

FRAMEWORK DEVELOPMENT OF BILLS OF QUANTITIES  
ACCURACY IN CONSTRUCTION ORGANISATION

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A thesis submitted in fulfilment of the  
requirements for the award of the degree of  
Doctor of Philosophy (Quantity Surveying)

Faculty of Built Environment  
Universiti Teknologi Malaysia

JUNE 2015

To my beloved parents/in laws,

Tuan Haji Bandi Sukerman and Puan Hajah Saripah Raban  
Tuan Haji Khalid Hashim and Puan Hajah Ngatini Osman

Thank you for becoming my ultimate teacher in life

My wife,

Farial Hanum Nurul 'Ain Khalid, and

My bundles of joy,

Alyaa' Hana Farial and Aeddin Imran Farial

## ACKNOWLEDGEMENT

*Alhamdulillah*, all praises to *Allah* for granting me a good health, opportunity and perseverance to remain firm in this path. This arduous journey has made me realised how weak a *mujahid* of knowledge can be, in paddling in this vast ocean of wisdom. I clasped humble in his graciousness and indebted for all his mercy.

I am indebted to my main supervisor, Assoc. Prof. Sr Dr. Fadhlin Abdullah and my co-supervisor, Assoc. Prof. Dr. Ismail Mohamad for their diligent supervision, support and advices. I could never repay their commitment to me and feel thankful for having such wonderful supervisors by my side. May *Allah* grants them with good health, his bounty and rewards for nurturing an unpolished mind like mine.

Special thanks to International Islamic University Malaysia (IIUM), UTM and Department of Higher Education, Ministry of Education (MOE) for the scholarship, study leave, facilities and travelling grants. This has allowed me to spend valuable time abroad. I appreciate the attention given by Prof. Roger Flanagan, Dr. Carol Jewel and staff from the School of Construction Management and Engineering (SCME), University of Reading during my stay in Reading, UK. Thank you very much for sharing your thoughts in my journey and making my winter stay bearable.

I would like to acknowledge the advice given by numerous key academics and industry personnel who had imparted their knowledge in shaping the course of this research. This goes to Prof. Sr Dr. Khairuddin Abdul Rashid (IIUM), Assoc. Prof. Dr. Roslan Amiruddin (UTM), Dato' Sr Hisham Hj Jafrey (ARH Jurukur Bahan), Prof. Sr Dr. Hjh. Wan Maimun Wan Abdullah (RISM) and others from the contracting organisations. The acknowledgement also goes to my thesis presentation panel, Assoc. Prof. Sr Dr. Maizon Hashim, Assoc. Prof. Dr. Emma Mustafa, Dr. Kherun Nita Ali, Sr Dr. Sarajul Fikri Mohamad and others from the Faculty of Built Environment, UTM.

I would like to thank all respondents who have participated in the survey. This includes those, despite their busy schedule, have agreed to be contacted and interviewed in various phases of the research. I acknowledged that this research was not possible without their valuable inputs. It was an admiration to see their passion and commitment intertwined in making the construction industry a better place to be.

Last but not least, I cherish the support given by my friends and families. Thanks to my parents, wife and kids for their endless love, support and understanding.

## ABSTRACT

The Bill of Quantities (BQ) is a document that itemises information collected from the process of measurement and provides the descriptions, quantities and information of items required in a contract. These information are mainly used by contracting organisations in fulfilling their contractual duties. However, previous studies have revealed some concerns on the information contents of the BQ that have impacted its usability by contractors. Attempts to improve the BQ seem to concentrate on the BQ formats that do not parallel the improvements required for the BQ. This research aims to develop a conceptual framework that indicates important information requirements and significant issues as the basis to improve the uses of the BQ. The research outlines five objectives which include determining the uses of the BQ to the contracting organisations, determining the important BQ information requirements, determining significant issues impeding the uses of the BQ, developing and validating a conceptual framework as the basis to improve the uses of the BQ. Through survey, questionnaires were distributed to 500 active G7 contractors in Kuala Lumpur where 22.4% responded. Data was tested and analysed by means of Community, Cronbach's Alpha, Relative Importance Index and the Analysis of Importance. The research determines 30 uses of the BQ, and shows that quantities is the most important information required in the overall uses of the BQ while inaccurate/wrong quantities, insufficient information on quantities, and inaccurate descriptions are the most significant issues impeding the uses of the BQ. The information requirements and issues that were considered important from the analyses are the main inputs to the framework. These are organised into two levels of importance, with inputs featured in the first level have higher weightage in improving the respective uses of the BQ as compared to the inputs featured in the second level of the framework. The framework asserts that improving the respective uses of the BQ can be planned in two stages based on the respective levels of importance. Validation for the framework was carried out through interviews with 10 personnel with at least 15 years of construction related experience. The results show an acceptable congruity where no changes are required, affirming the validity of the framework. The framework provides a usable basis in strategising improvements on the uses of the BQ to the contracting organisations.

