and Brandon, 1991).

Notwithstanding, the above explanations of cost planning, it can be 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 based on production plans. 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 during the process of cost planning. According to Morton and Jaggar (1995), 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. Morton and Jaggar (1995) 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, Ferry and Brandon, (1991), states that a complete system of cost planning must comprise of 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 (Ibid).

Cost planning as a cost management technique for construction project operates by employing specific cost plan models. The Association of South African Quantity Surveyors (ASAQS, 1998) 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 (Association of South African Quantity Surveyors (ASAQS), 1998). Knipe et al. (2002) 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 a more comprehensive understanding of all benefits and associated costs. Cost managers (cost planners) should 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” (Ferry and Brandon, 1991). Cost planning is one of the major areas of cost management that needs special attention in the construction industry.

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 the both literature review and semi structured question among top quantity surveyors. The reasons for using the interview was triangulate literature review data to improve, expand and create depth to the results by exploring the experience of the practitioners in relation to the phenomena under consideration. Through this eighteen barriers (18) were achieve (see table 1). 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.

<table>
<thead>
<tr>
<th>No</th>
<th>Factors</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Unavailability of Cost Data</td>
<td>Anderson et al., 2009</td>
</tr>
<tr>
<td>2</td>
<td>Low education for proper data collection at site by professionals</td>
<td>Becker et al., 2011</td>
</tr>
<tr>
<td>3</td>
<td>Unstable prices of construction materials</td>
<td>Aziz, 2013; Azhar, et al., 2008</td>
</tr>
<tr>
<td>4</td>
<td>Frequent changes in inflation</td>
<td>Aziz, 2013</td>
</tr>
<tr>
<td>5</td>
<td>Unavailability of cost analysis</td>
<td>Ali and Kamaruzzaman, 2010</td>
</tr>
<tr>
<td>6</td>
<td>Lack of proper/current indices</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Lack of details in designing</td>
<td>Tang et al., 2012</td>
</tr>
</tbody>
</table>
Unwillingness to give out information
Unstable market condition
Low level of research in cost planning in Ghana
Poor knowledge management by professionals
Late involvement of QS in planning process
Poor understanding of the variables to consider in cost analysis
Lack of technical know how
Poor scope definition
Concept of cost planning is not well understood by organizations
Allowance of numerous variations during projects during project implementation
Lack of professional training

The second stage considered quantitative technique which was involved the collection primary (questionnaire) data to derive the barriers of cost planning Ghana construction industry using a sample of consulting quantity surveyors. This individual groups represent the population of Ghanaian construction consultants who are involved cost planning activities. The questionnaire utilized closed-ended questions, to explore barriers by measuring respondents’ perceptions on the level of severity of same on a series of Likert items, where: 1 = least (barriers); 2 = low; 3 = high; 4 = higher; and 5 = very highest. Thus, the numerical perception, representation and statistical analysis and subjective underlying individuals’ perceptions.

Sampling Technique and Sample Size
For the first section 20 semi-structure interview question were administer to quantity surveyors within Ghanaian Construction Industry with a minimum of 10 years practical experience or more. All were registered with Ghana Institution of Surveyor (GhIS). The second section was involved the use of closed ended questions, which were administer two senior associates within a consulting quantity surveyors firms. In 144 questionnaires were administered thus to 72 firm registered with GhIS. In order to make sure that right persons within the firms answer 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 were obtained, which represented a relative high response rate 56%

Data Analysis
The choice of an analytical tool for the data analysis is dependent on a comprehensive review of available analytical and statistical tool. Bryman (2004) opined that the need to first identify the type of variable(s) and data to determine appropriate analytical methods. Hence, individual responses were processed and entered into International Business Machines 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 (Field, 2005a). 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 (Neumann and Kreuger, 2003). Similarly, Ahadzie (2007), 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 (DeCoster, 1998).

Following this, check for reliability that samples are adequate for factor analysis, Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) was conducted. Field, (2005a) indicates that the sample is adequate if the value of KMO is greater than 0.5. As presented in Table 2, 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.

<table>
<thead>
<tr>
<th>Table 2: KMO and Bartlett's Test</th>
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<tbody>
<tr>
<td>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</td>
</tr>
<tr>
<td>Bartlett's Test of Sphericity</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Sig.</td>
</tr>
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</table>

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. Communalinity 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 3). Table 3 shows that the average of the communalities of the variables after extractions was >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 (Field, 2005).

<table>
<thead>
<tr>
<th>Table 3: Communalities</th>
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<tbody>
<tr>
<td>Barriers to Cost Planning Practices</td>
</tr>
<tr>
<td>Unavailability of Cost Data</td>
</tr>
<tr>
<td>Lack of keeping records of site performance</td>
</tr>
<tr>
<td>Low education for proper data collection at site by professionals</td>
</tr>
<tr>
<td>Unstable prices of construction materials</td>
</tr>
<tr>
<td>Frequent changes in inflation</td>
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<tr>
<td>Unavailability of cost analysis</td>
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<tr>
<td>Lack of proper/current indices</td>
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<tr>
<td>Lack of details in designing</td>
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<tr>
<td>Unwillingness to give out information</td>
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<tr>
<td>Unstable market condition</td>
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<tr>
<td>Low level of research in cost planning in Ghana</td>
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<tr>
<td>Poor knowledge management by professionals</td>
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<tr>
<td>Late involvement of QS in planning process</td>
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<tr>
<td>Poor understanding of the variables to consider in cost analysis</td>
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<tr>
<td>Lack of technical know how</td>
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</table>
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.

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) 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 4).

