

Importance and Functions of Bills of Quantities in the Construction Industry: A Content Analysis

Atikah Razali¹, Anas Tajudin², Ahmad Fadzli Ahmad Tajuddin³

¹PhD Candidate Student, Kulliyyah of Architecture and Environmental Design, International Islamic University, Gombak, 53100 Kuala Lumpur, Malaysia

²Faculty of Management and Information Technology, Sultan Azlan Shah University College, 33000 Kuala Kangsar, Perak, Malaysia.

³The Malaysian Institute of Integrity, Menara Integriti, Persiaran Duta, Off Jalan Duta, 50480 Kuala Lumpur

ABSTRACT: Bills of Quantities (BQ) is one of systematic ways applied in the construction industry in which its primary function is to record items of works for tendering purposes and to create a fair agreement among the parties involved for contracting purposes. However, there are some issues pertaining to BQ functions such as BQ is a misunderstood facet in the construction industry today, BQ is only useful for tendering purposes, BQ's benefit is not fully utilised by the construction team and most of them cannot relate BQ with everyday construction works and processes. Therefore, the purpose of this paper is to study on the importance of BQ and its functions in the construction industry. A content analysis was used to identify the importance and functions of BQ from reviewing articles and books. Findings from this paper are beneficial in providing knowledge to the education field and construction teams on the importance and functions of BQ in the construction industry.

KEYWORDS : Bills of Quantities, importance, functions, construction industry.

I. INTRODUCTION

Bill of quantities (BQ) has existed and developed over 300 years (Miliken, 1996). As mentioned by Hussein (2009), the BQ have been proposed in the year of 1774 by Thomas Skaife, purposely for pricing tenders based on designer drawings in order to know the cost of a completed project before the construction projects begins. Odeyinka, et al (2009) mentioned that, BQ “has been documented as far back as when the Egyptian pyramids were being constructed”.

In the construction industry, BQ is a document used in construction projects with complete descriptions of materials, workmanships including quality, and the quantities (Davis and Baccarini, 2004; Davis et al., 2009; RISM, 2000; Rosli et al., 2006; The Aqua Group, 2003) . Primarily, it has been used to call for tendering, which enables contractors to price the construction projects (Davis and Baccarini, 2004; Davis et al., 2009; Rosli et al., 2006) and to create a fair agreement among the parties involved (Lee et al., 2011) for contracting purposes (Davis and Baccarini, 2004; Davis et al., 2009; Rosli et al., 2006) in construction projects.

II. PROBLEM STATEMENT

Even though BQ is a multipurpose document and comprised of vast amount of imperative information, there are still issues arising on the BQ such as, BQ is a misunderstood facet in the construction industry today (Davis and Baccarini, 2004; Davis et al., 2009), BQ is only useful for tendering purposes (Rosli et al., 2006), BQ's benefit is not fully utilised by the construction team and most of them cannot relate BQ with everyday construction works and processes (Davis and Baccarini, 2004; Davis et al., 2009; Rosli et al., 2006). This shows that there is a lack in terms of explanation and information on the importance and functions of the BQ in the construction team.

III. OBJECTIVES OF THE STUDY

Based on the problem statement, the objectives of this research:

- i. To discuss the importance of BQ in the construction industry
- ii. To review the functions of BQ in the construction industry

IV. RESEARCH METHODOLOGY

The methods used for this study is content analysis of literature reviews of books and articles. The content analysis conducted is done manually by coding the repetitive functions which then enables the researcher to group the functions into sixteen categories.

V. FINDINGS

a. The Importance of the Construction Industry Reflects the Roles of BQ

In Malaysia, the construction industry is one of the industries that contribute to the economy of the country (Abu Hassan, 2009; Abdul Rashid, 2008; Fadhlin, 2004; Fadhlin, et al 2004). In his writing, Abdul Rashid (2008) mentioned that, the construction industry plays an important role in the country's economic development (Fadhlin,2004; Fadhlinet al., 2004) through exportation, increasing employment opportunity, generating foreign exchange and enhancing Malaysia's image (Abdul Razak, et al 2010).

