

APPRAISING THE NEED TO STUDY ON THE FORMAT OF BILLS OF QUANTITIES

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ABSTRACT

There are concerns reported on various aspects of Bills of Quantities (BQ). This includes concerns over the BQ format that helps to organise and convey critical information to parties in construction. Although concerns over the BQ format are mentioned in various literature, these however have been highlighted in fragment. Consequently, there is limited opportunity to demonstrate its enormity, in justifying a study to be conducted. Therefore, by reviewing, analysing and synthesising various issues concerning the uses of BQ, this paper seeks to provide theoretical justification on whether a study to re-examine the BQ format is impending. In adopting to the issues-driven-approach, two objectives were outlined: (1) to critically review the literatures to identify the issues on the application of the BQ; and (2) to synthesise the outcome of the review process to identify relevant research focus. The study which had essentially employed an extensive literature review had synthesised three categories of issues related to: (1) information; (2) format; and (3) working methods. It was found that issues concerning BQ information have been mentioned more frequently in the synthesis. Following the approach, it implies that concerns over BQ format is not considered impending. Rather, a study to re-examine BQ information is much needed and may contribute by offering substantial improvement to the uses of BQ.

Keywords: *Bills of Quantities, Construction industry, Format, quantity surveying*

INTRODUCTION

The Bills of Quantities (BQ) itemise information collected from the process of measurement and provides the descriptions, quantities and information of items required in a contract (Kwakye, 1997). The BQ is unique to the Quantity Surveyor and could be used for many purposes. Among its main purpose is to provide the necessary information to the construction participants which according to Hughes (1978), Wilcox and Snape (1980) and Ashworth (2004) imperative to arrive at the following: (1) obtaining competitive tender; (2) serving as a contractual document; (3) uniform basis for tendering; (4) the basis for interim certificates and valuing of variations; (5) assisting the contractor in organizing his works; (6) facilitating financial control by the employer; (7) a basis for feedback of information for the contractor and (8) a data source for the Quantity Surveyor's future estimating. Hence, due to the purposes it serves, the BQ should be regarded as an indispensable tool for the management of a construction project and an important source of information in the process of construction.

In relation to the Malaysian construction industry, the BQ has been recognised as an important component in the overall process of construction. This was largely caused by the extensive domination of the traditional lump sum system of construction procurement

(Khairuddin, 2002, Khairuddin and Samer, 2014) which fundamentally placed the BQ as an integral element in its process (Jaggar et al., 2001, Seeley, 1997). Data from the Construction Industry Development Board (CIDB) shown in Table 1 indicates that the adoption of the traditional lump sum system (TLS) of construction procurement has been consistently strong. Hence, the data reaffirmed the representativeness of the BQ in the Malaysian construction industry.

Table 1: The frequencies on the use of TLS as compared to other types of procurement (2012 – September 2016 - latest)

Procurement types	Year/Percentage									
	2012	%	2013	%	2014	%	2015	%	2016*	%
TLS	7450	94	7685	96	7692	96	7060	96	3793	97
Others	442	6	355	4	333	4	284	4	106	3
Total:	7892	100	8040	100	8025	100	7344	100	3899	100

Source: Adapted from CIDB Quarterly Statistical Bulletin (CIDB, 2014, CIDB, 2015, CIDB, 2016). *Data as at Sept. 2016.

In the context of the Malaysian construction industry, the BQ is generally used for the purpose of tendering and contracting (Rosli et al., 2006, Rosli et al., 2008, Khairuddin et al., 2016). Besides this general use, the BQ could also be used to serve the industry in a variety of other purposes. According to Rosli et al. (2006), the use of the BQ could essentially be viewed from the perspective of the contractors, clients and consultants. To the author, the BQ is used to provide the parties with necessary information that enable them to manage the project effectively and pivotal as the base for making an informed decision. The facts thus situate the BQ as important and indispensable component in the process of construction.

Despite, there have been concerns reported on various aspects of Bills of Quantities (BQ) (Baccarini and Davis, 2002). This includes concerns over the BQ format that helps to organise and convey critical information to parties in construction (Kodikara, 1990, Khairuddin, 2011, Hamimah et al., 2011). Although concerns over the BQ format are mentioned in various literature, these however have been highlighted in fragment. Consequently, there is limited opportunity to demonstrate its enormity, in justifying a study to be conducted. Therefore, by reviewing, analysing and synthesising various issues concerning the uses of BQ, this paper aims to provide theoretical justification on whether a study to re-examine the BQ format is impending. Accordingly, two objectives were outlined: (1) to critically review the literatures to identify the issues on the application of the BQ; and (2) to synthesise the outcome of the review process to identify relevant research focus. The fulfilment of the objectives outlined in this paper has enabled substantial information to be gathered which allowed critical inferences to be made as the basis to support or refute the need to re-examine the BQ format.

Accordingly, this paper is structured to firstly review the development of BQ formats. This is followed by a review of issues that are affecting its uses. The paper ends by discussing important insights gained from the study as well as some recommendations for the stakeholders to consider.

METHODOLOGY

This paper has essentially employed an extensive literature review and applied techniques which are common in content analysis. According to Bowen (2009), the technique involves skimming, reading and interpreting the documents which according to Bryman (2008), necessary in searching-out underlying themes and omission in the materials being analysed. In

this paper, relevant literatures were reviewed to identify the themes in the form of issues before detail categorization is established to represent the aggregated information. The process was considered crucial in identifying the omission or gaps in the existing literature and act as the foundation which links the previous researches which were discrete in nature, into a single interwoven framework for suggesting the research focus aimed in this paper.

