



Recapitulating the issues Concerning the Applications of the Bills of Quantities

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ABSTRACT

A preliminary review of the literature had indicated a growing concern over various issues concerning the application of the Bills of Quantities (BQ). Though eminent, these issues, however, have sparsely been highlighted on a fragmentary basis, thus requires a systematic restructuring to manifest its underlying meaning. Following this review, a study has been conducted with an aim to recapitulate and subsequently suggest some of the most compelling issues concerning the application of the BQ. In this regard, it has objectively strived to identify relevant issues from the literature and ensue by critically synthesizing the outcome in response to the aim. Correspondingly, with support from tables and models developed to represent the concepts, the study has proposed three main categories of issues from the restructuring process. These are: (1) issues related to information, (2) issues related to format and (3) issues related to the method of working. Issues related to information have been suggested from the process as the issue considered most compelling thus warranting further consideration by the industry. The significance of this study is on the methodological way of restructuring and refocusing the issues related to the BQ. The finding has the potential prospect for future research and act as a basis from which the industry's awareness can be bolstered.

1. Introduction

The Bills of Quantities (BQ) is an integral part of the quantity surveying profession. It remains an essential service in many quantity surveying practices, and its production is often seen as the bread and butter of the profession (Charles, 2007; Olatunji *et al.*, 2010). BQ preparation is traditionally regarded as the main source of income for the independent quantity surveying consultants (Marsden, 1996). In fact, the service which helped to stage and establish the profession in the construction industry (Ferry *et al.*, 1999; Marsden, 1996).

The impressive reputation relished by the BQ seems to permeate following its long period of engagement in the industry. In this instance, Milliken (1996) stated that this particular document has been prepared in various form for more than 300 years, over which it was subjected to various degree of evolution in meeting the demand placed by the industry (Khairuddin, 2011). Following this pace, the existence of various proposals which focuses on improving the BQ format (Shamsulhadi and Fadhlin, 2012) had utterly enunciated this fact and serve as the hard evidence supporting the multi-faceted degree of its evolution.

As far the Malaysian construction industry (MCI) is concerned, the BQ has long been recognised as an important element in the overall process of construction. This element was largely caused by extensive domination of the traditional lump sum system of construction

procurement (Khairuddin, 2002) which integrally include the BQ in the forefront of its process (Jaggar *et al.*, 2001; Seeley, 1997). Table 1 shows the frequencies of the adoption of the traditional lump sum system as compared to other types of procurement used. This point asserts that the adoption to this system has constantly remained strong which unswervingly reaffirm the position of the BQ in the Malaysian construction industry.

Table 1 The frequencies of adoption of the traditional lump sum system as compared to other types of procurement (2009 - 2013)

	Year/Percentage									
	2009	%	2010	%	2011	%	2012	%	2013	%
Traditional lump sum system	6724	96	7027	96	7324	96	7217	94	5717	96
Other types of procurement used	315	4	275	4	281	4	433	6	268	4
Total:	7039	100	7302	100	7605	100	7650	100	5985	100

Source: CIDB (2011) CIDB (2012) and CIDB (2013).

Apart from being evidently prominent through its wide industrial adoption, studies by Abdul Rashid and Normah (2004); Fadhlin and Ismail (2006) and Rosli *et al.* (2008) had also confirmed the significance of BQ preparation to the independent quantity surveying firms in Malaysia. Rosli *et al.* (2008) further reiterated that the service had considerably formed the backbone of their professional fees and seem to contribute substantially to their operating income. Hence, given the fact

that 84.4% of this job-scope had been outsourced by the Public Works Department of Malaysia (PWD) in 2004 alone (Abdul Rashid and Normah, 2004) strongly indicates that BQ is highly relevant and has contributed much to the process in the MCI.

Despite the importance and contribution of the BQ to the construction process in Malaysia, there have been prior reports published in the UK and Australia that clearly show the use of the BQ in these countries have begun to wane. Table 2 shows the use of BQ as a tender document in UK from 1985 to 2007 reflected an overall declining trend (Ashworth and Hogg, 2007). A similar situation was observed from a survey carried out by the Construction Economic Committee of Victoria (CECV) in Australia (Davis and Baccarini, 2004; Wood and Kenley, 2004). The reports indicate that some dissatisfaction exist over some aspects of the BQ that probably contributes to its declining usage.

