Ethiopian Journal of Environmental Studies & Management 10(7): 931 – 941, 2017.
ISSN:1998-0507 doi: https://ejesm.org/doi/v10i7.9
Submitted: June 19, 2017 Accepted: September 21, 2017

# A SURVEY OF CURRENT PRACTICE OF PREPARING BILL OF QUANTITIES IN SOUTHWEST NIGERIA

***KADIRI, D.S.[1] AND AKWA, V.M.[2]**
[1]Department of Quantity Surveying, Obafemi Awolowo University, Ile-Ife, Nigeria
[2]Department of Building, University of Lagos, Akoka, Nigeria
Corresponding author: deleskadiri@yahoo.com

**Abstract**
*The study explored the current practice of preparing bill of quantities by Quantity Surveyors in southwest Nigeria with a view to determining their project cost control and communication effectiveness. A survey questionnaire was administered on the 85 frontline consulting firms of Quantity Surveyors (those with not less than 10 years practice experience) in Southwest Nigeria. The questionnaire elicited information on the formats of bill preparation, the codes of measurement used for preparing bills of quantities, the methods of billing engineering services in buildings and the factors influencing these billing practices. Using the 58 retrieved questionnaire, percentages were computed for the practices and factors. The study concluded that most quantity surveyors in Nigeria use archaic methods in preparing bills of quantities. The use of these billing practices was influenced more by availability and familiarity of practioners with them than by current global practice requirements. It is also concluded that the presentation of engineering services installations in bills of quantities is confused in Nigeria. The study therefore recommended that Quantity Surveyors in Nigeria should embrace current global practices in bill preparation as well as ensuring that engineering services are measured in details so as to enhance project cost control and planning.*

**Key Words:** *Bill, Communication, Practice, Preparation, Quantity surveyor*

## Introduction

According to Ashworth, Hogg and Willis (2005), the Quantity Surveyor's role is to ensure that the resources of the construction industry are utilized to the best advantage of society by providing, *inter alia*, the financial management for projects and a cost consultancy service to clients and designers alike during the whole construction process. Seeley and Winfield (2009) explained that a bill of quantities consists of a schedule of items of work to be carried out under a contract with quantities entered against each item prepared in accordance with a Standard Method of Measurement (SMM). A bill of quantities is a cost model used to obtain bids in a format which enhances comparison between various contractors and transparency. It aids the Quantity Surveyor in valuing variations, calculating stage payments and the

preparation of the final account. It contains general information on a construction project together with quantities measured from drawings in accordance with a current measurement code. The document will subsequently be priced by contractors and used throughout the construction stage for valuations and cost control purposes.

The overall purpose of a bill of quantities is to obtain competitive tenders from contractors, subcontractors and suppliers. According to Hore, Kehoe, McMullan and Penton (1997), the use of a bill of quantities will reduce risk of errors in measurement when prepared by professionals; acts as vehicle for valuing changes; assists in preparing approximate estimates for future work; and assists contractors in planning and scheduling resources.The preparation of a bill of quantities, which is a core function of the Quantity Surveying profession, is still a much sought-after skill (Cartlidge, 2009).

In spite of its inherent usefulness, various concerns have been raised about the effectiveness of a bill of quantities as a communication tool in general and, in particular, about its adequacy as a cost control and planning contract document. For example, Morledge and Kings (2006) cited in Adnan, Nawawi, Akhir, Supardi and Chong (2011) argued that bills of quantities are not cost effective in their current formats. Ayodele and Ayodele (2010) asserted that the prime cost (P. C.) and provisional sums for electrical and plumbing installations in bills of quantities were always adjusted because appropriate costs for them were not included. Moreover, Yusuf and Mohammad (2012) reported that it was difficult to get realistic and useable cost data on electrical and mechanical engineering services from past projects because of their inclusion in bills of quantities as lump sums instead of detailed measurements. Davis and Baccarini (2004) found that the use of traditional bills of quantities based on SMM were in decline in Australia. In other words, the use of SMM for the preparation of contract documents was in decline.