DEVELOPMENT OF BQ FORMATS

Prior to 1950s, the common form of BQ produced and used particularly in the UK has been in the form of trade format. As interest in cost planning grew, the Elemental Bill was introduced in which works are measured and organised into its functional elements. This bill however was far from being satisfactory (Seeley and Winfield, 1999). At the time, there were no standard elements to follow and different bodies had used different elements to produce the bill (Kodikara et al., 1993, Rose, 1956, Nott, 1963). In addition, the format which sorted dimensions under elements had resulted repetition of items across the billing elements. This had affected sub-quotation enquiries (Turner, 1983, Kodikara et al., 1993, Lee et al., 2011) and making pricing a time consuming process (Skinner, 1979).

Following the resentment, a Sectionalised Trades Bill was introduced in the 1960s (Nott, 1963). It aims to mediate the arrangement between the popular trade bill and the Elemental Bill. The Sectionalised Trades Bills were basically trade BQ with each trades sectionalised into elements (Kwakye, 1997). It retained its appeal as a trade BQ but at the same time, capable to be re-collated as an Elemental Bill for subsequent use in construction management (Kodikara, 1990, Skinner, 1979, Kwakye, 1997). Although it had removed the objections raised against the Elemental Bill, the industry implementation of this format had been reportedly poor (Kodikara, 1990, Skinner, 1979). It was summed up by the Quantity Surveying Techniques Working Party of the Cost Research Panel that neither bills appear to be amended to relate site costs to bill prices (Kodikara, 1990, RICS, 1962). Hence efforts were stalled without significant improvement to the BQ format.

Further development has coined for a new concept known as the Operational Bill (OB). It moved from the traditional concept of measuring works as it fixed in place to new concept which measured the labour and materials as a separate item in the bill (Skoyles, 1964, Skinner, 1979). In this regard, a scheme was divided in neither trades nor elements but in actual site operations shown with the aid of the precedence diagram (Skinner, 1979, Seeley and Winfield, 1999, Kodikara, 1990, Kwakye, 1997, Skoyles, 1964). In this concept, operation is defined as the amount of work that can be produced by a gang of operatives at some definite stage in the construction process without any interruptions (Skoyles, 1964, Kwakye, 1997, Seeley and Winfield, 1999). These were sequentially arranged and formed the basis of which information was structured in the bill (Skinner, 1979).

One of the major changes brought about by the OB was the separation between labour, materials and factory made components (Skinner, 1979). To illustrate, information on plant required was given together with the labour as a single description without quantities, while materials were given in a unit which corresponded to the contractor's purchasing units (Turner, 1983). These changes involved fundamental divergence from the rules of measurement prescribed in the SMM (Seeley and Winfield, 1999, Turner, 1983). This however was compensated with advantages posed to benefit the contracting organisations. The prime advantage from the OB was its ability to give the contractor's estimator as much information for the purpose of estimating (Skoyles, 1964). This was considered innovative and responded

to the needs of the contracting organisations. It was also lauded to include wider application apart from tendering which has been the BQ's only function.

However, the concept behind OB had received fairly little use (Wood and Kenley, 2004, Seeley and Winfield, 1999, Mohd Hisham and Azman, 2008) due to various issues. It was bulky and costly to produce (Seeley and Winfield, 1999) and the operational arrangement had required similar items to be repeated across the bill (Mohd Hisham and Azman, 2008). This seems to repeat the issue with the Elemental Bill. In addition to this, substantial works was involved in the preparation of drawings. It required conventional drawings to be prepared first before the designer could prepare the operational drawings (Mohd Hisham and Azman, 2008, Kodikara, 1990). This requirement has forced the designers to pre-judge the contractor's method of working which was not in accordance with the actual method (Turner, 1983). This hampered OB's implementation in the industry hence reduced its popularity.

In response to the criticism towards OB, an Activity Bill (AB) was later introduced. AB was an intermediary between OB and later the BQ in operational format (BQOF) (Lear, 1966). In terms of preparation, AB was a mixed between the traditional bill and that of OB (Lear, 1966, Skoyles, 1968b). Gradually, extensive works on AB has enabled BQOF to be introduced (Lear, 1966). In terms of measurement, items in BQOF were measured in accordance with the SMM. Subsequently, these items were billed in sections that were related to the network diagram. Therefore, the approach has retained the features of a traditional bill. This however had removed the separation between labour and materials which was the main feature of OB (Lear, 1966). Despite the changes, uptake was still reportedly poor (Skoyles and Fletcher, 1970). This implies that the industry at the time was not fully prepared to adapt to the changes introduced (Turner, 1983). Hence, this stalled further improvement towards the BQ particularly in aspect related to its format.

The period after BQOF saw efforts to improve the BQ were rather slowing. This was until 1983 when the British Property Federation (BPF) introduces a format called the BPF System (British Property Federation, 1983). In the new format, BQ was replaced by the Schedule of Activities (SOA) (Hodgetts, 1984, Kodikara, 1990, Seeley, 1997, Sierra, 1984). The SOA was prepared by the contractor by specifying and pricing all activities within the total programme (Kodikara, 1990). This was based on the idea that cost model is best represented by the contractor's work programme. It will align the documentation directly to how cost will be incurred on site, thus becoming the basis for planning and control (Hodgetts, 1984, Jaggar et al., 2001). Similar with other formats introduced, the BPF had received very little use (Ramus et al., 2006). This was mainly caused by mind-set issues and some technical problems (Kodikara, 1990). It was also considered too revolutionary to the existing practice in construction (Jaggar et al., 2001).

The effort to develop BQ format later came with the introduction of the Builder's Quantities in 1985 (Kodikara, 1990). This was developed by Pasquire and McCaffer (1985) and aim to suggest alternative to contract where BQ is not supplied as part of the tender document. Together with this, a complete set of measurement guidelines has been prepared to guide on the preparation of quantities. The format was similar to OB but with more advance features of operations, taking-off and buying units (Kodikara, 1990). To justify the operability of this format, field trials were conducted to gauge its performance in live setting. The result indicated that it was well received for contract without BQ and not for contract where BQ is supplied. Further records on this format were sparse, hence placing limit on the elaboration.