Omar (2008) mentioned that the strength of one industry depends on the governance of the industry. Malaysian Construction industry has governance adopted by the government of Malaysia and plans and policies have been practiced. For instance, Abdul Razak et al. (2010) mentioned that the government of Malaysia has launched Vision 2020 to make Malaysia a fully developed country in the year 2020. The main focus to achieve vision 2020 is by providing budget for infrastructures particularly in the Kuala Lumpur metropolitan area and the Economic Transformation Programme (ETP) with the intention to propel economy to a better level.

In the Malaysian Construction Industry, Traditional General Contracting method (with BQ) has been used worldwide by majority of clients in the construction projects at least for the past 150 years (Maizon, 1999). This shows that construction industry is a strength sector and the BQ is used worldwide and by most of the clients in the construction projects because of its importance and functions as mentioned by The Aqua Group (2003) that,

“new techniques and procedures aimed at supplanting them (bills of quantities) are tried frequently. However, bills of quantities have survived thus far, no doubt because in addition to their two primary functions they contain vast amounts of information that can be of use in many ways”.

b. The importance of BQ in the Construction Industry

As previously mentioned by Rosli et al. (2006), BQ is a multipurpose document and can be useful in many ways (Brook, 1998; 2004; 2008). Proven by The Aqua Group (2003) the imperative of information contained in the BQ is known by the people in the construction industry because the document is still being using even though many alternatives were introduced to replace it.

BQ is a very important document and there are a lot of advantages to have a BQ in a construction project because BQ “provides the best basis for estimating, tender comparisons and contract administration” (Ashworth and Hogg, 2002). The Aqua Group (1999) explained that the contract with bills of quantities has a lot of advantages as follows:

- i. Contractor's estimating risks are considerably lower.
- ii. The competition is much fairer as all contractors are tendering on the same basis
- iii. Contractor's overheads in tendering are reduced and therefore the whole building industry works more economically.
- iv. The measurement of quantities allows the total price to be analyzed in great detail, thus providing cost feedback on the job, which in turn can be used statistically in cost planning other work.
- v. Bills of quantities provide the best means of controlling the cost of variations in the contract.
- vi. Although neither the Standard Form of Contract nor the Standard Method of Measurement dictates that quantities will be used for management purposes, they do in fact provide documents which are a great help on the site, particularly for ordering and the management of sub-contract work. It is likely that new methods of measurement, coupled with computer technology, will lead to their more extensive use for management purposes in the future.
- vii. The process of measuring quantities before tender is a useful test as to whether what has been drawn and specified can in fact be built. Having someone from a different profession examine the drawings and analyze construction in detail is undoubtedly helpful in identifying problems not apparent at first sight.

The BQ is used in the traditional procurement system (Rosli et al., 2006) and the advantages of the procurement method rely on the BQ. Ashworth and Hogg (2002) mentioned that, there are advantages to opt for traditional procurement system which are as follows:

- i. A high level of price certainty of a construction project since cost is known before the construction starts;
- ii. Allow to offer for a low tender price;
- iii. Adapts with design changes and assists the cost management process;
- iv. High quality of tender document

Lee et al. (2011) also agreed that the BQ continues to be important because even though the BQ has declined in usage for large projects, 50% of the value of all building projects in the UK still uses traditional contracts. They also mentioned that, other procurement routes also require quantifications of the work that involve measurement processes, a similar process in preparing BQ document and the end product is as concise as a BQ document (Rosli et al., 2006).

BQ is very efficient and sufficient as a reference for any changes and variations in construction projects (Davis et al., 2009; Ashworth and Hogg, 2007; The Aqua Group, 2003). As stated by Muhammad, et al., (2010), variations are unavoidable in any construction project and a change is a fact of life in construction (Dmadi, 2003). This is proven by Adnan (2008) and Ogunsanmi, et al (2011), and Chritamara, et al (2002), in which they stated that design and build projects are at risk to cost overrun.