Table 2 Percentage of project value where BQ (firm and approximate) is used as tender document in the UK

	1985	1987	1989	1991	1993	1995	1998	2001	2004	2007
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
% by value of projects	64.7	55.5	55.9	50.8	45.7	46.1	30.1	23.1	26.1	15.2
*Increase / Decrease		-9.2	-0.4	-5.1	-5.1	0.4	-16.0	-7.0	3.0	-10.9

Note: Rate of increase / decrease measured from 'report-to-report'.

Source: Adapted from the Royal Institution of Chartered Surveyors (RICS) report on contract in use in the UK (RICS, 2010, p. 8) and Ashworth and Hogg (2007, p. 256).

Correspondingly, the concerns relayed from data published by the reports have sent an alarming question on what to have triggered such predicament. In some ways, it indicates that some issues closely related to the BQ might currently un-resolve and possibly have become the factors that have triggered the dissatisfaction. Asserting from this point, an initial review of the literature was conducted for the purpose of identifying pertinent studies involving the BQ. This identification has been done on a broad basis and aim to gauge the extent of which issues related to the BQ have been expressively outlined. The outcome of the preliminary review suggests that issues related to the BQ have been highlighted on a fragmentary basis. It shows a gap was highlighted and prompted for an organized effort to collect and finally represent the issues in its entirety. Hence, a systematic effort to identify, restructure and reorganize every compelling issue concerning the BQ might be considered timely and would offer the necessary assistance in pursuing future interest in research relating to BQ.

A study has been conducted with an aim to recapitulate and subsequently restructure the compelling issues concerning the application of the BQ into a hypothetical model representing the identified issues. Accordingly, the objective is to explore, identify and critically synthesizing the literature concerning the subject. Typical connotation among the issues will be identified with a focus expanded to reduce and subsequently suggesting the significant issues. The fulfilment of the purpose is posed to restructure the fragmented issues hence achieving the aim envisaged in this paper.

The paper is structured to provide a brief explanation on the methodology employed in identifying the issues. This identification is followed by general review on the BQ and ensues by presenting detail discussion on the pertinent issues identified from the review process. A model on the most compelling issues is suggested from the outcome of the synthesis and concludes by signifying the issue in reference to the

immediate and future interest concerning the BQ. The finding presented in this paper is significant, considering the lack of the current effort in reviewing the array of issues concerning the application of the BQ either in Malaysia or elsewhere. It was firmly justified from the fragmentary nature of the issues and the need to answer the concerns indicated by the reports. Apart from recapitulating issues related to the BQ, the study is also posed to reinvigorate industry-wide interest on the subject, hence, providing a foundation for any forthcoming research with regards to the BQ.

2. Research Methodology

The study involves the process of identifying and reviewing the literature. More than hundred pieces of printed and on-line materials have been gathered from library search and subjected to rigorous review and appraisal. Some techniques employed in the review process were skimming, reading and interpreting (Bowen, 2009) with high focus expanded in detecting salient issues and searching-out any underlying themes (Bryman, 2006). For the purpose of synthesizing the outcome from the review, we use specialist qualitative analysis software - NVivo. The software facilitates coding the inputs derived from the review and helps to draw meaningful relationship among categories and detail cohorts espoused from the coding process. Accordingly, the methodological process employed indicates that the study has been systematically pursued, and thorough in its approach for manifesting the aim envisaged in this study.

3. The Use and Concern over the Use of the BQ

The BQ is not a dormant subject per se and has been subjected to various degree of development (Khairuddin, 2011). It grows in significance with the adoption of the conventional or the traditional process of building contracting and helps to ensure that efficiency is achieved in the process of tendering (Jaggar, *et al.*, 2001; Wilcox and Snape, 1980). As modern building operations increase greatly in scale and complexity, it becomes seemingly impossible for a contractor to price and compete for a job without substantial use of the BQ (Seeley, 1997). It indicates that the use of the BQ is at best considered indispensable and apparently is still the best method for placing contract in the construction industry.