Regardless of this scarcity, more generic Builder’s Quantities or better known as abridged bill has been mentioned and popular in Australia (Odeyinka et al., 2009, Slattery, 1994, Davis et al., 2009). This followed a drop in principal’s sponsored BQ (Davis and Baccarini, 2004, Davis et al., 2009). Although an abridged bill is prepared without following any specific rules (Davis et al., 2009), the inception of BQ in this format indicate a strong desire to simplify the measurement process but at the same time, providing appropriate and sufficient information for tendering purposes (Davis and Baccarini, 2004). In the turn of the 21st century, extensive focus had shifted from proposing further alternative to the BQ to the idea for coordinated project information.

ISSUES CONCERNING THE USES OF BQ IN THE CONSTRUCTION INDUSTRY

Twenty-nine issues impeding the uses of the BQ were identified from various sources of literature as showed in Table 2. To facilitate interpretation, the distinct concepts that underlie the issues were defined, accentuated and reincorporated back in the list of issues identified from various sources of literature (Shamsulhadi and Fadhlin, 2014). In the process, the variables of ‘concept identified’, ‘concern identified’ and ‘categories of issues’ were featured to explicate the identified issues. This process helps in disclosing the gist of the issues and provides a preliminary appreciation on the category of issues embodied in the literature (Bryman, 2008). The process consequently allows the general topography of the issues to be viewed and highlight the pertinent concerns conveyed through the literature.

Following this, a thematic analysis is carried out by enumerating the frequency which certain accentuated concepts have occurred (Bryman, 2008). This is to reveal the predilections that have exaggerated certain number of concepts and disclosing any considerable weightage from the concepts. To assist with the thematic analysis, a word cloud as showed in Figure 1 is used to demonstrate the weight of the identified concepts. Accordingly, it shows that ‘information’, ‘format’ and ‘methods’ are the three most occurring concepts from the issues identified and presumably are the three main concepts by which the issues can be categorised. In relation to weightage, ‘information’ contain the most number of issues followed by ‘format’ and ‘methods’ respectively. The analysis implies that issues concerning ‘information’ pose a considerable concern with the uses of the BQ, hence suggesting a focus for consideration.

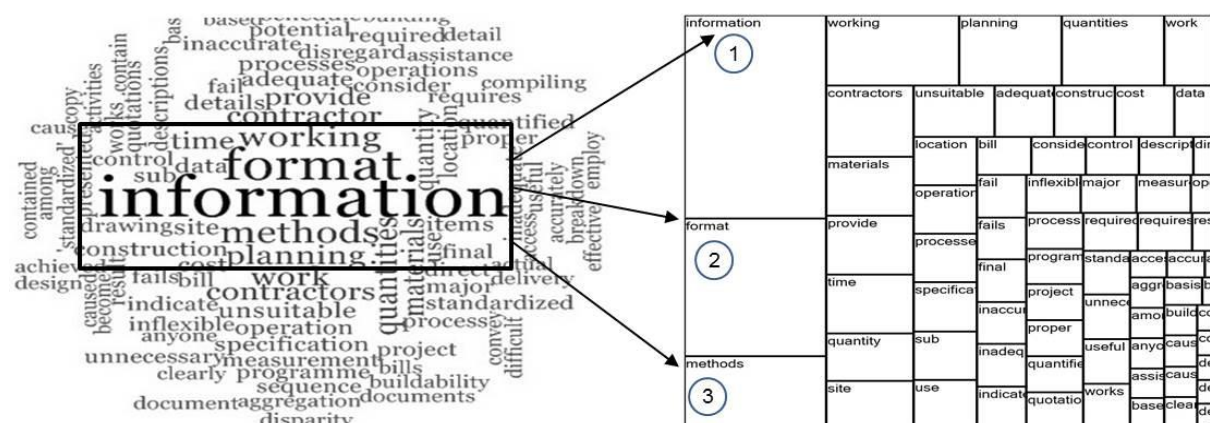


Figure 1: The main concepts underlying the issues identified from the literature

To relate the main concepts identified in Figure 1 with the array of issues concerning the BQ, the issues presented in Table 1 are restated to correspond with ‘information’, ‘format’ and

'methods'. This is conducted within an interpretative context and aim to provide details that can describe the categories developed from the thematic analysis (Hart, 1998, Booth et al., 2012, Shamsulhadi and Fadhlin, 2014). The result from the process is presented in Figure 2. In this respect, pertinent matters related to quantities/quantities location/quantity units, BQ descriptions, material specifications, time, preliminaries and temporary works have described the concern related to 'information'. The weightage implores that 'information' related issues have underlain much concern on the uses of the BQ. This in relation to two other categories prompted from the analysis. The analysis and synthesis carried out provided an insight to understand the issues hence denotes the theoretical framework on the issues impeding the uses of the BQ.

