2 COST PLANNING

2.1 Introduction

Clients undertake construction projects in order to enhance their business. This can be at a corporate or personal level. Take for example a manufacturing corporation that wishes to construct a new industrial plant. This can be because they need to expand their business or break into a new market. A multinational consultancy may wish to construct a new headquarters as part of a marketing strategy to improve their image or to expand their operations and employ more people. They may also wish to give their staff more comfortable accommodation to improve productivity. At a personal level a person wanting to build a private villa to change to a more convenient space or location. A public sector body may wish to construct a new road to reduce congestion and travel times or reduce maintenance costs for the wider society which is beneficial for the economy. Whatever the reason the decision to construct can always be thought of as a business decision.

Construction is an expensive process that consumes a lot of effort and time. As such the decision to build requires careful deliberation and planning. In order to improve business the decision is undertaken only if the client perceives that it will add value to their operations. The concept of value and value for money will be discussed in more detail later in the module. But for now we can safely say that value is related to cost. This makes the cost of construction a major part of the decision to build. In fact cost is a major factor in any business decision. There are very few products that we buy without knowing or wanting to know their cost just as there are very few (if any) clients who undertake construction without needing to know how much it will cost them. The first task in cost planning therefore is about forecasting how much a building will cost.

Construction projects are complex and their design and construction can take years. During this time many events that were not foreseen when setting the initial estimate can happen. The result is that the project can end up costing a lot more than the client has anticipated. At this new inflated cost the project might be unviable or non profitable for the client. There are many examples of such failures in industry with high profile projects such as Wembley Stadium, The Scottish Parliament, Burj Dubai, Sydney Opera House, the Panama Canal turning out to cost twice, thrice or 5 times the initial estimate. The process of cost planning therefore does not end with setting the initial cost estimate for a project but follows the
processes of design and construction closely to ensure that the final cost of the project remains within that estimate.

The first part of this unit will focus on how to set a most realistic cost estimate. The unit will then discuss the mechanisms to control this cost as the design develops until the project is ready to go out to tender.

### 2.1.1 Early attempts at forecasting capital cost

Prior to the 1960s there were a number of well-recognised methods used to forecast the capital cost of building works. All of them would arrive at a capital cost but only one – Approximate Quantities – gave any detailed breakdown of that cost which was at all useful. To explain why a detailed breakdown might be useful now would be premature but it will be explained later when we understand in more detail what modern cost planning is all about.

The first two methods used are generally gathered together under the heading of ‘single rate estimating’. A brief description follows with further detail in Appendix A, however, they all relied on the keeping of statistics by the quantity surveyor and this was done on an office basis, data only being shared between offices within the same private practice. The data was hand written into a ledger style register.

#### 2.1.1.1 The superficial area method

Also referred to as the superficial method it is readily understood by clients. This method relies on calculating the area of each floor and multiplying by a cost per square foot (or more recently the square meter). The floor area is calculated from the internal dimensions of the building. The cost per square unit is derived from a quantity surveyors previous experience. When a successful tenderer’s offer was accepted details of the contract, the nearest two other offers and the cost per square unit of enclosed floor area were noted down.

#### 2.1.1.2 The cube method

In this method a formula was used to arrive at the volume of the building including its roof. Once again when the successful tenderer’s offer was accepted details of the contract, the nearest two other offers and the cost per cubic foot were all noted down.

#### 2.1.1.3 Functional Unit

A very imprecise method of forecasting cost, this relies on the winning tender amount from previous contracts being divided by the functional unit for the type of building which has been built, the resulting ‘rate’ being used in forecasting. For example, school buildings’ costs can be divided by the number of pupils which each can accommodate, similarly beds for
hospitals, student places for university buildings, theatres and cinemas by the number in an audience, car parks by the number of vehicles etc. The system has never been recognised as seriously viable for forecasting cost but is still used in the very initial stages to set maximum amounts for public and institutional buildings.

