# IMPROVING THE METHODS OF DESCRIPTION OF BUILDING WORKS IN THE UK

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Since 1922, methods and rules of measurement have been developed to address the continual need to describe and quantify building work in the UK and revised to adapt to changes in industry practices and materials, yet not all changes have been addressed adequately. Currently, surveyors often work directly for clients and, as a result, have lost the knowledge relating to some aspects of construction cost which was historically provided by builders and merely describe the material content of elemental building designs produced by architects. Therefore, a knowledge gap exists in the belief that the current methods are efficient and effective (i.e. produce full descriptions of building work). This paper identifies key issues with these methods and develops the main criteria for a superior solution. The research method includes the analysis, synthesis and evaluation of thirteen documents, which represent the evolution of the rules of measurement in the UK, and academic literature. An improved system based on describing 'workpieces' of work on-site, including the key criteria required to produce an enhanced standard method of description of building work is offered.

Keywords: building work; communication; cost; description; measurement

## INTRODUCTION

Description of building work is an important aspect of construction contract administration as, inter alia, it is used to identify and provide products whose quality and price are satisfactory to clients. This activity plays an essential role in defining two of the most critical contractual requirements of building projects for clients: cost and quality, which are legally enforceable. Thus, accurate and comprehensive descriptions of the cost and quality of building work are essential.

Whilst building quality is generally dictated by clients, builders' output is required to establish price, since estimating involves contractors' rates for listed building work. The process usually involves two stages. Firstly, quantity surveyors (QS) measure building work by using methods of take-off (e.g., units of measurement plus item description) which stem from the use of the Standard Method of Measurement (SMM), or the New Rules of Measurement (NRM2) for building works. Secondly, contractors rely upon those descriptions to complete the estimates. However, there are

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issues with the current system, including (i) the SMM and NRM2 descriptions are not complete; (ii) although contractors may be aware of (i) they would need to undertake further quantity takeoffs to identify those deficiencies and (iii) the quantity take-offs are typically using the dimensions on the drawings with no adjustments made for waste and other factors (RICS, 2013; Lee *et al.,* 2014).

Currently, QS often work directly for clients and, as a result, have lost contact with the knowledge of builders relating to other aspects of cost, including labour, plant, waste, and complexity of the building works. They merely describe the material content of items which architects classify as elements of buildings, but which do not include the full cost of building works. Historically, QS worked for builders who provided this invaluable information in typically bespoke processes (Thompson, 1968; Lee *et al.,* 2014). It is argued here that, as a result, descriptions supplied to contractors do not reflect fully the intricacy of the work or the practical needs of those involved in the production process of building, infrastructure, or engineering projects.

This paper stems from a study which began because it was realised that often descriptions of building works do not describe the physical work of labour and plant involved, they mainly describe materials. Furthermore, such descriptions often exclude information which might help contractors to select suitable equipment or plant. This paper presents the results and key findings from the study which developed criteria for a method of describing building work that reflects production and facilitates feedback, not only of basic costs but also of the intricacies which cause differences in costs.

## LITERATURE REVIEW

Within the architecture, engineering, and construction (AEC) industries, descriptions of work are presumed to be used to encapsulate the essence of work needed to deliver the product. Connected by the product, these are three industries with a need for a common information system. The system of descriptions of work in the UK is used as an example by many other countries in the world and is defined by the rules of SMM, together with restrictions imposed by the methods of working of QS.
The Royal Institution of Chartered Surveyors (RICS), the body responsible for both SMM and QS methods of working, affirm that '…the general and overruling principle to be followed in the preparation of bills of quantities (is) that accurate and adequate information shall be given so that the estimator shall understand the exact nature of the work to be executed…' (RICS 1966, 1972). The three prominent words in that statement are 'accurate', 'adequate' and 'exact', and it might be assumed that the proclamation is true. It is therefore imperative to ensure that for a system of description, the work of the operatives is faithfully represented, continually cognisant of such issues as cost, procurement, service arrangements, and the need for interlocking information. However, published literature identifies significant challenges, particularly of differing user perceptions, understanding of intricacy and accuracy, and appreciation of descriptions (Olander, 2007). For the purposes of this paper, these challenges have been grouped into three core themes, namely (i) industry fragmentation; (ii) origins of the rules and practice of measurement and (iii) information management and coordination, whose significance is examined next.