Table 2: The literature review outcome – issues impeding the uses of the BQ

No.	Issues identified from the literature review	Authors	Concept identified	Concern identified	Category of issues
1.	BQ <i>does not provide</i> (*information) on the (time) and quantity schedule for the on-site delivery of materials required for the works.	Hamimah et al. (2011), Smith and Hoong (1985)	Time/duration	Insufficient	Issues related to information
2.	BQ (*information) provide <i>no assistance</i> to anyone drawing up a pre tender programme (*time).	Contributed (1964)	Time/duration	Insufficient	Issues related to information
3.	BQ (*information) only represent cost breakdown structure with <i>no link</i> to actual project schedule (*time).		Time/duration	Insufficient	Issues related to information
4.	SMM based BQ (*information) <i>unable to provide</i> a useful basis for contractor's work programme (*time).	Jaggar et al. (2001), Smith and Hoong (1985)	Time/duration	Insufficient	Issues related to information
5.	<i>Preliminaries bill</i> and <i>specification</i> (*information) documents <i>contain many unnecessary</i> (*insufficient/ inadequate) items as a result of direct copy and 'standardised' document.	Hamimah et al. (2011)	Preliminaries/ specification	Insufficient/ Inadequate	Issues related to information
6.	BQ <i>quantities</i> and <i>descriptions</i> (*information) <i>do not accurately</i> provide information on work sequence and <i>contractor's methods</i> of operation (*working methods and planning).	Hamimah et al. (2011), Leon (1966)	Quantities/descriptions/ working methods	Inaccurate/wrong quantities/Inaccurate description/ Insufficient	Issues related to information/ Issues related to contractor's work planning
7.	The specialist trades contractors consider that the <i>tasks of planning</i> (*time) <i>could not be achieved</i> by using the bills (*information).	Morledge and Kings (2006)	Time/duration	Insufficient	Issues related to information
8.	BQ (*information) is <i>unnecessary for compiling</i> (*format) sub-contractor's quotations and is <i>inadequate</i> for reviewing materials quotations from potential supplier as <i>quality of materials</i> (*specification) are <i>not clearly stated</i> .	Hamimah et al. (2011), Kinlay (1984b)	Specification/Unsuitable format	Inadequate/ Unsuitable	Issues related to information/format
9.	(*Information) in BQ are <i>uncoordinated, aggregation on similar materials</i> rather than <i>operation</i> (*format and working methods).	Kodikara et al. (1993)	Unsuitable format	Unsuitable	Issues related to format
10.	BQ (*format) is <i>not in final forms</i> for direct use by site personnel.	Kodikara and McCaffer (1993), Kodikara et al. (1993)	Unsuitable format	Unsuitable	Issues related to format
11.	BQ (*information) <i>requires sub-processes</i> as the information are <i>not presented</i> in a standardised (*format).	Cornick and Osbon (1994)	Unsuitable format	Unsuitable	Issues related to format
12.	BQ <i>fail to become a mechanism</i> to determine <i>construction processes</i> (*working methods). It does <i>not consider input</i> (*information) to the construction process (*working methods) but only identifies the end result or product of construction.	Holes (1990), Jaggar et al. (2001)	Working methods	Insufficient	Issues related to contractor's work planning
13.	BQ <i>only present</i> (*information) <i>that have been processed</i> and <i>in final form</i> (*format). Detail (*information) such as supporting details on <i>quantities measured, work location</i> and <i>types of operations</i> (*working methods) the contractors have to employ are of use by estimators should access is given.	Hamimah et al. (2011), Turner (1983), Wood and Kenley (2004)	Inflexible format/Quantities location	Inflexible/ Insufficient	Issues related to format
14.	BQ (*information) had <i>inadequacies for utilisation</i> by contractors. (*Quantities) <i>Location of quantified information</i> was <i>not adequate</i> for its purpose.	Baccarini and Davis (2002), Wood and Kenley (2004)	Quantities location	Insufficient	Issues related to information

Note: Bold lettering/*italics* are the accentuated concepts and are reincorporated back in the list of issues.

Table 1: The literature review outcome – issues impeding the uses of the BQ (continued)

No.	Issues identified from the literature review	Authors	Concept identified	Concern identified	Category of issues
15.	BQ do <i>not indicate</i> (*information) as <i>where the quantity is located</i> (*location) and therefore <i>difficult to get a feel</i> for the projects from the bill.	Slattery (1994)	Quantities location	Insufficient	Issues related to information
16.	BQ <i>disregard potential</i> further value of reanalysing the (*information) into activities, operations or elements (*format).	Kinlay (1984a)	Inflexible format	Inflexible	Issues related to format
17.	BQ (*format) is <i>not adequate</i> as it <i>hinder effective use of</i> (*information) contained.	Rosli et al. (2006), Smith and Hoong (1985)	Unsuitable format	Unsuitable	Issues related to format
18.	BQ <i>fails to convey</i> details (*information) of <i>materials</i> (*specification), <i>plants</i> and <i>temporary works</i> required for <i>proper work execution</i> (*working methods and planning) and to enable those resources to be identified, quantified and valued by contractor's estimator.	Ahenkorah (1993), Hamimah et al. (2011), Holes (1990)	Specification/Working methods/Temporary works	Inadequate/ Insufficient	Issues related to information/ Issues related to contractor's work planning
19.	BQ only useful for tendering and financial control but <i>not used extensively</i> for <i>contractor's site operation</i> (*working methods and planning).	Smith and Hoong (1985)	Working methods	Insufficient	Issues related to contractor's work planning
20.	BQ <i>do not support</i> contractor's management function. BQ (*information) <i>disregard</i> resource requirements and <i>only</i> measures (*quantity and units) <i>fixed in place measurement</i> .	Baccarini and Davis (2002)	Quantities/ Quantity units	Inaccurate/wrong quantities/ Inappropriate	Issues related to information
21.	<i>Nett quantities</i> and <i>inaccurate quantities</i> (*information) are <i>major dissatisfaction</i> among contractors in the way (*quantities) are provided in BQ.	Hamimah et al. (2011)	Quantities	Inaccurate/wrong	Issues related to information
22.	BQ (*format) other than trade <i>fails to facilitate</i> contractor's pricing (*unsuitable format).	The BOQ Working Group (1995)	Unsuitable format	Unsuitable	Issues related to format
23.	BQ (*format) <i>do not indicate</i> project's buildability, work sequence and control of work (*inflexible format).	Skoyles (1968a)	Inflexible format	Inflexible	Issues related to format
24.	BQ (*format) <i>do not adequately reflect the interaction</i> (*inflexible format) between the design of a building and the production process (*working methods and planning).	Skoyles (1964)	Inflexible format	Inflexible	Issues related to format
25.	BQ (*format) is <i>not adequate</i> to fulfil its maximum functions (*unsuitable format).	Hughes (1978)	Unsuitable format	Unsuitable	Issues related to format
26.	BQ (*format) and <i>data presentation</i> (*unsuitable format) are the <i>major cause for inefficient</i> flow of estimating data.	Kodikara and McCaffer (1993)	Unsuitable format	Unsuitable	Issues related to format
27.	BQ data (*information) <i>fail to provide</i> contractors with information they need for <i>proper planning, organising and managing</i> of their work (*working methods and planning).	Contributed (1964), Holes (1990), Leon (1966), Waterworth and Weddle (1978)	Working methods	Insufficient	Issues related to contractor's work planning/ Issues related to information
28.	BQ (*information) <i>requires sub-processes</i> by site QS as the information <i>are not presented</i> in a standardised format (*unsuitable format).	Cornick and Osbon (1994)	Unsuitable format	Unsuitable	Issues related to format
29.	BQ (*information) produced is <i>inaccurate</i> in terms of its <i>quantities</i> and <i>descriptions</i> . Inaccuracy is caused from an omission of important cost items, disparity between drawing details and quantity list and over and under measurement of cost items.	Abdul Rashid and Normah (2004), Rosli et al. (2008)	Description/ Quantities	Inaccurate/wrong quantities	Issues related to information