Similarly Adnan *et al.* (2006) reported that temporary works, descriptions and P.C. sums were key elements in bills of quantities which needed urgent improvement. Darke (2002) and Babalola and Adesanya (2009) argued that inadequate measurement expertise on the part of Quantity Surveyors in, and the production of inaccurate estimates for, mechanical and electrical services were becoming unacceptable given their increasing cost significance in total building cost. Presently, there is scanty empirical evidence in literature on the formats of bill preparation, the codes of measurement that are used in preparing bills of quantities, the methods used in preparing electrical and mechanical engineering services as well as the factors which influence these practices in Southwest Nigeria, hence, this study. This study was justified in Southwest Nigeria going by the claim of Fagbemi (2008) that more than 75% of quantity surveying firms in Nigeria operate from the study area. It was against the foregoing background that this paper examined the current bill preparation practice in Southwest, Nigeria with the aim of determining their cost control, planning and communication effectiveness.

***Overview of Bill Preparation Practice***

The Royal Institution of Chartered Surveyors (RICS) (1998) described a bill of quantities as a document which adequately describes the quality and accurately represents the quantity of work required in a construction project whether proposed or executed. Cartlidge (2009) opined that the purpose of a code of measurement is to provide succinct and precise definitions to permit the accurate measurement and descriptions of buildings on common consistent basis. According to Oforeh and Alufohai (2007), any code of measurement should aim at establishing the correct physical quantity of a defined work item together with the description of the quality of materials and workmanship required for its economic execution.

Prior to the introduction of the first edition of the SMM for building works (SMM1) in 1922 in UK, bills of quantities were prepared according to practioners' whims and caprices (Seeley and Winfield, 2009). Thus a large diversity of practice existed, varying with local customs and even with idiosyncrasies of individual surveyors. In UK, the first edition of SMM was published by the Royal Institution of Chartered Surveyors (RICS) in 1922 with its last edition being SMM7 published in 1988. However, SMM7 has been replaced with RICS New Rules of Measurement (NRM2: Detailed measurement for building works) effective from 1 January, 2013. The first edition of SMM, adapted from SMM6 of UK, was issued in Nigeria in 1988 and revised in 1996 by the Nigerian Institute of Quantity Surveyors (NIQS). In 2003, NIQS produced a Building and Engineering Standard Method of Measurement (BESMM2) to replace the 1996 edition. This document which was modelled after SMM7 of UK was reissued in 2008 as BESMM3. NIQS has also published BESMM4 in 2015 which was adapted from NRM2 of UK.

Oforeh and Alufohai (2007) argued that it was necessary to domesticate measurement codes worldwide to take care of local peculiarities in construction practice. This practice is also in place in Australia and Malaysia (Davis and Baccarini, 2004; Oforeh and Alufohai, 2007 and Seeley and Winfield, 2009). It is noteworthy that in UK, the SMM was jointly published with the agreement of the Royal Institution of Chartered Surveyors (RICS) and the former Building Employers Confederation (now the Construction Confederation) (Lee *et al*., 2005). In Nigeria, however, the NIQS is the sole publisher of SMM. The above paragraphs show that the variants of SMM available for preparing bill of quantities include old, new and local. There is need to know the variants used in Southwest Nigeria and the factors influencing their usage.

The different bill formats available include elemental, trade-order, operational, annotated, activity, and sectionalized-trade order (Mogbo, 1979; Rashid *et al*., 2006; Cartlidge, 2009 and Seeley and Winfield, 2009). A trade-order bill of quantities is one in which the work items are arranged strictly in trade-order sequence. That is, bill items relevant to a tradesman's operation are aggregated under a particular heading. This type of bill of quantities is mostly favoured by contractors because it facilitates their submission of competitive bids. It is however not easily amenable to the preparation of interim valuations. An

elemental bill is one in which arrangement of work items is based on structural, architectural and services components order. The main divisions of the bill are the building elements or functional parts of the building irrespective of the materials or methods of construction.

According to Willis and Trench (1997) the main purpose of preparing an elemental bill is to assist a standardized system of cost analysis, which may be adopted particularly where buildings of similar nature are to be repeated. This bill format is not popular with contractors who intend to sublet work to subcontractors as they find it difficult to collect similar items together. In the same vein, estimators find the bill difficult in assessing the cost of similar trades which occur in different number of elements. The elemental bill of quantities was introduced in the 1950s because of the post-war dictates of building demand which brought about the first reshaping of the tendering documentation (Skoyles, 1979).

