

# Overview the Benefits of Standard Method of Measurement Implementation

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## Abstract

The need to introduce a standardised measuring system in the construction industry is an implicit reflection of the efficiency of the projects. Nevertheless, the execution of the standard is still not widespread among the construction stakeholders. To date, little consideration has been paid to the need to re-examine current awareness of benefits that influence the standard method of implementation of a measurement. Previous relevant literature on the benefits of implementing the standard measurement method in construction industry had been located from electronic databases, journals, conference papers, texts, unpublished research articles, and standards. It has been found that the most reported benefits are to provide continuity, precision, and reliability for the principles of measurement. It also offers competitive and reliable tender price, minimizes unnecessary disputes, facilitates contract management, and to provide effective and systematic bill of quantities preparation. Based on the review of the available literature sources, this paper discusses the identified benefits to examine how far these benefits may well affect the process of the method of measurement uniformity implementation particularly in the context of Malaysian construction sector.

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## I. INTRODUCTION

The construction sector is a generic term for the service industry that constitutes part of the country's economic system. The sector carries many tasks, including preparation, designing, construction, alteration, maintenance, fix, and demolition of structures [19], [26]. Project construction information needs to be standardised urgently and also documentation to ensure the growth of construction sector [31]. In order to achieve the value for money, particularly for consumers, it is essential to ensure precise budgets before starting work and to provide the appropriate monetary value to complete projects. The generic bearings are designed to eliminate waste,

cost overruns, mismanagement, and conflicts as well [18],[28].

A bill of quantities (BQ) is an essential document for the process of estimating costs and planning work for construction [13]. It is a kind of technical information produced by various styles developed during a construction project's lifetime. Among its purposes, as stated by [13], [25], competitive tendering is obtained, assisting as a contract report, a standard tendering basis and a basis for interim certificates and variations. In addition, it supports the contractor in his works such as estimating or pricing the job on exactly the same basis for the contractor's input of knowledge to allow fair and square bidding

and data base for future calculation by the quantity surveyors [13]. Next is assisting the cost control of the employer, the bill of quantities application will affect the accuracy of the costing construction works in budget estimates, and the quality of work implementation schedules [13]. As far as the Malaysian construction industry is concerned, the bill of quantities was regarded as an important document in the overall construction process [25]. This takes place in the conventional lump-sum process domination of construction procurement in the midst of the phenomenon of staying alive. According to [2], [25], the bill of quantities in the Malaysian context is mostly used for tenders and contract. The bills have their benefits, according to the views of contractors, clients, and consultants. Therefore, BQ is calculated as the foundation of the professional fees of the Malaysian quantity surveyors. Indirectly, it organizes the majority income and activity in any quantity surveying establishment. The quantity surveyor plays a role in the provision of services to encourage the use of these bills, including preparing initial estimates feasibility studies, cost forecasts, schedules and BQ.

By employing the standard document, where all the scope of workplace is clearly and uniformly described, each contractor entering the project tender will have the same data and a shared discernment of the work to be performed. The standard also reduces or does away with uncertainty in the preparation of tender prices, and qualified contractors can choose more objectively and transparently. Indirectly, it facilitates contract management and reduces ambiguity in project costs [26], [5]. Efforts to systematically update these written reports are still lacking, given the abundance of research on the standard method of measurement adaptation. This article seeks to fill the understanding gap and discusses the advantages of SMM adoption, especially in the construction sector. Nevertheless, it has not been modified to use this standard. Some benefits contribute to the application of its design activities in preparing BQ.

The main focus of the study was the strengths of the construction sector implementation activities of SMM. It will be directly related to quantity surveyors working in the construction sector for consultants, clients, and contractors' firms. The research aim in this paper is to expand the awareness of stakeholders about the advantages of the standard method of measurement implementation through a literature review.

## II. OVERVIEW OF SMM IMPLEMENTATION

The standard measurement system has been the industry model for the preparation of bills of quantities for almost a hundred years. It first appeared in 1922 and was based on the profession of London's leading quantity surveyors. It was an effort to bring uniformity to the measurement of quantities and priced construction works [31]. A switch to standard methods has been used by quantity surveyors for years to provide amounts for calculation, tenders, and final accounts. Nevertheless, the measurement's success was attributed to the common use of BQ [25].

