Assessment of Cost Management Functions of Quantity Surveyors with Lean Methodology

Maroof Opeyemi Anifowose[1], Wasiu Adeniran Ola-awo[2], Tanimu U Mohammed[3]

Department of Quantity Surveying, Federal University of Technology Minna, Nigeria

*Corresponding E-mail: anifowosemo@futminna.edu.ng, anny4yemi2000@yahoo.com

Received 03 May 2013; Revised 25 September 2013; Accepted 06 November 2013

Abstract

The Construction industry in Nigeria is made up of a wide variety of activities which include the provision of professional and technical services to clients in the built environment. Despite the provision of these services to a large number of clients worldwide, the construction industry is still awash by the chronic problems of low productivity, insufficient quality, time over-runs, and poor safety, which hinder customer delivered value. The Just-In-Time phenomenon is a characteristic of lean production systems which operate with very little "fat" (e.g. excess inventory extra workers, wasted space).This study aimed at assessing the construction management function of the quantity surveyor in line with the principle of lean methodology (Just-In-Time). This was achieved by exploring the cost management function of the quantity surveyor, to investigate the current practice of cost management by quantity surveying firms. Data for the study were sourced primarily with the use of questionnaire and the subsequent data analysis, which employed the use of descriptive analysis of presenting the data as obtained on tables during the field survey and attempts a rudimentary establishment of patterns using percentages. The study concluded amongst others, that: all activities involved in the cost management function of the quantity surveyor are important, and value adding, corresponding to conversion activities in line with the Just-In-time/lean methodology.

Keywords: *Just In Time/Lean Methodology, Cost, Management, Quantity Surveyor*

1.0 Introduction

The construction industry has achieved a significant impact in term of contribution to nation's economy when compared with other sectors of the economy worldwide. Ref [1] confirmed construction industries as the major productive sector any nation. In Nigeria Construction industry is made up of a wide variety of activities that includes the provision of professional and technical services to clients within the built environment. In spite of the provision of these services to a large number of clients locally and internationally, the construction industries are still overflowing with the chronic problems of low productivity, unsatisfactory quality, time over-runs, and poor safety, which adversely affect customer delivered value [2]. However, for a better performance, to provides an excellence services and to avoid the issues stated above, is the Quantity Surveyors that plays the major role among the professionals involves in construction process within the built environment [3].

The Quantity Surveyor, often refer to as a cost economist, is the recognized professional as cost and value consultant within the construction industry [4]. He has the required knowledge and expertise; therefore shoulder with the responsibility of advising the client on the cost implication that may arise during the design, the subsequent construction process and with the overall control of the cost of a construction project.

The Royal Institute of Chartered Surveyors (RICS) report titled "The Challenge of Change"[5], has identified the current and potential changes in the external factors affecting the services that is being provided by the Quantity Surveyors and the way it is being provided by them. Such factors were identified as follows: (i) the structural changes that occur in the construction sector, (ii) the continuing Information Technology (IT) revolution, and (iii) changes in both the client base and its growing anticipation. However, the services provided by the

Quantity Surveyors has transcended from the traditional role of preparing bills of quantities, valuation of variation, interim valuation, and final account etc., to a more advanced service delivery such as risk management, value management, project management etc., all these were as a result of the changes in external factors as stated above.

The Just-In-Time phenomenon is a characteristic of lean production systems which operate with very little "fat" (e.g. excess inventory extra workers, wasted space) [6]. The principle JIT was originated and first used in a Japanese Toyota car manufacturing company in the late 1940s. Although predominantly used in the manufacturing industry and the practice not limited to but include the following: (i) pull system, (ii) cellular manufacturing, (iii) agile manufacturing strategy, and (iv) bottleneck removal [7]. The adoption and application of JIT into service based industry most especially the construction industry were discussed by [8].

The importance or main objective of JIT is to improve performance by avoiding, eliminating, or reducing the waste. While others objectives are to eliminate disruption, reduce lead and set up time, system flexibility and most importantly value generation [8]. In addition recent study by [9-11] emphasized the importance of JIT principles to competitive capability and firm performance in a present day time-based competitive environment [7].However, the idea has been summarized into conversion, flow and value generation. Thus conversion was further explained by [8]as the transforming of the client's requirement into a desired finished product and flow activities binding the conversion activities. Several tools and techniques have been devised for implementation of lean thinking (JIT) aimed at increasing the performance of the professionals in the field/area of quality assurance, computerized integration of design, procurement, and electronic data interchange, which can be implemented to the profession of Quantity Surveying.

This study is therefore aimed at assessing the cost management function of the Quantity surveyor in line with the principle of JIT /lean methodology. The justification of this study is that there is no single studied of this nature previously carried out on the application of the JIT/lean process to cost management function of the Quantity Surveyors, although some studies has been carried out in other field/areas such manufacturing, operational management etc., as it was revealed by the previous literatures.

2.0 Literature Review

2.1 Lean Methodology: Just-in-time

Lean methodology is a repetitive production system in which processing and movement of materials or goods occurs just as they are needed, usually in a bit by bit or in small batches. It is used to refer to a production system in which both the movement of materials or goods during production and deliveries from suppliers are carefully timed so that at each step of the process, the next batch of the materials arrives for processing just as the preceding batch is completed. According to [12] the concept of JIT is aimed at facilitating the production of mass customized end products in cost efficient way, with lower inventory, faster and less amount of working capital tied up in the process. However, the outcome of this is a system with no idle items waiting to be processed and no idle worker or equipment waiting for items to be processed thus it is a routine operation [6]. Ref [12, 13], describes a system of lean methodology that delivered products free from defects to customers in zero time, and with nothing left in the inventory. The ultimate goal of JIT is a balanced system, in the sense that it achieves a smooth and rapid flow of materials throughout the system. The idea of lean methodology JIT is to make the processing time as short as possible by using resources in the best possible way. The degree to which the overall goal is achieved strongly relies on how well certain supporting goals are achieved. Those goals include: (a) Avoid disruption, (b) System flexibility, (c) Reduce set up and lead times to minimal, (d)less inventory, and (e) Eliminate waste.

