CHAPTER FIVE

NEED FOR A NEW ESTIMATING TECHNIQUE AT BRIEFING STAGE

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5.1 INTRODUCTION

This chapter explains the reasons to propose a new estimating technique at very early stage of the design process (Briefing stage). Characteristics of a suitable model are examined from different perspectives. Findings of previous research works and survey conducted for the dissertation research are synthesized to corroborate the necessity of a new estimating technique at Briefing stage. The capability of bill of approximate quantities, prepared in accordance with SMM, is emphasized especially since research prototype links elements, sub elements and bill of approximate quantities in forecasting exercise.

5.2 DESIGN RELATED ISSUES

The impact of design process and design methods on consequent costs was discussed in the chapter two. The fact that the 80% of the cost is committed before the sketch design stage is formalized provides the necessary ground to formulate new estimating systems.

Design process is iterative. Many design alternatives may be tried before reaching an optimum solution to meet a particular need. Techniques should be developed with this aspect in mind.

Perera (1989) reveals the fact that clients reach designers at Sketch plan stage. Entire design team is formed at detail design stage. Design is developed without referring to the consequent cost implications. Such cost implications cannot be evaluated without a suitable estimating tool. Therefore, requirement is for design phase sensitive tool.

The evidence suggests that even when cost advisor is acting in the lead consultant role he uses existing frames of thinking with which to solve problem. Most practicing architects conform to conventional patterns to accomplish the clients' requirements (Brandon, 1987). This indicate the practicality and necessity of developing cost models referring to how cost advisors think and architects create within the existing frame work (existing practice).

However, the involvement of the cost advisor is incomplete without suitable forecasting techniques. Approximate estimating techniques used in practice exhibit several deficiencies. These deficiencies are explained next.

The approximate estimating techniques commonly used in the Briefing stage are cost/m2 method and functional unit method. These methods fail to account for design decisions with design development. These techniques do not provide consistent cost break down for design cost control. But it should be admitted that they are fast in producing estimates.

Approximate quantities estimating technique is slow in producing estimates but system can incorporate any information at any stage from the Sketch plan stage. The cost/m2 method with appropriate parts taken from approximate quantities has both deficiencies as of approximate quantities technique and cost/m2 techniques. Both techniques cannot be used at the Briefing stage.

Elemental estimating system requires fairly informative sketches to predict elemental costs. This is a valuable tool for forecasting which can extensively be used by Quantity Surveyors. The method can easily incorporate functional requirements of the proposed facility. Elemental estimating technique cannot, however, be used at the Briefing stage.

The bill of quantities provides more cost information but requires sufficient details and time to measure and price items. The format of the BOQ can be improved and modified to provide consistent cost break down. The BOQ is heavily depends upon detailed information. The elemental bill of quantities is an example of a BOQ model which can provide consistent cost

break down. Since detailed drawings are produced at very later stage of the design process, BOQ doesn't qualify as a forecasting tool to be used at Briefing stage.

Therefore, an estimating system is required which can perform through all design stages. The requirement is, therefore, for a single estimating system. Gilmour and Skitmore (1989) state characteristics of a single estimating system which fulfills above requirements. The objectives of such a system are as follows:

1. Flexibility

Flexibility in this research context means to accommodate different types of buildings from the Briefing stage onwards .

2. Continuity of Information use

The techniques shall not dispose the information collected in the previous stage to move to next stage. If this happens each stage of the design process requires re-measurement of works. Since the design process is iterative backwards and forward thinking of the designer may result in laborious work to cost advisor.

3. Ease and speed of use

With the development and innovation of computers ease and speed is a viable scenario.
In addition computers can process information with higher degree of accuracy. In the context of approximate estimating techniques this means the capability of the techniques to produce fast and accurate outcome easily.

4. Detailed and consistent cost breakdown

Techniques shall provide the consistent and detailed cost break down in a predetermined way.Elemental breakdown of the building structure is one of accepted ways. Initial realistic cost

estimate is decomposed into these elements. This allows the cost advisor to distribute the cost between elements and control each elemental costs. This accomplishes purpose and principles of control.

5. Accuracy in keeping with available information

Design information evolves as the designers carry out works in detail. Degree of details depends on the design stages. Cost advisor has to up date information to match the latest stage in which he works. As explained in the Chapter 1 measurable information become available from sketch plan stage.

6. Easy implementation

The estimating technique should be compatible with the design process and procedures.
Since the design progresses through stages techniques shall comply with the stages.