Note: Bold lettering/*italics* are the accentuated concepts and are reincorporated back in the list of issues.

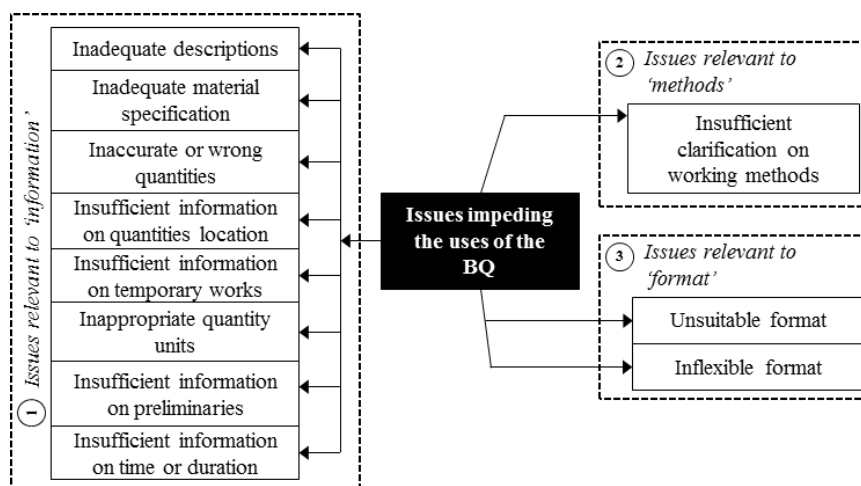


Figure 2: The theoretical framework on the issues impeding the uses of the BQ

IDENTIFYING THE FOCUS FOR A STUDY

The issues identified have prompted several solutions to be proposed to improve the situation. It has centred on suggesting various forms of new BQ format and has concentrated on this aspect to improve its uses to the contracting organisations. Accordingly, the solutions identified and discussed from the review are:

- (1) Elemental Bill (Rose, 1956);
- (2) Sectionalised Trades Bill (Nott, 1963);
- (3) Operational Bill (Forbes and Skoyles, 1963, Skoyles, 1964);
- (4) Bills of Quantities (Operational Format) (Skoyles, 1969, Skoyles, 1968a, Skoyles, 1968b);
- (5) Activity Bill (Lear, 1966);
- (6) BPF System (schedule of activities) (British Property Federation, 1983);
- (7) Builder's Quantities (Pasquire and McCaffer, 1985); and
- (8) Abridged bill (Davis et al., 2009, Slattery, 1994).

Aspect on format has been the focus of past researches and was proposed to ameliorate concerns over the uses of the BQ (RICS, 1965). It posed to restore confidence over its presence in the construction industry (Mohd Hisham and Azman, 2008).

Apparently, it implies that the solutions had placed much focus in developing new BQ formats. This despite the call made by the Quantity Surveying Techniques Working Party of the Cost Research Panel to focus on improving the usefulness of the BQ data (RICS, 1962). To add, further researches by Skoyles and Fletcher (1970), Turner (1983), Kodikara (1990); Jaggar et al. (2001) and Ramus et al. (2006) have concluded that improving the BQ format seemed not in the best interest of the industry. Within the context of this paper, the solutions proposed show that only issues concerning the BQ format had been considered. This despite issues concerning BQ information was mentioned more frequently in the literature. Besides, as there was too much focus in developing new BQ format, little is known whether the information contain in BQ has truly accorded with the requirements of its main user. For this reason, a study to re-examine BQ information is considered timely. This refute the need to focus a study on BQ formats. Hence, this complies with the evidence synthesised from the literature and stood as the gap for current research concerning the BQ.

Following the gap identified from the past researches, pertinent questions need to be asked which should centre on the contracting organisations which have been identified as the primary user of the BQ. Accordingly, the questions that could be asked concerning the gap are as follow:

- i. What are the uses of the BQ to the contracting organisations?
- ii. What is the BQ information required by the contracting organisations to achieve the uses of the BQ?
- iii. What are the significant issues impeding the uses of the BQ to the contracting organisations?

As the step to answer the questions which will ultimately lead to satisfy the focus, this paper is suggesting the following approach:

- i. To determine the uses of the BQ to the contracting organisations;
- ii. To determine the important BQ information requirements for achieving the uses of the BQ to the contracting organisations;
- iii. To determine the significant issues impeding the uses of the BQ to the contracting organisations.