## ABSTRAK

Senarai Kuantiti (BQ) merupakan satu dokumen yang memperincikan maklumat dan proses pengukuran serta menyediakan huraian, kuantiti dan item-item yang diperlukan di dalam sesuatu kontrak. Maklumat ini digunakan terutamanya oleh organisasi kontraktor di dalam melaksanakan tugas-tugas seperti yang termaktub di dalam kontrak. Kajian-kajian lepas telah mendedahkan bahawa perhatian perlu diberi kepada kandungan maklumat BQ yang telah memberi kesan kepada kegunaan BQ oleh pihak kontraktor. Usaha-usaha yang telah diambil untuk menambahbaik BQ seolah-olah hanya tertumpu kepada memperbaiki format BQ. Ini didapati tidak selari dengan keperluan penambahbaikan BQ. Kajian ini bertujuan untuk membangunkan satu kerangka kerja konsep yang menunjukkan keperluan-keperluan terhadap maklumat dan isu-isu penting sebagai asas untuk menambah baik penggunaan BQ. Kajian ini telah menggariskan lima objektif iaitu mengenalpasti kegunaan-kegunaan BQ kepada organisasi kontraktor, mengenalpasti keperluan maklumat penting BQ; mengenalpasti isu-isu signifikan yang menghalang penggunaan BQ, serta membangunkan dan mengesahkan kerangka kerja konsep sebagai asas untuk menambahbaik penggunaan BQ. Melalui pendekatan kaji selidik, borang-borang soal selidik telah diedarkan kepada 500 kontraktor G7 yang aktif di sekitar Kuala Lumpur di mana 22.4% telah memberikan maklumbalas. Penilaian dan analisis data telah dibuat melalui kaedah Keakraban, Cronbach's Alpha, Indeks Kepentingan Relatif dan Analisis Kepentingan. Kajian ini telah mengenalpasti 30 kegunaan BQ serta menunjukkan bahawa kuantiti merupakan maklumat terpenting yang diperlukan dalam keseluruhan penggunaan BQ manakala kuantiti tidak tepat/salah, kekurangan maklumat berkaitan kuantiti dan keterangan item tidak tepat merupakan isu signifikan yang menghalang penggunaan BQ. Hasil yang diperolehi adalah input utama kepada kerangka kerja konsep yang dibangunkan. Ia disusun berdasarkan dua peringkat kepentingan, di mana input yang berada di dalam peringkat pertama mempunyai pemberat yang lebih untuk menambahbaik penggunaan BQ berbanding input di dalam peringkat kedua. Oleh itu, penambahbaikan BQ boleh dibuat dalam dua peringkat berdasarkan tahap kepentingan input seperti di dalam kerangka kerja konsep tersebut. Pengesahan yang telah dibuat keatas kerangka tersebut secara temu bual dengan 10 responden yang mempunyai sekurang-kurangnya 15 tahun pengalaman kerja berkaitan pembinaan menunjukkan kesepadanan telah dicapai dan mengesahkan kerangka kerja konsep yang telah dibangunkan. Kerangka kerja konsep ini menyediakan satu asas bagi merangka strategi penambahbaikan penggunaan BQ oleh organisasi-organisasi kontraktor.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

This chapter provides an introduction to the thesis that includes the background to the study, statement of the research problem, research questions, the aim and research's objectives. The scopes of research, a brief introduction to the research methodology are also presented in the chapter. The organisation of the chapters is outlined in order to provide an overview to the details that follow.

