

ASSESSMENT OF COMPUTER SOFTWARE USAGE FOR ESTIMATING AND TENDER ANALYSIS BY NIGERIAN QUANTITY SURVEYORS

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Abstract

It has been discovered that there are limitations to the use of computer software packages in construction operations especially estimating and tender analysis. The objectives of this research is to evaluate the level of computer software usage for estimating and tender analysis while also assessing the challenges faced by Nigerian Quantity Surveyors in using computer software for estimating and tender analysis. The survey design methodology was adopted for this research. Data were obtained through the use of questionnaires and oral interview of practicing Quantity Surveyors. Frequency tables showing highest frequency (mode), and cross tabulation were used for the analysis of data collected. It was observed that very high percentage (about 80%) of Nigerian Quantity Surveyors are aware of computer software used for estimating and tender analysis. About 27% uses always while 25% of the Quantity Surveyors use very frequently, 27% uses sometimes and 18% never use. The result of the research also revealed that lack of technical know-how of computer software is the main challenge faced by quantity surveyors in the use of computer software for estimating and tender analysis. It is hereby recommended that computer application for the use of estimating and tender analysis should be inculcated into the professional curriculum so that the technical know-how of Quantity Surveyors in the use of software for estimating and tender analysis will improve.

Key-Words: Computer estimation, Software usage, Tender analysis and Quantity Surveyors

Introduction

Computers and Information Communication Technology (ICT) had revolutionized the way documents are generated, the way people exchange information and documents (Rivard, 2000). The growth of ICT has had unquantifiable impact on business systems and processes. The global acceptance and widespread adoption of ICT has accelerated the dimensions of competition not only among organizations globally but among professions locally (Oyediran and Odusami, 2005). Information technology continues to develop at an exponential rate. Virtually everyone in the construction industry now has extensive access to this technology despite the wide ranging implications its uses entails (Ashworth and Hogg, 2007).

Research has shown that the successful completion of a project depends on the accuracy, effectiveness and timing of such exchange between the project team members, which is easily facilitated by use of ICT (Uden and Naaranoja, 2007). Estimating and Tender analysis according to Cartlidge (2009) involve the distribution of large volumes of documents and information that must be digested, manipulated and returned as a submission. The processes have become more electronic as files are created on computers, but the main processes – invitation, distribution, queries, evaluation and contract queries mostly remain un-automated (Olarinoye, 2006).

Ayeni (1996) defines Estimating as a process by which cost computation of a particular project is carried out. It can be for the entire scheme in order to establish the overall cost of the construction work or for cost computation of alternative designs as done at cost planning stages. A Quantity Surveyor can undertake it as a means of checking tenders received or can be

undertaken by an estimator of a contracting firm for the purpose of submitting a tender. It can also be a means of establishing the cost of any measurable variation during the construction period of a project.

Tender analysis according to Jagboro (1989) involves the breakdown of tenders received into various components for the purpose of comparison. This process begins with arithmetical checking of errors in the tender. Arithmetical errors may occur in the item extensions (i.e. the multiplication of the quantities by the unit rates); in the totaling of page, in the transfer of totals to collections or summaries. It can also be in the calculations of percentage addition in the general summary or by rounding off the bill total when carrying it to form of tender. The adjusted tender sum is termed "corrected Tender Sum". After comparison, a report in which the analysis of the strength and weaknesses of the contractors' tenders are given.

For any construction project to be executed properly and also have the benefit of value for money to the client, it is imperative that adequate professional skills are utilized. One of the means of improving the professional expertise of a Quantity Surveyor rendering services to the client is to employ the use of current innovations in ICT (Ejimofo, 2000 and Ologun, 2001).

The construction industry according to Ruddock (2006) is not among the foremost industries on its use of many categories of ICT. There are limitations to the use of computers in construction operations. Ashworth and Hogg (2007) are of the opinion that only about 60 % of Quantity Surveyors make use of information technology for their practices. These findings are still valid today (especially in Nigeria), despite the fact that the last two decades have witnessed a remarkable increase in computer power development and "user-friendly" operating systems. In addition, there has been a substantial reduction of capital cost, all of which makes computers more attractive for construction organizations to adopt. The aim of this study is to assess the level of computer software usage for estimating and tender analysis and identify the challenges faced by Quantity Surveyors in using computer software for estimating and tender analysis.