Operational bill of quantities was developed by the Building Research Establishment of UK in the 1960s and they subdivided the work into site operations as distinct from trades and elements. Labour and sometimes plant requirements were described in terms of the operations required, together with a schedule of the materials for each operation. The level of adoption of operational bill format has been very low (Potts, 2004).The annotated bill of quantities is one in which work items have a note against them in the bill giving their locations. They are mostly used for demolition and alteration works.

The introduction of alternative bill formats were aimed at securing greater value to the contractor at both tendering and construction stages. Seeley and Winfield (2009) asserted that a key determinant of the bill preparation practice was the role such bill performed in the tendering and construction stages as well as the nature of design information available. Others are the level of development of the construction industry, the type of contract, the type of client, the type of contractor on the project and construction business environment (Burnside and Westcott, 1999; Rashid *et al*., 2006). From the several formats available, it is necessary to establish the ones used in Southwest Nigeria for preparing bill of quantities.

Emanating from the above studies, it appears that there is paucity of literature on bill preparation practices and the factors influencing them. These were therefore the foci of this paper. Specifically, the paper addressed the codes of measurement used in Southwest Nigeria, the formats of bill preparation, and the methods of presenting engineering services installations in buildings in bills of quantities as well as the factors which influence these practices.

## Methodology

The study was carried out using 85 frontline quantity surveying firms (those with more than 10 years practice experience) in Southwest Nigeria. The Nigerian Institute of Quantity Surveyors (NIQS) classifies its corporate members into three: Fellows, Members with greater than 16 years and Members with less than 10 years experience. The study was restricted to this group in order to get

expert opinion on the study objectives. The data for the survey were collected from these 85 frontline quantity surveying firms using structured questionnaire. Fifty-eight (58) responses were found suitable and were used for analysis representing 68.3% of the sampling frame. The questionnaire elicited data on the profiles of respondents and responding firms, usage of SMM and bill formats; methods of billing engineering services installations and the factors influencing these billing practices in Southwest Nigeria. The data collected were analysed using percentage and mean score.

## Results and Discussion

### *Characteristics of the Respondents and Responding Firms*

Table 1 shows that 44,8% of the respondents were holders of B.Sc. degree; 38% held HND certificates 6.9% held PGD and 10.3% were Masters degree holders. These implied that all the respondents had requisite academic qualifications for bill preparation in Nigeria.With regard to professional qualification all the respondents were corporate members of the Nigerian Institute of Quantity Surveyors (MNIQS).

Table 1: Highest Academic Qualifications of the Respondents

| Academic Qualification | Number | Percentage of Total |
|---|---|---|
| HND | 22 | 38 |
| PGD | 4 | 6.9 |
| B.Sc | 26 | 44.8 |
| M.Sc | 6 | 10.3 |
| Ph.D | 0 | 0 |
| Total | 58 | 100 |

Table 2 shows that, on the average, none of the respondents handled less than 12 projects in the last five years. This meant that the respondents handled more than two projects each year. Consequently, it could be concluded that the respondents' opinion can be trusted on bill preparation practices. Similarly, none of the respondents handled less than five projects in five years.

Table 2: Number of Building Projects Handled by Respondents

| Interval | Midpoint (x) | Frequency (f) | Fx |
|---|---|---|---|
| 1- 5 | 3 | 7 | 21 |
| 6 - 10 | 8 | 17 | 136 |
| 11 - 15 | 13 | 10 | 130 |
| 16 - 20 | 18 | 19 | 342 |
| Above 20 | 23 | 5 | 115 |
| | | ∑fx=744 | ∑f=58 |

Mean =12.8

### *Usage of Standard Methods of Measurement*

In Table 3 it is shown that BESMM3 ranked first with 53.4% as the measurement code used for the preparation of bills of quantities in Nigeria. It was followed by SMM6 (25.9%), SMM7 (15.5%) and BESMM2 (5.2%).No firm made use of SMM5 and

NRM2 for bill preparation. These implied that practicing firms of Quantity Surveyors in Nigeria are more predisposed to the use of domestic code of measurement than foreign. Those of them who used foreign codes made more use of older editions than the new. The results show that modern codes of measurement like the NEW Rules of Measurement (NRM2) are hardly used by Quantity Surveyors in Nigeria. This trend should be revised to take account of the global nature of the construction industry. There is the need for Nigerian Quantity Surveyors to adopt the current best global practices in their professional practice. This will make them to continue to be relevant in the international market place. The above findings were not in support of Davis and Baccarini (2004) who concluded that the use of SMM was in decline in Australia. All the responding firms in Southwest Nigeria make use of SMM in preparing bill of quantities.