#### **1.2 Background of the study**

The construction industry is an important economic sector in Malaysia. It is central as being the catalyst for development and a major indicator and determinant of domestic performance in the economy (Abdul Razak *et al.*, 2010). The Malaysian construction industry has strong correlation coefficient with the country's gross domestic product (GDP) (Fadhlin, 2004). The correlation thus indicates that

construction activities in Malaysia are strongly dependent on the level and characteristics of the country's economy.

Due to the proximity of the construction industry to the level of economy in any given country, sudden changes in the economic environment would have detrimental effect to the construction industry. This is evident based on the 1997 financial crisis which saw the industry recorded an average growth of only 0.7% between 2000 and 2007 (Chan, 2009). However, the period between 2007 and 2011 saw the industry's growth rate stabilised (Jabatan Perangkaan Malaysia, 2012). It has registered a double digit growth since 2012 with 10.9% growth recorded in the fourth quarter of 2013 (Jabatan Perangkaan Malaysia, 2014a). The first quarter of 2014 saw the industry growing at 18.9% (Jabatan Perangkaan Malaysia, 2014b). This supports its role as the pillar of industrialisation and a major contributor to Malaysia's growing economy (Chan, 2009; CIDB, 2014b; Khan *et al.*, 2014).

In order to sustain the industry's growth, there is an urgent need within the industry to streamline the construction processes and to coordinate information in a quest for an improved construction performance. The need for streamlining and coordination is evident due to the nature and the environment in which the industry operates which was characterised by separation and fragmentation of different organisations (Baiden *et al.*, 2006; Janipha and Ismail, 2013; Kwakye, 1997; Ofori, 1990). Fragmentation in the construction industry exists due to the diversification of its participants (Baiden, *et al.*, 2006). Although volatile and sometimes adversarial, it is an indispensable character of the industry which, if unmanaged, may impede the success and performance of a construction project (Fulford and Standing, 2014).

In order to minimise the impact of separation and fragmentation of diverse participants in the construction industry, information was perceived as the enabler and an important input for coordination (Atkin, 1995; Griffith *et al.*, 2000; Kwakye, 1997; McDonagh, 1995; Winch, 2010). In achieving this, it is prerequisite for all participants in a project to be supplied with the right information in an adequate and

timely manner (Hackett *et al.*, 2006; Kwakye, 1997; Laing, 1976). This has sparked concerns from the industry especially with the increasing complexity of buildings, legal, statutory and contractual requirements (Griffith, *et al.*, 2000). Atkin (1995) for instance, has foreseen the difficulty to provide sufficient information that matches precisely with the need of others. Hence, this instils an awareness on the significance of information as the hallmark in increasing construction efficiency (McDonagh, 1995).

Despite the concerns, information generation remain the major source of activity in a construction project (Kwakye, 1997; Nourbakhsh *et al.*, 2012). It was regarded by Winch (2010) as the essence of construction management, without which a construction organisation would cease to function (Griffith, *et al.*, 2000). Information in the context of construction industry broadly represents data or knowledge evaluated for specific use (Barton, 1985). This is processed to provide meaningful information and transmitted by the process of communication (Barton, 1985; Dainty *et al.*, 2005). According to Atkin (1995) and Griffith, *et al.* (2000), the forms of information required in a typical construction project could be classified into commercial (or financial), technical, legal and managerial (or administrative) information. Regardless of the classification, the contents of the information need to be adequate to inculcate effective utilisation by participants in a construction project.

In the course of a construction project, numerous forms of information will be produced at the various phases of a project. These are intended to be shared among the parties and instrumental in realising the project's objectives (Kwakye, 1997). Table 1.1 indicates the producers of construction information, the stages of its production and its forms throughout the life of a construction project. As shown in Table 1.1, numerous forms of information are generated by the client, consultants, contractor and suppliers to the project in the forms of report, brief, drawings, manuals and estimates. The Bills of Quantities or the BQ in this sense is unique to the Quantity Surveyor and an important form of information which has contributed much to the industry. Basically, the BQ signifies a breakdown of construction works into component parts (Baccarini and Davis, 2002; Davis *et al.*, 2009; Hughes, 1978;

Turner, 1983) and essentially aid tenderers in the process of tendering (Hughes, 1978; Wilcox and Snape, 1980). Hence, the itemisation process carried out in the course of its preparation results in numerical and structured textual information (Fryer *et al.*, 2004) which is envisaged to fully and accurately describe a project.