### Industry fragmentation

There are several aspects of fragmentation of the construction industry, including (i) contractor size (e.g., most of the circa 163,000 building companies listed employed

less than eight people (Hampson and Brandon, 2004); (ii) many relatively small projects and (iii) many disciplines involved (Fairclough, 2002). Fragmentation impinges directly upon the type and quality of information sent and received which can be often compounded when users from various disciplines are fixated on their specific requirements (Betts, 1999). The current system causes frustration and challenges, particularly with communication inadequacy and isolation of professionals because of a lack of congruence on issues. More importantly, it can create a lack of coordination and understanding between design and construction which impacts design decisions (Arditi *et al.,* 2002; Nawi *et al.,* 2014). This challenge is considerable as, typically, the initial production of information is carried out by clients' advisors to satisfy the early need for 'cost' prediction, necessary for a decision to proceed. Following this, more detailed information is produced to inform clients of, inter alia, future financial commitments and schedules of work. However, assumptions are often made that the same kind of information will be adequate for the needs of all parties involved in the production stage which follows. Hence, attempts made to ensure that all required information is included (Nicolini *et al.,* 2000), fail through insufficiency.

The challenge of providing information which accommodates all parties is reflected in methods of measurement worldwide (Bureau of Indian Standards, 1987; Singh and Banjoko, 1990; Rosli *et al.,* 2006; Yuan and Shen, 2006; Siglé *et al.,* 2015; Africa Association of Quantity Surveyors, 2015; World Economic Forum, 2016; Utterback, 2017). The fragmentation is extreme in the QS profession, where some QS are employed by clients to give 'cost' advice which is primarily concerned with information obtained by analysis of contractors' prices whilst others are employed mostly by contractors, dealing mainly with information based upon analysis of contractors' costs and synthesis of contractors' prices. The result is, among other things, a highly specialised and fragmented profession (Hackett and Hicks, 2007).

Pierce (2013) claims that a system of description which works well should include the action, the element involved, and a location identifier. This study should be read in the context of the criteria produced by Jeanes (1966) because Pierce's work, inter alia, expands and develops those criteria. Maylor (2010) asserts that a 'work breakdown structure' (WBS) can be carried out in several ways, including by activities, by the function of elements and by the function of spaces. It is argued here that the WBS to be developed is that of the contractor, as also is the related Cost Breakdown Structure.

In essence, the specific challenge relates to representation and perception - hence the need for a comprehensive and unambiguous method of description. The use of a common language that works for all participants is recommended here. For that to come about, the very words used in all relevant documents must mean precisely the same to all parties and disciplines, particularly the word 'cost'.

**The rules and practice of measurement**

The UK developed a system providing an equal basis for tenderers (Kodikara *et al.,* 1993). The system focuses on the description and measurement of materials, where the descriptions arising are about the artefacts produced rather than the physical work of producing them. The principles on which measurements are based have received little criticism (Skoyles, 1981). It is argued here that to examine the rules of measurement and their application the following three aspects require examination.

The measurement rules

The most recent reincarnation of the SMM is contained in NRM1, 2 and 3, (RICS, 2013), where maintenance 'works' (NRM3) are separated from capital 'works', (NRM1 and 2). Until this 'suite' of documents, all building works had the same set of rules. NRM1 links the measurement of 'works' to three estimating methods: (a) floor area method; (b) functional unit method (e.g., per bed space) and (c) elemental method. It is the latter which occupies most of the document. From critical analysis of the last, it is concluded that the 'elements' listed are 'architectural' rather than 'work' elements. Nevertheless, they are described in the text as 'cost elements', thus referring to clients' costs. This indicates, in turn, that there is no direct relationship between clients' costs (which are typically based upon such 'elements') and contractors' costs (which are based upon 'pieces of work').

The interpretation of measurement rules

This usually means that the descriptions produced by QS, or obtained from standard lists (e.g., Fletcher and Moore, 1965; Monk and Dunstone, 1965), adhere closely to the language and content of SMM; notwithstanding the note, from the fourth edition onward, to the effect that QS should give more detail than required by the rules where necessary to define the nature and extent of the work (NRM2, 3.1.3). It should be noted that the people who decide whether this is necessary are QS (i.e. the producers rather than the users). If QS were on any occasion to follow the advice in that note, they would be admitting that the rules do not define the work that they are attempting to describe. It would also be necessary for them to be able to explain why the rules were not suitable for that particular purpose so that they could defend their judgement if called upon to do so. The critical analysis of the published literature has found no mention of that situation having occurred in any of the identified documents.