Table 3: Usage of Standard Methods of Measurement (SMM)

| SMM | Frequency | Percentage |
|---|---|---|
| SMM6 | 15 | 25.9 |
| SMM7 | 9 | 15.5 |
| BESMM3 | 31 | 53.4 |
| BESMM2 | 3 | 5.2 |
| SMM5 | 0 | 0 |
| Total | 58 | 100 |

On the factors which influenced the use of the codes of measurement above, it is shown in Table 4 that familiarity (31%) ranked highest. It was closely followed by ease of application (25.9%), availability for use (15.5%), level of development in the industry (12.1%) and firm's tradition (10.3%), in that descending order. The results show that Nigerian Quantity Surveyors need to be more innovative by jettisoning old professional procedures just because they are familiar and easy to apply. They should take advantage of the development in the international construction industry to leapfrog their practices into global lime light.

Table 4: Factors Influencing the Usage of SMM

| **Factors** | **Frequency** | **Percentage** |
|---|---|---|
| Availability for use | 9 | 15.5 |
| Level of development in industry | 7 | 12.1 |
| Familiarity with SMM | 18 | 31.0 |
| Ease of application | 15 | 25.9 |
| Firm's tradition/preference | 6 | 10.3 |
| Client's preference | 1 | 1.7 |
| None | 2 | 3.4 |
| **Total** | **58** | **100** |

***Usage of Bill Formats***

Table 5 shows that elemental bill format (89.7%) was the dominant format preferred by consulting firms of Quantity Surveyors in Nigeria for bill presentation. It was followed by trade-order bill format

(8.6%) and operational format (1.7%). These results agreed with Rashid *et al.* (2006) and Cartlidge (2009) who reported that the trade-order, elemental and operational formats in that order were the most popular formats in UK. However, it would have been expected that the annotated bill format was more in use than the operational bill of quantities. This is because works in existing buildings in the form of renovation, conversion and alteration works will necessarily be prepared using annotated bill format. However, the predominant use of the elemental format by consulting firms of Quantity Surveyors is not surprising to say the least because of its immense benefits for the preparation of cost analysis and subsequent cost planning of proposed schemes.

Table 5: Usage of Bill Formats

| **Bill Format** | **Frequency** | **Percentage** |
|---|---|---|
| Elemental | 52 | 89.7 |
| Trade-order | 5 | 8.6 |
| Operational | 1 | 1.7 |
| Sectionalised-Trade | 0 | 0 |
| Activity | 0 | 0 |
| Annotated | 0 | 0 |
| **Total** | **58** | **100** |

The factors which mostly influenced the choice of the above bill formats used by Quantity Surveying firms in Southwest Nigeria as revealed in Table 6 were familiarity with the formats and contract administration effectiveness (37.9%). They are followed by simplicity of the format (8.6%), firm's preference (5.2%) and the speed of preparation (3.4%), amongst others. The claim by the respondents that the elemental bill format facilitates contract administration is true. Post-contract functions of the Quantity Surveyor like interim valuations for payment on account are usually easier done with elemental rather than with the trade-order format. The finding that bill formats are used based on contract administration effectiveness is in disagreement with Adnan *et al.* (2006) that current formats were not cost effective.

Table 6: Factors Influencing the Usage of Bill Formats

| **Factors** | **Frequency** | **Percentage** |
|---|---|---|
| Familiarity with format | 22 | 37.9 |
| Simplicity | 5 | 8.6 |
| Nature of Project | 2 | 3.4 |
| Contract Administration Effectiveness | 22 | 37.9 |
| Firm's Tradition/preference | 3 | 5.2 |
| Speed of preparation | 2 | 3.4 |
| Compatibility with QS Soft ware | 2 | 3.4 |
| **Total** | **58** | **100** |

***Methods of Billing Services Installation***

Shown on Table 7 were the methods of billing engineering service installations by the responding firms of Quantity Surveyors. From the Table, detailed measurement (51.7%) was the predominant method of billing electrical, plumbing and mechanical engineering service installations in buildings in Southwest Nigeria. It is followed by P. C. sum (25.9%) and provisional sum (22.4%). The predominant use of detailed measurement for engineering installations means that their drawings must have been completed before their contracts are let. These results are not in agreement with the claim by Babalola and Adesanya (2009) that detailed engineering services drawings are rarely ready by the time bills of quantities are prepared. The findings also contradict the claim by Yusuf and Mohammad (2012) that engineering services were always presented using lump sums.