Being prominent, the BQ has been highly useful to the industry due to the information contain in the document. The BQ follows the meticulous process performed by the quantity surveyors in interrogating the drawings and specifications (Davis *et al.*, 2009), which results into a concise schedule of descriptive and quantified items of the proposed project (Hackett *et al.*, 2006). Succinctly, the schedule provides detailed breakdown of the materials (Kwakye, 1997; Lee *et al.*, 2011; Lenard, 1992), labor (Baccarini and Davis, 2002; Kwakye, 1997), services required (Lenard, 1992; Mohd Hisham and Azman, 2008), workmanship (Rosli *et al.*, 2006), cost (Rosli, *et al.*, 2008), nature of work (Rosli, *et al.*, 2008), plant (Kwakye, 1997) and other works necessary to complete the construction project. In essence, the manner in which the BQ is prepared indicates that it contains the highest detail of information, which is consequently usable to the varying needs of its users in the industry.

The information that characterizes the BQ is useful and has generally benefited the clients, consultants and the contracting organizations (Rosli *et al.*, 2006; Sierra, 1984). This character has been transpired from the details available from the quantification process, which help a

project to become more transparent among the contractual parties. Although the BQ may have benefited various parties, there was a strong consensus in the literature for associating the BQ to the practice of the contracting organizations (Davis and Baccarini, 2004; Davis, *et al.*, 2009; Kodikara, 1990; Kodikara *et al.*, 1993; Skinner, 1979). This presumably rest with the acceptance that this organization have been the primary user of the BQ (Davis, *et al.*, 2009; Wood and Kenley, 2004) either for establishing the contract price or later in the course of the construction work.

Charting out from this view, the BQ has been accorded as expediently useful to the array of tasks that need to be performed by the contracting organizations. This circumstance was demonstrated from earlier studies by Skinner (1979); Smith and Hoong (1985); Kodikara, *et al.* (1993) and Davis and Baccarini (2004) which shows the variability of its functions to the party in addition to its traditional use in the tendering process. In addition, a recent study by Shamsulhadi *et al.* (2014) had further supported the proposition presented in the earlier studies. In this instance, thirty fundamental uses of the BQ, as shown in Table 3, have been suggested and were derived from detail consideration of concerning literatures. Accordingly, the wealth of literature available concerning this indicates that the BQ is fundamentally useful to the organizations concerned hence providing assistance across the main phases of a project.

Table 3 The fundamental uses of the BQ to the contracting organizations

Project period	Project phases	The fundamental uses of the BQ to the contracting organizations
A.	Tender period	Estimating <ol style="list-style-type: none"> 1. Materials enquiries to supplier. Such as: material details, stock availability and method of assembly. 2. Basis for materials quotations from suppliers. 3. Basis for works quotations from sub-contractors (work trade). 4. Building up own price for work/items requested in the BQ.
		Planning <ol style="list-style-type: none"> 1. Identification of task/activities and planning of construction method. 2. Programming the duration of task/activities for tender pricing. 3. Drafting method statement for the identified task/activities.
B.	Pre-contract period	Purchasing <ol style="list-style-type: none"> 1. Identification of material requirements to order from suppliers. 2. Preparation of material schedules for ordering purposes.
		Planning <p>Preparation of detail work program i.e. establishing the relationship among task/activities.</p>
		Site management <ol style="list-style-type: none"> 1. Planning for the allocation of materials for works. 2. Planning for the allocation of plants/equipment for works. 3. Planning for the allocation of labor for works.
C.	Construction period	Purchasing <ol style="list-style-type: none"> 1. Placing orders for materials to suppliers. 2. Purchasing/leasing plants for works. 3. Procurement of sub-contractors. 4. Scheduling sub-contractor's work. 5. Procurement of general labor.
		Planning <ol style="list-style-type: none"> 1. Off-site manufacturing of building components. 2. On-site manufacturing of building components.
		Site management <ol style="list-style-type: none"> 1. Recording actual use of materials. 2. Recording actual use of plants. 3. Recording actual use of labors.
		Quantity Surveying/ Financial control <ol style="list-style-type: none"> 1. Preparation of claim document for interim valuations. 2. Preparation of claim document for varied works to client (variation orders). 3. Evaluation of claims submitted by sub-contractors employed for the works. 4. Preparation of payment to sub-contractors. 5. Monitoring planned and actual project's expenditure.
D.	Defects and final account period	Quantity Surveying/ Financial control <ol style="list-style-type: none"> 1. Preparation of final claim document to client. 2. Preparation of document for closing of project's account (final account).