2.1.1.4 Approximate Quantities

The most accurate method of providing a present day cost. In this method the cost of major composite items is arrived at by measuring its constituent parts and costing these from a previous bill of quantities. The cost of composite items can also be directly obtained from price books or an existing database. The principal requirement is a well defined design and specification, hardly available at the time when the client is only giving his brief to the design team. Appendix B gives a fairly full explanation of the technique which is used in modern cost control, although not to cost out the complete building. It will be shown how this works when working through an example later in the module.

What the methods have in common is the reliance on historical data. Most practices kept records of the cost from previous projects and these are used to arrive at a final cost. The methods also rely on what is referred to as a yardstick approach. In this approach a building is broken down into units; the cost of a unit is derived and multiplied by the total number of units. This makes it much easier to compare two buildings of different sizes. However it is not so straightforward because although a two storey building has double the area of a one storey building (of the same footprint) its cost is not the double and the cost of three storeys is not the triple. Such adjustments must be made by the estimator. Today the most commonly used unit is the square meter.

2.1.2 Selecting a method for forecasting costs

Selecting an appropriate method depends on several factors:

- Availability of project information: during the early stages little information is available. For this reason the unit rate method might be appropriate rather than approximate quantities method which requires a sufficiently detailed design. If there is a previous project that is very similar then approximate quantities may provide a more accurate estimate.

- Time: all methods have been developed to provide an estimate within time constraints at the initial stages. It is clear that some are faster and easier to prepare than others.

- Availability of cost data: all methods rely on usage of data and cost information from previous projects. A quantity surveyor would greatly benefit from easily accessible,
precise data for a more reliable estimate. Additionally a larger the data base means that the quantity surveyor is more likely to find a building as close to the requirements as possible for improved accuracy.

- Preference and familiarity: naturally the quantity surveyor would prefer to use a system he is familiar with providing all other conditions are met.

### 2.1.3 Achieving accuracy

The process of forecasting is about estimating the cost of a building that will be completed at a future date. Realistically no one can forecast the future and hence the true cost of the building will remain unknown until completion and preparation of the total account. Still as discussed earlier the client needs to have an understanding of how much the building will ultimately cost in order to make key decisions at the appraisal stage. The cost of the building is a key determinant for the decision to build since the project needs to remain affordable. This in turn will determine the profitability of the building as well as the amount of finance to be raised in order to complete the project. The client may also have several options and the cost of each is clearly a key determinant of the optimum or best option. It is therefore vital that an accurate estimate is prepared. However this estimate needs to be prepared with minimum information available. The quantity surveyor has a lot at stake. Once a figure is quoted to the client it is sure that he would expect the building to cost that much. It would be very difficult to justify a significant change to this number without seeming unprofessional. Additionally as mentioned previously the quantity surveyor is liable to the estimates he submits to the client and can be considered negligent if these estimates are wrong. Since each building is unique historical records cannot produce an accurate or realistic estimate. The sections discuss the factors that need to be considered to improve the accuracy of a first estimate.

#### 2.1.3.1 Quantity

Most estimating techniques rely on using data from previous projects to obtain a cost per unit area. The assumption is that the cost per unit area of buildings with the same function and similar specifications are the same or at least lie within a similar range. The reality is very different. There are various issues that need to be considered when comparing a cost of a large vs. small building. First of all constructing a larger building involves a higher level of complexity in terms of transporting material, coordinating the various parts, larger equipment which would mean a higher cost. On the other hand a larger quantity of material would mean the opportunity of using economies of scale which would result in a lower cost per unit. The cost would therefore have to be adjusted to take into consideration these issues.
2.1.3.2 Quality
The selected standard of quality is purely based on the client’s preference. This may require a good understanding of client’s objectives most importantly the level of quality. A client may choose a higher specification for aesthetic reasons or to minimize maintenance costs and cost in use of the facility. Whatever the reason the cost per unit rate would differ for different levels of quality. This can be for the building overall or for certain parts of the building.

