IDENTIFICATION OF THE POTENTIALS AND BARRIERS OF ADOPTING STANDARD METHOD OF MEASUREMENT FOR MECHANICAL AND ELECTRICAL SERVICES IN MALAYSIA

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Abstract: Building services is an important subsector of the Malaysian construction industry, accounting for about 40 percent of the total cost of buildings. Unfortunately, cost management and procurement process of Mechanical and Electrical (M&E) services have not received due attention from the practitioners', as bills of quantities (BoQ) are still produced in lump sums and provisional sums, making it difficult to get realistic and useable cost information from past projects. This paper reports part of a larger and ongoing research work and its purpose is to provide a generic identification of the potentials and barriers of using Standard Method of Measurement (SMM) for M&E services. The paper is based on comprehensive review of literature which includes journal articles; conference papers; text books and web trawl. Highlights on global usage of SMM were made and current practice in the country identified. Interestingly, the potentials of adopting SMM for preparing BoQ for M&E services has been identified as: reducing ambiguities in design; reduce tender cost; ensure commonality in tenders; reduce contract risk; the coding system in SMM will allow ease of application of computer; and it will ensure conformance of BoQ with standard forms of contract. However, the barriers preventing quantity surveyors from measuring M&E services includes: inadequate knowledge of M&E technology; traditional practice which regarded M&E as specialist technical area and therefore not often measured; non – completion of M&E services design before tender; non – involvement of specialist contractors during design and late involvement of M&E services consultants. The paper concludes that there is need to develop and encourage consultants to use SMM for M&E services measurement and courses of action by which the barriers could be overcome by the industry stakeholders were suggested with emphasis on the need to address the knowledge gap among professionals and ensure early involvement of specialist contractors.

Keywords: Bills of quantities; building services; mechanical and electrical services; standard method of measurement; stakeholders

INTRODUCTION

Mechanical and Electrical Engineering Services (M&E) is an important subsector of the Malaysian Construction Industry needing improvement in the cost management and procurement process. The M&E services cost according to [1] constitute about 40 percent of total building cost in Malaysia, but in a more developed countries, the cost of M & E services according to[2], could make up 10 to 70 percent of total construction cost as shown in Table 1.

Table1: M&E services Costs as a Percentage of the Total Construction Cost

S/No	Type of Building	Percentage of total Cost
1	Warehouse	10 – 15%
2	Apartment	15 – 20%
3	School	20 – 25%
4	Shopping Centre	20 – 30%
5	Hotel Development	30 – 40%
6	Office fit -out	35 – 45%
7	Hospital	40 – 55%
8	Data Centre	60 – 70%

The procurement and cost management of this important element of building has not received deserved attention from practitioners' as many bills of quantities are still produced in lump sums and provisional sums, making it difficult to get realistic and useable cost information from past projects. The Malaysian Construction Industry Development Board [3] has expressed concern about the inconsistencies in the manner in which consultants prepare tender documents for M&E services. The Board observed that the current practice could lead to unnecessary disputes, claims and variation in construction project if not corrected. The major cause of non adherence of consultants to the required standard has been identified as: reluctance to change; lack of regulating and enforcement body; very slow learning curve; attitude and clients insufficient knowledge of the benefits of adopting standard method in preparing bills of quantities for M&E services [4].

This paper is a preliminary report on a larger study investigating the need to develop Standard Method of Measurement for M&E services in Malaysia. The paper argued that, adoption of Standard Method of Measurement (SMM) in preparing Bills of Quantities (BoQ) for M&E services in buildings is essential in order to achieve better value for client's money in a transforming economy. This standpoint becomes necessary considering the view that, M&E services are the only major building element where bills of quantities are prepared without following the rules of the current Standard Method of Measurement in use in the country [5]. This paper provides brief explanation of M&E services systems in buildings, the SMM and the current practices in the preparation of tender documents for M&E services. The potentials of adopting SMM and the barriers that must be overcome to use SMM for M&E services in the Building Services subsector of the Malaysian Construction Industry were identified.