Source: adapted from Shamsulhadi, *et al.* (2014, p. 128)

Despite the assistance provide by the BQ, there were profound evidence from reports mentioned earlier that suggests a declining trend with the adoption of the BQ from the practice of the industry. This seemingly shows that some dissatisfaction exist over its use and consequently vitiate its reputation as a valuable mechanism to the industry. Following

this, the preliminary review of the literature suggests various causes of the predicament to surface. For instance, Waterworth and Weddle (1978) and Benedict (1972) pointed out that the BQ give no substantial value to the contractor while Charles (2007) blamed cost and labor as the hindrance in its production. Accordingly, the initial outcome from the preliminary review reflects the presence of a concern, hence deliberately supports the effort to review the subject further.

It is rather clear at this point that the predicaments probably were the main causes which had invoked the concern over the use of the BQ in the construction industry. This somehow has impacted the credibility of the BQ (Blyth, 2001; Choy and Sidwell, 1991; Marsden, 1996; Morledge and Kings, 2006; Uher, 1996) and resulted with a backward perception over its ability to embrace the needs of a changing industry (Smith and Hoong, 1985; Turner, 1983). In addition, there was also claim by Hodgetts (1984) that suggest the obsolescence of the BQ. For this reason, its suitability in representing the approximate nature of the construction environment was utterly questioned (Khairuddin, 2011) with unwieldy actions reported in supplanting the BQ with new techniques and procedures (Hackett, *et al.*, 2006; Kwakye, 1997). This portrays that an apprehension towards the BQ is mounting and possibly a drawback for its future application in the construction industry.

The concerns over the use of the BQ as described had placed a strong justification for a systematic identification on the sources of the predicament. This could be represented by the model proposed in this paper that could help to restructure the issues to a common ground. Hence, the next section will delve into the issues as identified from the literature and move on towards synthesizing the outcome.

4. Identifying the Issues concerning the Application of the BQ

The process of identifying and reviewing the literature has managed to gather pertinent sources of information for the purpose of this study. In this instance, every regarding cause of predicament – or issues, mentioned by authors from the studies was listed and interpretively defined to accentuate its underlying concept. The purpose of this process was to accumulate as many issues from the literature with the prospect of manifesting ordinary connotation among the issues from the list. This process will subsequently assist in highlighting the concerning issues and help to aggregate any similar issues indicated by different authors. The outcome from the process is presented in Table 4 with deliberations ensued in the following paragraph.

Following the rigorous process of appraisal, we identified twenty-nine discerning issues from the studies of various authors and presented in Table 4. In order to facilitate interpretation, the concepts which underlie each of the identified issue was defined, accentuated and integrated back in the list of issues identified from various sources of literature. The defined and accentuated concept – depicted in (*bracket), helps the study to proceed by disclosing the gist of the issues and provide a preliminary appreciation on the category of issues embodied in the literature (Bryman, 2008). This concept consequently allows the issues to be structurally viewed and highlight the general heading of the issues in preparation for the synthesis needed in this study.

5. Weightage and Focus of the Identified Issues

Though the list shown in Table 4 has managed to point out the discerning headings of all related issues, these issues however have been

accentuated in fragment and have followed the individual interpretation of the identified issue. In this instance, there was no chance to confirm on the theme and cumulative weightage of the issues, which critically were needed to suggest direction or focus that is worthy of consideration. This has placed bounds in the quest to synthesize the issues and indicates that an analysis of theme/weightage is required before an acceptable level of synthesis could be performed to the developed concepts.