2.1.3.3 Market
This factor is a combination of general economic conditions and trends in the market. For example the performance of the economy would give a clear indication of inflation rates which can have a significant impact on prices. Supply and demand for material, labour and equipment would determine whether there will be a rise or reduction in prices. This can be limited to a region or across the world. For example the emergence of Chinese and Indian economies led to massive building programmes within these two countries. The result was an increase in demand for building materials the impact of which could be seen as far as Europe and United States where large increases were seen in the cost of steel. The quantity surveyor therefore needs to have an awareness of current conditions and the likely future conditions of the market. This can be translated into a general overall increase or reduction in the estimate.

2.1.3.4 Building Services
For certain types of projects building services would constitute a significant part of overall cost. Take for example a hospital building where medical equipment is vital for the operation of the facility. The cost of electrical mechanical services would therefore constitute a significant proportion of the overall building cost and may even exceed it. In such cases building services cost might be calculated as a separate package. A building like Burj Dubai (currently the tallest building in the world) electrical and mechanical services formed one third of overall building cost. The importance of providing the best vertical transportation to ensure the safety of occupants added to the complexity of providing services at such a scale has to be taken into consideration. In this case it is difficult to consider building services separately from the building.

2.1.3.5 Location
There are two aspects of location that need to be considered: the wider location which refers to a specific country or city and the location in terms of site location and characteristics. This would necessitate taking into consideration the current local market conditions in terms of supply and demand, inflation, etc. In terms of the specific site location there is a need to understand if there are any constraints such as an adjacent railway line or highway.
Additionally if there is any information about the soil condition such as the need for excessive dewatering or contamination both of which would mean higher costs. External works can differ significantly for different projects. This may mean that they be treated as a separate package.

2.1.3.6 Design economics

Different design solutions bring about their own complexities when it comes to costing. Building shape (round, square or rectangular); building height or size have a direct impact on construction and hence cost. For example the same area of building spread horizontally or vertically demands different approaches. High rise would mean the need for using equipment such as lifts or cranes while low rise spread over a large area would need additional transport costs. These two costs are not necessarily equivalent therefore each has to be calculated differently. For the same area a circular building would mean a different structural solution to a rectangular or square building. Design economics are dealt with in a separate unit in these notes. For now we need to appreciate the impact of design on cost.

2.1.3.7 Final notes

The overall project and client conditions would need to be considered. For example the client might be in a rush to complete the building. This might indicate that there will be a need to work overtime leading to higher costs.

The quantity surveyor might be under a lot of pressure to reduce his estimate. He might know that the client has a specific budget or cash problems and hence feel the need to quote a reduced figure. It is important to avoid optimism bias and remember that he is responsible and duty bound to inform the client on the real cost not the cost the client wants to pay. He needs to clarify within the cost plans all inclusions and exclusions to make the client aware about what he is paying for. Things like professional fees, fittings and specialist works must be clearly included or excluded. Also inflation should be dealt with by stating whether costs are current or future.
2.2 Cost control

The fact that every client wants to minimise cost is clear. If not to minimise cost clients surely want to have an understanding of how much a development will cost them. This can be with the purpose of raising finance or to ensure that they have the necessary resources to develop and if not develop to an extent that matches their available finance. If the process of cost planning was left until tenders come in there are clear disadvantages to waiting to see the outcome of tendering to understand the building cost. Abortive measures will have to be made to bring the costs down to the appropriate and affordable level. This means that the design will have to be rethought to match cost or worse it could be totally abandoned.

The cost planning process starts when the client perceives a need for a building. At that stage and with limited information available the client would want to have an understanding of the costs that are involved. The various methods of estimating can be used to arrive at a figure. However once the project is sanctioned and the design process starts there is a need to monitor and maintain this budget figure closely. The process therefore follows the development of the design very closely and is designed to enable the investigation of various design options to maintain the budget figure. It should enable the cost planner to check the estimate as the design develops without waiting for the design to be completed. It should develop into sufficient detail to enable production of the bill of quantities and to compare tenders.