**Table 1.1:** Forms of construction information in relation to project phase and information producer

Information producer	Project phase	Forms of information
Client	Conception	Brief
Architect	Feasibility	Reports
	Design	Drawings
	Construction	Revised drawings
	Commissioning	As-built drawings
Engineers	Design	Drawings
	Construction	Revised drawings
	Commissioning	Operating/Maintenance manual
Quantity Surveyor	Design	Cost estimates and the bills of quantities
	Construction	Cost report and final account
Contractor	Construction	Progress report and contractual claim
	Commissioning	Maintenance manual
Material suppliers	Construction	Material availability and supply report

Source: Adapted from Kwakye (1997, p. 53).

Being an important form of information in the construction industry, the BQ is an integral part of documentation in construction and has been prepared in various forms for over 300 years (Milliken, 1996). It has its root in the UK dating back in 1875 (Wexler, 1986) and was regarded by Ferry *et al.* (1999) as the foundation to the quantity surveying profession. Essentially, the BQ contains a schedule or bills of fully described and quantified items of labour, plant, materials and other works which is set down in a systematic and recognised manner (Kwakye, 1997). The schedule or bills, which were recognised as the most important part of the BQ (Kodikara *et al.*, 1993) contains vast amount of information that can be used in many ways (Hackett, *et al.*, 2006). Accordingly, with the increasing scale and complexity of building operations, it would be impossible for contractor to price a medium and large sized project without a BQ (Seeley, 1997) which in a way, reinforcing its status as an important form of information in 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 Malaysian Construction Industry Development Board (CIDB) shown in Table 1.2 indicates that the adoption of the traditional lump sum system of construction procurement has been consistently strong. Since the traditional lump sum system is being characterised by the application of the BQ, the data thus reaffirmed the important role play by the BQ in the Malaysian construction industry.

**Table 1.2:** The frequencies on the use of the traditional lump sum system as compared to other types of procurement (2010 – September 2014)

Procurement types	Year/Percentage									
	2010	%	2011	%	2012	%	2013	%	2014*	%
Traditional lump sum system	7027	96	7324	96	7450	94	7588	96	3857	97
Other types of procurement	275	4	281	4	442	6	350	4	119	3
Total:	7302	100	7605	100	7892	100	7938	100	3976	100

Source: Adapted from CIDB Quarterly Statistical Bulletin (Data for 2010: CIDB (2012b), 2011: CIDB (2013); 2012, 2013 and 2014: CIDB (2014a). \*Data as at Sept. 2014.

Accordingly, the familiarity towards the traditional lump sum system of construction procurement implies that the BQ is still relevant in the Malaysian construction industry. It is the service that forms the backbone of the Malaysian Quantity Surveyor's professional fees and had significantly contributed towards their income (Rosli *et al.*, 2008). Abdul Rashid and Normah (2004) reported that this activity constitutes 84.4% of total works outsourced by the Public Works Department of Malaysia (PWD). Hence this entails the centrality of the BQ, especially in terms of the service offered by the independent quantity surveying firms in Malaysia (Abdul Rashid and Normah, 2004; Fadhlin and Ismail, 2006; Rosli, *et al.*, 2008).



### 1.3 Problem statement

The BQ is useful in providing the contractors, clients and consultants with the necessary information that will enable them to manage the project more effectively (Rosli *et al.*, 2006). It was well recognised in the process of tendering and is expandable to be used in a variety of other purposes. The uses of the BQ can be summed up from the perspectives of contractors, clients and consultants (Rosli, *et al.*, 2006). In this regard, substantial interest is vested to the contractors as they are considered as the main user of the BQ (Davis, *et al.*, 2009; Morledge and Kings, 2006). Rosli, *et al.* (2008) states that BQ is important to the contracting organisation as it assists them in budgeting, establishing materials/labour requirement, claims as well as procuring sub-contractors in various trades requirement. Overall, the BQ creates a platform for the fairest bidding to take place and allow the contractors to perform an estimate on the same basis (Rosli, *et al.*, 2006, 2008).