Mechanical and Electrical Engineering Services Systems in Buildings

Mechanical & Electrical services systems comprise all engineering systems associated with building other than civil and structural engineering works [6]. [7] classified M&E engineering services systems into Mechanical systems, electrical Systems and Building Operation Systems as shown in Table 2.

In addition to the cost of M&E components, consideration of accommodation space for these components is as important. Space requirement for medium and large vertical ducts, medium and large horizontal ducts may require the creation of underground subways inside a building, the use of raised access floor, and suspended ceiling as well as the equipment and appliances will need to be adequately accommodated. The M&E space affects the gross floor area, the size and shape of the building's ground floor, floor to floor height, geometry and architectural expression. For instance, central equipment used for large buildings like PETRONAS twin tower may require floor- to- floor heights of up to two (2) times normal height. All these have their cost implication which could be a significant addition to the cost of M&E services components. Failure to measure all these in line with highly detailed rules of measurement will make cost management of M&E services a difficult task and will put the client at a financial risk.

Standard Method of Measurement

Standard Method of Measurement (SMM) can be described as a document that contains a standard format for the presentation of measured work and set of rules which are mutually known and accepted [8]. According to[9], SMM set out detailed rules for the measurement of commonly occurring works and provides guidelines as to what a tendering contractor is to allow for against each measured item.

Table 2: Classification of M&E Services Systems in Buildings

Mechanical Systems	Electrical Systems	Building operation systems
Heating ventilating and air conditioning Site utilities: water supply, sanitary disposal, gas supply etc Plumbing: water distribution, water treatment, sanitary facilities Fire protection: water supply, stand pipe, fire and smoke detection, automatic sprinklers, etc Special systems	Electrical power: normal, standby and emergency power supply and distribution Lighting: interior, exterior and emergency Auxiliary: telephone, signal, data, audio/video sound, fire alarm, security systems etc Special systems	Vertical transportation systems: lift and escalators, elevators and material moving systems. Processing: production, kitchen equipment, Automation: environmental controls, management, etc Special systems

Table 3: Role of Measurement at each Stage of RIBA Plan of Work

ID.No	Outline construction Process	Role of Measurement
1.1	Briefing	Not applicable
2.1	Sketch Plan	Measurement of approximate quantities for the purpose of preparing approximate estimates and cost checking exercise
3.1	Working Drawings	Taking off quantities from drawings and preparation of Bills of Quantities in line with SMM
4.1	Site operations	Measurement of work on site for the purpose of preparing valuations, payments to subcontractors and suppliers, claims, and final account

Measurement is central to the financial management of construction projects and it involves the Quantity Surveyor in measuring different types of work as shown on the drawings produced by the architect or engineer [10]. The quantities are prepared in line with the rules of accepted SMM and the tender document prepared is referred to as BoQ. The completed BoQ is normally forwarded along with other documents for the contractor to price [11].

According to [12], cost panning process comprises of three (3) phases: defining the brief and setting the budget; the cost planning and control of design process and the cost control of the procurement and construction stages. These three phases follow the RIBA plan of work and the role of measurement at each stage is shown Table 3 [11].

Global Usage of Standard Method of Measurement

Standard Method of Measurement is adopted in measuring construction works in various countries of the world. An international survey of SMM in use by Royal Institution of Chattered Surveyors (RICS) [13] revealed that, there are 46 SMM spread over 27 countries of the world. However, literature survey further revealed that there are some other countries that uses various types of SMM but are not reported in the survey. For instance, three SMMs identified to be in use in Malaysia are: Malaysian Standard Method of Measurement of Building Works (SMM2), [14], Malaysian Standard Method of Measurement for Civil Engineering Works [5] and Standard Method of Measurement in Water & Wastewater industry [4].

Table 4: Summary of Section "Q" of SMM2 - Plumbing and Mechanical Engineering Installations.