Table 7: Methods of Billing Engineering Services in Buildings

| **Method** | **Frequency** | **Percentage** |
|---|---|---|
| Detailed Measurement | 30 | 51.7 |
| Provisional Sum | 13 | 22.4 |
| Prime Cost Sum | 15 | 25.9 |
| **Total** | **58** | **100** |

Table 8 shows the status of the engineering services installations of the last projects handled by the responding firms. From the table, 51.7% of the respondents claimed that the drawings were not ready before the preparation of the bills of quantities by their firms. Similarly, the drawings were ready in 48.3% cases. This results are also not in agreement with the findings in table 7 that detailed measurement were mostly done for services installations in bills of quantities in the study area. Detailed measurements could not have been done by the QS when the drawings were not finalised. The best in that situation would have been the use of provisional sum to cover works which have not been fully detailed by the time tender documents are prepared.

Table 8: Status of Engineering Services Drawings of Respondent's Last Project

| **Status** | **Number** | **Percentage** |
|---|---|---|
| Details were ready | 28 | 48.3 |
| Details were not ready | 30 | 51.7 |
| **Total** | **58** | **100** |

Similarly, Table 9 shows that 53.3% of the respondents claimed that engineering services were presented in bills of quantities as Provisional sums when detailed drawings were not ready. In contrast, 46.7% of the firms presented services installations in P. C. sums when detailed drawings were not ready. This is not supposed to be so. The practice of providing P.C. sum for service installations in bills of quantities even when detailed drawings are not available is not a good practice in Quantity Surveying. Whenever detailed drawings are not ready before the preparation of contract documents, the normal practice is for all construction works to be presented as provisional sum or provisional quantities. This is why substructure is described as 'All Provisional'.

Similarly, subcontractors should be appointed to handle the execution of specialty works like engineering services installations on the recommendation of the client or his professional advisers.

This is to ensure that good quality work is done. Traditionally, the onus of detail measurement and estimation of services installations is on nominated subcontractors or their QS on their behalf. The prime cost of services installations are then included in bills of quantities by consultant Quantity Surveyors on stated basis of the inclusion of profit and attendances to be priced by main contractors. However, a case could be made for the inclusion in contract bills of the detailed bills of quantities prepared by nominated subcontractors whenever such details are available. This practice will enhance the cost analysis of executed services installation and thus provide the needed cost data for planning the cost of future projects.

Table 9: Methods of Billing Engineering Services when Drawings are not ready

| **Method** | **Frequency** | **Percentage** |
|---|---|---|
| Provisional Sum | 16 | 53.3 |
| Prime Cost Sum | 14 | 46.7 |
| **Total** | 58 | 100 |

## Conclusions and Recommendations

From the foregoing results, it was concluded that the function of bill preparation in Southwest Nigeria is carried out by experienced Quantity Surveyors who also possess cognate professional and academic qualifications. However, current global practice is not adopted for bill preparation in the study area because of the predominant usage of old rather than new SMM. Although there are concerted efforts to measure engineering services in buildings in detail, a good number of them are still presented as provisional or P. C. sums in bills of quantities in the study area. The use of both concepts is also confused in the study area with regard to engineering services installations. It was also concluded that appropriate formats are used in preparing bill of quantities in the study area.