The process is based on creating a control system whereby targets are set, monitored for change and corrective action is taken to maintain the targets. Any of the previously discussed estimating techniques can be used to provide an overall preliminary cost estimate. However an overall estimate cannot be controlled as the design develops. There is therefore a need to break down this estimate and spread across various parts of the building. The result is an overall project cost with a breakdown describing how this cost will be spread across the building. As the design develops the quantity surveyors monitors closely to assess the impact of design decisions on the cost plan. The quantity surveyor then needs to consult with the client to decide whether the cost plan can modified and the cost either increased or decreased to accept the design or whether the design team must revisit the design to keep to the cost plan. In the latter case alternative design solutions must be considered to retain the initial cost estimate. This process is iterative and continues until the design stage is complete and the design goes out to tender.
2.2.1 Elemental Cost Planning

By the 1960s the construction industry had undergone immense changes and the whole economy was changing so fast that old methods of forecasting cost of construction were found to be inadequate. What was required was a new method of cost control which would take account of this accelerating change, which would produce an accurate cost but also allow the quantity surveyor to keep on top of changes both in the design of the building and also the economy at large, and so keep the final cost within a budget prepared perhaps one or two years before.

2.2.2 Brief history

This, at the time, revolutionary method of pre-tender cost control was brought to the attention of the general quantity surveying membership first by articles in various professional journals and other construction press publications and then by the publication of a self learning text entitled, ‘Cost Control in Building Design’ by the Research and Development Group of the Ministry of Public Building and Works in 1968. The text was in two parts. The first, in self learning style, taught the reader the principles of elemental cost control, and the second part gave a worked example together with a discussion of the techniques used in elemental cost control.

Since then many books have been written about cost control but not until 29 years later was the idea of the self-learning text revisited when Roger Flanagan and Brian Tate published, through Blackwell Science, a revised and up to date version of the original self learning text.

The notes which follow in this module are very firmly based on the original 1968 text and the original usage of terminology has been adhered to throughout.

2.2.3 The element

The use of the building element was the key in this process to several things which make the system unique. But what do we mean by the term ‘element’? An element in this context refers to a piece of construction in a unique situation in a building. Most important of all the actual form of construction used does not need to be the same in every building, but the situation of the element in every building must always be the same. For example we can cover a roof in slates, tiles of various kinds, sheet metal or thatch and hold the whole roof up with timber, steel or concrete structures of various types and shapes, but they will always belong to the roof element. We can allow rainwater to simply run off, or provide basic or complex guttering systems, but they will always belong to the roof element. Providing we
always follow the rules on what is included in an element then we can compare the cost of one form of construction for that element with another. Also, if the roof construction is altered in anyway, the new form can be costed with the same degree of accuracy as the original and the two costs can be truly comparable.

2.2.4 The principles of elemental cost control

The three basic principles are:
1. There must be a frame of reference;
2. There must be a method of checking;
3. There must be a means of taking remedial action.

2.2.4.1 The frame of reference

Like any control system the process starts with the setting of parameters. Two parameters are set: the first is a *realistic first estimate* or *cost limit* of the overall construction cost of the building. The second is *planning how the estimate should be spent among the elements of the building*.

The first estimate can be arrived at using any of the estimating methods discussed earlier. Alternatively the client can define a cost limit to which the building must be designed. In this case the design team would have to agree on how to allocate this limited cost to various parts of the building. Bear in mind that this is done at the initial phases with very limited information available. In both cases the quantity surveyor needs to breakdown the cost over various parts of the building. It is clear that is makes it much easier to control the overall cost as the design becomes more detailed. In order for this process to function the cost of each individual part must be independent. How that is done is described later in the module but the fact that elements of the building are used where each element is described according to a set of rules features heavily in the process. Each discrete portion of the building is allocated a cost known as a ‘cost target’.

2.2.4.2 The method of checking

In control system terms this is the monitoring stage.