With this condition in mind, a thematic analysis was performed based on the method espoused by Bryman (2008). In this regard, Bryman (2008) had suggested the counting of frequency with which certain words occur, in order to reveal the predilection that has exaggerated certain number of concepts used in the study. It helps by disclosing the weightage that the concepts have and consequently provide evidence for confirming the categorization contained within the concepts. For this purpose, we used dedicated qualitative analysis software – NVivo in respect of the analysis. The software helps to minimize any error in the counting process hence increasing the credibility of the themes that are developed from the concepts.

Subsequent to the analysis, a model representing the frequency of the accentuated concepts was generated from the software as shown in Figure 1. The model shows that ‘information’, ‘format’ and ‘methods’ were the three most occurring concepts from the issues and presumably were the main concepts that underlie the issues in its broadest term. Hence, it is clear from the model that ‘information’ contain the most number of issues followed by ‘format’ and ‘methods’ respectively. The model thereby indicates that the fractional issues that has emerged from the prior review could succinctly be clustered into three main categories hence suggesting relevant focus that is worthy of consideration.

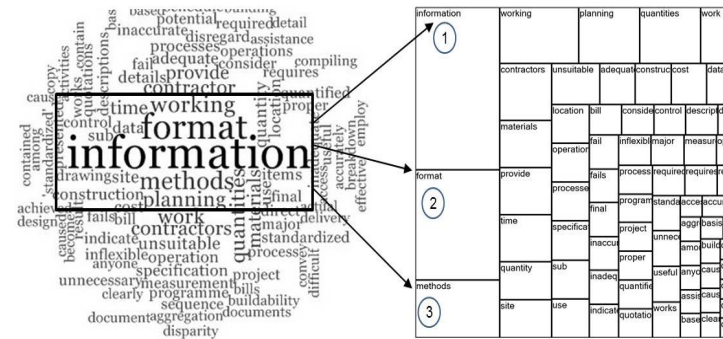


Figure 1 The NVivo model for representing the frequency of concepts underlying the issues - showing reference to three categories of the most occurring concepts

For the purpose of expounding the categories further, it seems imperative to re-associate the categories developed in Figure 1 by revisiting the array of issues identified and presented earlier in Table 4.

This process was conducted within an interpretative context and aim to synthesize as much details in respond to the developed categories. Cohorts – or details to the categories were identified and have facilitated in recapitulating the issues aimed in this paper. Accordingly, this course has managed to restructure the fragmented issues and help to provide a new perspective on it.

The outcome is presented in Table 5 with elaborations ensued in the paragraph that follows.

Table 4 The summary of issues concerning the application of the BQ – aggregation of similar issues from various authors

