



An investigation into the current practice of elemental cost planning

[Link to publication record in Manchester Research Explorer](#)

Citation for published version (APA):

Lowe, D., Egbu, C. (Ed.), & Tong, M. (Ed.) (2003). An investigation into the current practice of elemental cost planning. In C. Egbu, & M. Tong (Eds.), *Proceedings of The First Scottish Conference for Postgraduate Researchers in the Built & Natural Environment (ProBE)* (pp. 17-27). Glasgow Caledonian University.

Published in:

Proceedings of The First Scottish Conference for Postgraduate Researchers in the Built & Natural Environment (ProBE)

Citing this paper

Please note that where the full-text provided on Manchester Research Explorer is the Author Accepted Manuscript or Proof version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version.

General rights

Copyright and moral rights for the publications made accessible in the Research Explorer are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Takedown policy

If you believe that this document breaches copyright please refer to the University of Manchester's Takedown Procedures [<http://man.ac.uk/04Y6Bo>] or contact uml.scholarlycommunications@manchester.ac.uk providing relevant details, so we can investigate your claim.



This is the author's version of a work that was submitted/accepted for publication in the following source:

Soutos, M and Lowe, D J (2003), *An investigation into the current practice of elemental cost planning*. In Proceedings of The First Scottish Conference for Postgraduate Researchers in the Built & Natural Environment (ProBE), Glasgow Caledonian University, 18-19 November, Edited by C Egbu and M Tong, ISBN 1-903661-50-1, pp 17-27, eScholarID:[244410](https://www.escholar.manchester.ac.uk/244410)

This file was downloaded from: <https://www.escholar.manchester.ac.uk>

© Copyright 2003 Glasgow Caledonian University

Reproduced in accordance with the copyright policy of the publisher.

Notice: *Changes introduced as a result of publishing processes such as copy-editing and formatting may not be reflected in this document. For a definitive version of this work, please refer to the published source.*

AN INVESTIGATION INTO THE CURRENT PRACTICE OF ELEMENTAL COST PLANNING

Michail Soutos & David Lowe

Project Management Division, Manchester Centre for Civil and Construction Engineering, UMIST, UK

Elemental cost analysis is perhaps the best known product-based cost model and provides the data upon which elemental cost planning is based (Ferry et al., 1999). Quantity surveyors have been using this technique to base their predictions during the design stage since the 1950s (Morton and Jaggar, 1995). However, there has been no recent attempt to establish the extent to which practicing quantity surveyors use this technique (if indeed they do so) and the manner in which cost analysis is currently carried out. These factors have prompted research into the field of cost analysis at UMIST. The results of a nationwide questionnaire survey of UK quantity surveying practices are presented, which detail the percentage of the projects for which elemental cost estimates are prepared. Furthermore, the format used to prepare these estimates is investigated together with the extent to which the BCIS standard form of cost analysis is still used. Finally, the way that factors such as the time-stage of the estimate or the size of the project affect the use of elemental cost estimates and the level of the detail to which these estimates are analysed are examined.

Keywords: Cost analysis, Element, Elemental cost estimating, Elemental Cost planning.

INTRODUCTION

Elemental cost planning, during the design phase of a project, first came into vogue during the years after the Second World War, when the art of accurate single practice estimating became increasingly difficult to practice because of unsettled economic conditions and the use of non-traditional designs (Ferry et al., 1999). This system is still used, enabling the cost of a scheme to be monitored during design development. An element is defined as a major part of the building, which always performs the same function irrespective of its location or specification (Ferry et al., 1999). A series of elements are used to perform a cost analysis, which is a major characteristic of the elemental cost planning. According to Ashworth (1999), cost analysis is the systematic breakdown of cost data, generally on the basis of an agreed elemental structure. The process of using such an elemental structure, during the estimating process, to calculate approximately the cost of each of the elements, is called elemental cost estimating. This paper will attempt to establish the extent to which quantity surveyors practice cost planning and the manner in which elemental cost estimating is currently applied.