Ref [14], adopted a performance criteria and defined waste for a particular production system, stated that failure to meet the unique requirement of the client is a waste. He goes further in outlying this criterion by defining waste as time, space, or materials used in the discharge of an activity that does not directly add value to the end product. Waste according to the lean methodology[15], include; (a) excess use of materials leading to overproduction, (b) inadequate space resulting to waiting time that adds no value to the production, (c) unnecessary transporting increases handling charges, and work-in-process inventory, (d) processing waste cause unnecessary production steps and scrap, (e)inventory cause idle resources, hides quality problem and production inefficiencies, (f) inefficient work methods indicates poor layout, material movement patterns, and increases work-in-process inventory, and (g) product defects requires rework, increases costs and possible sales loss as a result of customer dissatisfaction.

2.2 Application of JIT/Lean Methodology to Service Based Industries

Despite the enormous success recorded by the manufacturing industry in it application of lean methodology, little achievement has been made in Nigeria construction industry as a result of low level of acceptance of its application in the industry. This according to [14] is as a result of uniqueness and the complexity of construction projects. He stressed further on the uncertainties that associated with construction projects in respect to time and schedule pressure, these factors however differentiate it from the manufacturing industry. [16], backing up by [14] stated that the critical factors responsible and making the implementation of the lean methodology a difficult task is largely due to the slow response to changes in the construction industry. In view this, [16] further said that is due to the numerous decisions that has to be made over years with numerous interdependence under uncertainties.

Moreover the complex nature of construction projects has demand for different professionals with different backgrounds and cultures in its actualization [16]. These professionals are experts in the various disciplines with different learning styles which make it difficult in understanding each other and reaching agreements in making relevant decisions that are necessary for the accomplishment of the project. Thus the interactions between the various participants accrue a lot of flow waste [17], some of which cannot be easily identified. While [17] puts forward that people do not really understand the concept and principles of lean methodology. On this note [18] confirmed that the implementation of methodology involves a lot of money. These factors make industrial practitioners weary of implementing lean methodology and other new techniques on large and complex projects [12, 19]; rather, simulations of the techniques are presently developed to test the applicability of the philosophy to construction activities.

In other to achieve successful implementation of the lean process, [3] brought out the following points: (a) there should be proper and careful selection of the right people (management) who would see to the overall processes involved, (b) the culture of the construction industry has to be changed. There should be closer cross relation and staff training. This view was also supported by [20], and (c) there should be strategic procurement methods which would emphasis on mutual trust, effective communication and long term commitment to add value along design and construction process. [16]Also proposed the stages needed for improvement in achieving lean design process. The stages are: (a) Evaluation and diagnosis of the problems involved in the process, (b) Implementation of changes occurring from the diagnosis done, (c) Control of the implementation and processes involved, and (d) Standardization.

Notwithstanding the problems encountered in its adoption to construction as mentioned above, the lean methodology creates a better avenue for value generation in the Construction industry than the various project management structures already existing [21]. They pointed out the fact that Flow, the movement of materials and information through networks of interdependent specialists is almost invincible to those who see through the eyes of traditional project management. They further stated that traditional project management assumes that variability in work flow is outside management control and does not attempt to systematically

reduce variability. Furthermore, the existing project management thinking is not based on theory. This is due to the fact that traditionalist are of the opinion that project management cannot be founded on theory, as the decisions of project managers are so much conditioned by context. The identification of flow wastes and value generation which the traditional thinking ignores, [22], gives lean production an upper hand and thus making it suitable for improving the activities and services provided by construction professionals, the quantity surveyor inclusive.

2.3 Factors Affecting the Service Delivery Process of the Quantity Surveyor

Reports produced by the Davis, Langdon, and Everest consultancy group QS 2000 [23], and the challenge of change [14], identified current and potential changes in the external factors affecting the services that QS's provide and the way in which they provide them. These include:

i. The structural changes that are occurring in the construction sector, via the changing nature of contracting and management of construction project.
ii. Continuing IT revolution
iii. Changes in both the client base itself and its increasing expectations
iv. Changes in markets
v. Changes in the profession.

The structural changes such as those outlined above have resulted in QSs working in private practice or consultancy, and to a lesser extent those working in a commercial capacity, being subject to changes in: identity and types of client; client objectives and expectations; type, size and location of projects; sources and structure of finance; and skills and services demanded by clients.

3.0 Research Methodology

This paper employs a quantitative approach to the study of cost management function of quantity surveyors in line with the principle of lean methodology. Data for this study was sourced from quantity surveyors using questionnaire. Questionnaires were prepared and designed in a simplified and closed ended format. The sampling frame of the study covers both the public and the private quantity surveyors in consulting and contracting firms in Kaduna and Niger state. A total number of fifty five sets of questionnaires were distributed to quantity surveyors within Kaduna and Minna, in a random manner, out of which thirty seven sets were retrieved. According to Ref [24] cited by [25], a sample size larger than 30 and less than 500 are recommended for most research study. The research instrument employed compared with those adopted by [26] in his study of cost comparison between built-in security components and some physical characteristics of buildings in Nigeria and [27] in her study of internationally comparable indicators of violence, which relied on a questionnaire to elicit relevant information.

The data obtained from the questionnaires were analyzed using the descriptive and inferential analysis and respondent's opinion was graded on a Likert scale. In addition graphical illustration were produced which provides visual evidence of patterns within the data. The results are presented in the subsequent figures and tables below.