Despite these roles, there have been concerns identified from the literature on the inadequacy of the BQ for utilisation by the contractors (Baccarini and Davis, 2002). These as contractors are constantly baffling to relate the BQ to the project development process (Rosli, *et al.*, 2008) thus resulting to the great loss of its utility during the construction process (Jaggar, *et al.*, 2001). In the midst of these concerns, information has been perceived to characterise issues concerning its use to the contracting organisations. Wood and Kenley (2004) have pointed out that the information provided had failed to address the needs of the contractors while Hamimah *et al.* (2011) argued that details supporting the information would be of great assistance should these were included in the BQ.

Prompted by the concerns, further review and syntheses of the literatures had revealed several issues pertaining to the uses of the BQ to come into sight. As shown in Table 1.3, the syntheses entailed that these issues can be categorised into three important categories. These are: (1) issues related to BQ information; (2) issues related to BQ format and (3) issues related to contractor's method of working. It is

important to realise that issues related to BQ information were the most prominent issues synthesised, apart from issues concerning BQ format and contractor's method of working. This seems to indicate substantial discontentment over the way information is provided and probably the main source of dissatisfaction on the uses of the BQ in the industry. Hence, the syntheses attest the need to focus on BQ information, given its bearing towards the concerns ratified from the literature.

Following this, several solutions have been proposed in an attempt 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 were identified as: (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, 1968a, 1968b, 1969); (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). These were proposed to ameliorate concerns over the uses of the BQ, hence restoring confidence over its presence in the construction industry.

Figure 1.3: The organisation of issues identified from the literature - showing the pertinent issues prompted from the syntheses

Problem keyword	Issues keyword	Issues prompted from the synthesis (the syntheses outcome)		Literature sources (authors)
Inaccurate	Quantities	1.	Inaccurate (and wrong) quantities.	Abdul Rashid and Normah (2004); Baccarini and Davis (2002); Hamimah, <i>et al.</i> (2011); Leon (1966); Rosli, <i>et al.</i> (2008)
	Descriptions	2.	Inaccurate descriptions.	Abdul Rashid and Normah (2004); Hamimah, <i>et al.</i> (2011); Leon (1966); Rosli, <i>et al.</i> (2008)
Inadequate	Material specifications	3.	Inadequate material specifications.	Ahenkorah (1993); Hamimah, <i>et al.</i> (2011); Holes (1990) (1984b)
Insufficient	Information on the location of the quantities	4.	Insufficient information on quantities, for instance the location.	Baccarini and Davis (2002); Hamimah, <i>et al.</i> (2011); Leon (1994); Turner (1983); Wood and Kenley (2004)
	Duration/ Time	5.	Insufficient information on duration/time.	Contributed (1964); Hamimah, <i>et al.</i> (2011); Jaggar, <i>et al.</i> (2001); Mohd Hisham and Azman (2008); Morledge and King (1985); Smith and Hoong (1985)
	Preliminaries	6.	Insufficient information on preliminaries.	Hamimah, <i>et al.</i> (2011)
	Information on temporary works	7.	Insufficient information on temporary works.	Ahenkorah (1993); Hamimah, <i>et al.</i> (2011); Holes (1990)
Inappropriate	Quantity units	8.	Inappropriate quantity units.	Baccarini and Davis (2002)
Unsuitable	Format	9.	Unsuitable format (and presentation).	Cornick and Osbon (1994); Hamimah, <i>et al.</i> (2011); Kinlay (1978); Kinlay (1984b); Kodikara and McCaffer (1993); Kodikara, <i>et al.</i> (1993); Rosli, <i>et al.</i> (2006); Smith and Hoong (1985); The BOQ Working Group (1995)
Inflexible	Format	10.	Inflexible format (and presentation).	Hamimah, <i>et al.</i> (2011); Kinlay (1984a); Skoyles (1964); Turner (1983); Wood and Kenley (2004)
Insufficient	Working method	11.	Insufficient (clarification) on working methods.	Ahenkorah (1993); Contributed (1964); Hamimah, <i>et al.</i> (2011); Holes (1990); Jaggar, <i>et al.</i> (2001); Leon (1966); Smith and Hoong (1985); Waterworth and Weddle (1978)

d.