BACKGROUND

The idea of elemental cost analysis first developed as the need for a design cost plan emerged. The process is based on the concept of being able to compare the value of a

building with other schemes in order to ascertain whether or not the amount of money allocated to each part of the building is reasonable both in itself and as proportion of the total building cost (Ferry et al., 1999).

How can two different buildings be compared to achieve the above requirements? A simple way would be to compare the summary pages of their bill of quantities. Before doing this, however, one has to account and/or eliminate the influence due to any difference in the size of the two buildings. To do this, each part of the bill of quantities would have to be divided by the floor area of the respective building. This would give comparable figures (cost/m²). Unfortunately, comparing the summaries of bill of quantities does not necessarily provide useful information, as the bill of quantities is separated into trade or work section totals. It would only provide information about how much each work section, such as, excavation, concrete, brickwork etc. will cost. One building may have more expensive concrete works than another simply because the first one is a concrete framed building, while the second one, has a steel frame. It is clear from this example that work section totals do not give valuable information to make applicable cost comparisons.

This is where the concept of “elements” arose: the bill of quantities had to be divided in such a way that makes a comparison between two buildings easier and that produces more useable results. It was considered that some parts of the building always perform the same function irrespective of the building type. The frame, for example, always provides structural stability no matter what the building is. Therefore, if the buildings were divided into such “elements” a comparison would then be straightforward. Nevertheless, there are numerous ways of sub-dividing a building into elements as some of them might perform more than one function. A parapet wall, for example, could be part of the element “roof” or the element “external walls”. This is one only of numerous examples, all of which indicate the need for standardisation.

It was this need for standardisation that led the Building Cost Information Service of the RICS to introduce the first Standard Form of Cost Analysis (SFCA) in December 1969. Robertson (1995) states that while the BCIS succeeded in producing its first form of elemental cost analysis in 1963, it took a further six years before the elemental format could truly be called a “Standard Form of Cost Analysis”. This form uses the concept of “elements” discussed above. It provides a standard way of dividing the building into elements by separating it into 8 major divisions: substructure, superstructure, finishes, fittings and furnishings, services, external works, preliminaries and contingencies. Each one of these divisions is separated further into subdivisions. According to Ferry et al. (1999), because the detail is grouped in this hierarchical way an analysis at the top level into the eight items only, will be quite compatible with a fully detailed analysis of another project. This makes the comparison of two projects very easy, regardless of the amount of information that is available for each project. The SFCA also has a set of rules on how to separate the building into elements, resolving the problem of standardisation discussed above. The establishment of the SFCA laid the foundations for the further development of cost analysis and cost planning.

Despite its long existence, the SFCA is still widely used. This is due to the fact that it gained a great measure of support during its formation and subsequent use. Most quantity surveying practices implement their analyses according to it, while those that do not risk being isolated from acknowledged good practice. Despite this, however, currently there are some reservations concerning its use, most of which are concerned

with the way that the elements are separated. Whilst it is indeed a standardised form, some commentators suggest that the standard sub-divisions are inappropriate.

Gleeds, an international property and construction consultancy have initiated the strongest opposition to the use of the SFCA as common practice. According to Southgate (1988a), the SFCA has served the profession well since the early 1950's, but it neither adequately reflects the manner in which the buildings are constructed nor, except in a very general way, the order of construction. It is, therefore, difficult without further analysis to relate the cost to form, shape, structural type, or construction time. Further, it has been stated that because of the way that the standard form is currently structured, there is a difficulty in dealing with different options for structural and elevational items because they are allocated to different sub-elements (Annon, 1989).