Where the client is happy with the realistic first estimate and the ideas for a building produced by the design team, then the process of detailed design begins. As the detail emerges from discussions between the designer and other team members, the quantity surveyor must put an accurate cost against that detail and compare the new figures with the cost target(s) set in the frame of reference. Here again, the use of elements in the first breakdown will prove crucial.
2.2.4.3 Remedial action

In control system terms this is the ‘action’ stage. Generally design decisions will affect the cost(s) of parts of or whole elements and it becomes relatively easy to insert into the elemental breakdown the more accurate forecasts of costs for the design decisions. The cost effect of every design decision must be reported to the design team. The remedial action commonly consists of distributing the difference in cost between cost target(s) and detail design costing(s) for the affected element(s) and adjusting the overall cost to keep within the first estimate. Should the cost difference be too large then alternative materials or building techniques may have to be considered and costed out until the offending element’s cost is no threat to the first estimate. The client may decide to increase the overall cost rather than change the design. Whatever the decision it is important to note that the control process gives the client the opportunity to make these decisions based on complete information about the design. In extreme cases several elements may be affected quite seriously and a radical redesign becomes necessary. In a case like that one has to question the validity of the first estimate and the breakdown. Again it might be due to the wishes of the client as he decides that a more expensive building would infact offer him value for money.

2.2.4.4 In summary

The quantity surveyor’s first task as part of the design team is to produce a realistic first estimate or cost limit for the proposed building and to allocate that cost over parts of the building as cost targets. In elemental cost control these parts will be the elements themselves. As the design team firm up on design for various parts of the building, the quantity surveyor must cost out that detail and report back to the design team on the effect of their decisions. Should the new costs differ widely from the cost targets, action must be taken to either bring the new design into line with the cost target or the amounts allocated to the cost targets are redistributed so that the cost limit is not increased. Savings can be kept back for future use in this remedial action. As cost targets vary individually they will affect the cost limit which may affect other cost targets or may be used by them.

2.2.5 The database

It has to be noted that no technique for forecasting a value or result can function unless there is a database from which to work and elemental cost control is no exception. In the beginning it was envisaged that practices would keep their own databases as they had always done, but this had serious drawbacks for the majority of practices in that early period.
The biggest drawback was the sheer effort required to produce the detailed costs of the parts of the building we now know as ‘elements’ from a priced bill of quantities. Typical bills of quantities at the time for a smallish building could run from 1800 to 2400 items. Each had a cost, each fell into at least one ‘element’ and none were in an ‘elemental’ order. Depending on the system adopted, there could be anything up to 40 elements and sub-elements. So regrouping these items on other pieces of paper was the only option, followed by adding up the costs for each grouping and finally adding up the group costs to check against the tender amount. Inevitably the last check did not work out and it was back to the start checking every entry, sub-total and total until the errors were found.

In the early 1960s with the introduction of the use of the computer in bill production many of the larger practices, the MOPBW and several computer companies saw the huge data processing effort of bill production as a worthwhile task for the modern computer. Systems proliferated, some developing where good system design decisions and viable computer systems were being used. Others fell by the wayside for exactly the opposite reasons. The good ones which survived and which developed into modern bill production systems, now based on the ubiquitous PC, quickly realised that elemental cost control was an important feature which they could not ignore. These systems were able to produce a bill of quantities in not just a work section or trade format but also in an elemental format. Not only that, even if the bills were kept in, say, trade format, elemental costs were always available and, if the computer program was bug free, they were always mathematically correct.

The value of a centralised database of cost material was also realised and the RICS set up the Building Cost Information Service. This presents the elemental costs and contract information and even some drawings for a variety of buildings across the whole of the UK. When and where the buildings were erected is noted and the data is generally filed under the CI/SfB system of building type by end use. More about the BCIS system later in these notes.