Literature Review

Information Technology according to Seeley (1984) is one of the most rapidly growing industries. Transferring knowledge and information across projects had earlier been a major challenge. The breakthrough in computer technology represents a great achievement in devising better methods of performing repetitive and routine tasks more efficiently through information technology (Diya, 2004). Computers are becoming increasingly important to construction organizations. However, the construction industry has been slow to recognize the benefits of computers as a major communication tool (Egbu and Botterill, 2002).

Estimating function is an integral part of systemic project planning. Estimation is dependent on a lot of information such as price of materials, labour, plant and equipment. These can be processed on the computer, which provides both the facility for processing data and storage. Previously stored information can also be retrieved by the estimator, which enables him to apply information from past projects in the current project. Tender analysis requires a lot of data processing, which may sometimes include word processing, calculations and logical decisions.

In construction projects, the most recognized and effective method of contractor selection is known as tendering. Tendering procedures cover the various methods that are used by the client's professional advisers to obtain offers to execute the construction project at a price. The offers are made by the contractors approached who in turn submit prices based on an assessment of their production cost and margin level to cover their overhead and profit (Olarinoye, 2006).

The process of selection of a contractor to carry out a construction project is an important matter requiring careful thought (Ramus and Birchall, 2005). The method of the selection of contractors may either be by competition or negotiation. In either case, the decision taken should reflect the client's development aims – that is the timely delivery of the project giving value for money.

A good contractor is an important factor contributing to the successful completion of a project and the client's professional advisers may look for the many attributes when drawing up a list of suitable contractors from whom to invite tenders (Seah, 2004). These include: Contractor's reputation in business: a contractor's good past record of performance in the construction industry is considered. The number and monetary value of projects the contractor has completed successfully, as well as the quality of workmanship are attributes to consider. Other factors include: Contractor's financial standing, Contractor's potential resources, Contractor's normal conduct of business, Contractor's attitude on contractual claims.

Non-economic factors according to Seah (2004) are: contractors may be selected for reasons unrelated to performance, for instance, a contractor may be appointed to foster business relationship (subsidiary company) or to maintain or promote employment in a locality. Technical factors include: an engineering evaluation is made of past performance related to estimations accuracy, project management personnel, site superintendent, cost reporting ability and systems, and scheduling. Services: the availability of technical support in staff and administration systems, suitable post constructions service capability, and a good track record with past projects. At the end of the pre-qualification process, the most suitable contractors are listed for bidding. This is followed by an invitation to tender, then evaluation of submitted tenders.

Ramus and Birchall (2005) group the methods of contractor selection under the competitive method into: Open tendering, Selective tendering and Nomination. Other categories are the Open-selective tendering and the Serial tendering. The main aim of the two stage selective tendering is to involve the chosen contractor on the project as early as possible (Ashworth and Hogg, 2007). This procedure is used when it is desired to obtain the benefits of competition and at the same time to have the advantage of bringing a contractor into the planning of the project, thus making use of his practical knowledge and expertise. It may also result in an earlier start on site (Ramus and Birchall, 2005). A contractor is selected at the first stage on documents sufficient to provide a competitive basis for selection, establishing at the same time the broad principles of layout and design as a basis for detailed development later without duplication of work.

Errors in tenders are dealt with in two ways in accordance with section 6 of the Code of Procedure for Single Stage Selective Tendering. The first approach states that when errors are found in a tender, the tenderer is informed of the errors and then asked to confirm or withdraw the tender. The second course of action is to inform the tenderer of the errors and enquire if the tender is to be confirmed and if genuine errors are to be corrected. After correction of a tender, if the tender that was the lowest now becomes higher than another it is set aside and the new lowest tender is now considered.