The structure of a building, for example, is contained within the frame, upper floors, roof, stairs, external walls (load bearing) and partitions (load bearing) (Southgate, 1988a). The structure, however, is the responsibility of the structural engineering consultant. The point that Southgate makes with this example is that the way that the SFCA is separated into elements does not serve the surveyor in an optimum way as the responsibilities for each work section involved in the building process are scattered among the elements. Furthermore, it does not help the surveyor examine alternative solutions in an effective manner; for example, if the cost of different structural solutions had to be examined then this would be difficult as each one of the different options would affect all the elements that the structure influences. By combining these elements into one section of the cost plan, such investigations would be simplified. This would help to make the recording of cost information more simple and flexible. A further advantage, according to Southgate (1988b), is that the data from one type of building could be used for another. For example, the comparisons between the cost data of an office block and a hotel could be implemented. This is because with the structural data kept together the structural element of the building may be directly comparable. Therefore, for the example given above, if the structure of the office block and the hotel were similar then there could be a direct comparison of the costs of the two even though the function of the buildings is different.

While the discussion in the previous paragraph was mainly directed towards the structural elements of a building, it is not only the structure that it is spread across different elements of the SFCA. The same situation applies to the building envelope and interior partitions. What Gleeds, therefore, propose is to restructure the traditional form of cost analysis in order to reflect the concerns discussed above. According to them, this does not require a great change: the only difference occurs within the superstructure and internal finishes elements of the SFCA. Gleeds have named their own method "functional elements" in order to distinguish them from the traditional elements and to stress that they consider the function to which the buildings are constructed.

Impetus for the Research

Ongoing research at UMIST has resulted in the production of ProCost; a Neural Network based modeling software, which can predict the final cost of a building during the very early stages of the design process (Emsley et al. 2002, Lowe et al. 2002). Research found that there are 41 variables that influence the cost of the building (i.e. procurement, site variables, structure variables etc), which were

incorporated in the input section of the software's interface. After the user inputs a value for each of these variables for the building under consideration into the software, then the neural network can predict a cost for the building based on similar relationships from past projects. The output of the model is deterministic, that is the prediction is given in form of a single figure.

During 2002 research was conducted to evaluate the use of ProCost in practice (Soutos, 2002), using semi-structured interviews and practical experiments of the software with potential users. Four different people from three different companies were interviewed. A beta version of the software had been distributed to these organizations so that they could use it in parallel with their existing estimating techniques. Part of the interview schedule related to user satisfaction with the software in its current form and sought ways in which it might be improved. The results of this research indicated that the potential users of ProCost required not only a single figure output but also an elemental breakdown of the estimate. The existing capabilities of ProCost and the provision of a single figure output do not totally reflect the requirements of the estimator.

These results initiated a new development stage for the software: an investigation into the feasibility of providing an elemental breakdown of the output of ProCost.

The ProCost development team are determined to make the software as compatible as possible with the way Quantity Surveyors function, thereby, making the software more appealing to a greater portion of the market. As discussed above the results were based on short interviews with a relatively small number of people, who do not necessarily represent the profession as a whole. It was, therefore, decided to implement a nationwide survey of current cost planning practice.

METHODOLOGY AND ANALYSIS

It was decided that the most efficient way to carry out the survey was to issue a questionnaire to a series of quantity surveying practices. In order to find this sample, the RICS online directory was used (<http://www.ricsfirms.co.uk/>).

The original questionnaire included a total of nine questions, all of which were in the form of a multiple-choice answer. The questionnaire was divided in two parts. Part one investigated the current elemental cost estimating practice, while part two was more specific to ProCost investigating ways in which the software could be improved. The analysis of the first part of the questionnaire only is reported in this paper.

Five hundred questionnaires were distributed by mail. The aim was to make the survey nationwide, so England, Scotland, Wales and Northern Ireland were covered. With the aid of the online RICS directory individual named quantity surveyors at quantity surveying practices within an 80 miles radius of London, Cambridge, Birmingham, Manchester, York, Cardiff, Glasgow, Inverness and Belfast were selected. Of the 500 questionnaires distributed, 200 were returned, a response rate of forty percent. This is a rather high figure, indicating the high interest of the industry in the research project. Of the returned questionnaires, seven were incomplete, either because the addressee was no longer practicing as a quantity surveyor or was not in a position to answer the questionnaire. Therefore the following analysis (descriptive statistics) is based on the remaining 193 responses.