Reference [22] clarified that the purpose of the standard measurement method is to provide the measure with a consistent basis for proper itemisation. It is a document which includes standards, specifications, guidelines, or features that can be consistently applied to ensure that materials, products, processes, and services are suitable for the purpose. Royal Institution of Chartered Surveyors (RICS) defines the SMM as a text that provides a primary basis for the measurement of construction works and civil engineering works. The purpose is to ensure that a bill of quantities produced can fully describe the amount and quality of the works to be performed [18] and accurately represent it. The SMM would allow the construction sector to achieve greater reliability in providing data on construction projects that everyone can easily understand [1], [11]. The non-standard practice of preparing the BQ and their costing is one of the main reasons for project failures in the construction sector. This practice may be due to the use of the different method of

measuring quantities, as well as the degree of accuracy of measuring [17].

As explained by [12], the rationale for developing the SMM in the construction sector is for measurement uniformity and aligned with new techniques and materials in construction. Also, it helps to clarify and simplify the measurement rules by confirming the specifications and contract conditions. The standard will require a national classification for bills of quantities format for the tender documents to satisfy the industry stakeholders, especially the contractors.

That gives rise to the requirement for clearly defined SMM. For example, International Principles of Measurement (POMI), Standard Method of Measurement (SMM7) [4] and New Rules of Measurement (NRM) for building works category meanwhile Civil Engineering Standard Methods of Measurement (CESMM4) [7] purposely for civil engineering works. The standard is defined as a document containing a uniform format for regular work presentation. It also includes a set of widely known and accepted measurement rules [24]. It should also set specific standards for measuring commonly occurring projects, according to [28]. It also provides useful guidance on what to do for each measured item by a tendering contractor. The standard can be localized to fit with local customs and practices of performing a particular construction work type in the construction industry [4].

#### A. History and Development of SMM in Malaysia

The most important benefit of the developed standard is to mitigate the discrepancies and ambiguities in producing an adequate bill of quantities [6]. The Standard Method of Measurement of Building Works Second Edition (SMM2) and Malaysian Civil Engineering Standard Method of Measurement Second Edition (MyCESMM2) are amongst the current standard measurement used in the Malaysian construction sector. Table-I and Fig.1 show the SMM transformation for the past six decades in the Malaysian construction sector.

Table-I: The SMM used in the Malaysian construction sector (Adaption from [4])

Category	Measurement method	Year
Building	SMM1	1959
	SMM1 (Metric)	1976
	SMM2	2000
Civil Engineering	CESMM	2003
	MyCESMM	2011
	MyCESMM2	2018



Fig. 1. SMM evolution in the Malaysian construction sector

The current condition in Malaysia is that different construction projects have a different standard. The player in the industry typically has their departments in-house which implement their version of the generic measurement method. In addition, they might hire professional surveyors who have probably already developed their versions of the standard method of measurement. These criteria differ materially and therefore do not address discrepancies in measurement and cost-related conflicts [26]. Knowing this issue, the Royal Institution of Surveyors Malaysia (RISM) introduced the standard called SMM2 in 2000, while the Construction Industry Development Board (CIDB) set the new standard called MyCESMM2 for major civil engineering works in 2018 [6] attempted to facilitate the awareness among the construction stakeholders in preparing BQ.

### III. METHODOLOGY

The research methodology approach used for this study is mainly based on literature reviews of the benefits or advantages of the SMM implementation.

This promotes the development of theory, which is useful both for research and practice. This review includes to the method of measurement studies making claims on the subject of SMM benefits or importance published in an academic journal, conference papers, textbooks, unpublished research papers and standards included in this study. The selection of literature was based on relevant research in the last past 19 years (2000 to 2019). Fig. 2 summarises the overall process and flow of analysis. This begins with the selection of a suitable search engine, followed by an initial desktop search for relevant articles, a quick review of the initial search results to find more related articles, a critical review and evaluation of the related articles, classification, presentation and discussion of the benefits of SMM, and finally making recommendations and conclusions.