General Information	Items	Remarks
Kind & Quality of Materials Nature of background Connection to existing services		Information on brand, rated capacity, size and nature of receiving surface and if there is need for connection to existing service should be given
Q.2:Classification of work		Work to be measured under appropriate heading, e.g. fire fighting installations; cold water installation; air handling installations e.t.c
Q.3: Location of Work		External, internal or roof top.
Q.7: Pipework,	**Q.8:**Pipes and Fittings **Q.9:**Special Connections **Q.11:**Sundries **Q.12:** Pipework supports	Fully described and measured in linear meter with associated fittings; special connection enumerated and others fittings like head, flashings enumerated, Bends etc; pipework support are enumerated
Q.14: Ductwork	**Q.14:**Ducting and Fittings **Q.15:**Special Connections **Q16:**Ductwork Supports	Measured in linear meter with associated fittings; special connection enumerated and ductwork support are enumerated stating size and type of materials
Q.19: Equipment and Ancilaries	**Q.19:** Equipment and ancillaries **Q.20:** Anti- vibration & sound insulation **Q.21:** Equipment Supports **Q.23:** Chimneys	All fully described and enumerated in according to general information above.
Q.25: Insulation	**Q26:**Insulation to pipe work **Q27:** Insulation to ductwork **Q.28:** Insulation to equipment	Kind, quality, thickness, finishing materials and method of fixing to be stated. Pipe to be in linear meters; around ancillaries, flanges are to be enumerated.
Q.30: Sundries	**Q.30:**Sundries	Testing, commissioning, as built drawings etc are given as an item
Q.31: Builder's Work	**Q.32:** Builder's Work	All builders work in association with services; measured under the relevant section of SMM (e.g. excavation) or enumerated (equipment and ancillaries) or in meters (cutting chases)

Similarly, in Singapore, [15] reported the use of Standard method of Measurement for Mechanical and Electrical services contained in part 2 of CP97 Code of Practice for Construction Electronic Measurement Standards. It has been confirmed also by [16] that SMM7; SMM5 and ICE CESMM3 are currently used for measuring construction works in Ghana.

Current practices in Malaysia.

Method of measuring M&E services is contained in sections "Q" and "R" of the Malaysian Standard Method of Measurement (SMM2) in current use. While section "Q" provides detail rules for measuring Plumbing and Mechanical Engineering Installations as shown in Table 4. Section "R" is on Electrical Engineering Installations as shown in Table 5. The provisions of this important document are not adopted by consultants in the preparation of BoQ for M&E services in Malaysia [5].

The table 4 shows brief summary of essential and cost significant items under section Q with highlight of the required descriptions and rules of measurement.

It has been confirmed by [17] that there are no generally accepted Standard Method of Measurement for M&E services in Malaysia; that schedule of prices are often used rather than bills of quantities for engineering services works; where BoQ is used the method of Measurement is usually spelt out either in the preamble to the BoQ or in specification and different consultant may have different bills of quantities. Stating the Contractors perspective on the use of Standard Method of Measurement, [18] confirmed that lump sum contract is the most popular procurement method for M&E services in Malaysia. However, M&E services contracts are often covered with provisions such as ...."the successful tenderer shall provide all materials and necessary fittings and perform any work which is necessary for the proper and efficient function of the complete electrical system even though such materials, fittings or works may not be explicitly mentioned in this specification or shown on the drawings attached to this specification….." [18].

This type of provision cannot be said to have provided fair contract conditions for the parties under the contract. Specifically, the tenderer is made to bear all the risk associated with under-specification and inadequate descriptions; this could increase the cost of tender to contractors which will be transferred to the client. In addition, tender evaluation is made difficult, assessment of variation order as well as preparation of valuation for interim certificate at post – contract stage [9].

Benefits of Using Standard Method of Measurement

Cost management of construction project according to Potts [19] is important to ensure that the planned development of a design and procurement of a project is such that the price for its construction provides value for money. Measurement is strategically important to effective cost management of construction project, and the quality of measurement is dependent and varies directly with the quantity and quality of design information, economic conditions as well as the clarity with which the available information are presented as can be seen in Figure 1 [10]; [12].

There are four main pressures according to [20] that make effective cost management of construction project more important to clients and stakeholders: (a) Delivery time for a project is important (b) Clients requirements are more complicated (c) The number of organisation involved in project has increased (d) Current practice in design where new ideas, techniques, materials and components are used

Effective pre – contract cost management comprise two essential components: the establishment of realistic budget through cost estimating and modelling and to ensure compliance with budget as design evolves through the process of cost control.