No.	Source of predicament (issues) identified from the review of the literature	Authors
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 <i>et al.</i> (2011); Smith and Hoong (1985)
2.	BQ (*information) provide <i>no assistance</i> to anyone drawing up a pre tender program (*time).	Contributed (1964)
3.	BQ (*information) only represent cost breakdown structure with <i>no link</i> to actual project schedule (*time).	Mohd Hisham and Azman (2008)
4.	SMM based BQ (*information) <i>unable to provide</i> a useful basis for contractor's work program (*time).	Jaggar, <i>et al.</i> (2001); Smith and Hoong (1985)
5.	<i>Preliminaries bill and specification</i> (*information) documents contain <i>many unnecessary</i> (*insufficient/ inadequate) items as a result of direct copy and 'standardized' document.	Hamimah, <i>et al.</i> (2011)
6.	BQ <i>quantities and 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, <i>et al.</i> (2011); Leon (1966)
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)
8.	BQ (*information) is <i>unnecessary</i> for <i>compiling</i> (*format) subcontractor's quotations and is <i>inadequate</i> for reviewing materials quotations from potential supplier as <i>quality of materials</i> (*specification) <i>are not clearly stated</i> .	Hamimah, <i>et al.</i> (2011); Kinlay (1984b)
9.	(*Information) in BQ <i>are uncoordinated, aggregation on similar materials</i> rather than <i>operation</i> (*format and working methods).	Kodikara, <i>et al.</i> (1993)
10.	BQ (*format) is <i>not in final forms</i> for direct use by site personnel.	Kodikara and McCaffer (1993); Kodikara, <i>et al.</i> (1993)
11.	BQ (*information) <i>requires sub-processes</i> as the information are <i>not presented</i> in a standardized (*format).	Cornick and Osbon (1994)
12.	BQ <i>fail to become a mechanism</i> to determine <i>construction processes</i> (*working methods). It <i>does not consider input</i> (*information) to the construction process (*working methods) but only identifies the end result or product of construction.	Holes (1990); Jaggar, <i>et al.</i> (2001)
13.	BQ <i>only present</i> (*information) that <i>have been processed and in final form</i> (*format). Detail (*information) such as supporting details on <i>quantities measured, work location and types of operations</i> (*working methods) the contractors have to employ are of use by estimators should access is given.	Hamimah, <i>et al.</i> (2011); Turner (1983); Wood and Kenley (2004)
14.	BQ (*information) had <i>inadequacies</i> for utilization 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)
15.	BQ <i>does 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)
16.	BQ <i>disregards potential</i> further value of reanalyzing the (*information) into activities, operations or elements (*format).	Kinlay (1984a)
17.	BQ (*format) is <i>not adequate</i> as it <i>hinders effective use</i> of (*information) contained.	Roshi <i>et al.</i> (2006); Smith and Hoong (1985)
18.	BQ <i>fails to convey</i> details (*information) of <i>materials</i> (*specification), <i>plants and 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, <i>et al.</i> (2011); Holes (1990)
19.	BQ is 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)
20.	BQ <i>does not support</i> contractor's management function. BQ (*information) <i>disregard</i> resource requirements and <i>only measures</i> (*quantity and units) <i>fixed in place measurement</i> .	Baccarini and Davis (2002)
21.	<i>Nett quantities and inaccurate quantities</i> (*information) are <i>major dissatisfaction</i> among contractors in the way (*quantities) are provided in BQ.	Hamimah, <i>et al.</i> (2011)
22.	BQ (*format) other than trade <i>fails to facilitate</i> contractor's pricing (*unsuitable format).	The BOQ Working Group (1995)
23.	BQ (*format) <i>do not indicate</i> project's buildability, work sequence and control of work (*inflexible format).	Skoyles (1968)
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)
25.	BQ (*format) is <i>not adequate</i> to fulfil its maximum functions (*unsuitable format).	Hughes (1978)
26.	BQ (*format) and <i>data presentation</i> (*unsuitable format) are a <i>major causes</i> for <i>inefficient</i> flow of estimating data.	Kodikara and McCaffer (1993)
27.	BQ data (*information) <i>fail to provide</i> contractors with information they need for <i>proper planning, organizing and managing</i> of their work (*working methods and planning).	Contributed (1964); Holes (1990); Leon (1966); Waterworth and Weddle (1978)
28.	BQ (*information) <i>requires sub-processes</i> by site QS as the information are <i>not presented</i> in a standardized format (*unsuitable format).	Cornick and Osbon (1994)
29.	BQ (*information) produced is <i>inaccurate</i> in terms of its <i>quantities and 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, <i>et al.</i> (2008)

Note: (*) – the accentuated concept in defining the identified issues. Key dissatisfaction identified and details of the dissatisfaction are presented in *italic*.

Assisted by NVivo, it is highly indicative from the synthesis that the numbers of identified cohorts were reflective of the frequency model

presented in Figure 1. In this instance, issues related to BQ ‘information’ were recorded to have the highest number of cohorts followed by cohorts from issues related to BQ ‘format’ and contractor’s ‘method of working’. While cohorts related to the later categories of issues seem straightforward, extensive variability of cohort details were recorded within the first category. In this respect, pertinent matters related to quantities/quantities location/quantity units, BQ descriptions, material specifications, time, preliminaries and temporary works were identified, which correspondingly relates to BQ information. The outcome indicates that focus on issues could substantively be redirected in accordance to the findings hence recapitulating concerning issues related to the BQ.