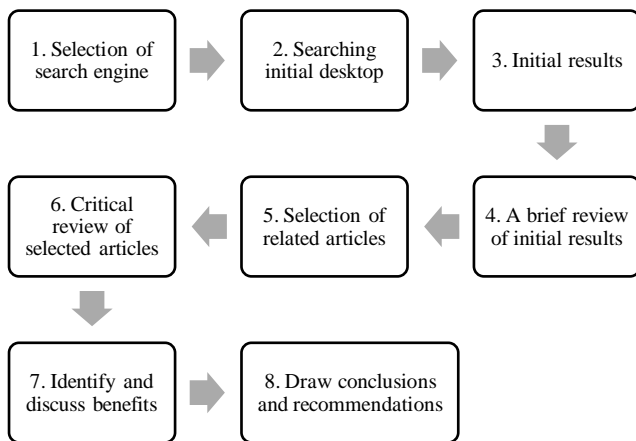


Fig. 2. Overall research flow

This paper is part of on-going study on the benefits of the implementation of the SMM in Malaysia. It is still at an early stage. As such, the information presented in it based primarily on the review of relevant literature materials available on the system. A review of the literature to be considered as part of the research methodology is necessary for the organization of the theoretical framework, the creation of a substantial statement of problems and research questions. The literature review discusses and illustrates the concept, application and benefits relevant to the implementation of the SMM and the

subsequent new paradigm shift in group integration in the construction industry.

#### IV. BENEFITS OF SMM IMPLEMENTATION

A review of the 15 articles considered in this study summarized the results of each article. Table II was used to allocate the established SMM benefits for ease of presentation. Of the 15 articles, a total of 10 benefits have been identified; however, for further analysis only benefits found in at least three papers listed in Table-II are used. Table II shows that there are several benefits of the SMM, but the five most reported benefits include continuity, precision, and reliability for measurement principles, provide competitive and reliable tender price, minimise unnecessary disputes, facilitates contract administration and provide efficient and systematic bill of quantities preparation. This paper addresses only the top five benefits in the SMM implementation due to space or word constraint.

Table-II SMM benefits identified from previous research

No.	Benefits	Authors
1.	Provide consistency, accuracy, and uniformity for measurement	[3], [9], [14], [15], [22], [26], [30], [31]
2.	Provide the competitive and reliable tender price	[2], [3], [8], [10], [20], [21], [26], [30], [31]
3.	Minimise unnecessary disputes	[9], [14], [22], [26], [30], [31]
4.	Facilitates contract management	[2], [3], [8], [9], [10], [20], [21], [26], [30]
5.	Provide efficient and systematic bill of quantity preparation	[4], [22], [26], [27], [30], [31]

6. Provide database for cost analysis	[8], [9], [20], [21], [23], [26]
7. Improve productivity	[14], [26], [29], [31]
8. Provide efficient control of payment	[10], [16], [26], [30]
9. Provide efficient cost control	[2], [9], [26]
10. Assist in tender pricing	[10], [11], [26]

The standard's purpose is to achieve uniformity, unevenness, and minimize the potential for conflict arising from different interpretations of the measurement method and work description. Previous studies found that for the principles of measurement, SMM will provide consistency, accuracy, and uniformity. The standard will provide a consistent approach and easy to use reference [14]. Reference [22] supported it, with the aid of computerisation; the standard will be more apparent and unambiguous. Coordinate project information with quantities measurement is to reduce repetitive and wasteful factors, specifications and plans to use as a cooperative system [15]. A study carried out by [26] indicates that reliability means bills of quantities are going to be much more stable. All work items are clearly expressed and defined when using the template in an understood manner. The accuracy of the standard will take consideration of the involvement of the key players and stakeholders who developed the standard. Besides that, uniformity means it will provide a consistent basis for measurement works [26], [30]. At the same time, it will reduce the tendency of misinterpretation of specifications. For the measurement itself, the key players in the Malaysian construction sector are using the SMM [3]. The aim is to serve the construction stakeholders to consider in implementing the standard in measurement for a more practical direction of doing the taking off and drafting the bills of quantities. It is advisable to apply the same standard among the construction stakeholders particularly clients, contractors, and consultants, to

avoid any circumstances and will supply a basis for measurement principles in the construction sector.