Tenders are analyzed according to the amount of contract sum, the proposed project duration (that is the amount of time the contractor intends to execute the project), the discount that the contractor is willing to give and other specific details peculiar to the project. The tenders are ranked in ascending order of contract sum and weeks, thereby highlighting the highest and lowest tender sums and contract periods. After the analysis, the Quantity Surveyor must report to the Architect or the Project Manager and the client as soon as his examination of the tenders is complete. He must remember that the purpose of the report is to aid the client in making up his mind whether to accept any of the tenders and if so, which one. Thus the report is supposed to focus on matters of importance and also on minor matters such as arithmetical errors (Nyenke, 2004). The form of the report will include the following: The opinion of the Quantity Surveyor as to the level of the price of the tender in relation to the level that is expected, the quality of the pricing, the extent of errors and inconsistencies in pricing and the action taken in regard of them, the details of qualification to the tender (if any), the likely total cost of the project, if not a lump sum contract, a recommendation as to acceptance or the otherwise.

Other researchers include: Rivard (2000) on impact of information technology on the Canadian architecture, engineering and construction industry; Arif & Karam (2001) on architectural practices and their use of IT in the western Cape province, South Africa; Odeyinka and Doherty (2008) on the evaluation of Quantity Surveying Software usage in Northern Ireland; Oyediran and Odusami (2005) on computer usage by Nigerian quantity surveyors; and Oladapo (2007) on use of ICT in the Nigerian Construction Industry.

Computer Software used for Estimating and Tender Analysis

Computers have had a major impact upon the profession of quantity surveying, in respect of the role and function of the professional activities. Whilst the capability of computers and their associated software continues to increase, their relative and real price decreases. Reliability is now generally good and their use has become easier as simplified and user-friendly procedures have been introduced (Ashworth and Hogg, 2007).

The quantity surveyor's work processed using computer software varies from calculations, collating coded descriptions and dimensions, word processing etc such as in the preparation of Bill of quantities, valuation, final account, tender documents preparation, and measurement of construction works just to mention a few (Oforeh, 1989; Braimoh, 2006).

Almost all Quantity Surveying softwares include estimating programs in their package. There are various Quantity Surveying software used for estimating and tender analysis. The selection of the particular software depends to some extent upon its familiarity and the perceived future needs (Ashworth and Hogg, 2007). Some of these are WINQS, SNAPE PLT and MASTERBILL

Wings

Wings is used for the production of Bill of Quantities. It was developed by ACE Solutions CC (South Africa). The calculation of monthly valuations, the cost analysis of projects, the production of estimates documents, contract price adjustment calculations, tender analysis, financial review, and cost reports (Ajanlekoko, 2004).

Snape

Snape Computer was founded in 1983. With more than 20 years of experience Snape has developed into providing quality software for the construction industry. Snape software has two major modules; CONTENDER and VECTOR.

Contender is the proven building estimating software that performs the following operations: Provides solid framework to maintain custom database of costs and prices, Produces more estimates in little time and gives a detailed analysis of the estimates, Enables data to be imported from Microsoft word and excel, Includes a full post contract support for valuation and final account. Contender is basically used for estimating. It has a standard library that uses the SMM7 format. The library can be customized to suite individual purpose. It can be used in estimating major works, minor works, alterations and repairs and also maintenance works. Different types of printouts can be got using Contender and well as profit maximization using various derived profit systems. Contender deals with all vital information necessary for accurate estimation. These are: Price information, Time and labour rates, Materials required, Plant and equipment needed.

Vector makes it easier for you to create documents quickly and easily. The keyword is accessibility; the ability to see exactly what is going on. Vector is an incredibly flexible program able to produce almost any output. In addition to having exceptional printing capability, Vector can output bills to Microsoft Excel or Word or create a CITE file for those wanting bill on desk. Vector is supplied with a SMM7 bill production library with 65000 items, plus a linked specification database.