4.0 Result and Discussion

Data was collected in two states of Nigeria among the practitioners with various levels of expertise which were also analyzed and are presented in this section. Figure 1 shows the two states from which data was collected for this study. 65% of the overall number of the respondents was recorded from Kaduna in Kaduna state, while the remaining 35% of the respondents were from Minna in Niger state. The spread of the respondents within these two locations shows a good representation of the practice of quantity surveying within the region.

Figure 2 shows the academic qualification of the respondents. 59.5% of the respondents were BSc holders in quantity surveying from various universities, 35.1% had higher national diploma in quantity surveying, while 4.5% owned ordinary national diploma in quantity surveying.

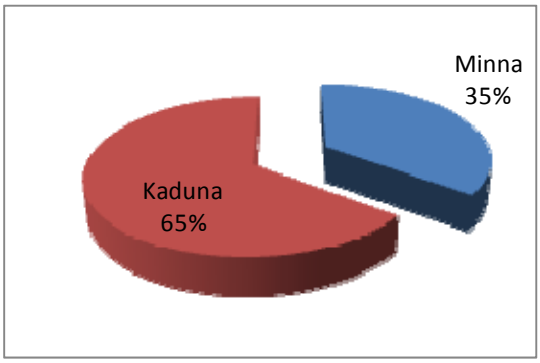

Figure 1: Frequency of the Data collected

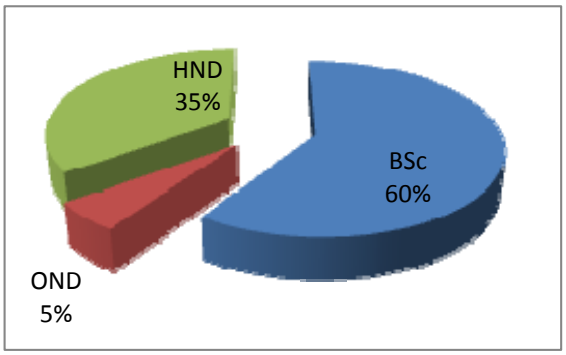

Figure 2: Qualification of respondents

Figure 3 above shows that majority of the respondents with 51%, had experience of between one to four years. 22% of the respondents had working experience of between five to nine years. 13% of the respondents had experience of between ten to fourteen years. While the remaining 14% covered respondents with working experience of fifteen years and above.

Figure 4 depicts information about respondent's place of work. Majority of the respondents with 65% work in quantity surveying consultancy firms. Contracting firms had minimum number of 13%, while the respondents working with the ministry of works covered the remaining 22%. However, the spread of the respondents within the various sectors is an indication that the data obtained is reliable for making analysis.

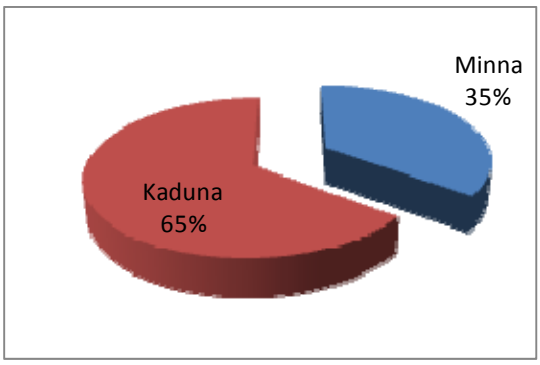

Figure 3: Working experience of respondents

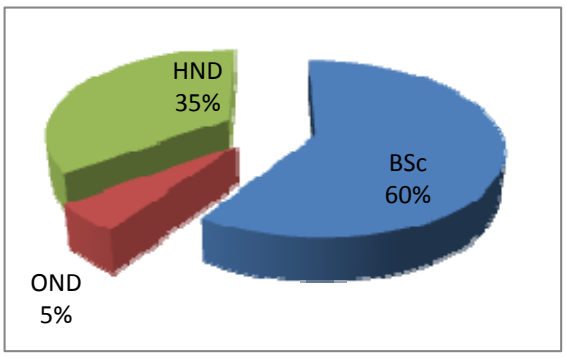

Figure 4: Place of work of respondents

Figure 5 below shows how often the respondents carry out the various cost management activities highlighted while performing their cost management functions. It was observed from the figure that over 95% of the respondents carry out all the cost management activities frequently with taking off quantities for works being done by them. Though, it can also be seen from the figure that some of the respondents only carry out the activity occasionally, but when compare the results, those who do it occasionally were being over shadowed. In the area of cost planning(group b),it was an exceptional result in which the selection of suitable cost analyses, and analyzing the chosen analysis with approximate estimate produced is only being occasionally done by most of the respondents. This can be seen from the difference in percentages obtained from the respondents on comparison, having 55% to 45% in the case of obtaining and selecting suitable cost analysis, and 59% to 35% in the case of analyzing approximate estimate with suitable cost analysis chosen for occasionally done and regularly done respectively. A very negligible percentage of the respondents have indicated that they have never carried out some of

the cost management activities. This could be as a result of the level of working experience of such respondents. Their percentages though very minute, the lowest being 4%. While the highest were recorded in the case of developing budgets, and determination of design and price risk with percentages of 20% and 21.1% respectively, to those who do not carry out these activities at all. See appendix, table 1.