7. Facility to allow the user to apply professional judgment at all stages

This means human and estimating techniques interaction. In this context the techniques shall complement the judgment of the cost advisor. Replacement of the cost advisor is not anticipated. More commonly used methods as revealed by the research survey are now examined to check the compatibility of them with the characteristics explained above.

Table 5.1-Traditional estimating techniques versus single estimating system characteristics

Estimating technique	Use from Breifing to working drawing stage	Applicable to many building types	Continuity	Ease Speed	Consistent cost break down	Keep available information	Easy implementation	Professional judgement
1 FUNCTIONAL UNIT	Y	Y	N	Y	N	N	Y	N
2 COST/M2 (SUPERFICIAL AREA)	Y	Y	N	Y	N	N	Y	N
3 COST/M2 WITH APPROXIMATE QUANTITIES	N	Y	N	N	N	N	Y	N
4APPROXIMATE QUANTITIES	N	Y	Y	N	Y	Y	Y	Y
5 ELEMENTAL ESTIMATING	N	Y	Y	N	Y	Y	Y	Y
6 PRICING BOQ	N	Y	Y	N	Y	Y	Y	Y

Notes: Y= Yes, N=No

Above table shows that approximate quantities technique, elemental estimating technique and pricing BOQ satisfies more requirements of a single estimating system. These approximate estimating techniques can be improved to accomplish all the requirements of a single estimating technique. The table shows two deficiencies of techniques 4, 5 and 6. First deficiency is inability to forecast from Briefing stage. Second is low speed. Gilmour and Skitmore (1989) suggest that introduction of cost and design databases and computer based information processing system can solve both problems respectively.

Jayalath (1992) suggests single estimating technique to produce construction cost estimates in his proposals to improve quality of preliminary cost forecasting. Requirement for a single estimating system in local practice has been already addressed.

Therefore, it can be stated that computerized single estimating system with necessary databases provide the frame work for a new estimating technique.

The existing technology has the capability to cope with the requirement. The properties of a single estimating technique proposed by Gilmour and Skitmore (1989) provide the conceptual frame work for the estimating technique which developed in this research.

5.3 DESIGN COST CONTROL RELATED ISSUES

The research survey findings show that application of approximate estimating techniques is limited to traditional techniques. Following techniques claim as most commonly used approximate estimate estimating techniques:

Briefing stage

1. Cost per m2 method (cost/m2)
2. Cost per unit method (cost/bed, cost /seat)

Sketch plan stage

1. Approximate quantities estimating technique
2. Cost per m2 method with appropriate parts taken from approximate quantities technique
3. Elemental estimating technique

Working drawing stage

1. Pricing bill of quantities

5.3.1 Purposes of cost control and traditional approximate estimating techniques in local practice

Chapter three stated three purposes of cost control:

1. To give client value for money

2. To achieve required balance of expenditure between the various parts of the buildings

3. To keep expenditure within the amount allowed by the client

Value for money criteria

All above traditional approximate estimating techniques can estimate construction cost of a building. Quality and fitness for the purpose, initial capital cost and life cycle cost are all important factors which determine the value for money. In order to establish best value, the functional solutions will need to be priced. Functional analysis system creates different solutions which require alternative cost estimates. Flexible estimating system is required to price functional alternatives. Elemental estimating technique and approximate quantities technique can be used to satisfy the requirements from Sketch plan stage. Bill of quantities can price functional options at Working drawing stage which is too late. Cost/m2 method and functional unit method fails to price functional alternatives. Therefore, an estimating technique which can price functional options from Briefing stage is desired.

Achieving balance of expenditure between various parts of the building

To achieve required balance between various parts of the building the techniques should have a facility to allocate cost to various parts of a building. One widely accepted method is elemental cost estimating. The Royal Institution of Chartered Surveyors (RICS) has developed a set of standard elements for cost analysis.

Cost /m2 method or cost per unit method cannot meet the second purpose of the cost control. The bill of quantities can be structured to meet the second purpose of the cost control. The example is elemental bill of quantities.

Approximate quantities estimating technique can also be structured to elements to meet the second purpose of the cost control.

Elemental estimating technique is the most suitable technique to satisfy the requirements. However, this method cannot be used from Briefing stage. Therefore, investigating a method to accomplish second purpose of cost control is desired.

To keep expenditure within the amount allowed by the client

The third purpose of the cost control is keeping the expenditure within the amount by the client. To keep the expenditure within the amount allowed by the client two things are important:

1. The first estimate prepared for the project should be realistic
2. Mechanism is required to check and control the costs and to take remedial action if required.