Master Bill

MasterBill Micro systems limited is a member of the Microsoft developer network that deals with the production of construction industry software. It has various packages used for estimating and tender analysis. These include: MB³, QSCAD, EstimatorPro, Feasibility Estimate, and Solution. Masterbill MB³ is a fully featured Bill of Quantities production package comprising Pricing, tender analysis and valuation features, plus multiple libraries and the ability to transfer data between projects. It is Microsoft Windows enabled, it has the usual windows features and it is simple and direct on screen entry. MB³ contains libraries for SMM7, SMM6, CESMM3, User defined and so on. It uses Electronic Tendering (eTendering) in standard CITE format. Transfer of data is possible using disk or email. It uses SQL data base technology for fast access, robust and secure data transmission, NT or NOVELL compatibility and MULTI-USER capability with no limit to user license. It is designed around traditional dimension patterns i.e. QS dim-paper principles. This makes taking-off easy and flexible, as data can be transferred within and between projects.

MB³ can also be used to perform other functions such as compilations of bills of quantities, cost estimates, financial accounts preparation, and also comparison of tender figures. The bills of quantities and schedules of rates can be produced in any combination of part, element or workgroup. Cost and elemental analysis and tender evaluation features are also available. Descriptions are selected from the various standard libraries available, which could also be user defined. These libraries are compiled having the authorized SMM descriptions. Quantities or data can be transferred from other windows packages and relevant features required could also be applied since MB³ is Windows compatible. This means that the available features in MS WORD such as the font types and sizes, the MS EXCEL features can all be used in MB³. MB³ is cost efficient in that printing is made easy. An additional printing package is not required as the software has facility for printing. MB³ is a very useful tool in carrying out estimating and tender analysis as it enhances efficiency, effectiveness and maximized productivity. It can also be used to check and correct any tender error provided such tender is returned in soft copy.

Estimator^{pro}

This software was designed solely for estimation purposes. It is user friendly, has user defined functions and also professional features. It has an extensive range of standard libraries of descriptions available including SMM7, CESMM, and BESMM. World Wide Software Limited developed it. It has all the features of Estimator software including sub-contract and comparison routines.

Research Methods

In order to achieve the aim and the set objectives of this study, the data obtained is from the use of questionnaires and oral interviews of practicing quantity surveyors. Some of these respondents included those that work in government Parastatals, some in consulting firms, some in construction firms, and others in banks. The study population size is 50 respondents. This was decided on by selecting at random and using probability about half of the number of registered quantity surveyors in Lagos as updated in 2007 by the regulatory body. Of the 50 questionnaires administered, 41 are valid for data analysis.

Data Analysis and Results

Table 1 shows the organization distribution of the respondents. Majority of the respondents are in consulting firms. There is a decrease in the number of respondents with increase in the years of construction industry work experience. Majority of the respondents are in the 6-10 years of construction industry work experience group (table 2). Most (39%) of the respondents who use software hold a bachelor's degree (Bsc) as the highest qualification followed by MSc and HND holders who constitute a quarter of respondents each (table 3). Almost half of the respondents are corporate members of the Nigerian Institute of Quantity Surveyors (NIQS), the

nation's quantity surveying professional body. Very few respondents indicated membership of the Royal Institution of Chartered Surveyors (RICS), the quantity surveying professional body for Britain and for commonwealth (before independence) (table 4). Table 5 indicates that Masterbill software is the most commonly used software for estimating and tender analysis followed by WINGS.

Table 1: ORGANISATION DISTRIBUTION OF RESPONDENT QUANTITY SURVEYORS

TYPE OF ORGANISATION	FREQUENCY	PERCENTAGE
CONSULTING	24	58.5%
CONSTRUCTION	11	26.8%
GOVERNMENT	2	4.9%
BANK	1	2.4%
OTHERS	3	7.3%
Total	41	100.0%

TABLE 2: EXPERIENCE OF RESPONDENTS IN YEARS

(YEARS)	NO OF RESPONDENTS	PERCENTAGE
21-25	1	2.4%
16-20	2	4.9%
11-15	7	17.1%
6-10	17	41.5%
1-5	14	34.1%
Total	41	100.0%

TABLE 3: ACADEMIC QUALIFICATION OF RESPONDENTS

HIGHEST QUALIFICATION	NO OF RESPONDENTS	PERCENTAGE
PhD	1	2.4%
Msc	10	24.4%
Bsc	16	39.0%
PGD	2	4.9%
HND	10	24.4%
ND	2	4.9%
Total	41	100.0%