Pre – contract cost control should be seen as a proper mix between design – cost control and cost monitoring but with emphasis on positive cost control rather than passive monitoring [19]. An effective tool used in achieving this is the detailed bill of quantities [9] as shown in Figure 1. These detailed BoQ are usually prepared in accordance with highly detailed rules contained within the appropriate Standard Method of Measurement and reflect the quantities of work to be executed by the contractor [19]. The BoQ according to [9] is designed primarily as a tendering document, but it also provides a valuable aid to the pricing of variations and computation of valuations for interim certificates. The principal reasons for adopting SMM to prepare detail BoQ are: (a) It prompts the client and design team to finalize the design before the bill can be prepared. One of the principal merits of detailed BoQ is that it requires Quantity Surveyors to interrogate the design and specification, thereby allowing design team to identify ambiguities in the contract documentation prior to tender and the subsequent reduction in post contract problems [19];[21].

Table 5: Summary of Section "R" of SMM2 - Electrical Engineering Installations.

General Information	Items	Remarks
Kind & Quality of Materials Nature of the background Connection to existing services		Information on brand, rated capacity, nature of receiving background and if there is need for connection to existing service should be given
R.2: Classification of work		Work to be measured under appropriate headings, e.g. incoming services; Standby equipment, mains installation e.t.c.
R.3: Location of Work		External, internal.
R.4: Equipment & Control gear	**R.4:** Equipment and control gear **R.5:**Equipment Supports	All enumerated and fully described
R.6: Fittings and accessories	**R.7:**Lighting Fittings **R.8:**Accessories	Enumerated and properly described with method of fixing
Conduit, trunking and cable trays	**R.9:** Conduit and Fittings **R.10:** Trunking and fittings **R:11:** Busbar trunking and fittings **R.12:** Trays and fittings	All fully described and measured in linear meters to include all fittings
R.14: Cables:	**R.15:** Cables **R.16:** Cable Supports **R.17:** Connection to mains	Measured in meter except in final sub-circuit; cable support enumerated and connection as provisional sums.
Final Sub- circuits	**R.18:** cables, conduit, etc.	Cable, conduits and associated fittings are fully described and measured per point
R.20: Sundries.	**R.22:** Sundries	Marking position of holes, testing, commissioning and as built drawing given as an item
R.23: Builder's Work	**R.23:** Builder's Work	All builders work in association with services; measured under the relevant section of SMM (e.g. excavation) or enumerated (equipment and control gear) or in meters (cutting chases)