2.2.6 The purposes of cost control

There are three purposes in having a modern cost control system in place:
1. To give the client good value for money
2. To achieve a balance of expenditure over the various parts of the building
3. To keep the expenditure within the amount allowed by the client.
2.2.6.1 Value for money

We all know what we mean when we say we wish to have value for money but value is a subjective concept. For example, one can read in the press reviews carried out by reporters who dine on expense accounts and then commit their gastronomic experiences to print, usually ending up with a value for money scale of 1 to 10 or an equally irrelevant comment on how they felt the meal met expectations against the total amount spent. How many of you have eaten in those restaurants reviewed and what did you think of what you were charged for your meal? Would you agree with the published review? There is good reason for thinking that not many people would.

From that simple example we move to a building and here things get much more complex, but to try to keep it simple take the example of a client wishing to build a factory for the manufacture of precast concrete units. A framed structure of either concrete or steel with an in-situ concrete floor and profiled metal cladding to walls and roof would seem to be obvious. But what if the designer came up with the idea of mass masonry walls and a cladding of ashlar stone and the insitu concrete floor. Would this represent value for money? It would undoubtedly be much more expensive and the client would not be able to realise profitability as quickly as if he had spent less and built the framed, metal clad structure. But then again the client might consider the expensive building ‘value for money’ if he placed a value on having his factory looking like something more in keeping with a city centre office block or department store. How do you tell? The answer is simply to engage the client in dialogue on costs at an early stage in the whole design process.

2.2.6.2 Balanced expenditure

Which brings us nicely to getting the balance of expenditure correct across the whole building. In the last example we contrasted what would have been a modestly priced building with an expensive building. But suppose the client chose the framed building giving him a modestly priced structure and then decided that he did not like crinkly metal and wanted a stone facing. At this juncture, the quantity surveyor must present the costs of metal cladding and possible alternatives as unequivocally as possible. A range of cost options can be given for artificial through reconstructed to natural stone and in various formats from random rubble to ashlar. Such a presentation should then convince the client that the balance of the expenditure could be upset and not only that, the final budget figure could be in jeopardy.

2.2.6.3 Keeping to the budget

This is the prime reason for a modern cost control system.
If you were shopping and, in the course of that expedition, came across an item you wanted at a marked price of, say £5.00 and when you approached the sales assistant were told that price was really £15.00 it is fairly certain that you would first feel disappointed and then perhaps aggrieved and misled. Ponder then what a client might feel when the building he has eaten, drunk and slept with for a number of years suddenly costs him not just £10.00 more but tens of thousands of pounds more! His first reaction would be incredulity; his second would be suing the socks off his design team. The motto is quite clear: quote a figure to the client as the cost of the building work and that is the most he will expect to pay.

So the quantity surveyor has a lot hanging on his expertise with costs and needs to employ a technique that will negate the possibility of an overrun on the budget for the building works. To be able to use a cost control system properly, the quantity surveyor must have experience of costs from previous contract work. This will involve knowing the range of costs for similar buildings down to the detail of what the range of bill rates are for the more common forms of construction in a particular geographical area. The quantity surveyor must have a good knowledge of building construction and be up to date with the latest techniques and materials together with their relative costs. The surveyor must keep up to date with current affairs on the domestic and international front and be aware of how these can affect the costs of building materials, components and labour.

While the above seems a pretty tall order for one person it is not a matter of carrying all the facts in one’s memory but being aware of the effects of events, being aware that some things are more expensive, being aware of alternative techniques and materials and then being aware of where to find the cost information required to help with the decision making process. More succinctly, it’s not what you know it’s whether or not you know where to find it.
2.3 The Process of Cost Planning

The pre contract cost control process is parallel to the design process. It is convenient to compare the processes the quantity surveyor goes through with those of the architect and for that we need to refer to a chart from the Plan of Work published by the Royal Institution of British Architects shown in Figure 2.3.1. Against this chart we can plot the stages of work through which the quantity surveyor will work from start to finish of the whole cost control process.

As discussed previously the process can start by setting an overall cost estimate for the building. In elemental cost planning this involves comparison with a similar building or several similar buildings. The quantity surveyor needs to know the total area of the scheme, the function of the building, the location and the level of quality. These factors need to be adjusted to enable a meaningful comparison and hence a most realistic estimate as explained below.