The rules of description and their wording

The 'rules' of description set out in SMM and NRM2 relate mainly to the content of descriptions, which is almost the same as the 'wording' of descriptions. RICS (1966, 1972) states: 'The surveyor is at liberty to word his descriptions in any manner he considers appropriate provided that the required information is clearly expressed'. Despite this, RICS issues a warning which indicates that they will be unable to support surveyors who deviate from rules in cases of professional negligence. Consequently, surveyors are likely to choose the wording of the rules closely. Furthermore, some rules of measurement affect what is to be measured and described. Chief among these is the deduction of openings in walls, floors, and roofs, rather than measuring around them. Admittedly, deduction is easier for the QS, but measuring around the openings, whilst giving precisely the same quantities, opens the gate for fuller and more accurate information to be provided. The RICS does not wish that scenario to come about, since NRM2, Clause 3.3.2. (2)(c) says: 'Do not measure separate items for widths not exceeding a stated limit where these widths are caused by voids'. They refuse to consider that there is additional cost caused by the walling between openings just because the openings are there. Although such an analysis is beyond the scope of this paper, it is argued that, if the cost of items of building work was prioritised over Clause 3.3.2., the pricing of building work would be more exact.

It is important to recognise that the earliest reason for measurement, and consequently description, in the life of a contract, is to establish contractors' cost, a reason which has never changed. That cost includes the materials, labour, plant and equipment expected to be deployed in producing the article, and it will usually have profit and overheads added to produce a price to the client. The cost may need to be established

for any or all the components at any given time and many different purposes. For cost checking, it is essential that feedback information of good quality is available, and that it should be in precisely the same terms as those of the original item.

**Information management and coordination**

Examination of the various editions of SMM/NRM2 (from 1922 to 2013) presents gradual changes in the meaning of the words and expressions involving the word 'works', indicating that, for example, work is defined by the artefact produced, such that SMM and NRM2 deem labour to be included in the description. The RICS (1962) define 'deem' as items that are not measurable and need not be mentioned in descriptions, which underpins the notion that operatives are not normally provided with descriptions of their work processes (Bertelsen, 2004). Here it is concerned with work as being the physical effort of operatives in construction and has been described as the labour involved in producing artefacts.

Current 'costing' practices do not provide a good representation of the work carried out (Buchan *et al.,* 2008; Robson *et al.,* 2016). Essentially, the only source of true cost information is the workface. This has been acknowledged to an extent by Al-Hasan *et al. (*2006), but they suggest that the lack of a suitable recording system for feedback is the main reason for the dearth of such information, rather than that the current system of description does not cater for the collection of feedback data simply because it does not describe the physical work. Accurate cost-estimating BIM models, like bills of quantities (BQ), must be sufficiently detailed to provide the material quantities needed for cost evaluation (Demian and Walters, 2014). However, as aforementioned, BQ do not provide all the information required to enable labour costs to be evaluated precisely and hence cannot provide accurate costs. Thus, currently, BIM models are unlikely to contain such data.

Also, the current system does not describe the intricacy and practicality of construction work. In that connection, Doyle and Hughes (2000) question the use of cost databases which are generally 'based on the premise that the building's total cost is equal to the sum of its constituent parts'. They suggest that this '…is simply not the case when issues such as buildability and complexity feature on the list of cost determinants'. It is argued here that most, if not all, databases are founded on feedback, not on physical work, but on prices obtained from BQ for projects, where, inter alia, there is no way of allowing for differences between those that have made a profit or a loss for the contractor, those which have over-run their time and those that have not, those which gave rise to substantial claims and those that did not.

Given the inherent deficiencies in the current usage of BIM, it becomes counter-productive to attempt to make it conform to the UK measurement methods and practices, as it has been suggested by Wu *et al. (*2014). It is argued here that such restrictions would deny BIM the opportunity to show what it can do in a system which is free of the constraints and undisclosed information of the established system.

In summary, industry fragmentation, the rules and practices of management, and information management/coordination are three central tenets of this challenge. Whilst these three tenets are inextricably linked, the real issue is to understand and appreciate fully the requirements for a system of describing work which allows estimators and all other stakeholders to have complete information regarding the actual work to be performed. Hence a need to develop criteria which can produce rules to rationalise descriptions of work and reveal process practicality and intricacy. The word 'intricacy' is used rather than 'complexity' because the latter is often

regarded as being synonymous with 'complicated' (Wood and Gidado, 2008), and 'complexity theory' is an area of study that is not required to be used for this paper. It should also be made clear that this study deals with descriptions of building work which enable builders' costs to be established. Without accurate cost information for builders, there is little hope of producing accurate prices (i.e., clients' costs). In that respect, it is also recommended that the construction of a building is described in the same way as the work which must be carried out if the best use is to be made of descriptions.