RESULTS

The aim of this survey questionnaire was to investigate current elemental cost estimating and planning practice. The major questions that needed to be answered were:

- Do quantity surveyors currently prepare elemental cost estimates, and if so to what extent?
- What format do they use in order to prepare these estimates?
- What is the detail level to which the elemental estimates are prepared?
- How do factors such as the stage of the estimate or the size of the project influence the decision to prepare elemental cost estimates and their level of detail?

Question 1: How often do you prepare elemental cost estimates?

This was the first question of the questionnaire opening the subject to the respondent. It was one of the most important questions as the subject of elemental cost estimating has not been investigated for some time, and the team wanted to know if quantity surveyors indeed currently prepare elemental cost estimates in practice or whether it is a term that exists only in theory and in the profession's manuals. Another reason for the significance of this question was that the rest of the questionnaire was dependent on it. If the majority of practitioners replied that they do not generally prepare elemental cost estimates then the whole idea of researching into the manner that these estimates are prepared has no practical significance.

This question had five possible answers: Always (100% of the projects), Often (about 75% of projects), Sometimes (about 50% of projects), Rarely (about 25% of projects) and never (0% of projects). The respondent could only choose one answer. Figure 1 illustrates in pie-chart form the percentage of the respondents that answered each of the possible answers. Only 1.6% of the people that answered said that they do not use elemental cost estimates at all, and this percentile will not be considered during the rest of the analysis, as it is the purpose of the study to examine the forms of functioning amongst people that prepare elemental cost estimates. Almost half of the respondents (49.7%) answered that they often (for about 75% of their projects) prepare elemental cost estimates. In addition to this, 30.1% declared that they used elemental cost estimating on all their projects. This means that virtually 80% of the respondents state that they use elemental cost estimating either often or always on their projects. This is a very interesting indication as it points out the significance of continuing with the research and further investigating current elemental cost estimating practice.

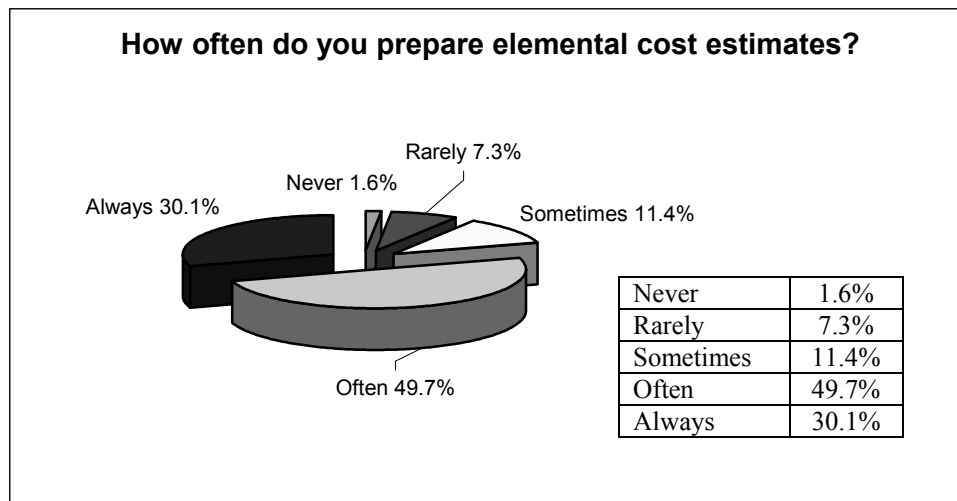


Figure 1: Responses to question one

Question 2: Which format do you use in order to produce an elemental cost estimate?