Apparently, it implies that the solutions had placed much focus in developing new BQ formats. It thus indicates that only a fraction of issues concerning BQ format had been considered and this does not seem to entirely parallel with the array of issues synthesised from the literature. Likewise, 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. This similarly goes to the array of issues synthesised, whether it possess significant impact on the uses of the BQ to the contracting organisations. For this reason, a research that considers information requirements and significant issues to improve the uses of the BQ is considered timely. It is based on the fact that BQ is a compilation of varying construction information and the issues associated will provide factual inputs to improve its presence in the industry. Hence, this complies with the evidence synthesised from the literature and will laid a foundation for improvement to take place.

#### **1.4 Research questions**

This research attempts to answer the following questions:

- (1) What are the uses of the BQ to the contracting organisations?
- (2) What are the BQ information required by the contracting organisations in order to achieve the uses of the BQ?
- (3) What are the significant issues impeding the uses of the BQ to the contracting organisations?

- (4) How to indicate the important BQ information requirements and significant issues to be considered for improving the uses of the BQ?
- (5) How to verify the validity of the important BQ information requirements and significant issues that can be used as a basis to improve the uses of the BQ?

The research questions form the basis for the formulation of the research's aim and objectives.

### **1.5 Research aim and objectives**

The aim of this research is to develop a conceptual framework to improve the uses of the BQ. The conceptual framework indicates the important BQ information requirements and significant issues to be considered for improving the usage of the BQ. Thus, this serves as the basis to further improve the uses of the BQ to the contracting organisations.

Accordingly, the following objectives were drawn as the steps to achieve the aim:

- (1) To determine the uses of the BQ to the contracting organisations.
- (2) To determine the important BQ information requirements for the purpose of achieving the uses of the BQ to the contracting organisations.

- (3) To determine the significant issues impeding the uses of the BQ to the contracting organisations.
- (4) To develop a conceptual framework that indicates the important BQ information requirements and significant issues to be considered for improving the uses of the BQ.
- (5) To validate the conceptual framework as a usable basis for improving the uses of the BQ to the contracting organisations.

#### **1.6 Significance of Research**

The significance of this research can be attributed as the following:

- (1) The research affirms the literature findings on the uses of the BQ by the contracting organisations. This provides evidence which affirmed its uses and helps to prepare the foundation for determining the information requirements and issues relevant to the uses of the BQ.
- (2) The research establishes the BQ information requirements that are important to the uses of the BQ. This is significant as it informs on the information needed for the purpose of achieving the uses of the BQ.
- (3) The research establishes the significant issues impeding the uses of the BQ. This is significant as it informs on the restraining factors that impedes the effort to achieve the uses of the BQ.

- (4) The research develops a conceptual framework that indicates the important BQ information requirements and significant issues to be considered for improving the uses of the BQ. This serves as the basis to further improve the uses of the BQ to the contracting organisations.
- (5) The conceptual framework developed in this research can be used as one of the reference by the RISM SMM working committee in reviewing the SMM so that the SMM can provide a more holistic basis for BQ preparation. Thus, the uses of BQ to the contracting organisations can be improved.