Briefing stage approximate estimating techniques, Sketch plan stage techniques such as approximate quantities estimating technique, cost per m2 method with appropriate parts taken from approximate quantities cannot meet both requirements. These methods do not use previous cost analysis to compare and adjust costs of proposed buildings.

Elemental estimating technique refers to previous cost analysis and adjusts cost of the proposed building satisfying the third purpose of cost control. This method cannot establish a realistic cost estimate at the Briefing stage.

There is no guarantee that the estimate produced pricing BOQ is within the limit allowed by the client. Since the BOQ is prepared at working drawing stage no cost control is possible other than revising the design and/or changing the level of specifications. All these involve abortive work, time cost and client dissatisfaction.

Estimating technique which can establish cost limit and support cost checking and remedial actions at very early stage of the design process is, thus, desired.

5.3.1 Principles of cost control and traditional estimating techniques in local practice

Chapter three introduced principles of cost control. Same is stated here with the intention to examine whether the traditional approximate estimating can meet the principle of cost control.

1. There must be a frame reference or set of conditions which must be adhered to. This consists of two parts:
   1.1 Establishing a realistic first estimate
   1.2 Planning how this estimated amount is distributed between various parts of building

2. There must be a method of checking or a feed back system.

3. There must be a means of remedial action.

Table 5.2 shows the capability of traditional approximate estimating techniques to satisfy above principles:

Table 5.2- Estimating methods and cost control principles

Stage	What is done	Method used	Reason for being unsatisfactory
Briefing stage	First estimate is prepared	Cost / m2 method Cost /unit method	First estimate cannot be realistic. Previous cost analyses are required to select appropriate building type and suitable adjustments should be made to selected analysis. First part of principle one is not met
Sketch plan stage	Firm estimate prepared	Cost /m2 Approximate quantities method. Cost/m2 method with approximate quantities	Cost targets cannot be set. To set cost targets building should be divide into various parts. Therefore, second part of principle one is not met.
Working drawing stage	Priced bill of quantities is compared with the accepted tender.	Pricing bill of quantities	BOQ is prepared from detail drawings. Only after pricing BOQ the estimated cost is known. Therefore, no way to control the cost. Cost checking is not possible in the absence of cost targets. Without cost checking remedial actions cannot be exercised.

The traditional approximate estimating techniques in practice fail to accomplish all three requirements of design cost control. Elemental estimating technique which uses previous cost analysis can satisfy all requirements from Sketch plan stage. Design cost control is a crucial part of the design process. Conclusion stems from this is that a new estimating technique should be resorted to overcome the failures of currently used approximating estimating techniques. To optimize the impact of the design cost control any estimating technique shall be operative from early stages of the design process, possibly from Briefing stage.

5.4 CLIENT RELATED ISSUES

Construction works originates from the clients. Behavioral aspects, experience, knowledge and organizational arrangements of clients should be investigated and addressed in formulating a new

estimating technique. This section examines the impact of client's brief and requirement in construction cost prediction.

The client has been defined as the person or firm responsible for commissioning and paying for design and construction of a facility (Kamara et al., 2000). The requirements of the client refer to objectives, needs, wishes and expectations of the client. Clients' requirements are generally put in simple terms with respect to functions, attributes or other special features of the facility that satisfy the needs of the client. In the Briefing stage the information available from client to cost advisor and Architect is limited to following:

Space: This refers to lettable area or useable area, car parking area etc.

Planning permission: Preliminary inquiry to planning authority (ex -UDA) to make sure that particular type of facility is allowed and plot ratio is acceptable.

Use: The facility will be sold or rent to middle class people or facility is used for general office purpose.

Quality: Depending on the use quality is determined. For example quality an office for government use is different from quality of an office proposed for a private bank.

Site: Site is in possession and a site plan is available. Initial demolition scope if required is known.

The expression of space, planning permission, use, quality and site describes the facility required by the client. These explicit and implicit client requirements require some form of processing. Processing involves following steps (Kamara et al., 2000):

1. Definition or identification of the client's requirement
2. Analysis of the requirements
3. Translation of requirements into solution neutral design specifications

Client's brief is the primary and original source of information to the architect and cost advisor. These information have to be presented in the manner that will facilitate following (Kamara et al., 2000):

1. Architectural, structural, services and other disciplines to work concurrently.
2. The early consideration of all life-cycle issues affecting the facility.
3. The integration of all professional disciplines involved in the process
4. The traceability of design decisions to original requirements through out the life cycle of the facility

These four targets can be accomplished if following prerequisites are met:

1. Define requirements precisely to eliminate ambiguity
2. Reflect all perspectives and priorities represented by the client
3. State requirements in solution-neutral format
4. State requirements in format that that makes it easy to correlate design decision to the original intentions of the client.