As discussed previously, there are a number of standard ways of carrying out an elemental cost analysis. The two most important formats according to the literature are the BCIS Standard Form of Cost Analysis (SFCA) and the functional elements format. The SFCA is the most established format, however, it has some disadvantages over the functional elements, this research wanted to investigate if the SFCA is still widely used or whether other forms of elemental estimating have replaced it. In addition to these two major formats there are other formats that individual practices might use and in order to incorporate these formats a third option was added to the possible answers for question two. The possible answers in this question were therefore, “BCIS SFCA”, “Functional Elements”, or “other”. The last one was an open-ended type of answer, giving the opportunity for the respondent to write down the particular format that he/she used.

As it can be seen in figure 2, the vast majority (76.3%) of the sample answered that they use the BCIS SFCA format when preparing elemental cost estimates. This is a highly significant amount and it shows that the SFCA is still very commonly used, despite its age. Only 14.2% of the respondents replied that they use functional elements, while 9.5% mentioned other ways of implementing elemental cost estimating. Of the latter, one third stated that they use both the SFCA and the functional elements format at the same time, or depending upon the project. Another popular answer amongst the category of respondents that replied “other” was that they use an in-house technique or specific company formats. Finally, other answers included hybrid estimates and approximate quantities.

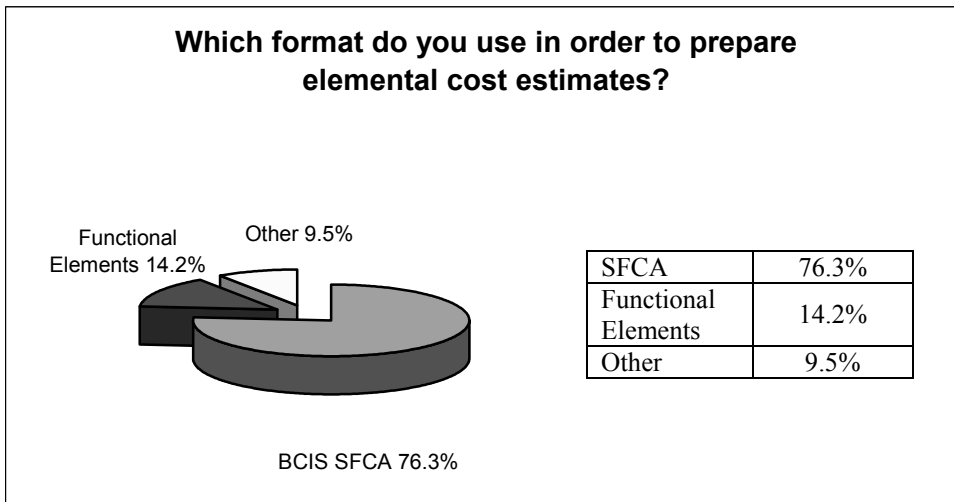


Figure 2: Responses to question two

Question 3: At which detail level do you prepare your cost analysis? What are the factors that affect the detail level?

Before starting with the analysis of question three it is worth mentioning that questions three and four were only directed to the 76.3 percent of respondents that answered that they use the BCIS SFCA in question two. The rest of the respondents were directed to skip these questions and continue with question five.

The answers to question two indicated that the vast majority of quantity surveyors in the UK use the BCIS SFCA to prepare their elemental cost estimates. However, as discussed above, the SFCA has two different levels of detail, the top level that consists of 8 group elements and the detailed level where each of the 8 groups are further subdivided into a total of approximately 35 elements.

The purpose of this question was to examine which of these two detail levels is used the most and to establish the factors that might influence this choice. While examining the possible answers for a multiple-choice question and after a series of discussions with the research team and some industrial collaborators it was apparent that one of the most important parameters that can normally affect the selection of the detail level of the SFCA is the time stage of the estimation process. Normally the top level is used at an initial stage, while the detailed level is used during the later part of the estimating process, when more information is available for the building under consideration. The second factor to be investigated is the size of the project. This was believed to be very significant, as some practices might consider it un-economical to conduct a very detailed elemental cost estimate for small projects.