## **1.7 Research Methodology**

The research is strategically driven to determine comprehensively about the uses of the BQ to the contracting organisations, the contracting organisation's requirements towards the information contain in the BQ and the significant issues impeding the uses of the BQ. The research is oriented towards exploration which according to Krishnaswami and Raganatham (2006), does not necessitates the formulation and testing of hypotheses. Yet, the basis provides through the research will essentially contribute to better understanding and situate the BQ with the needs of the current construction environment. Following the objectives outlined in section 1.5, the methodology for the research will be executed in four phases. This is illustrated in Figure 1.1 and is summarised as the following:

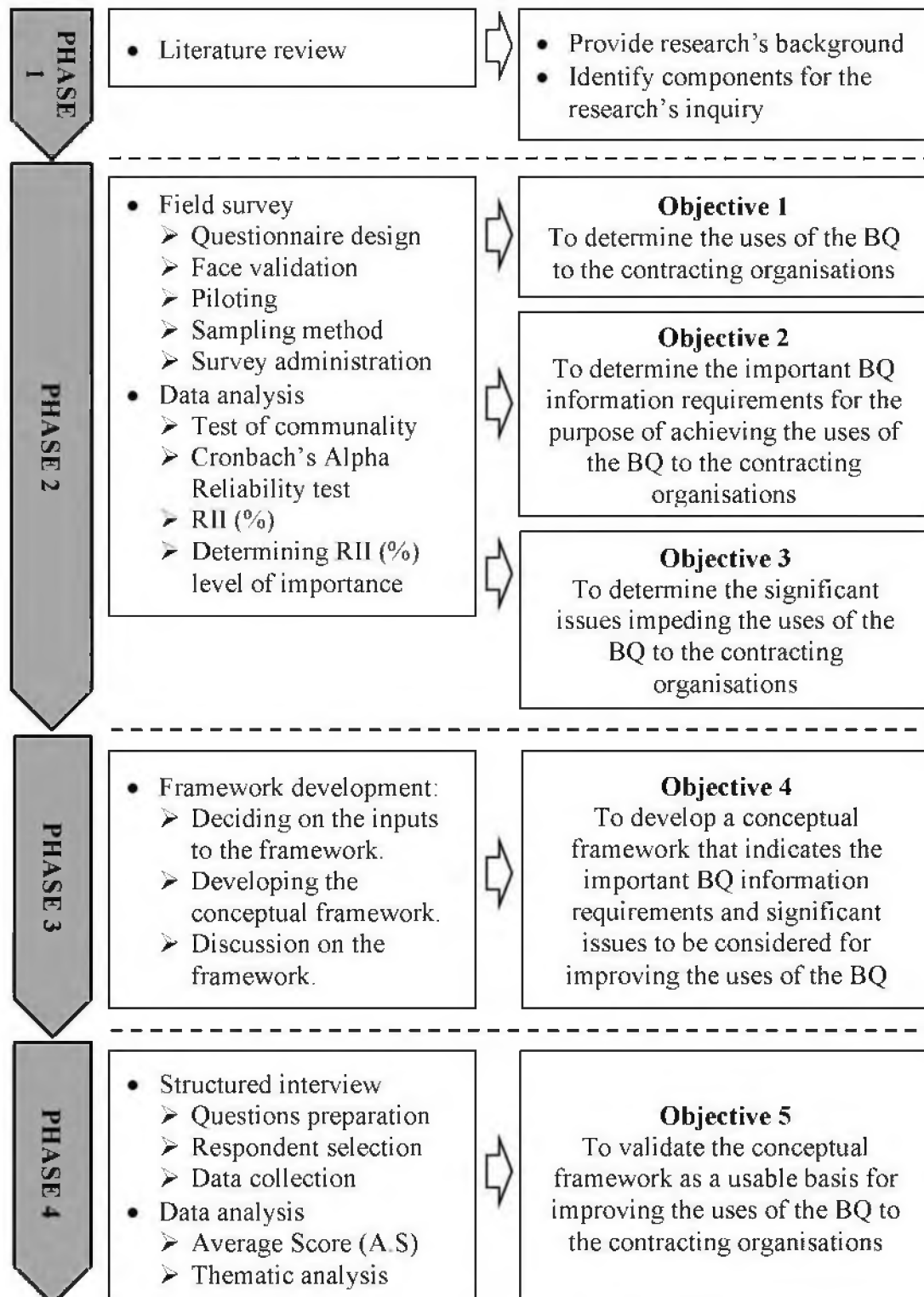


Figure 1.1 The research methodology



- (1) **Phase 1:** The first phase consist an expansive review of the literature. This is carried out to provide the research's background as well as the basis for the research's inquiry. The review has enabled pertinent knowledge on the BQ to be gathered. This includes its development, uses, information contents and issues impeding its uses. Information gathered through this phase has subsequently enabled the research's theoretical framework to be developed. This becomes the basis for accomplishing the tasks outlined in the research's objectives.
- (2) **Phase 2:** The second phase consist the approach towards data collection and analysis. It concentrates on survey which was adopted as the method for data collection. The tasks involved in this phase include questionnaire design, piloting, sampling and questionnaire administration. Data collected from this phase was then subjected to specific types of analyses in accordance to the objectives to be met.
- (3) **Phase 3:** Phase three concentrates on the development of the conceptual framework aimed for this research. It starts with a literature review to support the understanding on the process for developing a framework. Following this, the structure of the proposed framework is decided and this was then followed by representing the research's findings in the framework. The conceptual framework is the main contribution of this research. This is proposed to become the basis in improving the uses of the BQ to the contracting organisations.
- (4) **Phase 4:** Phase four was targeted at validating the conceptual framework developed in phase three. It is carried out to reflect the congruity of the findings with the opinions of the respondents, as well as justifying whether or not changes and/or improvement are needed to the proposed framework. This is also an important step in providing deeper understanding towards the research's findings.

## 1.8 Scope of research

The research focuses on contracting organisations which are actively involved with projects and operating in the Malaysian construction industry. As established, these particular organisations are the main user of the BQ and greater understanding in this respect is posed to bring substantial improvement to the way the BQ is to be used. The opinion solicited from the contracting organisations has become the pillar in developing the framework and the source of evidence in clarifying their requirements with regards to the BQ.