TABLE 4: MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS

GRADE OF MEMBERSHIP	NIQS	PERCENTAGE	RICS	PERCENTAGE
FELLOW	1	2.4%	0	0%
CORPORATE	20	48.8%	9	37.5%
PROBATIONER	15	36.6%	11	45.8%
STUDENT	4	9.8%	4	16.7%
Missing	1	2.4%	0	0%
Total	41	100.0%	24	100.0%

TABLE 5: SOFTWARE USED

Type of software	Frequency	Percent
MASTERBILL	15	36.6
WINQS	13	31.7
SNAPE PLT	2	4.9
RIPAC	1	2.4
OTHERS	1	2.4
Total	32	78.0
Missing System	9	22.0
Total	41	100.0

TABLE 6: AWARENESS OF SOFTWARE * OVERALL PROJECT COST

AWARENESS OF SOFTWARE	OVERALL PROJECT COST							Total
	ABOVE 100M	50-100M	20-50M	5-20M	1-5M	500,000-1M	BELOW 500,000	
VERY MUCH AWARE	8	8	1	4	1	2	1	25
JUST AWARE	3	2	0	1	0	0	0	6
NOT MUCH AWARENESS	4	0	0	0	0	0	0	4
NOT AWARE	0	0	1	0	0	0	0	1
Total	15	10	2	5	1	2	1	36

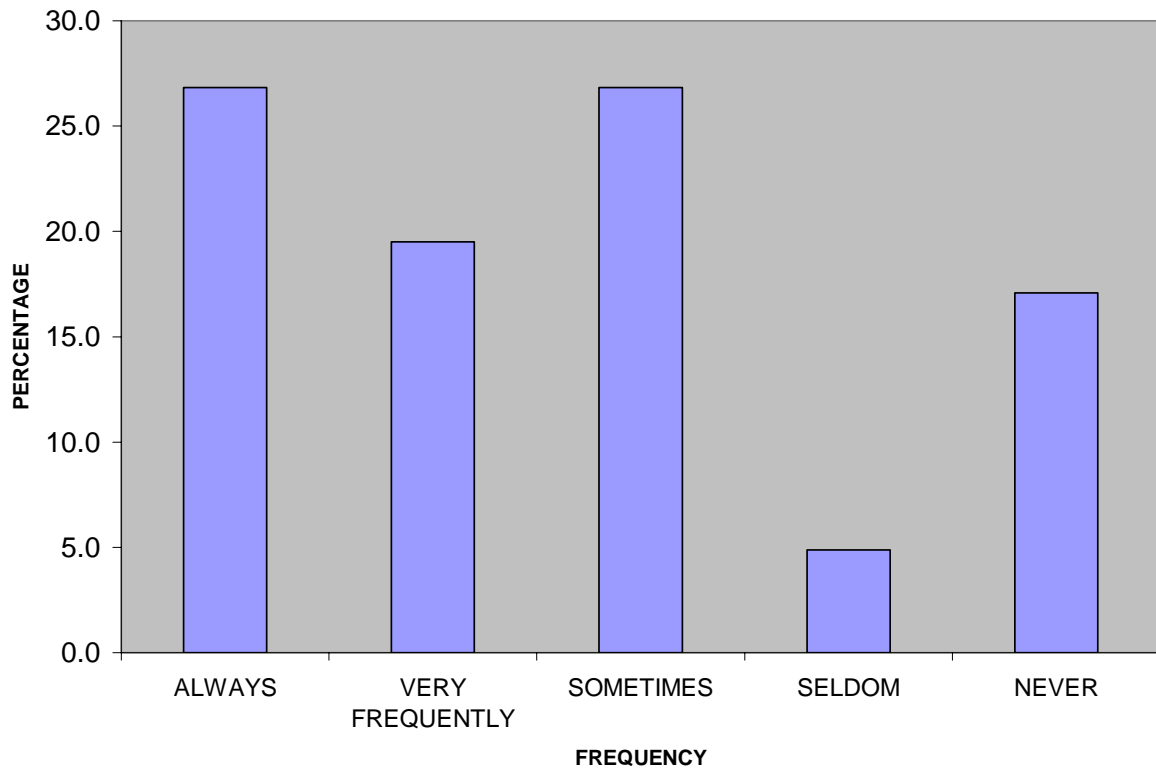


Fig. 1: Level of Computer Software Usage for Estimating and Tender Analysis.