Moreover, Lenard (1992, as cited in Khairuddin, 2011) conveyed opinions of Australian Institute of Quantity Surveyor on the projects that have not used the BQ. He claimed many problems would occur in the projects that are not using BQ and some of the riskier problems are as follows:

- i. Contractors can wield the information in the BQ for their own purposes;
- ii. It leads to more choosy work in comparison of tenders because the scope of works is a variety among the tenderers;
- iii. Riskier in terms of both time and cost because the projects are estimated based on overall floor area;
- iv. The valuation of progress payment would be more difficult without detailed information as provided in the BQ;
- v. There is the tendency of contractor to form a conspire group and bid high for projects.

c. Functions Of Bills Of Quantities

In general, Bills of Quantities (BQ) has two primary functions (Brook, 1998, 2004, 2008; Davis and Baccarini, 2004; Davis et al., 2009) in which during pre-contract administration, the function of BQ is to assist contractors in the formulation of their tenders as the BQ breaks down the contract works in a formal, detailed, and structured manner for tendering purposes, whereas during post contract administration, the BQ is useful in assisting the contractors and quantity surveyors in valuing progress payments and variations and it provides a financial structure for contract administration.

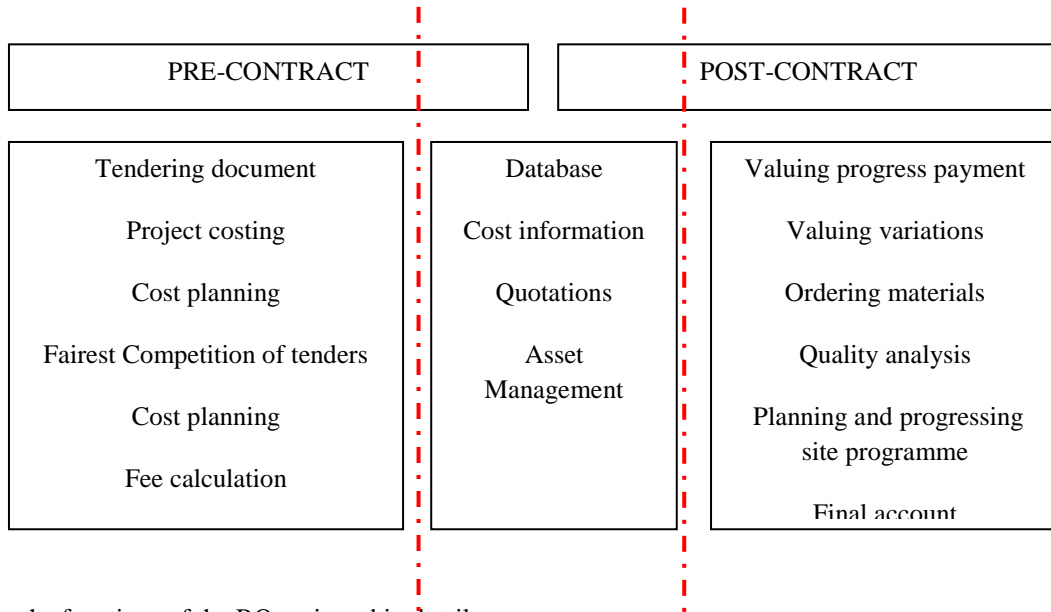
BQ is a multipurpose document (Rosli et al., 2006), and the functions are as many as listed in Table 1. Based on Table 1, there are sixteen functions of the BQ.

Table 1: Functions of BQ

No.	Functions of BQ	Researchers
1	Tendering document	Willis and Trench (1998); Seeley (1997); Ashworth and Hogg (2007)
2	Valuing progress payments	The Aqua Group (2003); Ashworth and Hogg (2007)
3	Valuing variations	Davis et al. (2009); Ashworth and Hogg (2007)
4	Project Costing	Rosli et al. (2006)
5	Database	Davis et al. (2009)
6	Fee calculation	Davis et al. (2009)
7	Asset Management	Davis et al. (2009)
8	Ordering of materials	Brook (1998, 2004 & 2008); Ashworth and Hogg (2007)
9	Elemental Cost Planning	Brook (1998, 2004 & 2008); Ashworth and Hogg (2007)
10	Quality analysis	Ashworth and Hogg (2007)
11	Quotations	Ashworth and Hogg (2007)
12	Fairest Competition for tender	Ashworth and Hogg (2007)
13	Planning for site program	Brook (1998, 2004 & 2008); Ashworth and Hogg (2007)
14	Final account	Ashworth and Hogg, 2007; Cartlidge, 2013a
15	Cost Information	Brook (1998, 2004 & 2008); Ashworth and Hogg (2007)
16	Cost Control	Brook (1998, 2004 & 2008)