This question asks the sub-set which level of detail they normally use. The possible answers were: “top level only”, “detailed level only”, “either depending on the stage of the project”, “either depending on the size of the project” and “other”. These answers gave the option to the respondent to state whether they use one level of detail only irrespective of any factors, whether the detail level that they use depends on the stage of the estimate, whether it depends on the size of the projects, and finally with an open ended option, it gave the opportunity to state any other possible factors that may affect the level of detail of the estimate.

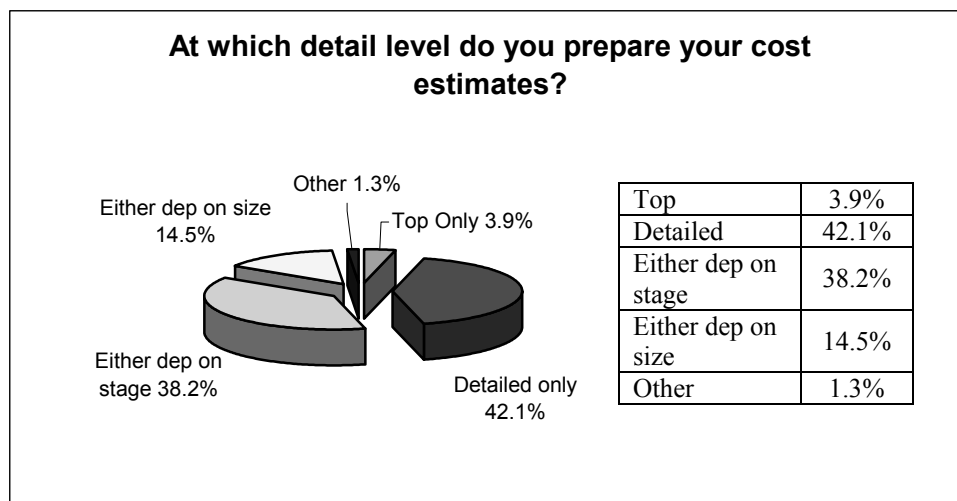


Figure 3: Responses to question three

As shown in figure 3 above, only 3.9% of the sample stated that they use the top level of the SFCA alone throughout the estimating process. The most common answer out of all five possible options was the detailed level: 42.1% of the respondents replied that they use the detailed level of the SFCA throughout all the stages of the estimating process regardless of any factors. A relatively high portion of the sample (14.5%) declared that the selection is depended on the size of the project. This means that a detailed level cost estimate might be applied when the project under consideration is a large one with the respective amount of profit to cover for the extra work of the surveyors and the additional resources needed. Only 1.3% indicated that there are other factors that might influence the decision. The most common examples given were: design complexity, similarity to historical projects, and level of information available for producing the estimate. This small percentage denotes that the major factors that actually influence the format used are the size of the project and the stage of the estimate. As illustrated in figure 3, 38.2% of the respondents stated that the selection of an appropriate level of detail level is a process depending on the stage of the estimate. This figure makes this answer the second most popular amongst the five possible responses. This means that the time stage of the estimate is indeed a very important factor that directly influences the choice of format. For this reason this particular relationship between the stage of the estimate and the selection of a format is analysed further in the section below.

Questions 4: How does the stage of the estimate affect the detail level selection?

In the previous question, almost four out of ten of the respondents answered that the selection of the format (detail level) of an elemental cost estimate is directly dependent on the time stage of the estimate. In order to investigate further the way that the stage of the estimate affects the selection of the level of detail, this question asked the sample to indicate at which stages they use the top level and the detailed level formats. The stages given were: the initial-brief stage, the sketch plan stage, the approved design and the pre-tender stage.