Table 5 The outcome from the process of re-associating the categories with the issues - showing the build-up of the recapitulated issues

Categories of issues	Dissatisfaction key-word	Category’s cohort	Issues recapitulated
Issues related to BQ information	Inaccurate	Quantities	1. Inaccurate (*and wrong) quantities.
		Descriptions	2. Inaccurate descriptions.
	Inadequate	Material specifications	3. Inadequate material specifications.
		Insufficient	Information on the location of the quantities
	Duration/Time		5. Insufficient information on *duration/time.
	Preliminaries	6. Insufficient information on preliminaries.	
	Information on temporary works	7. Insufficient information on temporary works.	
	Inappropriate	Quantity units	8. Inappropriate quantity units.
Issues related to BQ format	Unsuitable	Format	9. Unsuitable format (*and presentation).
	Inflexible	Format	10. Inflexible format (*and presentation).
Issues related to contractor’s method of working	Insufficient	Working method	11. Insufficient (*clarification) on working methods.

Note: (*) – added in context from the issues presented in Table 4.

6. Development of a Model and Discussion of the Findings

The analytical process pursued in this study has managed to restructure the concerning issues in accordance to the latent themes impelled from the review process. In this instance, three major categories of issues have initially been identified and this was subsequently followed by the identification of eleven cohorts which provide details to the categories. Accordingly, the cohorts suggest that the amounts of concern registered in the review are presumably the major concern with the application of the BQ. This has reinforced the issues recapitulated in this study, hence presenting the concerns on a much specific basis.

In view of the above finding, it was thought that a model in respect of the cohorts would possibly help to further explain the outcome derived in this study. Hypothetically, a model would allow detail pattern from the categorization of cohorts to be induced and contribute farther in espousing points not specifically known in the prior analysis. In this regard, the model is posed to offer an additional perspective to the finding, thus allowing relatable conclusion to be made in prospect for a

greater understanding. Subsequent to the premise, a model was developed by utilizing the NVivo’s modelling feature and presented in Figure 2.

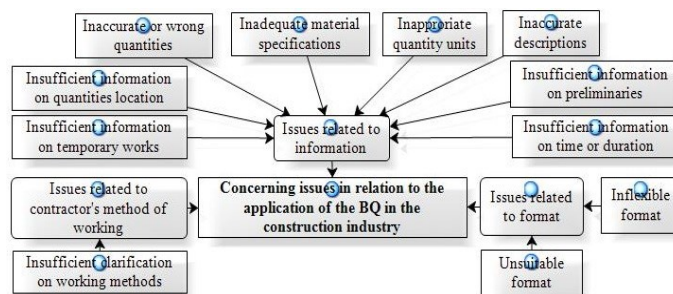


Figure 2 The NVivo model for recapitulating issues concerning the application of the BQ in the construction industry

As shown in the previous section, the model presented in Figure 2 had reaffirmed the severity of information related issues in comparison to issues related to BQ format and the contractor’s method of working. This model shows a substantial dissatisfaction over the way information is presented in the BQ and the oddities it might possess in meeting the varying requirements of its prospective user (Kinlay, 1984a; Morledge and Kings, 2006). Notably, the claim by numerous authors such as Hamimah, *et al.* (2011); Slattery (1994); Wood and Kenley (2004) and Smith and Hoong (1985) on various aspects of BQ information inadequacies had helped in justifying this presumption and broadly braces the general discontentment over its utility for a variety of purposes.

In addition to this point, the model also reflects the main causes that have triggered reported distress over the application of the BQ. It becomes apparent from the analysis that information issues have largely underpinned the concern, and this could again be related to the inadequacies spelt out in the foregoing paragraph. As the clarification might similarly suggest, it is seemingly obvious at this point that, with the exception of ‘quantity location’, all of the cohorts contained in the information category are generally elements that made up the overall content of a BQ. This notion follows from studies by Kodikara (1990) and Kodikara, *et al.* (1993) who suggest eleven types of element that were advocated to represent the BQ as a whole. Apparently, the concurrence that was reflected in the model shows that some elements that made up the BQ content may be currently deficient thus causing an intolerable dilemma over its use in the industry. This argument consequently suggests that effort to revisit the usability of the BQ content could be considered timely and may offer a new perspective in the quest to understand the predicament further.