The manner that information should be presented and the prerequisites of such presentation can be achieved if the client's requirements are defined, analysed and translated into solution neutral design specification.

The relevance of the foregoing explanation to the research is that not only the iterative nature of the design process but how to manage the original information source of such design decisions is vital in formulating a new estimating technique.

Translation of client's requirements into solution neutral design specification indicates the requirement for a design database. It should be noted that this translation occurs at very early stage of the project life cycle. A comprehensive design database formed from historically analyzed design information and client's requirements analysis can provide reliable information. A suitable estimating technique is consequently required to assemble costs from client's

requirements. Such an estimating technique should facilitate translation of requirements through the design database and correlation of design decision with original intensions of the client.

5.5 INFORMATION TECHNOLOGY BASED ISSUES

The research results show that organizations use computer software in approximate estimating applications. Such applications however are limited to very few software applications such as MS Excel, Word processing. Spreadsheet software is generally used by the respondents to calculate, store and retrieve estimating data. With the major application being spread sheet software the level of use of information technology tools in the approximate estimating is low.

All construction activities involve processing information. In the context of approximate estimating cost advisor requires large amount of design and cost information to be managed. The capability of computers to hold, recall and manipulate design and cost information makes it a invaluable tool in cost forecasting. An estimating technique coupled with design and cost data bases for forecasting will do minimum unless it is automated via computer technology. One way to mange this requirement is application of commercially available database management software. The major point here is application of computer technology.

Ferry and Brandon (1990) states that at more mundane level computers are not very economic where large amounts of detailed information needs to be input before a solution can be obtained. This is true for an estimating technique which requires large amount of cost and design and cost information to be input. But benefit is achieved when same information is used repetitively. This is true for an estimating system based on design and cost databases. Therefore, use and application of computer capability is a vital part of an estimating system linked to large amount of information.

Hunt (1988) explains the reasons for computer applications in the profession of Quantity Surveying as follows:

1. To operate more cost effectively and improve profitability.
2. To provide a better and more appropriate service
3. To meet the changes brought about by the evolving industry and advancing technology.
4. To meet the challenge of competition from fellow construction industry professionals who already have the technology to take over some of traditional quantity surveying roles.
5. To be able to develop financial management expertise using PC tools .

Memory of the computer can be used for storing information relating to items such as:

- Measurement
- Cost and price
- Site progress and valuation
- Specifications
- Drawn information
- Claims/instructions/queries
- Staff and resourcing
- Accounting(cost and job accounting)

Hunt (1988) identifies the functions which can effectively be automated using computer applications. These are as follows:

- Tasks which are duplicated
- Tasks which are repetitive
- Tasks which are frequently used
- Tasks which share common information
- Tasks which involve mechanical calculations
- Tasks which can be easily defined
- Labour intensive tasks

- Administrative tasks
- Technical

The estimating encompasses many of the tasks or activities listed above. Therefore, making the cost models computer based is an essential requirement. The research cost model is thus computer aided to reap the full benefits.

5.6 LINKING TO SMM

Sri Lanka Standard Institution has published SLS 573 (revised 1999 edition) for building works. Organizations follow this method of measurement or similar method to prepare bill of quantities. Cost model which links elements, sub elements and notional bill of quantities of historical buildings (cases) can produce wealth of information for designers and cost advisors. Facility to produce SMM level cost and design information with the assistance of databases at early stages of the design process is essential. Time required to price BOQ at detail design stage can be drastically reduced in this approach.

5.7 RECENT STUDIES

The research by Austin et al. (1994) develops a fresh approach to the programming, coordination and control of a multidisciplinary building design. The aim is to order design tasks more efficiently. Improved design information flow management techniques consequently appeal to suitable cost forecasting techniques. The reason for efficient design management systems is anchored to efficient cost management systems.

Khedro (1999) has developed a prototype of network software application called **CIFE WORLD,** to examine issues related to distributed collaborative building design and construction planning. In this architecture, software applications are enabled to store, access, and update data through a single database or multiple databases with central control. The literature emphasizes

the recent development on data modeling tools and integration architectures most of which are database centric. This research highlights the inalienable requirements of computer aided databases in activities sharing team effort. The design stage estimating is no exception. The developments in database techniques in foreign countries are likely to produce impact on local practice.

Akintoye et al. (1992) reporting on the construction cost management in Nigeria states that clients are aware of the failures of the quantity surveying profession to estimate and control construction cost within realistic limits. The awareness is presumably pressurizing the profession into corrective actions. The use of computer technology in cost management has been stressed as vital in improving the quality of advice.