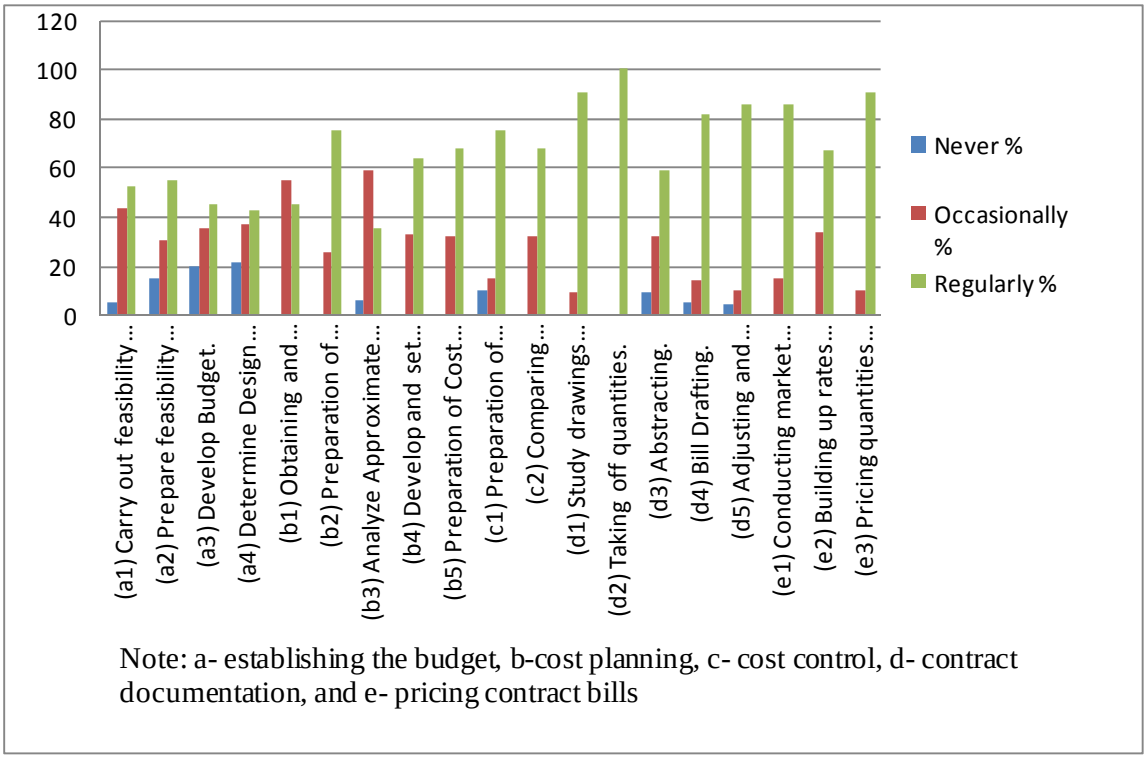

Figure 5: Frequency of conducting activities

Table 1: Frequency of conducting activities

Frequency of conducting activities	Never %	Occasionally %	Regularly %	Mean Score	SD
ESTABLISHING THE BUDGET.					
Carry out feasibility studies.	4.8	42.9	52.4	1.48	0.6
Prepare feasibility report.	15	30	55	1.4	0.75
Develop Budget.	20	35	45	1.25	0.79
Determine Design and Price Risk.	21.1	36.8	42.1	1.21	0.79
COST PLANNING.					
Obtaining and selecting suitable Cost Analyses	0	55	45	1.45	0.51
Preparation of Approximate Estimate.	0	25	75	1.75	0.44
Analyze Approximate Estimates with Analysis chosen.	6	59	35	1.29	0.59
Develop and set Elemental Cost Targets.	0	33	64	1.67	0.49
Preparation of Cost Plan.	0	32	68	1.68	0.48
COST CONTROL					
Preparation of Approximate Estimate.	10	15	75	1.65	0.67
Comparing Approximate Estimate with Cost Targets.	0	32	68	1.68	0.48

Frequency of conducting activities	Never %	Occasionally %	Regularly %	Mean Score	SD
CONTRACT DOCUMENTATION					
Study drawings critically.	0	9	91	1.91	0.29
Taking off quantities.	0	0	100	2	0
Abstracting.	9	32	59	1.5	0.67
Bill Drafting.	5	14	82	1.77	0.53
Adjusting and printing other contract documents.	4	10	86	1.81	0.51
PRICING CONTRACT BILLS					
Conducting market survey.	0	14.3	85.7	1.86	0.36
Building up rates (Rates build-up).	0	33.3	66.7	1.67	0.48
Pricing quantities with rates built.	0	9.5	90.5	1.9	0.3

Figure 6 shows the level of importance of activities for each of the various cost management activities previously outlined.