Much of the discussion has focused on the information which was indicated in the weightage as having the greatest impact in characterizing the issues. By all means, it did not infer that the two other categories of issues were not important but as the number of the cohorts suggest, these are considerably less worrying despite concerns over it was noticeably mentioned in the literature. Though this notion has consequently placed limits in the study, greater focus to ‘information’ is significant for one reason. In this respect, as information lays in the center of construction management (Griffith *et al.*, 2000; Winch, 2010), wieldy focus on this aspect would help to dissect the issues to the core and disclose details which was previously not known. Accordingly, it helps to unveil the principal cause of the reported predicament and supports focus for immediate attention.

The outcome from this study is primarily significant in restructuring the present way of observing issues related to the BQ. Supported by the model, it suggests that issues concerning the BQ should principally be viewed from three discerning aspects with emphasis to be given towards the cohorts related to the aspects. Somehow, this is important in establishing a valid perspective on the issues and allows substantive effort to be channeled in the direction reflected in this study. Apart from this, the study is also significant in its stance concerning the content and presentation of the BQ. This could substantially trigger interest over the state of information contained in the BQ and similarly point to a direction that is imperative to be pursued. Overall, it has the potential in prompting future research to be undertaken and act as the foundation from which the industry's awareness could be bolstered.

Although substantial contribution is expected, the fact that the study was carried out based on the literature had posed some limitations towards the findings. In this instance, the findings are mainly constrained by the subjectivity of the interpretation made towards the resources, which may or may not accord with the underlying meaning conveyed in the literature. The subjectivity of the interpretation consequently suggests that the model presented in support of the arguments were at best to be considered hypothetical. Notwithstanding this limitation, the effort expanded in analyzing and interpreting the resources indicate that the study has been pursued to the best endeavor and capability. This has resulted with a strong argument on the severity of the issues and was considered important in expediting current knowledge pertaining to the BQ. Perhaps the time is ripe for the industry to think over the issues recapitulated in this study, for the purpose of justifying whether the BQ is still needed and relevant in the current construction environment.

7. Conclusion

The finding derived from the analysis conducted in this study has offered a new insight on issues concerning the application of the BQ. It had provided a concise representation of the fragmentary issues spelt out in a wide array of studies and subsequently had exposed the main cause of the predicament that invoked recent dissatisfaction. As the method used in this study involved substantial degree of analysis, specialist qualitative software was used, and this has evidently helped by minimizing error while facilitating the interpretation with some of its features. In this instance, a model was developed and used to support the arguments presented in the study. Accordingly, the rigorous technique employed for identifying, analyzing and synthesizing the literature had utterly been supported by the expanse used of the software hence justifying the worthiness and credibility of the findings.

As the study has highlighted, the meticulous technique applied in interpreting the literature has made it possible for the study to cluster the issues in respect to three categories. Amongst this, information issues have been considered to highly characterize the issues and subsequently indicate pertinent concern on the way information is presented in the BQ. Though the finding clearly indicates the presence of the issues, this has only been backed with support of the literature. This somehow indicates that further study is needed and would provide deeper understanding in respect to any improvement needed with the BQ. Nevertheless, given the limited number of study that explore extensively on this aspect, it implies that the study of this nature is timely and accord to the need reflected by the industry. As shown in this study, it has abled to provide a cross-sectional view on the issues that impacting the application of the BQ and allow more focus to be given in the suggested direction.

With the support from the model that was developed, it clearly suggests that the study has been successful in achieving its aim. It prompts the industry to rethink on the impacts that the issues might bring to the existing practice and whether or not the BQ has been successful in representing their requirement to the fullest. Perhaps an investigation on how the issues are affecting the use of the BQ is needed and may provide further explanation to the current concerns. Supported by these recommendations, the paper hereby calls for more effort to be channeled in probing every possible cause that affects the application of the BQ. Accordingly, this will provide strong justification to remain or to change from the existing practice and further rationalize on the viability of using this instrument in the industry. With all in place, more exciting development concerning the BQ is expected from now on hence becoming a jumpstart in leaping this interest further in the industry.

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