All of the functions of BQ listed in the table are in both during pre-contract and post contract administration as simplified in Figure 1. Figure 1 shows the functions of BQ in a construction project from pre-contract administration until post contract administration via initiation of a construction project until its completion. Figure 1 proved that the BQ is a multipurpose and very useful document. Some of the data in the BQ is useful during pre-contract administration, some data only useful during post-contract administration and some of the data is useful during both the pre and post contract administration. Besides, functions of the BQ in the middle part of Figure 1 which has been with red dotted lines showed that such functions can be references for other construction projects.

Figure 1: Functions of Bills of Quantities during Contract Administration
(Source: Invented based content analysis)



Below are the functions of the BQ reviewed in detail:

i. Tendering Document

Originally, the bill of quantities is used as a tendering document (Willis and Trench, 1998; Seeley, 1997; Ashworth and Hogg, 2007). Commonly, BQ is used as a tender document for construction project with traditional procurement system (Rosli et al., 2006). The BQ tender is used in open tendering method (Mudd, 1984). The BQ documents enable the contractors to price the work on precisely the same information with the minimum amount of effort (Ashworth and Hogg, 2007).

ii. Valuing Progress Payments

BQ is frequently used to value construction works that have been done for the issuance of interim certificates and progress payments (The Aqua Group, 2003; Ashworth and Hogg, 2007). This is supported by Davis et al. (2009), in which they stated that BQ is a basis for the evaluation of progress payment. Based on PWD Form 203A, clause 28.0, the valuation works of progress payment for the issuance of interim certificates including contractor executed work, unfixed materials or goods delivered to site for the construction project.

iii. Valuing Variations

Based on The Aqua Group (2003), one of the principal functions of bills of quantities is providing rates schedule that can be a basis to evaluate variations (Davis et al., 2009; Ashworth and Hogg, 2007). According to PWD Form 203A, clause 24.2, variation means “a change in the contract document which necessitates the alteration or modification of the design, quality or quantity of the works” that affects the contract sum. In clause 25.0, it has been mentioned that the valuation of variation are in accordance with the rates provided in the BQ.

iv. Ordering of Materials

It was stated by Brook (1998, 2004 & 2008) that the BQ is useful for contractors to order and purchase materials (Ashworth and Hogg, 2007). This is because BQ contains complete information of quantities and descriptions of materials for construction projects to be procured (RISM, 2000) from local or imported suppliers. As mentioned by Wang (1987), the use of materials in construction projects is above 50% such as cement, steel, timber etc. Therefore, the information of materials and quantities provided in the BQ made it easier for contractors to call for quotations from sub-contractors (Ashworth and Hogg, 2007).

v. Elemental Cost Planning

Elemental BQ is helpful to assist the consultant to plan for the cost of construction projects (Brook, 1998, 2004 & 2008; Ashworth and Hogg, 2007). Elemental cost planning provides detailed project cost by elements of works purposely for budgeting and cost control (Wang, 1987). According to Cartlidge (2013a), cost planning is a costing process during pre-contract stage which became important during the 1970s and the cost plan prepared based on standard list of elements developed by The Building Cost Information Service (BCIS).

vi. *Planning for Site Programme*

Brook (1998, 2004 & 2008) stated that BQ is a convenient document in planning for site program (Ashworth and Hogg, 2007) such as preparing resource programmes, preparing work breakdown structure (Rosli et al., 2006) and critical path network analysis with various activities and easier for monitoring progress of works at site (Wang, 1987).

vii. *Final Account*

According to Ashworth and Hogg (2007) and Cartlidge (2013a), BQ is practical for final accounting prior to completion of a construction project. Final account is the final part of the audit trail of all financial transactions relating to the contract by referring to the BQ and the process of final account stage might consume time. The final account includes all the following (Cartlidge, 2013a):-