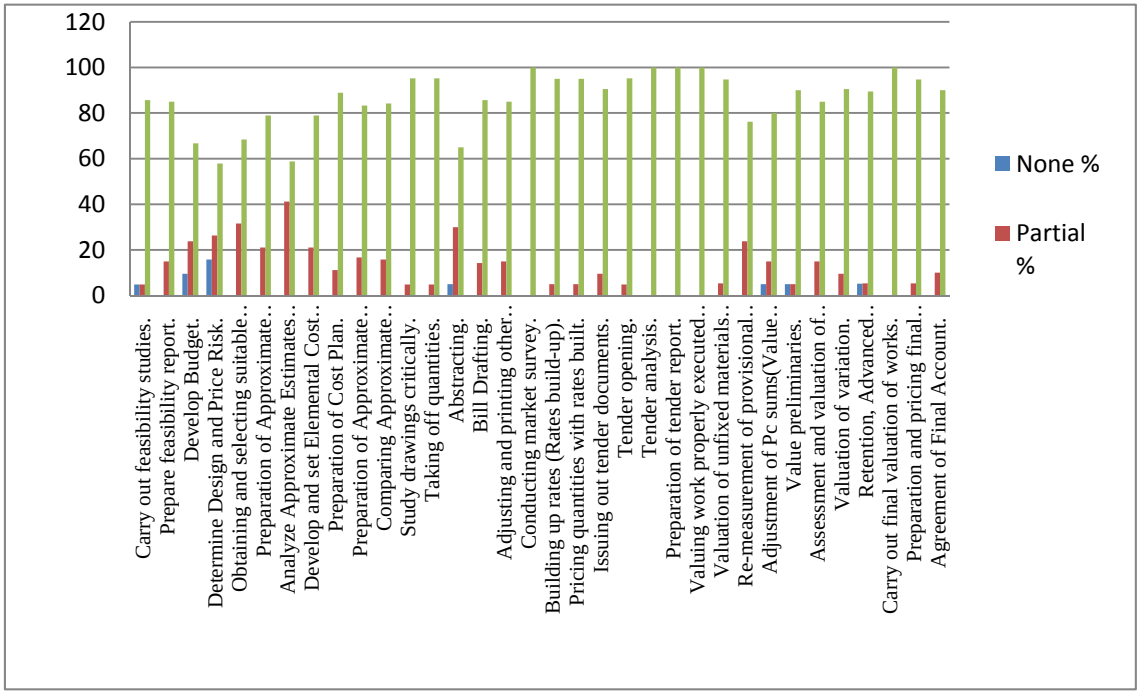

Figure 6: Level of importance of Activities

Results in figure 6 shows that majority of the respondent strongly believe that all the activities outlined are of paramount importance in performing the cost management functions of the quantity surveyor. This can clearly be seen from the figure above, as the activity which tagged lowest in the category of those with high importance had the support of about 57.9% of the respondent corresponding to the determination of design and price risk which is relatively high enough to determine the level of importance of such activity. Activities such as conducting market survey, and the valuations for both the interim and final valuation of work were shown to be of very high importance by all the respondents (100%). Other activities have percentages ranging from about 60% to 96% from the respondents as being activities of very high importance. See appendix, table 2. Level of difficulty encountered during the execution of works is summarized in figure 7.

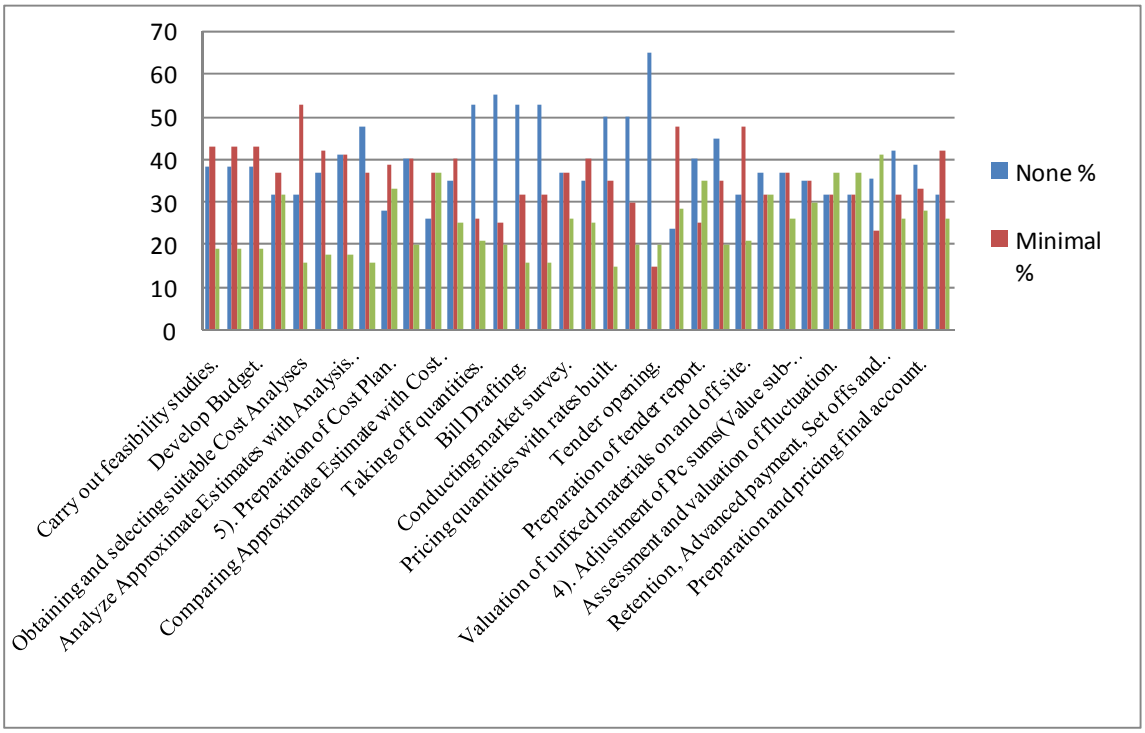

Figure 7: Level of importance of Activities

Table 3: Level of importance of Activities

IMPORTANCE OF ACTIVITY	None %	Partial %	High %	Mean Score	SD
ESTABLISHING THE BUDGET.					
1). Carry out feasibility studies.	4.8	4.8	85.7	2.81	.423
2). Prepare feasibility report.	0	15	85	1.85	.366
3). Develop Budget.	9.5	23.8	66.7	1.57	.676
4). Determine Design and Price Risk.	15.8	26.3	57.9	1.42	.769
COST PLANNING.					
1). Obtaining and selecting suitable Cost Analyses	0	31.6	68.4	1.68	.478
2). Preparation of Approximate Estimate.	0	21.1	78.9	1.79	.419
3). Analyze Approximate Estimates with Analysis chosen.	0	41.2	58.8	1.59	.507
4). Develop and set Elemental Cost Targets.	0	21.1	78.9	1.79	.419
5). Preparation of Cost Plan.	0	11.1	88.9	1.89	.323
COST CONTROL					
1). Preparation of Approximate Estimate.	0	16.7	83.3	1.83	.383
2). Comparing Approximate Estimate with Cost Targets.	0	15.8	84.2	1.84	.375
CONTRACT DOCUMENTATION					
1). Study drawings critically.	0	4.8	95.2	1.95	.218
2). Taking off quantities.	0	4.8	95.2	1.95	.218
3). Abstracting.	5	30.0	65.0	1.60	.598
4). Bill Drafting.	0	14.3	85.7	1.86	.359
5). Adjusting and printing other contract documents.	0	15.0	85.0	1.85	.366