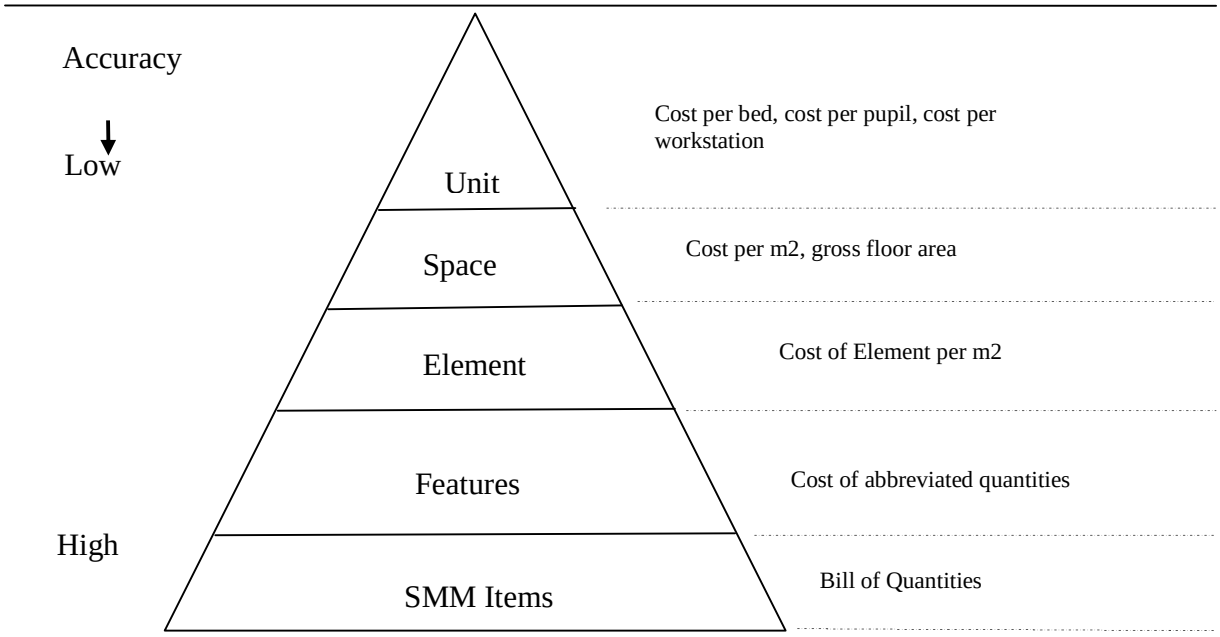

Fig.1: early stage estimating

(b) Avoids the need for all contractors to measure the works themselves before bidding and avoid duplication of effort with resultant increase in contractors' overheads which are eventually passed onto clients [9];[19]. If BoQ is not prepared, the tenderers will incorporate the cost of measuring the work within their tender thereby passing the cost onto the client [21]. (c) Provides commonality in tenders thus providing the opportunity for realistic tender evaluation. The Structured format simplifies the assessment of tenders ([11]; [19]. Where a BoQ is not provided, each tenderer prepares its own quantities, thereby making it difficult to compare tender on the same basis [21]. (d) The unique coding system identified in the method of measurement against each item enables contractors to utilize computers efficiently for estimating [11]; [19]. (e) Can be used as basis for monthly interim valuations [11];[9];[21]. It also provides a post – contract cost management tool and become a basis for the evaluation of progress payments [21]. (f) Rates contained in the BoQ can be used as a basis for the valuation of variations. Infact, PAM 2006, PWD 203A and CIDB 2000, standard forms require variation to be valued using the rate contained in the BoQ or a fair rate agreed where the work is different from the one in BoQ. (g) Risk Management. The prices in the BoQ can be used as a basis for comparing a contractor's price with current trends in the market place [21].

Barriers to Adopting Standard Method of Measurement for M&E in Malaysia

The problems with M&E design development and costing is well reported. According to [6], M&E services engineer is a systems designer and can only specify equipment of required quality but he is not expected to design them (for example, he is not expected to design a boiler or transformer). [6] further stated that, the background and training of the services engineer has been traditionally limited in terms of his roles within the project team and an appreciation of architectural problems. Therefore, building services engineer required specialist advice at this stage of design development, but specialist designers, installers and manufactures are not usually involved because of the traditional way of design development and the late involvement of services engineers.

In addition,[22] pointed out that incomplete design is one of the major factors inhibiting the measurement of M&E services by quantity surveyors. [23] found that architects' training in building services is limited and the services consultants are always appointed late during design; meanwhile, little or no emphasis is given to the problems of services integration and co-ordination in the structural engineer's training [23].

Most of the M&E work involves element of design by downstream supply chain [24];[22]. However, they are not usually reflected in contractual relationships, according to [25]. Meanwhile, [26] (Al-

Harbi 1994) cited in [27], asserted that estimates produced from incomplete drawings is liable to inaccuracy.

In the study conducted by [28], they examined best practices in M&E services procurement and identified the sources of problems on a building services project which can impact successful cost management as follows: design standards; physical constraints; coordination; design management; effective contractor involvement; programming of works and commissioning.

Describing the roles of M&E quantity surveyors, [2] identified some of the challenges they face in managing the cost of M&E services project as: insufficient design; the nature of installation; lack of understanding by the main contractor; coordination of services; coordination of design; programming services; cost management of services and commissioning.