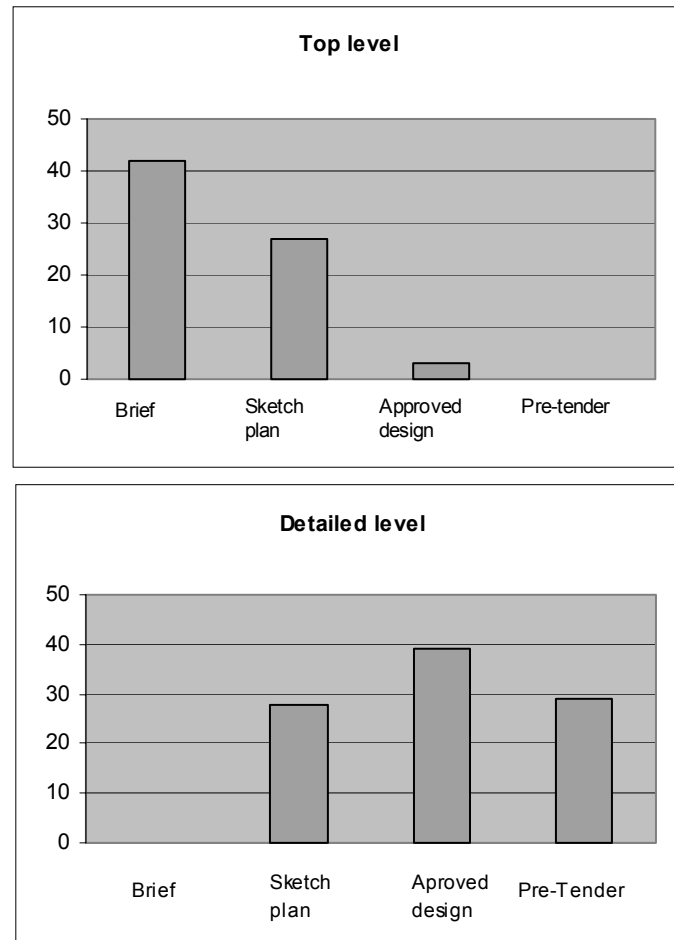


Figure 4: How the estimating stage affects the frequency of use of the top and detailed level

It can be seen in figure 4 that the top level is mainly used at the brief stage, while its frequency of use falls gradually as the estimating process continues reaching zero during the pre-tender stage. The situation is reversed on the detailed level graph, which starts with zero frequency of use at the brief stage. After that, there is a rapid increase at the sketch plan stage where the estimator has some information regarding dimensions and quantities and reaches its peak at the approved sketch design when the majority of the information is available. Following that, there is a slight fall at the pre-tender stage as other techniques are applied in combination with elemental cost estimating. If the two graphs are studied together, it can be appreciated that there is a general relationship between the frequencies at each given stage. When the frequency of the top level is high, that of the detailed is low, which is very appropriate as it denotes the gradual change in use of format (level of detail) depending on the stage of the estimate. Studying the two graphs in detail, during the brief stage the detailed level is not used at all, while the top level is at its greatest frequency. Moving to sketch plan stage there is an equal distribution between the frequency of use of the top level and the detailed level, as they are both used, depending on practice policy. At the approved sketch design the top level is not generally used, while the detailed level reaches its peak. Finally at the pre-tender stage the top level is not used at all and those who still use elemental cost estimating at this stage, use the detailed level of the SFCA.

Question 5: When would you normally prepare elemental cost estimates?

The purpose of this question was to examine whether the preparation of an elemental cost estimate generally depends on the requirements of the client or whether it is incorporated within the practices’ general policy. The possible answers for this question were “only on request by the client”, “as practice general policy on all projects” or “other”. The inclusion of the option “other” was made in order to elicit other possible reasons. In this manner, this question can be regarded as a continuation of question three.