IMPORTANCE OF ACTIVITY	None %	Partial %	High %	Mean Score	SD
PRICING CONTRACT BILLS					
1). Conducting market survey.	0	.0	100.0	2.00	.000
2). Building up rates (Rates build-up).	0	5.0	95.0	1.95	.224
3). Pricing quantities with rates built.	0	5.0	95.0	1.95	.224
TENDERING					
1). Issuing out tender documents.	0	9.5	90.5	1.90	.301
2). Tender opening.	0	4.8	95.2	1.95	.218
3). Tender analysis.	0	0	100.0	2.00	.000
4). Preparation of tender report.	0	0	100.0	2.00	.000
INTERIM VALUATION					
1). Valuing work properly executed according to the contract.	0	0	100.0	2	0
2). Valuation of unfixed materials on and off site.	0	5.3	94.7	1.95	0.229
3). Re-measurement of provisional item and quantities.	0	23.8	76.2	1.76	0.436
4). Adjustment of Pc sums(Value sub-contractor`s work)	5	15	80.0	2.8	4.549
5). Value preliminaries.	5	5	90.0	1.85	0.489
6). Assessment and valuation of fluctuation.	0	15	85.0	1.85	0.366
7). Valuation of variation.	0	9.5	90.5	1.9	0.301
8). Retention, Advanced payment, Set offs and Damages management.	5.2	5.3	89.5	1.84	0.501
FINAL ACCOUNT					
1). Carry out final valuation of works.	0	0	100.0	2.00	.000
2). Preparation and pricing final account.	0	5.3	94.7	1.95	.229
3). Agreement of Final Account.	0	10	90.0	1.90	.308

Results from the figure 7 shows that the level of difficulty faced is at the extreme, it is about 11.76% for all the activities. These activities include selection of suitable cost analysis, determination of design and price risk, preparation of cost plan, comparing approximate estimate with cost plan, tender analysis, Assessment and valuation of fluctuation, Valuation of variation, and Retention, Advanced payment, Set offs and Damages management with percentages from respondents as 52.6%, 31.6%, 33.3%, 36.8%, 26.8%, 36.8%, 36.8% and 41.2% respectively. See appendix, table 3 while figure 8 shows the results of cost indices.

Table 3: Level of Difficulty encountered while performing Activity

Level of Difficulty encountered while performing Activity	None %	Minimal %	High %	Mean Score	SD
ESTABLISHING THE BUDGET					
1). Carry out feasibility studies.	38.1	42.9	19	.81	.750
2). Prepare feasibility report.	38.1	42.9	19	.81	.750
3). Develop Budget.	38.1	42.9	19	.81	.750
4). Determine Design and Price Risk.	31.6	36.8	31.6	1.00	.816
COST PLANNING					
1). Obtaining and selecting suitable Cost Analyses	31.6	52.6	15.8	.84	.688
2). Preparation of Approximate Estimate.	36.8	42.1	17.6	.84	.765
3). Analyze Approximate Estimates with Analysis chosen.	41.2	41.2	17.6	.76	.752
4). Develop and set Elemental Cost Targets.	47.4	36.8	15.8	.68	.749
5). Preparation of Cost Plan.	27.8	38.9	33.3	.62	.744

Level of Difficulty encountered while performing Activity	None %	Minimal %	High %	Mean Score	SD
COST CONTROL					
1). Preparation of Approximate Estimate.	40	40.0	20	1.06	.802
2). Comparing Approximate Estimate with Cost Targets.	26.3	36.8	36.8	.80	.768
CONTRACT DOCUMENTATION					
1). Study drawings critically.	35	40.0	25.0	0.90	0.788
2). Taking off quantities.	52.6	26.3	21.1	0.68	0.820
3). Abstracting.	55	25.0	20.0	0.65	0.813
4). Bill Drafting.	52.6	31.6	15.8	0.63	0.761
5). Adjusting and printing other contract documents.	52.6	31.6	15.8	0.63	0.761
PRICING CONTRACT BILLS					
1). Conducting market survey.	36.8	36.8	26.3	0.89	0.809
2). Building up rates (Rates build-up).	35	40.0	25.0	0.9	0.788
3). Pricing quantities with rates built.	50	35.0	15.0	0.65	0.745
TENDERING					
1). Issuing out tender documents.	50	30	20.0	0.7	0.801
2). Tender opening.	65	15	20.0	0.55	0.826
3). Tender analysis.	23.8	47.6	28.6	1.05	0.74
4). Preparation of tender report.	40	25	35.0	0.95	0.887
INTERIM VALUATION					
1). Valuing work properly executed according to the contract.	45	35	20.0	0.75	0.786
2). Valuation of unfixed materials on and off site.	31.6	47.4	21.1	0.89	0.737
3). Re-measurement of provisional item and quantities.	36.8	31.6	31.6	0.95	0.848
4). Adjustment of Pc sums(Value sub-contractor`s work)	36.8	36.8	26.3	0.89	0.809
5). Value preliminaries.	35	35	30.0	0.95	0.826
6). Assessment and valuation of fluctuation.	31.6	31.6	36.8	1.05	0.848
7). Valuation of variation.	31.6	31.6	36.8	1.05	0.848
8). Retention, Advanced payment, Set offs and Damages management.	35.3	23.5	41.2	1.06	0.899
FINAL ACCOUNT					
1). Carry out final valuation of works.	42.1	31.6	26.3	.84	.83
2). Preparation and pricing final account.	38.9	33.3	27.8	0.89	0.832
3). Agreement of Final Account.	31.6	42.1	26.3	0.95	0.78

.