Second most reported benefits in the literature are to provide a competitive and reliable tender price. The all-important functions of bills of quantities obtained more competitive tender prices made in the research [20], [21]. The contract price will become more competitive and it will be easy to compare the tender documents. Reference [8] clarified that a comparison of all tenderers can be made on the same basis due to bills of quantities integrated with the measurement laws. It will reduce the risk in tendering because of commonality in the tenders by providing a realistic tender evaluation [10]. According to [31], the standard will help to offer fairer tender price and decrease risk allocation for the contractors. As for the benefits of the employer, with the application of the standard, the contractor will submit a more accepted tender price with employer's estimation and will create a competitive tender price [26]. A different method of measurement will affect the tender pricing by the contractor, and further will result in the non-competitive tender. With the standard, this matter will overcome [30]. The standard measurement system relating to bills of quantities function that assists the contractor in preparing a bid estimate and providing useful information for preparing bills of quantities [1], [3]. Once a standard is applied, the direct benefit to the employer is regarding the tender price, which more transparent for the contractors to pricing the tender.

Minimize unnecessary disputes is ranked third among the top five standard methods of measurement benefits identified from the literature. The advantage of using the standard in Singapore would help to reduce possible disputes [14]. According to [31], the standard will help to reduce the claims and disputes due to ambiguous descriptions. It will also cut Down the number of conflicts and the frequency of arbitration arising from ambiguities in the bills of quantities [22]. The SMM aims to avoid misunderstanding and doubts that will be referred to as disputes [30]. Meanwhile, [26] due to the appreciation of the rules of measurement, all sides are less likely to argue over needless conflicts by

improving productivity with minimising the conflict of miscalculation. The contractor can also reduce their risk of work items being miscalculated and mistaken and can concentrate on completing their job rather than causing needless arguments.

The review has identified that facilitates contract management are the fourth most reported benefits to the SMM implementation in the literature. Effective cost control is achieved efficiently by implementing this standard. The standard will indirectly provide financial control and management for analyzing and a basis for predicting the future cost[8]. It is supported by [20], [21] it is facilitating variation cost management. It also helps in controlling the cost of the works [30]. It will include the basis for valuing the contractors 'fee including claims, interim payments, variation orders, and final account, making it easy for the company to control the financial condition[26]. For monthly intermediate valuations and variations, the main reason for adopting the SMM to prepare bills of quantities is[10]. Effects of using the standard method of measurement are to facilitate accurate cost estimates for projects and provide a proper schedule for projects [31]. The implementation of the standard will be no doubt in providing efficient data on cost control and cost analysis, especially regarding contract management and involving the payments.

Our review has shown that providing efficient and systematic bill of quantity preparation is the fifth most reported benefit in the literature. Client and contractor will consider the minimum requirements of the construction project when preparing the bills of quantities. It will establish a standardised and uniform bill structure with the same understanding of the standard of measurement and produce a better bill of quantities[26]. It will result in producing bills of quantities with high standards [22]. The standard would facilitate the price by standardization the form and content of bills of quantities [30]. The research is done by [3], found out that a standard measurement system is used by key players in the Malaysian construction sector to prepare bills of quantities. This also provides the precision of the bills of quantities in construction projects. Despite benefits toward the

construction industry stakeholders, the standard also will provide a good source for academia, especially regarding measurement methods in construction. The awareness and knowledge of standardisation in the measurement method will be fundamental for the future quantity surveyors to encourage the other stakeholders to use the standard for the best result and benefits.

## V. CONCLUSION

This study has conducted a literature review on the benefits of the SMM implementation. From the objective of reviewing the literature on the SMM benefits, it found that there are many benefits occur once a standardised method of measurement is implemented but the most reported benefits in the literature are provided continuity, precision, and reliability for measurement principles. Also, provide competitive and reliable tender price, minimize unnecessary disputes, facilitates contract management, and provide effective and systematic bill of quantities preparation.

Through defining the most reported benefits in the literature, this research has contributed to the awareness of benefits influencing the standard method of measurement adoption. The results are important as they provide data on significant benefits in the SMM, leading to a better understanding of the its' implementation. The contribution is to provide a list of recommendations to drive the benefits to the standard method measurement implementation. It is expected that stakeholders will be more interested in increasing the use of the SMM rather than specific features in potential construction projects when the benefits are absorbed. In addition, the checklist of the standard measurement benefits and references presented in this paper may be applicable to scholars for further empirical studies at various locations and types of work on the standard measurement benefits.

A number of recommendations for future studies are proposed in the review. First, more qualitative studies are needed as they provide in-depth analysis and detailed explanations of the standard method of benefit assessment along with model adoption and, second, a specific and standard method of systematic

review to guide research synthesis in the context of the SMM in civil engineering.

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