- [1] Statement of Final Account
- [2] Final Account Summary
- [3] Adjustment of Prime Cost Sums
- [4] Adjustment of Provisional Sums
- [5] Adjustment of Provisional Items
- [6] Adjustment of Variation Account
- [7] Adjustment for Fluctuations
- [8] Adjustment for Contractor's Claims

The Standard Form of Contract PWD 203 A has provided a clause for final account process, clause 31.0 in which is stated that prior to the preparation of final account the final certificate will be issued and final payment will be made to the contractor, if any.

d. *Cost Information*

Brook (1998, 2004 & 2008) mentioned that the BQ can be used in many ways by contractors, for instance, data collected during construction can be cost information (Ashworth and Hogg, 2007) for estimators. The JCT 98 private with quantities has provided a clause 5.7, to mention that to only use the rates or prices of materials from the BQ as part of the contract as cost information.

e. *Project Costing*

Stated by Rosli et al. (2006), for traditional procurement system, the BQ is mainly used for project costing which is to estimate or price the work on precisely. According to Ashworth and Hogg (2002 & 2007), project costing covers the whole cost of construction project activities in starting from the inception process until the final account agreement purposely to match the cost estimation with the client's budget. The estimation during project costing is useful for cost advice prepared by the QS to the client (Ashworth and Hogg, 2002 & 2007) and also to forecast cost and value of the project (Cartlidge, 2013a). The processes included during the project costing are cost advice, cost planning, cost control, cost analysis, risk analysis, whole life cost and value management analysis (Ashworth and Hogg, 2002 & 2007; Cartlidge, 2013a).

f. *Database*

Based on Davis et al. (2009), one of the uses of BQ is as a database for future estimation that has similar type of construction projects. Moreover, Cruywagen (2010) mentioned that the price in the BQ can be a reference to derive weights for a new Tender Price Index (TPI). According to Gorse, et al (2012), a database is "a collection of computer data that can be sorted or manipulated in various ways". The database that is provided by the BQ such as the detail description of materials, workmanships, rates or prices of materials, quantities and unit of materials as mentioned in the sub-heading definition.

g. *Fee Calculation*

Davis et al. (2009) mentioned that the BQ provides an absolute basis for the calculation of consultants' fees. The consultant fees include various expertise such as architects, engineers, planners, QS and many more (Forster, 1986; Wang, 1987). There are few ways to determine the consultation fees and one of the ways is by multiplying certain amount of percentages with the contract sum of the project estimated from the BQ (Manual Perolehan Perkhidmatan Perunding, 2011). Ashworth and Hogg (2002 & 2007) refer fees as charge of services provided by the consultants to the client depending on the factor of complexity, volume and duration of the project.

h. Asset Management

Davis et al. (2009) stated that the BQ provides readily available data for asset management of the completed building, life cycle costing studies, maintenance schedules, general insurance and insurance replacement cost.

i. Quality Analysis

Ashworth and Hogg (2007) stated that BQ is also used for quality analysis by reference to the trade preamble clauses. The terms “analysis” means a thorough investigation, “quality” is a standard of service or product and “preamble” is information provided in the BQ on the rules of measurement and description of trade (Gorse et al., 2012).

j. Quotations

Besides that, BQ is also used to call for quotations from sub-contractors (Ashworth and Hogg, 2007). Quotations are prices given to undertake work (Gorse et al., 2012). In the construction industry, the quotations are given by suppliers to supply resources for construction projects such as materials, equipment, machineries and etc. (Cartlidge, 2013b). Usually, the suppliers are the sub-contractors which are selected based on certain criteria. In order to request for quotations from suppliers, various processes are involved (Cartlidge, 2013b).

k. Fairest Competition for Tenders

According to Ashworth and Hogg (2007), the BQ enables contractors to price the work precisely on the same information with minimum amount of effort and promote for the fairest type of competition (Rosli et al., 2006b; The Aqua Group, 2003; Brook, 1998, 2004 & 2008). Cartlidge (2013a) mentioned that, BQ is provided in the traditional procurement system that commonly practice single state competitive tendering which beneficial to get offer for lower tender price (Ashworth and Hogg, 2002; 2007). The BQ gives fair competition because all tenderers price the work on the same information of projects (Ashworth and Hogg, 2002 & 2007) and the competition among the tenderers (Cartlidge, 2013b) can lead to lower price offer of the project.

l. Cost Control

Brook (1998, 2004 & 2008) agreed that BQ is helpful for cost control during the contract to ensure work is within budget. According to Cartlidge (2013a), BQ provides cost of the construction project during pre-contract phase, planning cost and cost target which cannot be spiral out of control.