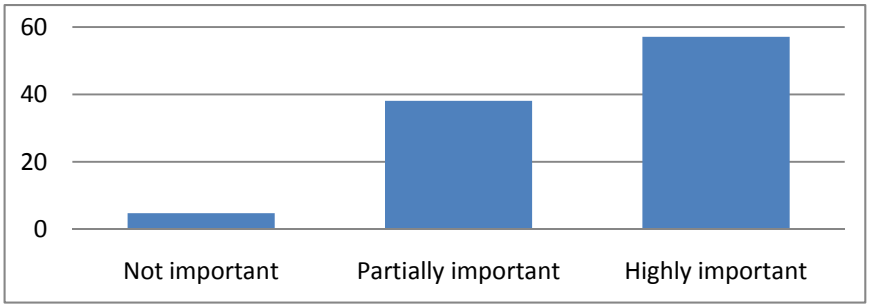

Figure 8: Establishing the Budget Using Cost Indices

Figure 8 shows the importance of cost indices for establishing the budget, were shown to be highly importance by 57% of the respondents and 38% of the respondents were partially in support of using cost indices to establishing the budget while about 5% of were for non-important this result was very low and insignificant when compare with respondents with highly and partially important. Cost management functions were also indentified and results are presented in table 4.

Table 4: Cost management functions performed for the project

COST MANAGEMENT FUNCTIONS	**Client Type**		**Nature of project**		**Magnitude of Project in million**		
	Public %	**Private %**	**Building %**	**Civil %**	**50-100 %**	**100-150 %**	**Above 200 %**
Establishing the Budget	40	29	40	60	33	33	33
Cost planning	60	86	80	50	67	67	83
Cost control	60	86	80	50	67	67	83
Contract Documentation	60	100	90	50	67	67	100
Pricing contract bills	80	29	50	50	33	100	50
Tendering	60	29	50	0	67	33	50
Interim valuation	40	100	80	50	67	33	100
Final Account	60	86	80	50	67	67	83

The table 4 above shows the extent to which cost management functions were conducted on some selected projects which the respondents have handled very recently or are currently being handled. It was observed from the table that budgets were established for 40% of the projects belonging to the public client, while 29% of projects owned by private clients had their budgets established by the respondents. 40% of project related to building works had the same function performed on them, while the same goes for 50% of projects relating to civil engineering works. Still on establishing the budget, a uniform percentage, 33% of the projects under the various magnitudes of project defined also had the function performed on them. With regards to cost planning and cost control, 86% of the projects belonging to the private client had these functions carried out on them by the respondents, while 60% for those belonging to the public client. As regards to the nature of works, 80% of building the projects went through cost planning and cost control, while 50% for those of civil engineering works. Based on magnitude of the project, projects over 200 million had the highest percentage of 83%. For the other two categories, 67% of the projects had cost planning and cost control conducted on them. The high percentage on the side of the private client shows that the private clients are in for value for money and minimization of wastages which is one of the main goals of JIT.

Contract documentation appeared as one of the most important cost management function of the QS. Contract documentation was conducted on all the projects belonging to the private client, equivalent to 100%, while 60% of those belonging to the public client had the same privilege. Also 90% and 60% of building and civil engineering projects went through the process of contract documentation. Based on magnitude of project, all the projects above 200 million went through the process of contract documentation, while 67% of the other two categories went through the same process as well. Projects over 200 million are definitely of large magnitude involving numerous consultants, sub-contractors and suppliers. Proper contract documentation is thus needed for proper administration of the project.

In the case of interim valuation, all projects belonging to the private client had this function performed on them, while 40% of projects owned by public clients went through the process. This again shows the differences in the orientation of both client types. The private client is more thorough in cost monitoring than the public client, and thus follows up the construction process strictly step by step making sure that payment is only made for what is due unlike what occurs in projects of public clients. With respect to nature of project, interim valuation was conducted for

80% of building projects and to 50% of civil engineering works. Likewise all the projects above 200 million went through interim valuation, 33% for projects within the range of 100-200 million ,and 67% for those between 50-100 million. The high percentage obtained for projects above 200 million could be as a result of various stake holders who form time to time demand for payment of work done, and also to finance the contractor and sub-contractors for work to continue without stoppage.

Moreover, 86% of the projects by private clients had their final accounts prepared after the execution of the projects. On the other hand, 60% of public projects had their final accounts prepared also. For building projects, 80% had their final account prepared, while 50% of civil engineering projects also had theirs prepared. 83% of projects above 200 million had their final account prepared on completion while 67% of projects between 50-100 million, and 100-200 million had their final accounts prepared.

5.0 Conclusions

All activities involved in the cost management function of the quantity surveyor are important, and value adding, corresponding to conversion activities in line with the Just-In-time/lean methodology. The activities are also being carried out on a frequent basis and supported by [12]. There are however extreme difficulties encountered while performing some of these activities especially in the area of cost planning, cost control and interim valuation. Since the activities are important and frequently done, they cannot therefore be removed from the cost management process in line with the principles of lean methodology as seen in figures 5,6,7,8, and tables 1, under data analysis. Improvement strategies only need to be sought in those grey areas for effective and improved service delivery in line with [12, 13].

The study indicates that all the documents highlighted used by the quantity surveyor are of paramount importance for effective service delivery. The study however revealed the unavailability of cost indices and standard guides which are needed to enhance the service delivery process of the cost management function of the quantity surveyor. The documents in question are also not sufficient enough for use by the Quantity Surveyor.

The study also revealed that some areas of information flow between the quantity surveyor and other stake holders need to be addressed especially in respect of the clients and designers (architects and engineers).

It was also discovered that majority of the cost management functions are performed under the private sector client and on projects ranging from two hundred million and above. This could be as a result of the demand for value for money by the private clients who are out on cost minimization and profit maximization.

6.0 Recommendations

The following recommendations are proposed based on the study

1. Designers should endeavor to service the quantity surveyor with all relevant contract drawings in good time, to avoid time wasted in no gainful venture, so as to meet up with the just-in-time principle of prompt service delivery.
2. Clients should endeavor to reply the Quantity Surveyor with the details of budget approval and confirmation of cost plan in good time, to void time wasted in no gainful venture, so as to meet up with the just-in-time principle of prompt service delivery.
3. Quantity Surveyors under the umbrella of the Nigeria Institute of Quantity Surveyor (NIQS) should come together and devise ways in developing an information system

like the Building Cost Information System (BCIS) which would go a long way in solving the problem of getting suitable cost analysis and cost indices.