It was therefore recommended that:

1. The use of old SMM for bill preparation should be discarded in favour of new ones. This will make the practicing firms to be more relevant in the global market place.
2. It is therefore recommended that Provisional sum should be used for engineering services only when their drawings have not been finalized before a contract is let. When drawings are ready before documentation, P. C. sum must be the vehicle for conveying the cost of service installations in buildings.
3. It is also recommended that whenever P. C. sum is used, it should be originated by subcontractors or their Quantity Surveyors on their behalf. The details of such P. C. sums should be incorporated in bills of quantities by the consultant QS. This way their cost data would be handy in planning the costs of future similar projects. The excuse of provisional and P. C. sums inclusion in bills of quantities because of lack of sufficient details, time and knowledge should be jettisoned.
4. Designers should be prevailed upon to provide sufficient details to aid the measurement of services. Besides, clients should be made to be aware that giving sufficient time for the detailed design and measurement of services installations in buildings before contracts are let will be in their

overall cost control and value for money interests. On their part, Quantity Surveyors should avail themselves of regular workshops and seminars on capacity building in the areas of measurement and estimating of services installations in buildings. To do otherwise will mean to vacate their cost control role on 30% - 40% of total construction cost which these aspects of the works have been found to represent (Babalola and Adesanya, 2009).

**References**


Adnan, H, Nawawi, A.H.M., Akhir, S.M.M., Supardi, A. and Chong, H.Y. (2006). Bill of Quantities: Perspectives of Contractors in Malaysia. *Austalian Journal of Basic and Applied Science*. (5)11: 863-873.

Ashworth, A. and Hogg, K. (2005). *Willis practice and procedure for the quantity surveyor (11th ed.).* Oxford: Blackwell Science.

Ayodele, E.O. and Ayodele, V.O. (2010). Communication Effectiveness of Contract Bills of Quantities in the Nigerian Building Industry-Implications for Quantity Surveyors. *Journal of the Canadian Institute of Quantity Surveyors*. Summer 2010, 24-27.

Babalola, O. (2006). Harnessing the Opportunities at the Grassroots to Make Quantity Surveying Profession Competitive at the National and International Markets. NIQS Bienniel Conference, Calabar, Nigeria.

Cartlidge, D. (2009). *Quantity Surveyor's Pocket Book* (1st ed.) Oxford: Butterworth-Heinemann.

Darke, S. (2002). The true cost of building services. *The Building Economist*. March, 10-11

Davis, P.R. and Baccarini, D. (2004). The Use of bills of quantities in construction projects-An Australian survey. In Ellis, R. and Bell, M. (ed), Proceedings of the International Construction Research Conference of the Royal Institution of Chartered Surveyors. Leeds Metropolitan University, 7-8, September.

Fagbemi, A.O. (2008). Assessment of quantity Surveyors' service quality in Lagos State, Nigeria. B.Sc. Project Dissertation. The Federal University of Technology, Akure, Nigeria.

Hore, A.V., Kehoe, J.G., McMullan, R., and Penton, M.R. (1997). *Construction 1: Management finance Measurement.* Hong Kong: Macmillan Press Ltd.

Lee, S., Trench, W. and Willis, A. (2005). *Willis's elements of quantity surveying*. (10thed.). Oxford: Blackwell publishing

Mogbo, T.C. (1979). Evolving a New Bill of Quantities Format for Nigeria. *Journal of Nigerian Institute of Quantity Surveyors*.

Morledge, R. and Kings, S. (2006). Bills of quantities – A time for change? Paper presented at the International Conference in the Built Environment in the 21st Century (ICiBE 2006), Mara University of Technology, Shah Alam.

Oforeh, E.C. and Alufohai, A. (2007). *Advanced Measurement of Building Works with an Introduction to Computer and their Applications.*

Potts, K. (2004). Quantity Surveying Tools and techniques- A review of client and Contractor requirements. RICS COBRA Research Conference Leeds Metroplitan University.

Rashid, A.R., Mustapa, M. and Wahid, A.S.N. (2006). Bills of Quantities- Are They Still Useful and Relevant Today? In Proceedings of International Conference on Construction Industry, Padang, Indonesia.

RICS (1998). *Standard method of measurement of building works* (7th ed.), London: Royal Institution of Chartered Surveyors and The Construction Confedration.

Seeley, I.H. and Winfield, R. (2009). *Building quantities explained* (5th ed.). London: Macmillan press.

Skoyles, E.R. (1979). Research and the Quantity Surveyor. *Journal of Institute of Quantity Surveyors* 35(16)

Willis, A. and Trench, W. (1998). *Willis Element of Quantity Surveying (9th* ed.), London: Blackwell

Yusuf, G.M. and Mohamad, S.F. (2012). Identification of Potential and Barriers to Adopting Standard Method of Measurement for Mechanical and Electrical Services in Malaysia. *International Journal of Sustainable Development*, 03(01).