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BILLS OF QUANTITIES – ARE THEY STILL USEFUL AND RELEVANT TODAY?

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ABSTRACT: *Historically, the formal form of Bills of Quantities was introduced in the United Kingdom after the Industrial Revolution in the 19th Century. They were mainly used by master tradesmen for paying their workmen and claiming payments from building owners by submitting it as partisan Final Account. BQ are widely used in most of the Commonwealth countries such as Australia, New Zealand, Malaysia, Hong Kong, South Africa, India, Pakistan, Nigeria, Kenya, the Middle Eastern countries etc. particularly in the traditional procurement system. BQ are mainly used for cost estimating and more importantly, as part of tender document for use in soliciting competitive tenders from contractors. They are also compiled together with contract form to form a contract document. However, as construction industry evolved and changed technologically, economically, legally and procedurally, so is the use of s in construction projects. It has been the subject of scrutiny and criticisms by the construction community. It was highlighted that the use of BQ in the UK construction industry is declining and it is possible that they will vanish from the industry in the near future. In 1991 the Royal Institution of Chartered Surveyors revealed that between 1984 and 1989 the usage of s in building works in the UK declined in value to almost 10%. Several reasons were given for such a situation. These include the lack of use by the project teams, its limited use after the tendering process and the increased use of more "advanced" non-traditional procurement system by the industry. That was the situation and prediction made twenty years ago. The question now "What is the situation in our construction industry today? Are BQ still relevant today, especially when more and more projects are contracted out using the non-traditional procurement systems? Are they still useful to the clients, architects, engineers and contractors throughout the construction process? This paper looks at the issue of BQ, their weakness and potential in the construction industry*

Keywords: Bills of Quantities, Project Cost Information, Quantity Surveyors, Cost Documentation, Construction Project, Construction Industry

INTRODUCTION

The splendour of construction can be traced back to as early as the Egyptians, Greeks, Roman and the Islamic civilizations era. It has evolved and changed significantly as men become more civilised in expressing and portraying their ideas and vision in terms of architecture and structures but the idea of cost finalisation was still reluctantly considered at that time *(Wainwright & Whitrod, 1980).* However, it has all changed after the Industrial Revolution. Apart from modernising the construction practices in Europe, it has also brought momentous change of perception towards the importance of proper costing and cost documentation of construction projects. It led to the emergence of formalised Bills of Quantities or BQ in 1859. In those early days, BQ were prepared by "measurers" or were also known as "custom surveyors" or "surveyors", who acted for the master tradesmen or known today as trade contractors. They measure and quantify the work after completion and frequently submitting it as partisan Final Account to the building owner to claim for payment.(ASAQS, 2006). Since then BQ has become an important tool for project costing and obtaining tenders from contractors. It is also a document for architects and other consultants to have a sense of control of their projects, in term of cost and finance. Today BQ are also used for cost planning; projected cash flows and budget, for valuation of interim payments and variation orders and for settlement of final account. In the contracting

organisations, they are sometimes used for preparing material schedules or bills of materials. *(Wainwright & Whitrod, 1980; Molloy, 2001).*

THE ISSUE

However in 1991, the Royal Institution Chartered Surveyors highlighted that a study showed that between 1984 and 1989, the usage of bills of quantities in building works in the UK has declined in value to about 10%. (*RICS, 1991 cited in Davis & Baccarini, 2004).* It also suggested that, BQ may totally disappear from the UK construction industry in the near future.

Many reasons were given for such state of affairs. These include the increased usage of the non-traditional or fast-tracking procurement systems such as turnkey contract, design and build contract, management contracting, build-operate-transfer etc. It has to a large extent revolutionised the construction practices, project management approach and the procurement and contract administration procedures.

For example, in 'Design and Build' contracting; the contractors are chosen based on clearly defined pre-requisites prior to development of working drawings, therefore no BQ is necessary or included in the tender document. The contractors are only required to provide cumulative or lump sum figure plus all the necessary professional and management fees. Even if the contractor is required to submit a priced BQ the use of this cost document is very limited.