## METHOD

This study investigates a highly under-researched area, and no previous studies of this kind have been found, i.e., studies which question using only/mainly descriptions of materials as the means of arriving at cost. The study aims to produce criteria which cover not only additional resources such as labour and plant but also what are other important cost-related areas: those of intricacy and practicality of work. The available research data are contained in the documents of the several editions of SMM/NRM2, together with some explanatory papers, namely SMM1, 1922; SMM2, 1927; SMM3, 1935; SMM4, 1948; SMM4 and 5, 1962; SMM5, 1963; SMM5 (metric 'm'), 1968; Notes on SMM5 (m), 1968; SMM**5(**m), 1972; SMM6, 1979; SMM6 Brief Guide, 1978; SMM7, 1988 and NRM2, 2013.

The research method is qualitative in that it consists of two in-depth examinations scrutinising the documents germane to the issue to (i) determine the effect of information content in the relevant methods of measurement when describing building work and (ii) understand the degree of change in such descriptions over time. The first was to search all editions of SMM/NRM2, looking to see the effect of changes and quantity surveyors' methods of working. In the second examination, this study evaluates the purpose of descriptions to find what is expected of them and what needs to be added to existing descriptions to make them suitable for those uses.

## FINDINGS

The findings can be divided into two groups, namely administrative and work categories. Table 1 shows the results in terms of the former and Table 2 illustrates the latter, namely issues with current descriptions and the offered recommendations.

*Table 1: Administrative categories*

| Admin category | Issues with current descriptions | Recommendations |
|---|---|---|
| Equitable | Currently are not (e.g. different depths for excavation but not heights for brickwork) | All items where height or depth has a cost effect should be so described |
| Inference | Some items are inferred e.g. mortar quantities | No information should have to be inferred |
| Understandable | Not always easily understood by operatives | Must be understandable by all |

The items tabulated above are kept separate from those which follow because they are not about individual pieces of work, they are qualities required of all descriptions (i. e. they could be applied to all information and information transmission).

The items pertaining to individual pieces of work are shown in Table 2. They are in effect the list of criteria found necessary for the range of descriptions for the work areas of excavation, (including demolition and underpinning), concreting (including shuttering and reinforcement), and masonry (including brickwork, blockwork and stonework). Since one of the biggest issues with the current methods is incomplete descriptions of works, the recommended criteria a likely to involve lengthier (but still

concise) descriptions to ensure their fullness. Currently, those issues are typically remedied by the site staff, after those who are paid to complete this task fail. The criteria outlined in Table 2 form a checklist of items which site staff currently have to hunt for information under stressful, time-limited conditions. These items must be considered for inclusion in every description. Some will not always be applicable, but having to exclude them makes for more accuracy.

*Table 2: Work categories*

| Work Category | Issues with current descriptions | Recommendations |
|---|---|---|
| Access to workpiece | Occasionally described | Always describe |
| Adverse conditions | Not defined sufficiently | Full list of conditions |
| Aggregation | Allowed | Only allowed when items are similar |
| Angles and mitres | Deemed included | Always numbered and included |
| Averaging | Allowed | Not allowed. Provide all dimensions |
| 'Blanket' clauses | Allowed | All info to be given in individual item |
| Bulking of excavated material | Left at contractor's risk | Soil conditions known or assumed for design to be passed to contractors |
| Categorisation | Allowed | Not allowed |
| Centre line measurement | Extensively used | Can only be used when numbers of angles, junctions etc. are stated |
| Changes of direction | Not defined | The number and type must be stated |
| Cost definition | Relevant to clients' cost | Costs must mean contractors' costs |
| Cutting | Not defined | Cutting to size and shape to be stated |
| Deduction of openings | Allowed | Not allowed. Measure all around |
| Deeming | Extensively used | Not allowed |
| Differences in workpieces | Aggregated or categorised | The slightest difference between workpieces makes a different workpiece |
| Enumeration | Used when 'measures' difficult | To be used for every item |
| Extra over | Used | Not allowed. Define different workpieces |
| 'Incremental work' | Not defined | Identified in the description of the work |
| Location | Occasionally defined | Must always be stated |
| Measurement net | Insufficiently defined | Must always mean net amount of material fixed, not net area covered |
| Orientation | Often defined | Must be defined where materials have different surfaces, e.g. plasterboard |
| Pattern | Usually stated | Must always be stated |
| Radius | Not always defined | Must always be stated |