By following the suggested approach, it is expected that the research could be able to gather evidences which indicates the important BQ information requirements and the significant issues to be considered for improving the uses of the BQ. Hence, the evidences collected could serve as the basis to ameliorate improvements to the uses of the BQ and in line with the gap identified from the synthesis carried out.

DISCUSSION ON THE CONTRIBUTION OF THE PROPOSED STUDY

Narrowing the gap conceptualised in this paper will be of significant value in addressing the current and the future needs of the industry. It will extend the current knowledge on the BQ by placing the actual requirements of the contracting organisations as the focus for improvement which imperative at re-extending the BQ usage to wider groups in a project. This effort is considered timely given the lack of attention currently given to this aspect of research although concerns were reported through the literature. This research is posed to contribute to the contracting organisations in at least one of the following:

- i. Determining the uses of the BQ;
- ii. Determining the BQ information requirements; and
- iii. Determining the impeding issues concerning the uses of the BQ.

Although been focused at the contracting organisations, the outcome of the research is also expected to benefit other parties in a project; hence improving the current construction environment which the industry is currently operates.

Besides focusing the gain to the current needs of the industry, the outcome of the research could also be useful in relation to the development and advancement of the Building Information Modelling or BIM. According to Azhar (2011); Lee et al. (2014), Porwal and Hewage (2013), Succar et al. (2013) and Love et al. (2014), the BIM technology which is still at its formative stage would require much research input before total deployment could be achieved. Following the requirements, several attempts have been identified from the literatures which aim at helping the technology to advance. The work of Taylor and Bailey (2011) for instance, have stressed the need to establish a standard coding structure to streamline construction processes in BIM environment while Jung and Joo (2011) have been acknowledged in developing the BIM practical framework for deployment. Though works

which revolve around the requirements are currently underway, its development is also found to bear some challenges. According to Becerik-Gerber and Kensek (2010); Keat (2012) and Monteiro and Martins (2013), in order to enable the BIM technology to advance, the industry must first address the issues of interoperability and software integration while letting the technology to evolve as it respond to user's specific need. Although the outcome would be far from addressing the major issues related to BIM deployment, yet this research is fundamental and posed to contribute by providing input to the coding structure which was poised as the most important aspect of its development. Accordingly, it is in this regard that the research proposed in this paper would come in to contribute to advance the BIM technology for deployment. This contribution however, is still small in comparison with the actual requirement of the technology. Regardless, it is a fundamental attempt that will situate BQ related research with the need of the BIM and hence, justifying its appropriateness with the current need of the construction environment.

CONCLUSION

The identified research gap has been substantiated with rigorous synthesis of the past researches. This is conducted to propose current research focus in the area concerning the BQ. Following the analysis conducted to the works of past researchers, the incapacity of the BQ to address the information need of its main user has been elevated as the primary concern and is considered as the gap that need to be filled and focused. This is in addition to the identification of issues impeding the uses of the BQ to the contracting organisations. It is proposed that a research concerning the aspects outlined is imperious and currently in need. This is also in line with the categories of issues synthesised from the literature. It is expected that the findings from focusing to the aspect highlighted offers benefit, not only to the immediate need of the construction industry, but also to the emerging concern over the BIM which is envisaged to elevate the quantity surveying profession higher with the need of the current construction environment.

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REFERENCES

- Abdul Rashid, A. A. & Normah, A. 2004. Outsourcing And Quality Performance: Malaysia's Public Works Department. *Structural Survey*, 22, 53–60. <https://doi.org/10.1108/02630800410530927>
- Ahenkorah, K. 1993. Exploring The Bills Of Quantities. *The Building Economist*, Dec., 23-25.
- Ashworth, A. 2004. *Cost Studies Of Building (4th Ed.)*, Essex, Pearson Prentice Hall.
- Azhar, S. 2011. Building Information Modeling (Bim): Trends, Benefits, Risks, And Challenges For The Aec Industry. *Leadership And Management In Engineering*, 11, 241-252.
- Baccarini, D. & Davis, P. 2002. Bills Of Quantities - A Literature Review. *The Building Economist*, Sept., 10-16.
- Becerik-Gerber, B. & Kensek, K. 2010. Building Information Modeling In Architecture, Engineering, And Construction: Emerging Research Directions And Trends. *Journal Of Professional Issues In Engineering Education & Practice*, 136, 139-147.10.1061/(ASCE)EI.1943-5541.0000023
- Booth, A., Papaioannou, D. & Sutton, A. 2012. *Systematic Approaches To A Successful Literature Review*, London, Sage Publications Limited.