It was said that the use of BQ to comes to an end when the contractor has been selected and the contract has been signed. It cannot be used for any other purpose once the tendering process has been completed. The priced and completed BQ tend to put away in a cabinet or sent to the store room to collect dust.

At the same time, John Ing (1984) has mentioned that BQ were not fully utilized by the project teams. It was said to be self perpetuating because many were not able to relate BQ to the everyday project development processes. The variety of potential uses of the BQ were fully realised, it is probably beyond most people's knowledge and experience.

As pointed by Willis et. al (2002), the suggestion that the use of is declining and would finally disappear from the industry in the near future has made the quantity surveying community expressing their serious concern and anxiety. There is a need for quantity surveyors to further develop and diversify their role and services in the industry.

In this regard, we need to ask ourselves now "What is the situation in our construction industry today with regard to the use of BQ? Are they still relevant in our construction industry today, especially when more and more construction projects are being let out using the non-traditional contracts? Are they still useful to the clients, consultants, contractors and suppliers throughout the project development process?

This paper discusses the function, use and the relevance of BQ in today's construction practice, with attention given to Malaysia. The paper is divided into 4 parts – the first part describes what BQ is, the second part looks into the historical back ground of , the third part discusses the basic use and function of and the use of in countries around the world and the final part considers the use and relevance of from different perspectives.

WHAT IS A BILL OF QUANTITIES?

Before going further into the question of whether BQ is relevant or useful in the context of our construction industry, it appropriate to understand what is BQ, its origin, usage around the world and its basic function or use.

Based on Hackett & Robinson (2003) and Chan (2002), it can be said that a bill of quantities or BQ is a document detailing the qualitative and quantitative aspects of every constituent parts of a proposed construction project. It is a document or a "**book**" containing a long list of all the **items** of works for construction. Each of these **items** is complete with the description of material, labour and workmanship for the work and its quantity (NSW Legislative Council, 1991; Marsden, 1998; Seeley, 1997 cited in Davis & Baccarini, 2004). Basically, it is a document with detail information about the type, nature and quantities of the finished work in a construction (Willis,et al 2002). Normally, it is compiled together with the form of tender, specification, preliminary bill and list of drawings to form a tender document.

THE ORIGIN OF BILL OF QUANTITIES

Bill of Quantities is synonymous with Quantity Surveyors. The profession was said to have emerged in England at the beginning of the nineteenth century, although the firm of Henry Cooper and Sons of Reading was established as early as 1785. Prior to the first recorded usage of the term "quantity surveyor" in 1859, the terms "***measurer***", "***custom surveyor***" or "***surveyor***" were used.(ASAQS, 2006)

BQ emerged in the 19th century after the Industrial revolution in Europe. In those early days the quantity surveyors acted for the ***master tradesmen***, measuring the work after completion for use in making payment to workers and frequently submitted as partisan Final Accounts to the building owner to claim for payment. Later on it was the practice of the building owners to call for tenders before any work was undertaken. A procedure was then developed to invite several **master builders** to submit tenders for **the total price** of the project rather than **a collection of prices** from master tradesmen or what is known today as **sub-contractors**. (ASAQS, 2006).

For the purpose of submitting the bid or tender, each builder then has to come out with accurate estimates of the project cost or tender. It was done by measuring and quantifying the quantities of all materials and labour necessary to complete the work, i.e. preparing a bill BQ ***for*** the project. As each builder had to prepare his own BQ for each project, they came to realise that they were duplicating a lot of effort by each measuring the same quantities from the architect's drawings. They realised that it is more economical for them as a group to employ one surveyor to measure the work and prepare the BQ

for them. The builders will then price the BQ and submit their tenders on the same basis. They would share the cost of the quantity surveyor (or the successful builder will pay the surveyor) and include the payment in their bids. On the part of the building owners themselves, since they ended up paying for the quantity surveyor's fees, it finally dawned on them that they might as well employ him directly and get some cost advice from him as well. (ASAQS, 2006; Myles, 2006, CIQS 2006).