Table 4: Extraction of Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>15.078</td>
<td>79.359</td>
</tr>
<tr>
<td>2</td>
<td>1.412</td>
<td>7.431</td>
</tr>
<tr>
<td>3</td>
<td>1.054</td>
<td>5.547</td>
</tr>
<tr>
<td>4</td>
<td>.722</td>
<td>3.798</td>
</tr>
</tbody>
</table>

Norusis (1988) and Dogbegah et al., (2011) 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 loadings factors in absolute value for some of the variables, making it easier to identify and interpret them. 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 5). If several factors have high loadings on the same variables, it is difficult to determine how factors differ. As noted by Chris (2004), results after factor rotation indicate the amount of variance between the variables that each factor accounts for and provides loadings of all the variables on each factor (Kissi et al., 2014).

Table 5: Rotated Component Matrix

<table>
<thead>
<tr>
<th>Barriers to Cost Planning Practices</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak knowledge base on cost planning</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Low education for proper data collection at site by professionals</td>
<td>.812</td>
</tr>
<tr>
<td>Low level of research in cost planning in Ghana</td>
<td>.820</td>
</tr>
<tr>
<td>Poor knowledge management by professionals</td>
<td>.815</td>
</tr>
<tr>
<td>Lack of technical know how</td>
<td>.829</td>
</tr>
<tr>
<td>Lack of professional training</td>
<td>.811</td>
</tr>
<tr>
<td>Poor Cost Databases and Understanding</td>
<td></td>
</tr>
<tr>
<td>Unavailability of cost data</td>
<td>.795</td>
</tr>
<tr>
<td>Unavailability of cost analysis</td>
<td>.777</td>
</tr>
</tbody>
</table>
Poor understanding of the variables to consider in cost analysis .801

Concept of cost planning is not well understood by organizations .797

Inadequate designs and planning

- 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

Economic Fluctuation

- Unstable prices of construction materials .900
- 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

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 19.52% of the variance. On this basis, component 1 was labelled 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.

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 6). 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 expert of cost management professionals (Smith, 2014). However, the competencies of professional involved in data collection activities in the industry have direct effects on the process. Professionals with lower level of education affects competences and poses a major challenge to data collection for cost planning in the industry. The Centre for Construction Research and Training (2012) 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. 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 (IFAD, 2007). 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 (Ly et al., 2005). In addition, constraints to proper cost planning is due to unforeseen technical difficulties. Abdul-Rahman et al. (2006) suggest that, lack of technical experience and inadequate contractors’ experience (Sambasivan and Soon, 2007) constitute the major delay factors in project crises (Abdul-Rahman et al., 2008).

Component 2: Poor Cost Databases and Understanding
The second component comprising poor cost database and understanding variables, accounted for 25.71 per cent of total variance not explained by the first components. Four variables loaded onto component 3 included unavailability of cost data; Unavailability of cost analysis; and Poor understanding of the variables to consider in cost analysis; 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 accounting for all the activities necessary to complete it (Washington State Department of Transportation (WSDOT), 2008). However, the availability of historical unit cost data is an important factor in developing accurate project cost estimates (Anderson et al., 2009). 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. Anderson et al. (2008) argues that even though most construction firms collect and store historical cost data, 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 it becomes necessary to integrate and coordinate human inputs and some physical components within the four fundamental constraints which are scope, cost, time and quality (Ali and Kamaruzzaman, 2010). To ensure effective cost performance on a project, cost analysis is key for cost planning. Hence, the lack of cost analysis systems is a challenged project development.

Component 3: Inadequate Designs and Planning
This component accounted for 23.03 per cent total variance not explained as the third component. 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 make span, net benefit, etc. (Haslum, 2012). Nevertheless due to lack of detailed representations emanating from professional inexperience, standardized designs update to cost plans are shallow (Stephenson, 1996). This could be due to lack of cooperation from consultants who have the necessary data needed to inform better cost plans. In addition, if design presented is inadequate this pose bad cost on the client expenses, thus upscale the construction processes.

Component 4: Economic Fluctuation
Component 5, whose variables concerned economic fluctuation, 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 (Smith, 2014). A global survey of the sector spanning twenty countries and five continents found that substantial cost escalation on construction and infrastructure projects is a rule rather than the exception (Flyvbjerb et al. 2003). 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 agreed with Aziz (2014) and Azhar et al., (2008) on the effect of inflation changes on prices of construction materials which have accounted for variation and cost overruns with it direct effect on effective cost planning practices. Heintz and Ndikumana (2010) argue that Sub-Saharan Africa countries such as Ghana needs to examine inflation dynamics that lead frequent changes in prices of commodities such as cement, iron rod among others. In addition, inflation rate in Ghana has been on rise since October 2007 (CDPR, 2008). This component confirmed to the current economic condition in the GCI and other developing countries where price of construction material are easily rocketed, for instance cement prices over the last two years in keeping on rising.

**Conclusion**

Cost planning practices in the construction have become prominent in the construction processes and such it is inevitable. The growing concern among stakeholders who are dissatisfied with monetary aspect of the process, are looking for a more innovative ways that will spearhead effective regime that will be devoid of excessive cost spending which are mostly estimated around 50 percent of the actual estimated. Although, effective cost planning system is important but the need for identification of the critical barriers to the practices of cost planning in the construction industry is the basis for which this can be established. Hence, the focus of this research was identify the critical barriers to effective cost planning practices.

This study revealed four main critical barriers to the cost planning process in the construction industry by the utilization of 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 economic fluctuation.

As a result of these findings in the light of the growing awareness of achieving values for money, this implies that government should create a more conducive economic environment where change in prices of commodities are subjected to standardization and regulation. Furthermore, this study suggest that construction professionals should be aware of growing trend 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 Surveyor should create more avenues for cost planning learning processes for their member through seminar for updating their knowledge.

Notwithstanding, the knowledge this study bring to bear, the limitation of the study is on the sample size and geographical focused. 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.
Reference