# DISCUSSION

It is virtually certain that clients and contractors require accurate cost estimates from contractors to facilitate their planning activities. The difference between these parties is that clients have deals which state the prices of most/all parts of buildings that are legally enforceable. Contractors, on the other hand, whilst supplied with information about the quantities of materials to be used, are typically given little/inadequate information regarding either the intricacy or practicality of the job, but often are required to assume that the information given is sufficient to produce accurate costs that are contractually binding. For accurate costs to be established, contractors require not only the current prices of all materials involved but also the likely output of their labour and plant, having regard to the intricacy and practicality of the work (Lee *et al.,* 2014). That is virtually impossible with the current methods because, inter alia, contractors are mostly given information about the main materials used in the construction process. The subsidiary materials are generally 'deemed' to be included even though they are often the focus of as much, or even more physical work than the main ones. Similarly, the labour to the main materials is anticipated to be apparent from the description of the material itself, whilst most cutting, jointing, mixing, folding and similar work (both to the main and subsidiary materials) are also deemed

to be included. 'Deemed to be included' means that QS are not required to describe or quantify it, but contractors are ruled to have included it in their costs (RICS, 2013).

Those rules are written, applied, and enforced by QS, who are deemed to be the cost experts. The QS are therefore believed to be experts in the costing of a considerable body of work (encompassing around a third of the contract cost) which they neither describe nor collect information about. That appears anomalous and inequitable. However, by providing a list of activities based on workpieces rather than architectural 'elements' together with materials descriptions from the National Building Specification and work description based on the suggested criteria, the opportunity exists for great advances in estimating, costing, and programming with practical origins (Robson *et al.,* 2016). The list of criteria in Table 2 provides a basis for descriptions which have a standardised format for analysing the work to be carried out, issuing instructions, checking that work is complete, recording feedback information and is capable of being coded.

## CONCLUSION

This study has found that SMM/NRM2 is about counting measures of materials rather than counting ‘things’ (or pieces of work). That has been the essence of its existence for a century. Despite that, it can be seen from early editions that the producers were then aware of and wished to include factors other than materials (i.e. information about items which made a difference to the contractors’ cost) in their information to contractors. Changes in later editions have diluted the content to the point where there is insufficient and/or inadequate thought given to contractors’ needs for information.

During this study, two main findings have emerged. The first is the SMM and NRM2's stated intention to provide an equal basis for tenderers by describing and measuring the material content of the building. Items which are the most intricate to measure tend to be enumerated, associated items are often ‘deemed to be included’. The second is that SMM/NRM2 item descriptions are used by contractors and others to provide a basis for programming, costing, valuing, allocating work and other processes, all of which require that the buildings need to be thought of as many relatively small 'pieces of work'. The pieces of work that are embodied in descriptions derived from SMM/NRM2 are pieces of designers' work, foundations, walls, roofs, and other large items. The two types of description are not compatible; those produced by SMM must be broken down into tasks for operatives. Those conclusions lead to another: items which are in effect measures of fixed materials rarely coincide with pieces of work, nor is there any reason why they should. There is no reasonable basis whatsoever for the assumption that SMM is the correct vehicle to use for describing, valuing, and allocating work, except that it is the only one that exists; the reverse could be true as it likely impedes progress in those fields.

This work shows the direction in which the methods of description are required to move if they are to keep pace with advances in the industry. The RICS could do much to enable the development of a system fit for purpose in the new era of digital construction, but they would have to reconsider their stance and change course. The study produces criteria for describing work that could assist stakeholders such as clients, consultants, contractors, suppliers, subcontractors and local authorities to communicate more successfully, beyond the tender stage, since they are designed to reflect the practical physical work on site and facilitate feedback. By providing detailed information about the work to be carried out the contractor would be given greater opportunity to consider alternative means without implying specific methods.

There has been an unstated theory in the use of SMM/NRM2 that measurement of materials is the only way to produce accurate building prices; it seems to have been there forever. There is no documentation to show that the theory is logical, reasonable, or even rational, it was just thought up as a way of standardising a job that was getting out of control. This study has challenged such thinking, looking with a practical eye at what is needed by the professionals who are required to use the information.

This is an under-researched subject which means that recent academic literature is limited. Empirical testing of the research findings is recommended.

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