- Bowen, G. A. 2009. Document Analysis As A Qualitative Research Method. *Qualitative Research Journal*, 9, 27-40.
- British Property Federation 1983. Manual Of The Bpf System. *The British Property Federation System For Building Design And Construction*. British Property Federation.
- Bryman, A. 2008. *Social Research Methods - 3rd Ed.*, New York, Oxford University Press.
- Cidb. 2014. Buletin Statistik Pembinaan Suku Tahunan - Suku Keempat 2014 (Sehingga Disember 2014). Available: <http://www.cidb.gov.my/cidbv4/images/pdf/buletin/2014/bahagian%20%20q4.pdf>.
- Cidb. 2015. Buletin Statistik Pembinaan Suku Tahunan - Suku Pertama 2015 (Sehingga Mac 2015). Available: <http://www.cidb.gov.my/cidbv4/images/pdf/buletin/2015/bahagian%20%20q1%202015.pdf>.
- Cidb. 2016. Cidb Construction Quarterly Statistical Bulletin - Third Quarter 2016 (January - September) - Part 2. Available: <http://www.cidb.gov.my/cidbv5/images/content/bisnes/buletin/2016/bahagian-2.pdf>.
- Contributed 1964. Operational Bills Of Quantities. *The Quantity Surveyor*, 21, 13-14.
- Cornick, T. & Osbon, K. 1994. A Study Of The Contractor's Quantity Surveying Practice During The Construction Process. *Construction Management And Economics*, 12, 107-111. <https://doi.org/10.1080/01446199400000017>
- Davis, P. & Baccharini, D. The Use Of Bills Of Quantities In Construction Projects - An Australian Survey. In: Ellis, R. & Bell, M., Eds. International Construction Research Conference Of The Royal Institution Of Chartered Surveyors (Cobra 2004), 7-8 September 2004 2004 Leeds Metropolitan University, Leeds. Rics Foundation.
- Davis, P., Love, P. & Baccharini, D. 2009. Bills Of Quantities: Nemesis Or Nirvana. *Structural Survey*, 27, 99-108. <https://doi.org/10.1108/02630800910956434>
- Forbes, W. S. & Skoyles, E. 1963. The Operational Bill. *The Chartered Surveyor*, 95, 429-434.
- Hamimah, A., Abdul Hadi, M. N., Siti Maimunah, M. A., Azizan, S. & Chong, H. Y. 2011. Bills Of Quantities: Perspectives Of Contractors In Malaysia. *Australian Journal Of Basic And Applied Sciences*, 5, 863-873.
- Hart, C. 1998. *Doing A Literature Review - Releasing The Social Science Research Imagination*, London, Sage Publications Limited.
- Hodgetts, M. F. 1984. Tomorrow's Qs - Will There Be One? A Challenge For The Institute And Us All. *The Building Economist*, 22, 397-399.
- Holes, L. 1990. Finding An Alternative. *Chartered Quantity Surveyors*, 10-11.
- Hughes, G. A. 1978. *The Anatomy Of Quantity Surveying*, Lancaster, England, The Construction Press Ltd.
- Jaggar, D., Ross, A., Love, P. E. D. & Smith, J. 2001. Overcoming Information Opacity In Construction: A Commentary. *Logistics Information Management*, 14, 413 - 420. <https://doi.org/10.1108/Eum000000006253>
- Jung, Y. & Joo, M. 2011. Building Information Modelling (Bim) Framework For Practical Implementation. *Automation In Construction*, 20, 126-133. 10.1016/J.Autcon.2010.09.010
- Keat, Q. J. Identifying Areas Of Research Relevant To Quantity Surveyors For The Adoption Of Building Information Modelling (Bim) - Balancing Between Priority And Impact Level. 16th Pacific Association Of Quantity Surveyors Congress (Paqs 2012), 7-10 July 2012 Bandar Seri Begawan Brunei. Persatuan Ukur Jurutera Dan Arkitek (Brunei) Puja (B).
- Khairuddin, A. R. 2002. *Construction Procurement In Malaysia - Processes And Systems, Constraints And Strategies*, Kuala Lumpur, Iium Press.
- Khairuddin, A. R. In Need To Assess The Effectiveness Of Bills Of Quantities. 10th Management In Construction Researchers (Micra) Conference (26 - 27 July 2011), 2011 International Islamic University Malaysia, Kuala Lumpur, Malaysia.
- Khairuddin, A. R. & Samer, S. K. Dominant Procurement Systems In Use In Malaysia. Management In Construction Researcher Association (Micra) Postgraduate Conference 2014, 6th Nov. 2014 International Islamic University Malaysia (Iium). Kulliyah Of Architecture And Environmental Design (Kaed).