Apart from some minor changes in term of method of measurement, content and format of presentation, BQ is still a document detailing description and quantities of all the construction work of a project. It may now may come in elemental, trade, work section or operational form. With the advent of ICT, the process of preparing s has evolved from the tedious manual and time consuming processes to semi-automated or fully automated processes involving the use of computers and sophisticated specialised software. But the whole process is still involving the toiling over many hundred drawings in doing the time consuming "taking off", many hours of meetings and discussion with the client and other consultants and drafting, checking, editing and printing the 300 – 500 pages document

THE USE AND FUNCTION OF BILL OF QUANTITIES

The function of BQ has not changed very much ever since it was introduced about hundred years ago. In the traditional procurement system, BQ is used mainly for project costing and as part of tender document for soliciting competitive tenders from contractors. It is a uniform document for contractors to estimate or price the work on precisely the same basis, thus allowing for the fairest bidding. (Willis et al., 2002). Later, it was found that BQ can be used for other further purposes, at any stage of the project development i.e. during the pre-contract and post-contract phases of a construction. (Molloy, 2001; Willis et al., 2002; Turner, 1979). To the quantity surveyors, BQ are also used for project costing or estimating, for assessing tenders, price negotiation; valuation of interim payment and variation orders and for the settlement of final account. It is considered as a multi-purpose document.

Although measurement and their preparation is very synonymous with quantity surveyors, s are also prepared by contractors such as in Taiwan and Thailand and by architect and engineers such as in Germany, France, Spain, Russia, Bulgaria, Hungary and Rumania. In countries like Malaysia, Brunei, Australia, New Zealand and most of the African and Middle Eastern countries, s are prepared mainly by consultant quantity surveyors. Traditionally, the preparation of BQ is considered as the '**bread and butter'** of a consultant quantity surveyor's profession (RICS, 1984 cited in Davis & Baccarini, 2004.

In Malaysia, bills of quantities are still widely being used for tendering and contracting purposes since the quantity surveying profession was introduced to this country in the 1940's. Since then, the preparation of BQ has evolved from the tedious manual and time consuming processes to semi-automated processes involving the use of computers and sophisticated specialised software. But the whole process is still involving the toiling over many hundred drawings in doing the time consuming "taking off", many hours of meetings and discussion with the client and other consultants and drafting, checking, editing and printing the 300 – 500 pages bill. To the practicing QS, it is worth the effort because according to the current Condition of Engagement of QS published by the Board of Quantity

Surveyors Malaysia, the preparation of is the bulk of the Consultant Quantity Surveyor's services and fees.

THE USE OF BILL OF QUANTITIES IN COUNTRIES AROUND THE WORLD

As highlighted earlier, the use of BQ is said to be declining and there is a possibility of it "vanishing" from the industry, but as pointed out by Myles (2006), although it originated from the UK, the use of BQ was not confined to the U.K only. Many other countries around the world are also widely using s in one form or the other. He also drew the attention to the result of a survey of 50 countries on the use of BQ for the procurement of medium sized building projects. It showed that 41 of the 50 countries use BQ in one form or another in their project procurement systems. He also provided a general picture of the usage of BQ in different countries throughout the world.

a) Europe

BQ are also used in many European countries for bidding purposes, but their format and development are independent of the British model. In Germany, France, Spain, Russia, Bulgaria, Hungary and Rumania, BQ are prepared by the architect or engineer and they are mostly used only for evaluating bid or tenders. It was pointed out that about 10 percent of the German Architects and Engineers' fee is for the preparation of the BQ.