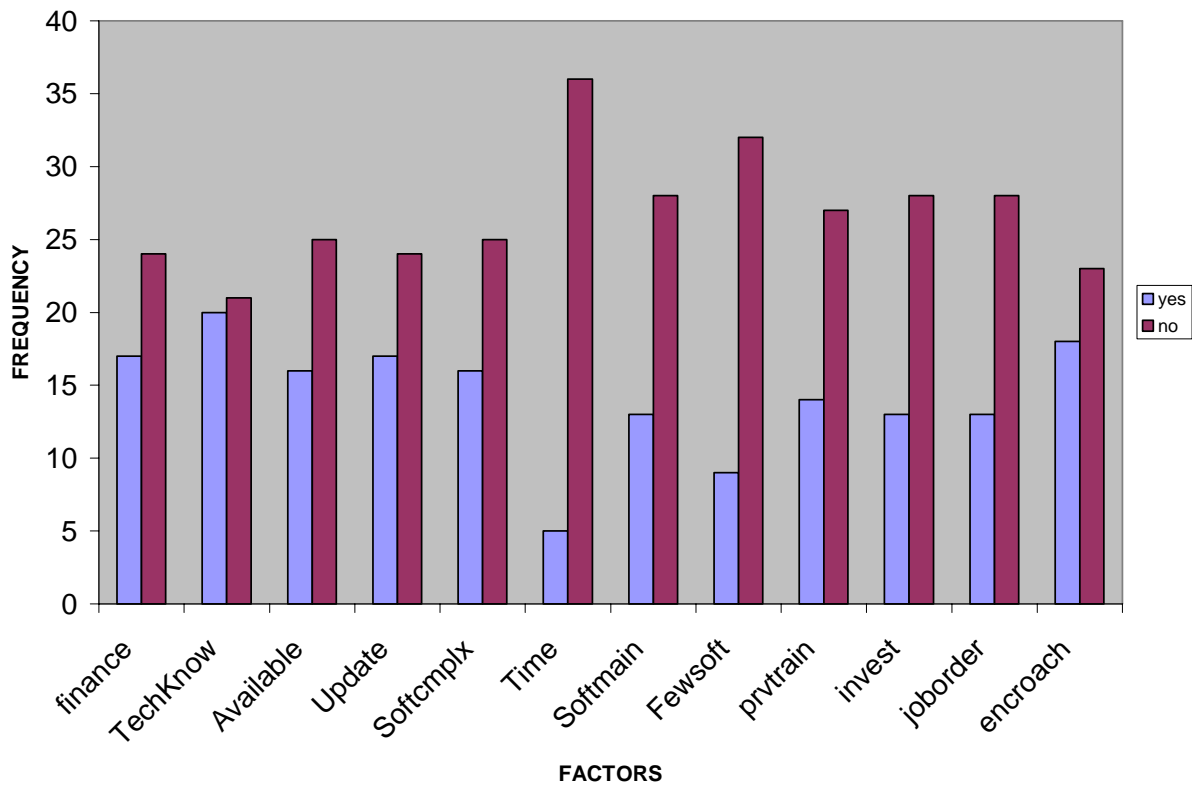


Fig. 2: Challenges Quantity Surveyors Face in Computer Software Usage for Estimating and Tender Analysis

Legend for Fig. 2

- Finance: Finance
- Techknow: Technical Know-how
- Available: Availability
- Update: Accessibility of updates
- Softcmplx: Complexity of software
- Time: Time consumption
- Softmain: Maintenance of software
- Fewsoft: Few software to choose from
- Prvtrain: Lack of available training by private computer school trainers
- Invest: Low return on investments
- Joborder: Inadequate job order to encourage investment in software
- Encroach: Perceived encroachment by other professionals on QS jobs.