5.8 REQUIREMENT OF A FORMAL MODEL OF HUMAN JUDGEMENT

Firms in the construction industry in the United Kingdom share information maintained by BCIS. Local design organizations do not have access to common cost or design information maintained by a third party. Local organizations, accordingly, rely on their on cost and design information in construction cost forecasting. Tabtabai and Diekmann (1992) states that firms (UK) rely on private judgment of their respective project managers for forecasting. However, requirement for formal models of human judgment is stressed for following reasons:

1.0 Models of human judgment are self consistent.

2.0 Models of human judgment are transferable to those who have not yet developed good judgment.

3.0 Models of human judgment may provide a vehicle for developing good judgment in young and inexperience predictors.

This research findings highlight requirement of models to forecast cost with special emphasis on human judgment. The research findings are of relevant to local organizations in conceptualizing a suitable model for cost forecasting.

5.9 TRENDS IN BUILDING SERVICE ENGINERING COST FORECASTING

Studies have been carried out to form models in conceptual and early design estimating for building services systems. Reynolds (1993) has developed a computer programme that will use historical data in databases to predict the cost of services of new projects. Emphasis is on methods that enhance the accuracy of early construction costs (services) so that they can stand on their own throughout the design process. This evidences that requirement for new estimating methods in construction discipline in different countries are emerging. Local construction industry (Sri Lanka) is no exception.

5.10 BIAS AND CONSISTENCY ASPECTS IN PRICE FORECASTING

Bias is the average of differences between actual bid prices and forecasts. Consistency is the degree of variation around this average. Skitmore and Gunner (1999) state that clients and designers alike do not generally consider the consistency aspect of a designer's price forecast. It is suggested that study into bias and consistency of model output will result in improved and reliable forecasts. First step is to formulate suitable cost models.

5.11 REALISTIC MODELS

A proper representation of the effect of a design change can be obtained only by calculating its effect on whole construction process. This can be achieved by analyzing and synthesizing cost in the way in which they arise. If a cost model can fulfill this requirement it can be described as a realistic cost model. Production of realistic cost models can be tackled in several ways. Beeston (1987) describes following approaches:

(a) the simulation of construction cost in detail
(b) attaching costs to activity net works
(c) representing the decision process of a planner

However, development of realistic models has rendered several problems. These are new methods of data collection and new contract documentation to replace the bill of quantities. Implementing realistic models in the local practice overcoming the problem of data collection and replacing the BOQ is hardly achievable in the present situation. However, requirement for design assumption and facility to check and modify design assumption if necessary has been addressed. This process will give valuable insight into how design differs from others from which assumptions were referred. Such assumptions should come from database of previous designs (Beeston, 1987). Major point is requirement of cost and design data bases in future models from historical designs.

5.12 VALUE MANAGEMENT (VM)

Value management is a structured approach to ensure value for money. Value management has the potential to develop strategic brief, reduce costs, evaluate various design options. Application of value management has been suggested by recent studies to satisfy clients who are dissatisfied with the service by the construction professions (Smyth,1999; Atkin,1995; Rumble,1998). It seems that application of value management is rapidly increasing in U.K. The relevance of VM to the research is that VM requires cost reduction and evaluate various design options. Cost models are required to predict cost of options with an acceptable level of accuracy. Models which facilitate comparison with elemental, sub elemental and SMM level costs can be very helpful in the VM exercise. In order to establish best value, functional solutions will need to be priced. Elemental estimating technique is probably the best suited model to describe functional requirements (Martin, 2001a)

5.13 SUMMARY

This chapter discussed and explained the reasons for a new approximate estimating technique. Issues giving impetus to form a new estimating technique were discussed under various headings. The traditional estimating techniques were proved unsuccessful against stringent

requirements discussed under each heading. The failure of traditional approximate estimating techniques and reasons thereof provide positive stimulus to form new estimating systems.

One important point is that models should allow the cost advisor to interact with it. If interaction with the model is not allowed cost advisor fail to apply his expertise based on the initial reference provided by the model. Since models are not perfect it must be transparent in its operation and use. It should be noted that expert cost advisors refer to previous experience. As the time develops expert tends to rely more on experience and less on theory (Brandon, 1987).

Any future cost model shall address and incorporate the historical data within it. In the context of construction cost forecasting, design and cost data provides the drive to the model. Local industry is benefited from new estimating models which can overcome the weaknesses of existing models.

Strategic management of Information Technology is vital to acquire competitive edge in any discipline. Planned investment in computer based estimating systems which share information between applications will prove useful.