- Khairuddin, A. R., Sharina Farihah, H., Puteri Nur Farah Naadia, M. F., Srazali, A. & Azila, A. S. 2016. A Review On The Application Of Bills Of Quantities (Bq) In Construction Project Procurement *Journal Of Scientific Research And Development*, 3, 102-105.
- Kinlay, G. 1984a. Bills Of Quantities - "Form Follows Function" Or Does It? *The Building Economist*, 23, 2-3.
- Kinlay, G. 1984b. Bills Of Quantities - You Pay The Piper - Why Not Call The Tune! *The Building Economist*, 23, 5-6.
- Kodikara, G. W. 1990. *Data Flow In Building Contractor Organizations*. Phd Thesis, Loughborough University Of Technology.
- Kodikara, G. W. & Mccaffer, R. 1993. Flow Of Estimating Data In Sri Lankan Building Contractor Organizations. *Construction Management And Economics*, 11, 341 - 346. <https://doi.org/10.1080/01446199300000038>
- Kodikara, G. W., Thorpe, A. & Mccaffer, R. 1993. The Use Of Bills Of Quantities In Building Contractor Organizations. *Construction Management And Economics*, 11, 261-269. <https://doi.org/10.1080/01446199300000038>
- Kwakye, A. A. 1997. *Construction Project Administration In Practice*, Essex, Addison Wesley Longman Limited.
- Lear, R. F. 1966. Notes On Activity Bills. *The Quantity Surveyor*, 23, 31-33.
- Lee, S.-K., Kim, K.-R. & Yu, J.-H. 2014. Bim And Ontology-Based Approach For Building Cost Estimation. *Automation In Construction*, 41, 96-105.
- Lee, S., Trench, W. & Willis, A. 2011. *Willis's Elements Of Quantity Surveying*, Sussex, Wiley-Blackwell.
- Leon, G. 1966. Tendering Documents And Final Costs. *The Quantity Surveyor*, 23, 65-67.
- Love, P., Matthews, J., Simpson, I., Hill, A. & Olatunji, O. 2014. A Benefit Realization Management Building Information Modelling Framework For Asset Owners. *Automation In Construction*, 37, 1-10.
- Mohd Hisham, A. & Azman, W. N. Bringing Back The Dead: Operationalizing The Bills Of Quantities. International Conference For Project Management (18-20 November 2008), 2008 Universiti Malaya.
- Monteiro, A. & Martins, J. P. 2013. A Survey On Modeling Guidelines For Quantity Take-Off Oriented Bim Based Design. *Automation In Construction*, 35, 238-253.
- Morledge, R. & Kings, S. Bills Of Quantities - A Time For Change? In: Torrance, J. V., Hamimah, A. & Roshana, T., Eds. International Conference In The Built Environment In The 21st Century (Icibe 2006), 2006 Mara University Of Technology, Shah Alam. 49-56.
- Nott, C. M. 1963. Sectionalised Trades Bills. *The Chartered Surveyor*, 95, 595-602.
- Odeyinka, H., Kelly, S. & Perera, S. An Evaluation Of The Budgetary Reliability Of Bills Of Quantities In Building Procurement. Rics Foundation Construction And Building Research Conference (Cobra 2009), 2009 University Of Cape Town 435-446.
- Pasquire, C. L. & Mccaffer, R. 1985. Builder's Quantities And Their Use In Contracting Organisations. *Report To Science And Engineering Research Council, Department Of Civil Engineering*. U.K: Loughborough University Of Technology.
- Porwal, A. & Hewage, K. N. 2013. Building Information Modelling (Bim) Partnering Framework For Public Construction Projects. *Automation In Construction*, 31, 204-214.
- Ramus, J., Birchall, S. & Griffiths, P. 2006. *Contract Practice For Surveyors* Oxford, Butterworth-Heinemann.
- Rics 1962. Working Party Report - The Function And Uses Of The Bill Of Quantities. *The Chartered Surveyor*, Dec., 324-325.
- Rics 1965. Working Party Report - Presentation And Format Of Bills Of Quantities. *Royal Institution Of Chartered Surveyors*, 1965.
- Rose, N. 1956. Billing By Elements. *The Chartered Surveyor*, 88, 605-607.
- Rosli, A. R., Muzani, M. & Siti Nurhuda, A. W. Bills Of Quantities - Are They Still Useful And Relevant Today? International Conference On Construction Industry (21 - 25 June 2006), 2006 Padang, Indonesia.
- Rosli, A. R., Muzani, M. & Siti Nurhuda, A. W. 2008. Bills Of Quantities - Are They Still Useful And Relevant Today? *The Building Economist*, March, 16-23.

- Seeley, I. H. 1997. *Quantity Surveying Practice (2nd Ed.)*, London, Macmillan Press Ltd.
- Seeley, I. H. & Winfield, R. 1999. *Building Quantities Explained (5th Ed.)*, London, Macmillan And Co. Ltd.
- Shamsulhadi, B. & Fadhlin, A. The Procedures For Reviewing The Issues Concerning The Application Of The Bq. Management In Construction Researcher Association (Micra) Postgraduate Conference 2014, 6th Nov. 2014 International Islamic University Malaysia (Iium). Kulliyyah Of Architecture And Environmental Design (Kaed).
- Sierra, J. 1984. Bills Of Quantities -The Roots Of The Quantity Surveyor (Part 2). *The Building Economist*, 23, 10.
- Skinner, D. W. H. 1979. *An Analysis Of The Utility Of Bills Of Quantities In The Process Of Building Contracting*. Ph.D Thesis, University Of Aston In Birmingham.
- Skoyles, E. 1964. Introduction To Operational Bills. *The Quantity Surveyor*, 21, 27-32.
- Skoyles, E. 1968a. Introducing Bills Of Quantities (Operational Format). *The Quantity Surveyor*, 24, 139-146.
- Skoyles, E. 1968b. Introducing Bills Of Quantities (Operational Format). *Brs Current Paper, Cp62/68*. Building Research Station.
- Skoyles, E. 1969. Examples Bills Of Quantities (Operational Format). *The Quantity Surveyor*, 25, 151-157.
- Skoyles, E. & Fletcher, L. 1970. Bills Of Quantities Or The Operational Bill? *The Architects Journal*, 1970, 233-240.
- Slattery, P. 1994. Bills Of Quantities - The Builder's View. *The Building Economist*, June, 13-14.
- Smith, J. & Hoong, W. K. 1985. Bills Of Quantities In Singapore - A Survey Of Their Use And Application. *The Building Economist*, 24, 18-22.
- Succar, B., Sher, W. & Williams, A. 2013. An Integrated Approach To Bim Competency Assessment, Acquisition And Application *Automation In Construction*, 35, 174-189.
- Taylor, S. & Bailey, C. 2011. Unlocking Bim Data. *Royal Institution Of Chartered Surveyors* [Online]. Available:
[Http://Questantinc.Com/Images/Articles%20and%20news%20media/Articles/Bim%20coding%20paper%20dec%202%20final.Pdf](http://questantinc.com/images/articles%20and%20news%20media/articles/bim%20coding%20paper%20dec%202%20final.pdf) [Accessed 15th May 2012].
- The Boq Working Group 1995. Act (Australian Capital Territory) Bills Of Quantities Working Group - Special Report. *The Building Economist*, Dec., 5-7.
- Turner, D. 1983. *Quantity Surveying - Practice And Administration (3rd Ed.)*, New York, George Godwin.
- Waterworth, H. W. & Weddle, A. E. 1978. Bills Of Quantities For Landscape Works. *The Quantity Surveyor*, 35, 244-245.
- Wilcox, C. & Snape, J. 1980. *Measurement Of Construction Work (Second Edition)*, London, George Godwin Limited.
- Wood, B. & Kenley, R. 2004. The Effectiveness Of The Bills Of Quantities In Australia. *Journal Of Construction Research*, 5, 291 - 309. <https://doi.org/10.1142/S160994510400019x>