TABLE 7: Overall Project Cost * Opinion Of Relationship Between Software And Project Cost
OPINION OF RELATIONSHIP BETWEEN SOFTWARE (S) AND PROJECT COST(C)

OVERALL PROJECT COST	S ↑ C		S ↓ C		S AND C HAVE NO RELATIONS HIP	TOTAL
	TREMENDOUSLY	MINIMAL LY	MINIMAL LY	TREMENDOUS LY		
ABOVE 100M	3	3	5	1	3	15
50-100M	1	4	4	1	0	10
20-50M	0	0	0	1	0	1
5-20M	1	1	2	1	0	5
1-5M	0	0	0	0	1	1
500,000-1M	0	0	1	1	0	2
BELOW 500,000	0	1	0	0	0	1
Total	5	9	12	5	4	35

↑ Signifies increase, while ↓ signifies decrease.

Discussion of Result

From the data analyzed above, most of the respondents indicated awareness of computer software for estimating and tender analysis. Majority of the respondents that are aware of a type of computer software also use the software for estimating and tender analysis. Above a quarter of respondents always use computer software for estimating and tender analysis, about one-fifth use very frequently, while above a quarter utilize software sometimes. This means that a very high percentage of respondents use computer software for estimating and tender analysis, about four-fifth (from figure 1). This shows that the level of awareness of software affects the level of usage. The more awareness there is on the different types of software that are available for estimating and tender analysis the higher will be the level of usage. Table 6 shows the relationship between awareness of computer software and overall project cost. Most of the respondents that execute projects with overall cost above Fifty Million Naira (₦ 50,000,000) are very much aware of computer software used for estimating and tender analysis. A very high percentage of this category is of the opinion that software usage reduces overall project cost minimally (Table 7). The level of computer software usage for estimating and tender analysis has minimal impact on the amount of overall project cost been handled. This is because it can be

inferred that software usage is just one of the determinants of overall project cost, and not the only or major determinant. Figure 2 shows that the factors that constitute challenges to quantity surveyors in the use of software for estimating and tender analysis are relatively non-inhibiting from the low percentages indicated by most of the respondents. Technical know-how is the most significant inhibiting factor. Most of the respondents believe that time consumption in using software is not an inhibiting factor. A high percentage of the respondents are of the opinion that the availability and features of a software package constitute challenges such as update facilities and the complexity of the software.

There is no recognized locally made computer software for estimating and tender analysis. Most respondents indicated using Masterbill Software and Wings. These two were not developed in the country and so are relatively expensive. This is another challenge especially for Quantity Surveyors that execute projects with considerably low contract sum. Also perceived encroachment from other professionals on the duties of Quantity Surveyors is another challenge since software utilization makes it easier to understand and execute the necessary functions. The other factors though regarded as challenges, are not considered to be so important as to affect the level of computer software usage for estimating and tender analysis.

Conclusion

A very high percentage (about four-fifth) of the respondents is aware of and uses a type of computer software for estimating and tender analysis. This means that computer software is widely used by quantity surveyors. Most of the respondents that execute projects with overall cost above Fifty Million Naira (₦50,000,000) are very much aware of computer software used for estimating and tender analysis. A very high percentage of this category is of the opinion that software usage reduces overall project cost minimally.

There are several challenges faced by quantity surveyors in using computer software for estimating and tender analysis, of these, lack of technical know-how is the main challenge faced generally. Other challenging factors such as lack of finance, perceived encroachment by other professionals on quantity surveying jobs, accessibility of updates, and availability of software were affirmed in low proportions. These factors though regarded as challenges, are not considered to be so important as to affect the level of computer software usage for estimating and tender analysis.

Recommendation

There is a need for more tutors in computer education particularly as applicable to quantity surveying practices. Computer application that is relevant to Quantity Surveying practice should be inculcated into the professional curriculum as advocated earlier by Oyediran & Odusami (2005), so that individual quantity surveyors will be well trained in computer software usage for quantity surveying practices especially for estimating and tender analysis, thereby improving the technical know-how of individual quantity surveyors.

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