In summary the barriers to measurement of M&E services can be identified under the following headings: (a) It was regarded as a specialist technical area which prevented many quantity surveyors from giving it serious consideration [22]; [2]. (b) Detailed design work on M&E services installations is not sufficiently complete for billing at tendering stage [23];[22];[28];[24]. (c) Some services engineers are hostile to quantity surveyors being involved in their work [22]. (d) Contractor design portion are always incorporated into M&E services project and [22];[24];[2]. (e) Non involvement of contractor at design stage [25];[28]. (f) Quantity surveyors are not always sufficiently skilled in the technology of M&E services installations [22]; [2]. (g) Inadequate knowledge of building services by architects and consultants M&E services consultants [23];[6].

Furthermore, in the work of [29];[30], they observed that if cost management of engineering services is made the responsibility of engineers the expected long term – solution may not be achieved because of the high cost of M&E services in relation to total cost of buildings. They proposed a method of analysing the quality of M&E services in a way that could be understood by quantity surveyors. They suggested that if the method is adopted it would bridge the gap between quantity surveyors knowledge and M&E services technology, enable more detailed analysis of M&E services costs, facilitate the collection of more appropriate historic cost information, and enable quantity surveyors to make better use of M&E services information.

CONCLUSION

Evidently, Standard Method of Measurement can make a considerable contribution to the financial management of M&E services projects in Malaysia. There is need to develop and adopt SMM for preparing BoQ for M&E so as to reduce the risk of price uncertainty and achieve better value for client's money. To achieve this, the following should be considered: (a) There should be a concerted effort from industry stakeholders and academics to resolve some pedagogical issues on M&E engineering services. (b) Relevant industry stakeholders should be identified and strategy to manage them developed so as to agree on the best classification method suitable for SMM in Mechanical and Electrical services. (c) A strategy should also be develop to involve major downstream supply chain at the inception of M&E services project to reduce the risk of incomplete design information which will affect the quality of cost information generated. (d) The quantity surveyors and M&E services consultants should develop strategy to work collaboratively at the beginning of M&E services project. (e) The application of Value engineering should also be considered in processing clients requirements on major M&E components at the early stage of construction project.

REFERENCES

[1] The Electrical and Electronic Association of Malaysia, TEEAM, (2010). CIDB Seminar on SMM in Construction Procurement, *The Publication of the Electrical and Electronic Association of Malaysia,* April, 2010.

[2] McCaffrey, J. (2011). What is an M&E QS? Building Services – The M&E QS, *RICS Student Construction Journal*

[3] CIDB, (2009a). Malaysian Standard Method of Measurement for Civil Engineering Works, *Seminar on Standard Method of Measurement (SMM) in Construction Procurement*, Kuala Lumpur, Malaysia.

[4] Sabaria, D. H. (2009). Roles of Standard Method of Measurement (SMM) in Construction, *Seminar on Standard Method of Measurement (SMM) in Construction Procurement*, Kuala Lumpur, Malaysia.

[5] CIDB, (2009b). Seminar on SMM in Construction- Towards Enhancing Standardisation and Best Practice, *News Letter of the Construction Industry Development Board, Malaysia*, Issue 2,

[6] Gura, J.H. (1984). Role of the Building Services Engineering Consultants, *IEE Proceedings*, Vol.131, No.6

[7] Tao, W.K.Y., Janis, R.R (2001). *Mechanical and Electrical Systems in Buildings*, (Second Edition), USA.Prentice Hall.

[8] Parker, A.D. (1996) *Building Measurement*, London, Pearson Education.