4. The Nigeria Institute of Quantity Surveyor (NIQS) should also strive to see that quantity surveyors are highly engaged in both civil engineering work and Building work, so that value for money can fully be achieved on construction projects.
5. The public sector client should try and engage the Quantity Surveyor on time in their projects to perform his cost management functions.
6. The use of internet facilities in information should be explored to the fullest.

References

[1] A. S. Ali and K. H. Wen, "Building defects: Possible Solution for Poor construction Workmanship," Journal of Building Performance, vol. 2, pp. 59-69, 2011.
[2] D. Cartlidge, New Aspect of Quantity Surveying Practice. Oxford: Butterworth Heinemann, 2002.
[3] N. Nissanka and S. Sepani, "Acceptability of Lean Concepts to Functions of Quantity Surveyors in Sri Lanka," Lean Construction Journal, vol. 1, pp. 1-11, 2007.
[4] A. Ashworth and K. Hogg, Willis's Practices and Procedures for the Quantity Surveyors. Oxford: Blackwell Publishing Ltd, 2007.
[5] RICS, " QS Think Tank: The Challenge of Change," RICS, 1998.
[6] B. M. Testa, "Lean Manufacturing: processing buzzword or operational livesaver," Engineered wood journal, vol. 6, pp. 12-15, 2003.
[7] P. Ward and Z. Honggeng, "Impact of Information Technology Integration and Lean/Just-In-Time Practices on Lead-Time Performance," Decision Sciences, vol. 37, pp. 177-203, 2006.
[8] J. K. Liker, The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. USA: McGraw-Hill Education, 2004.
[9] R. R. Fullerton, C. S. McWatters, and C. Fawson, "An examination of the relationships between JIT and financial performance," Journal of Operations Management, vol. 21, pp. 383-404, 2003.
[10] A. Nahm, M. Vonderembse, and X. Koufteros, "The impact of organizational culture on time-based manufacturing and performance," Decision Sciences, vol. 35, pp. 579-608, 2004.
[11] P. Rondeau, M. vonderembse, and T. Ragu-Nathan, "Exploring work system practices for time-based manufacturers: Their impact on competitive capabilities," journal of Operations Management, vol. 18, pp. 509-529, 2000.
[12] J. M. Farrar, S. M. Abou Rizk, and X. Mao, "Generic Implementation of Lean Concepts in Simulation Model," Lean Construction Journal, vol. 1, pp. 1-23, 2004.
[13] S. M. Wagner and V. Silveira-Camargos, "Decision model for the application of just-in-sequence," International Journal of Production Research, vol. 49, pp. 5713-5736, 2011.
[14] G. Howell, "What is Lean Construction," in Proceedings of the 7th Conference of the International Group for Lean Construction, Berkeley, California, USA, 1999.
[15] W. J. Stevenson, Operations Management, 7 ed. Boston: McGraw-Hill/Irwin, 2002.
[16] J. Freire and L. F. Alarco´n, "Achieving Lean Design Process: Improvement Methodology," Journal of Construction Engineering & Management, vol. 128, p. 248, 2002.
[17] G. Ballard, "The Lean Project Delivery System," Lean Construction Journal, vol. 4, pp. 12-46, 2008.
[18] L. Koskela, Application of the new production philosophy to construction vol. 72: Stanford university (Technical Report No. 72, Center for Integrated Facility Engineering, Department of Civil Engineering). Stanford, CA, 1992.
[19] R. Hwang and H. Katayama, "Integrated procedure of balancing and sequencing for mixed-model assembly lines: a multi-objective evolutionary approach," International Journal of Production Research, vol. 48, pp. 6417-6441, 2010.
[20] M. Hook and L. Stehn, "Lean Principles in Industrialized Housing Production: the need for a cultural change," Lean Construction Journal, vol. 1, pp. 20-33, 2008.
[21] G. Ballard and G. Howell, "Lean Project Management," Building Research & Information, vol. 31, pp. 119-133, 2003.
[22] S. Shingo, "A Study of the Tovota Production System From an Industrial Engineering Viewpoint," 1989.
[23] S. Sernaratne and D. Wijesiri, "Lean Construction as a Strategic Option: Testing its Suitability and Acceptability in Sri Lanka," Lean Construction Journal, vol. 2, pp. 38-44, 2008.

[24] J. T. Roscoe, Fundamental research statistics for the behavioral sciences, 2 ed. New York: Holt, Rinehart and Winston 1975.
[25] R. A. Rahim, F. W. Jalaludin, and K. Tajuddin, "The importance of corporate social responsibility on consumer behaviour in Malaysia," Asian Academy of Management Journal, vol. 16, pp. 119-139, 2011.
[26] O. M. Anifowose, "Cost comparison between built-in security components and some physical characteristics of buildings in Nigeria: Case studies of residential, commercial and institutional buildings in Abuja and Minna," Journal of Building Performance, vol. 2, pp. 18-26, 2011.
[27] R. Diprose, "Physical Safety and Security: A Proposal for Internationally Comparable Indicators of Violence I am grateful for the comments and inputs of Sabina Alkire, Proochista Ariana, Afsan Bhadelia, Alex Butchart, Anna Hiltunen, María Ana Lugo, Andrew Mack, Luca Mancini, Emma Samman, Frances Stewart, Diego Zavaleta and workshop participants. Without their support this paper would not have been possible. A longer, more detailed working paper can be found at www.ophi.org.uk or www.crise.ox.ac.uk," Oxford Development Studies, vol. 35, pp. 431-458, 2007.