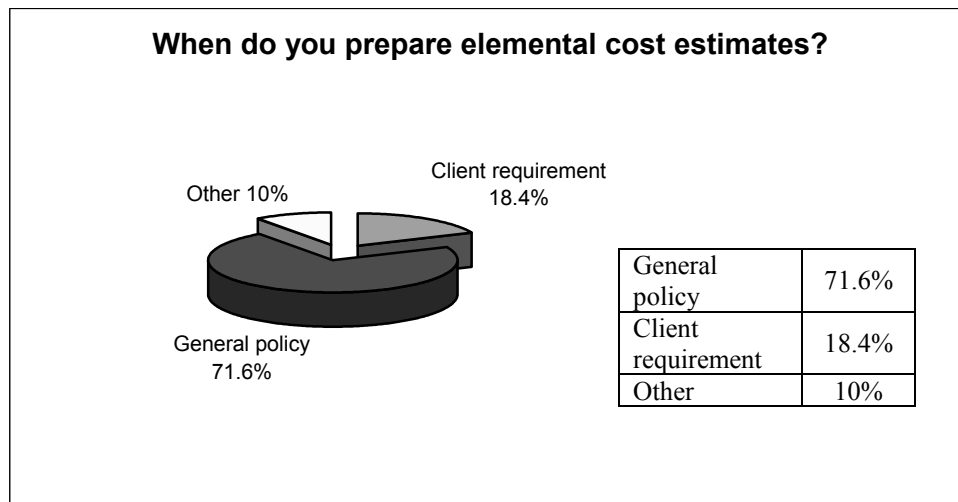


Figure 5: Responses to question 5

As can be seen in figure 5 the vast majority of practices (71.6%) responded that the decision to prepare an elemental cost estimate was due to their general policy. 18.4% said that they prepare elemental cost estimates only after the client requests one, while 10% said that other factors influenced the decision. About three quarters of the latter group stated that it depended on the project type and nature. Others answers included: ‘when there is enough information available’, ‘depending on the fee’, or for ‘complex schemes only’.

CONCLUSIONS

This research concludes that UK quantity surveying practices do indeed carry out elemental cost planning as a general practice during the design phase of a project. Approximately 80% of the respondents confirmed that they prepare such estimates for most if not all of their projects, while 70% said that they do so, not because the clients require it, but as general policy. Some stated that as a result of cost planning they have more control of the whole process and, therefore, the preparation of an elemental estimate is incorporated into their general way of functioning.

Regarding the format of the cost plan, three quarters of the respondents use the BCIS Standard Form of Cost Analysis. This means that the SFCA is still the major tool for cost planning regardless of its age and several criticisms from a number of sources. As regards the level of detail, four out of ten respondents use only the detailed level of the SFCA as a general practice. The rest generally use both the top and detailed level

depending on the size of the project and more importantly, on the stage of the estimate. The top level is used mainly at the brief stage of the project, while a mix of the two levels is used at sketch plan stage. During the latter stages of the design process the detailed level is the most commonly used.

REFERENCES

- Anon (1989), Cost planning system the Gleeds way, Construction Computing, Winter 1989/90, pp34-37
- Ashworth A. (1999), 3rd edition, Cost studies of buildings, Longman Publishing.
- Emsley M. W., Lowe D. J., Duff A. R., Harding, A. and Hickson A. 2002, Development of neural networks to predict total construction costs, Construction Management and Economics, 20, 465-472
- Ferry D.J., Brandon P.S. and Ferry J.D. (1999), 7th edition, Cost planning of buildings, Blackwell Science.
- Lowe D. J., Emsley M. W. and Duff A. R. (2002), The Costs of Different Procurement Systems: A Decision Support Model, Proceedings from the 3rd International Conference on Decision Making in Urban and Civil Engineering, London, 6-8 November, Edited by Farzad Khorsrowshahi
- Morton R., Jaggar D. (1995), Design and the economics of building, Spon, London.
- Robertson D. (1995), Building classification. Chartered Surveyor Monthly, April.
- Southgate T. (1998a), A new approach: Tony Southgate discussed a new method for cost planning, Chartered Quantity Surveyor, November, pp35-36
- Southgate T. (1998b), A new approach: The second part of Tony Southgate's discussion of a new cost planning method, Chartered Quantity Surveyor, November, pp 35-36
- Soutos M. (2002), Early stage construction cost estimating. PROCOST: A practical evaluation of a neural network based system, Unpublished MSc Dissertation, UMIST, Manchester