VI. CONCLUSION

As a conclusion, the importance of a BQ is as follows:

- i. Contractor’s estimating risk are considerably lower
- ii. The competition is much fairer as all contractors are tendering on the same basis
- iii. Contractor’s overheads in tendering are reduced and therefore the whole building industry works more economically
- iv. The measurement of quantities allows the total price to be analysed in great detail, thus providing cost feedback on the job, which in turn can be used statistically in cost planning of other works
- v. Bills of quantities provide the best means of controlling the cost of variations in the contract
- vi. Although neither the Standard Form of Contract nor the Standard Method of Measurement dictates that quantities will be used for management purposes, they do in fact provide documents which are a great help on the site, particularly for ordering and the management of sub-contract work. It is likely that new methods of measurement, coupled with computer technology, will lead to their more extensive use for management purposes in the future.
- vii. The process of measuring quantities before tender is a useful test as to whether what has been drawn and specified can in fact be built. Having someone from a different profession examine the drawings and analyse construction in detail is undoubtedly helpful in identifying problems not apparent at first sight.
- viii. A high level of price certainty of a construction project since cost is known before the construction starts.
- ix. Allow to offer for a low tender price
- x. Adapts with design changes and assists the cost management process
- xi. High quality of tender document
- xii. Reduce risk of Contractors wielding the information in the BQ for their own purposes

- xiii. May avoid choosy work in comparison of tenders because the scope of works is a variety among the tenderers
- xiv. May avoid risks in terms of both time and cost because the projects are estimated based on overall floor area.
- xv. The valuation of progress payment would be easier with detail information as provided in BQ.
- xvi. May avoid the tendency of contractor to form a conspire group and bid high for projects.

The functions of BQ are divided into 3 phases:

- i. At pre contract stage, the functions are as follows:
 - a. Tendering document
 - b. Project costing
 - c. Cost planning
 - d. Fairest Competition of tenders
 - e. Consultant Fee calculation
- ii. At all the time, the functions are as follows:
 - a. BQ can be a Database for new projects
 - b. Cost information
 - c. The BQ can be used for Quotations
 - d. BQ can be useful for Asset Management
- iii. At post contract stage, the functions are as follows:
 - a. Valuing progress payment
 - b. Valuing variations
 - c. Ordering materials
 - d. Quality analysis
 - e. Planning and progressing site programme
 - f. BQ as source of Final account
 - g. Cost control

VII. Acknowledgements

Special thanks to faculty members of Kulliyyah of Architecture and Environmental Design, International Islamic University Malaysia for their suggestions and recommendation