In Norway, BQ are prepared by the architect and priced by the contractor. Finland is also using BQ for bidding and bidding evaluation purposes. It has a published set of rules of measurement for building works.

b) Middle East

BQ are also widely used throughout the Middle East except in Iran and Iraq. Bahrain, Egypt, Jordan, UAE, Qatar, Oman and Saudi Arabia are also using BQ in most of their construction projects as part of the tender and contract documentation. Measurements are based on the Principles of Measurement (International) or POM (I) published by the RICS. It was pointed out that their use has not only provided the client with the benefit of lump sum bid, but also a document for his own financial control.

c) Africa

Since many of the African nations are (or were) influenced by Britain, they tend to adopt the British contracting practices in which BQ are widely used for project costing, tendering and contract administration.

d) Asia and Australia

Apart from some changes to adapt to the local administrative and business practices, Hong Kong, Indonesia, Australia, New Zealand, Singapore, India, Brunei and Malaysia have all adopted the British construction practice and procurement approach. BQ are prepared by the quantity surveyors and are widely used for project costing, tendering, as part of contract documentation and for valuation of interim payment and variation orders. They are produced according to the locally produced Standard Method of Measurement (SMM).

In countries like Thailand and Taiwan, BQ are sometimes required in the bidding process and procedure and they are prepared by the contractors. In this situation, errors in the contractor's quantities are not adjustable after the bid is accepted. The unit rates in the contractor-produced BQ are used for valuation of interim payments and variation orders.

e) The Americas and West Indies

The United States do not use BQ. Although in the mid fifties Canadian QS firms were providing Bills of Quantities to general contractors and major sub trades, it does not use BQ in its procurement system. South America and Central America have largely a Spanish heritage but BQ still can be found in one form or another in the project environment. In Guyana and in most islands in the Caribbean, BQ are prepared by Quantity Surveyors and it is recognised as a tool for obtaining bids and maintaining cost control during the contract.

THE USE AND RELEVANCE OF BILLS OF QUANTITIES

The question of whether BQ is still needed, useful or relevant in our construction industry should be considered holistically from various angles. It is an issue very much associated with project cost management which is an important part of Project Management Processes (PMBOK, 2003). Project cost management processes include cost estimating, cost planning, cost monitoring, cost control and cost information system. Since construction project development involves the client or the owner, the designers, the managers and contractors, it is fair to consider the issue of the use and relevance of BQ from the perspectives of these different groups.

a) From contractor's Perspective

For contractors, any construction project will involves the process of tendering or bidding, resources planning (money, materials, labour, plant), work planning and execution, procuring of sub-contractors, supervision, monitoring and controlling. The availability of BQ, prepared either by the owner's quantity surveyor or by they themselves, provide the contractors with the necessary information to carry out the various project management processes more effectively and efficiently. The descriptions and quantities of the works presented in the BQ provide the contractor with useful information to arrive at an accurate tender price. This information are also

essential for preparing project budget and cash flow, to compute the quantities of material required for the project, to prepare labour requirements and schedules, to claims for payments and to procure sub-contractors.

The list of the work items and their quantities contain in the BQ is in fact a detail **Work Breakdown Structure (WBS)** of the project concerned. They are useful information for the contractor's project planner to prepare the work plan or programme for the project which include organising of activities into logical sequence and estimating activity duration. At the same time, the quantities, unit rate and the cost of the many work items are useful for the monitoring and controlling of the project finance. These information can be readily processed or translate into cost of the various work section or cost of various trade contractor's work and projected monthly income and expenditure.

b) From Client's Perspective

For the building owners, their main concern is to see that their projects are completed on time, within the estimated cost and within specified quality. But in today's environment more owners want to be better informed of their projects and be provided with accurate and reliable information pertaining to the progress and financial aspects of the projects. Although it has been said that it is no more useful after the tendering process, the cost or financial information presented in the priced BQ can be translated into other cost information such as cash flows, periodic project account and cost variation. This information can then be communicated to the owners to continuously keep them informed of the progress and the financial status of the project.

c) From consultant perspective

As the representative of the owner, the consultants are expected to manage the project properly and effectively to ensure that the owner get **value for money** for their projects. They must ensure that the project is of high quality, completed on time and more importantly within the estimated cost or budget. The owner also should be provided with accurate and reliable cost information at the early stage of the project and always kept informed of the project's financial situation in term of monthly expenditure, any deviation from the estimated budget and how their fund are being used in the project.