[9] Molloy, J.B. (2007). Civil Engineering Measurement Claims in Hong Kong, available at http://www.fig.net/pub/fig2007/papers/ts_3g/ts03g_02_molloy_1664.pdf accessed on 28th August, 2011.
[10] Oforeh, E. C. (2008). *Installation and Electrical Works in Buildings*, (Second Edition) Nigeria, Cosines
[11] Hore, V., Kehoe, J.G., Macmullan., R., and Penton, M.R. (1997). *Construction 1: Management, Finance, Measurement for Construction and Built Environment Programmes*, Hong Kong, Macmillan.
[12] Potts, K. (1995). *Major Construction Works: Contractual and Financial Management*, London, Longman.
[13] RICS, (2003). *International Survey: Standard Method of Measurement in Current Use*, RICS Construction Faculty, Internation Database (Edition 3).doc, available at
[14] http://www.rics.org/site/download_feed.aspx?fileID=2664 accessed on 20/08/2011.
[15] Institution of Surveyors Malaysia, ISM, (2001). *Malaysian Standard Method of Measurement of Building Works*, (Second Edition), Malaysia, Petaling Jaya.
[16] Yong, S.K., Seah, E., and Sun H.W. (2004) *Construction Electronic Standard Part 2 – Standard Method of Measurement for Mechanical and Electrical Building Services*, available at http://www.itsc.org.sg/pdf/Journal%202004/Section_Five_04/Five_Earthb.pdf, accessed on 25/09/2011.
[17] Nani, G., Edwards, P.J., Adjei-Kumi, T., Badu, E. and Amoah, P. (2008). Customisation and Desirable Characteristics of Standard Method for Building Works in Ghana, *the Australia Journal of Construction Economics and Building*, vol 8, No.2.
[18] Kumar, P. (2009). Consulting Engineers Perspective on SMM in Water Supply Projects, *Seminar on Standard Method of Measurement (SMM) in Construction Procurement*, Kuala Lumpur, Malaysia.
[19] Stephen, K.H. (2009). Contractor's Perspective on SMM in M&E Projects, *Seminar on Standard Method of Measurement (SMM) in Construction Procurement*, Kuala Lumpur, Malaysia.
[20] Potts, K. (2008). *Construction Cost Management: Learning from Case Studies*, London, Taylor & Francis.
[21] Flanagan, R., and Tate, B., (1997). *Cost Control in Building Design*, Oxford, Blackwell Science
[22] Davis, P.R., Love, P. E.D., and Baccarini, D. (2009). Bills of Quantities: Nemesis or Nirvana? *Structural Survey*, vol 27 No.2.
[23] Murray, G.P. (1997) *Measurement of Building Services*, Londonn, Macmillan Press Ltd.
[24] Michie, A. (1981). Integration and Co-ordination of Building Services and its Relationship with project Management, *Building Services Engineering Research and Technology*, vol 2 No.15.
[25] Rawlison,S., Dedman, A. (2010). Specialist Costs: M&E Services: Building Services, *Building Magazine*, available at http://www.davislangdon.com/EME/Research/ResearchFinder/Specialist-Costs/Specialist-Costs---ME-services-2010/ accessed on 25/08/2011
[26] Pavit, T.C., Gibb, A.G.F. (2003) Interface Management Within Construction: In Particular Building Facade, *Journal of Construction Engineering and Management*, 9.
[27] Babalola, O., Adesanya, D. A. (2008). An Appraisal of the Factors Affecting Production of Cost Estimates for Electrical Services in Nigeria, Journal of Financial Management of Property and Construction, vol.13, No.32, pp. 200 – 208.
[28] Babalola, O., Adesanya, D. A. (2008). An Evaluation of the Level of Accuracy of Electrical Services Cost Estimates in Nigeria In: BOYD, D (ED) Proceedings 23rd Annual ARCOM Conference, 3 – 5 Sept. 2007, Belfast, UK, Association of Researchers in Construction Management, 75 – 83.
[29] Rawlison,S., Nugent, B., and Dedman, A. (2007). Procurement: Building Services, *Building Magazine, 68 economics* available at http://www.davislangdon.com/Global/Search/?q=building+services+procurement accessed on 25/08/2011
[30] Swaffield, L. and Pasquire, C. L. (2000). Improving Early Cost Advice for Mechanical and Electrical Services, *RICS Foundation Research Papers*, Vol.3 No.15
[31] Swaffield, L. and Pasquire, C. L. (1999). Examination of Relationships Between Building Forms and Function, and the cost of Mechanical and Electrical Services, *Construction Management and Economics, 17*, pp. 483 – 492.

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This paper is a preliminary report on a larger research work on "Sustaining Value for Money in Mechanical and Electrical Services through Standard Method of Measurement". The overall aim of the research is to propose a framework for developing an acceptable Standard Method of Measurement (SMM) for Mechanical and Electrical Services in Malaysia.

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