REFERENCES

- [1] Ashworth, A. & Hogg, K. (2007). *Willis's Practice and Procedure for the Quantity Surveyor*. (12th ed.). United Kingdom: Blackwell Publishing.
- [2] Brook, M. (1998). *Estimating and Tendering for Construction Work*. (2nd ed.). Oxford: Elsevier Butterworth-Heinemann.
- [3] Brook, M. (2004). *Estimating and Tendering for Construction Work*. (3rd ed.). Oxford: Elsevier Butterworth-Heinemann.
- [4] Brook, M. (2008). *Estimating and Tendering for Construction Work*. (4th ed.). Oxford: Elsevier Butterworth-Heinemann.
- [5] Caplehorn, P. (2012). *Whole Life Costing: A New Approach*. Oxon: Routledge Taylor & Francis Group.
- [6] Carlidge, D. (2013a). *Quantity Surveyor's Pocket Book*. (2nd ed.). Oxon: Routledge Taylor & Francis Group.
- [7] Carlidge, D. (2013b). *Estimator's Pocket Book*. (2nd ed.). Oxon: Routledge Taylor & Francis Group.
- [8] Chritamara, S., Ogunlana, S. O. & Bach, N. L. (2002). System dynamics modelling of design and build construction projects. *Construction Innovation*, 2, 269 – 295.
- [9] Cruywagen, H. (2010). The Use of Bills of Quantities for A New Tender Price Index. Proceedings of W 055 – Special Track held at 18th CIB World Building Congress 2010, 10 – 13 May 2010, The Lowry, Salford Quays, United Kingdom.
- [10] Davis, P. R., Love, P. E. D. & Baccarini, D. (2009). Bills of Quantities: nemesis or nirvana? *Journal of Structural Survey*, 27(2), 99-108.
- [11] Dmaid, N. (2003). The State of the Art in Integration of Cost and Time Models. *An-najah University Journal of Research (N.Sc)*, 17(1), 99-122.
- [12] Gorse, C., Johnston, D., & Pritchard, M. (2012). *A dictionary of construction, surveying and civil engineering*. Canada: Oxford University Press.
- [13] Lee, S., Trench, W. & Willis, A. (2011). *Willis's Elements of Quantity Surveying* (11th ed.). UK: Wiley-Blackwell.
- [14] Maizon Hashim. (1999). The effects of procurement methods on performance of construction projects in Malaysia. Unpublished doctoral dissertation, University of Technology Malaysia, Skudai, Johor.
- [15] Miliken, J. (1996). "Bills of Quantities and the Tendering Process". *Building Economist*, 14-17.
- [16] Muhammad, N., Che Ani, A. I., Rakmat, R. A. O.K., & Yusof, M. A. (2010). Investigation on the Causes of Variation Orders in the Construction of Building Project – A Study in the State of Selangor, Malaysia. *Journal of Building Performance*, 1(1), 73-82.
- [17] Mudd, D. R. (1984). *Estimating and Tendering for Construction Work*. United Kingdom: Butterworths.
- [18] Ogunsami, O. E., Salako, O. A., & Ajayi, O. M. (2011). Risk Classification Model for Design and Build Projects. *Journal of Engineering, Project, and Production Management*. Vol 1 (1). Pp. 46 - 60.
- [19] Omar, O. (2008). *Emerging Governance and Economic Issues in Construction Industry in Malaysia*. Pulau Pinang: Universiti Sains Malaysia.

- [20] RISM (Royal Institution of Surveyor, Malaysia). (2000). Malaysian Standard Method of Measurement of Building Works (SMM2). (2nd edn.). Selangor: Winston Enterprise.
- [21] Rosli Abdul Rashid, Muzani Mustapa & Siti Nurhuda Abd Wahid (2006, June). Bills of Quantities - Are they still useful and relevant today? Paper presented at the International Conference on Construction Industry 2006, Padang, Indonesia. Retrieved. http://eprints.utm.my/511/1/BQ_paper_Padang_12_6_06_Rosli.pdf
- [22] The Aqua Group. (1999). Tenders and Contracts for Building (with sketches by Brian Bagnall). (3rd edn.). Oxford: Blackwell Science.
- [23] Uzairi Haji Saidin. (1988). Aturcara Kontrak dan Taksiran. Selangor: IBS Buku Sdn. Bhd.
- [24] Verster, B. (2006). Managing cost, contracts, communication and claims: a quantity surveying perspective on future opportunities. A paper presented in 1st ICEC & IPMA Global Congress on Project Management and the 5th World Congress on Cost Engineering, Project Management and Quantity Surveying in April 2006 in Ljubljana, Slovenia.
- [25] Wang, B., T., H. (1987). Construction and Development. Malaysia: Pelanduk Publications Sdn. Bhd.
- [26] Willis, A. & Trench, W. (1998). Willis's Elements of Quantity Surveying. (9th ed.). Oxford: Blackwell Science.
- [27] Wood, B. & Kenley, R. (2004). The Effectiveness of the Bills of Quantities in Australia. *Journal of Construction Research*.5(2), 291-309.