A priced BQ, either prepared by the contractor or by the consultant QS, contains invaluable descriptive, quantitative and financial information for use by the consultants in the project cost management during pre-construction and construction phases. First of all, the priced s submitted by contractor provides useful information on the total cost of the project and the market condition. The qualitative and quantitative (including financial) information presented in the priced BQ are very useful for tender evaluation and selection of contractor for the project.

The quantities, unit rates and costs of the various items of work presented in a priced BQ are also useful for the valuation of interim payment and valuation of variation orders. The information, which as mentioned earlier, is a form of Work Breakdown Structure (WBS) of the project but complete with quantities and costs. They can be computed or translated into realistic work programme, cost plan, projected cash flow or budget and periodic financial reports that can be use for more effective project supervision and cost monitoring and controlling.

BQ can also be considered as a complete **shopping list** of the various item of works necessary for the construction and completion of a project as such it can also be used for the preparation of **project final account**.

BQ, Cost Information and Usefulness

As mentioned earlier, BQ is document containing the description, quantities and cost of project works. As can be seen, it is a source of valuable information for not only the management of project cost but also the management of the project. This is because project cost management is an integral part of project management which is about balancing competing demands among cost, time, quality and scope of a project. As pointed out Garrison (1998) information is vital to the success of financial management. In the absence of adequate, accurate and reliable cost information, project cost management exercise would be ineffective.

Cost estimating and tendering are basically about the generation, acquisition, evaluation and utilisation of **project cost information** by building owners, project managers, architect, engineers, quantity surveyors and contractors. Depending on the method of tendering or bidding chosen, the building owner and his consultants may end up having a single cost information (i.e. the total cost of the project) or loads of qualitative and quantitative information i.e. the priced BQ containing the total project cost, the elemental cost and the quantity, unit rate and cost of every item of works in the project.

The usefulness or relevance of BQ as project and cost information depends on the type, nature and magnitude of the information that is needed for cost reporting, and monitoring and controlling of project cost. The use of BQ in a project development, especially from contractor's perspective, is a mix of financial accounting and management accounting practices. It is about detail accounting of the day-to-day construction operations and the summarisation of the detail accounting information for the needs of projects managers and owners. The availability of these detail cost information is vital for the effective project cost management at ground level, but the summary of the information i.e. cost plan, budget and cash flow is crucial for the overall management of the project by the project manager.

The usefulness or relevance of BQ in a project development also depends on the types and emphasis of the project, the requirements of the owners and the construction business environment. Where cost is the emphasis of the project and fund is limited, it is appropriate to use BQ because it contains very detail project cost that can be used for detail project accounting and summarised financial reporting.

However, BQ is not necessarily useful for every type of project or procurement system. In the fast-track construction projects where the non-traditional procurement system is used, it is not possible for the consultant quantity surveyor to prepare a BQ. This is because the processes of design, documentation and construction, tend to run almost parallel to one another and the tendering process is much shortened. However, as far as the contractors are concerned, they still need to prepare the concept design or even schematic design and prepare a proper cost document for their bidding. These cost documents, which are often prepared by their own or consultant quantity surveyors, can be as detailed as to become a concise BQ. As described earlier, a BQ is a document containing list of construction works, complete with description and quantities. Therefore, any document that fit the description can be considered as a BQ that can be used as project cost documentation and information.

CONCLUSION

Evidently, despite of the emergence of new 'genre' of procurements in the global construction industry, BQ is still viable to be used as an important cost document, as far as Malaysia is concerned. The issue of declining use of BQ in the industry however, must be taken in a positive manner. The criticisms that it is too costly to prepare a BQ; the preparation of BQ is very time consuming and the description and quantities in the BQ are often not accurate, should be addressed professionally and scientifically. With the advancement of ICT, the process of measurement, billing and the extraction, translation and generation of project and cost information can now be automated and carried out in more scientific manner However, it is important and crucial for the quantity surveyors to further improve their cost management competency so that they can produce more accurate and reliable cost information in the form of BQ.

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