As the industry is characterised by contractors in different category of registration, decision was made to focus on contractors under the G7 category. This is the highest category of contractor registration in Malaysia which directly translates into expansive knowledge and greater industry related experience. In this case, the views gather from the contractors are backed by their exposure in the industry and sufficient understanding on the diversity of its operation.

## 1.9 Organisation of chapters

The research reported in this thesis is organised into seven chapters as follows:

**Chapter 1 (Introduction):** The chapter first presents the background of the study. This is followed by the problem statement, research questions, aim and objectives. The scope of research and brief introduction to the research's methodology are also

presented. The chapter aims to introduce the research before further details are presented in the chapters that follow.

**Chapter 2 (Literature review):** The chapter provides a critical discourse over previous studies concerning the BQ. It analyses the relevant literature sources and aim to present an outcome that commensurate the progress of the topic. This is presented by providing some perspectives on its development and its contribution to the construction industry. The aim of this chapter is towards providing background information to the research and formulating the research's theoretical framework from the review and syntheses of the literature.

**Chapter 3 (Research methodology):** The chapter explains the methodology employed to achieve the research objectives. This is segmented into four interrelated phases with each is geared in achieving a specific objective. The approach makes the research to become more systematic. It also helps to support the explanations on how the research's objectives are achieved.

**Chapter 4 (Data analysis and presentation of results):** The chapter presents the outcome from the analysis carried out to the survey data. It starts with the analysis of communality to determine the uses of the BQ to the contracting organisations. This is followed by Cronbach's Alpha reliability test, analyses of Relative Importance Index (RII %) and determining RII (%) level of importance. Findings from RII (%) analyses are presented by way of scatter plots. The approach allows the findings to be organised before these are considered as the inputs to the framework.

**Chapter 5 (Discussions, findings and framework development):** The chapter discuss the results from the analyses of the survey data. This is followed by discussion on the approach considered for developing the research's conceptual framework. Subsequently, it explains how the research's finding may be represented

in the framework's structure. The highlight of this chapter is the framework develops for this research.

**Chapter 6 (Framework validation):** The chapter discuss on the validation conducted towards the conceptual framework developed in this research. It starts with an explanation on the respondents who have participated in validating the framework and followed by the validation results.

**Chapter 7 (Conclusion and recommendations):** This chapter concludes the research. It reiterates how the objectives were achieved and explains the research's contribution to knowledge. The chapter also explains some of the research's limitation. It concludes by outlining some recommendations and suggestion for future research.

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