2.3.1 The Function

It is natural to assume that when costing a school building the starting point would be the cost per square meter of a completed school building. We cannot derive the cost of a school from the cost of a hospital building. The function of a building would impose specific requirements that would have a direct impact on cost. A significant part of the cost of a hospital building for example would be allocated to electrical mechanical works necessary
for operation theatres and other equipment necessary for the hospital to function. Although this might be a separate element it would have a direct impact on other elements such as roofs, finishes and substructures which need to be designed to accommodate more complex MEP fittings. Additionally the function of a building dictates specific building regulations that have to be met. Following on with the example of the hospital, the nature of occupants requires more stringent accessibility requirements. This means the provision of lifts, ramps, wider corridors etc. These requirements are not limited to one element but can be spread across all the elements of the building. It is therefore difficult to isolate them. Some buildings of different nature may seem similar such as an office block and a residential high rise tower. Although the structural requirements may be similar but care must be takes because an office block is a public building that must follow stringent fire regulations. Again this would affect the width of staircases and the length of escape routes. In some cases the type of building dictates the structural requirements such as the case of exhibition centres or airports where large spans are required. Again this has a direct impact on cost as we shall see later in the module. When selecting a building from the data base the function must match.

2.3.2 Building size and quantity

The impact of quantity on the accuracy of the estimate was discussed earlier. The same principles apply in the case of elemental cost control. Although the process is based on deriving a cost per square meter the size of a building would have an impact on this cost. The cost per square meter of a one storey building differs from that of a high rise tower. Similarly buildings with a large span have a different cost than buildings with a shorter span. In terms of the costs of elements large buildings would result in the possibility of economies of scale that can reduce overall cost. For this reason care must be taken in to select a building of similar size from the data base.

2.3.3 Location

The impact of site conditions was discussed earlier. What we need to consider here is the impact of the wider location on building cost. A building constructed in London would certainly be more expensive than a building constructed in a small town in Scotland. This is because the cost of transport, labour, materials would all be higher in a larger city. Additionally the complexity of building within such high site constraints would result in increased costs. Indices in BCIS are used to deal with this issue. A cost index is allocated for each region within the UK and is used to eliminate the impact of diverse locations in cost. BCIS can calculate an index of cost which shows how construction costs vary from one geographical area to another. The index is prepared across all construction forms, types and
end use of building. The base is 1 and variations from region to region are expressed to one place of decimals above or below that base. The index is known as the *Location Factor*.

But BCIS index includes various locations in the UK and not other countries. In other parts of the world where there is no such index it is up to the quantity surveyor to modify the costs as required. Ideally in this case the quantity surveyor would rely on data from his own organisation for similar previous projects. If there is a need to rely on BCIS data then these would have to be adjusted to factor in the peculiarities of a particular region. Dubai for example is a tax free zone hence material and labour is much cheaper than the UK. The cost of material however depends on where it is manufactured. A building with a high percentage of steel coming from China would be much cheaper in Dubai than UK. A building with requirement for marble or granite cladding coming from Italy (a country within the EU) would be much more expensive than in the UK.

### 2.3.4 Time

Again this issue is related to the use of historical data from previous projects. We all know the impact of inflation on costs. The cost of any item today is very different from the cost of the same item 20, 10 or even 5 years ago. The cost of a building a few years ago is different from the cost of constructing the same building today. BCIS again provides for converting historical costs to today’s cost by using a time index which can be described as a statistical scale of how data has changed over a period of time. Points on the scale correspond to data from any one period of time. The period of time used in the BCIS data is quarter of a year. How an index is made up is explained in Ashworth, Chapter 7, together with a great deal of good advice on the use of indices. Any index has a start date or *base year*, a date to which all other numbers in the series can relate and a *base measurement*; in the cost indices used in BCIS, usually 100. So as inflation rises, the index number for each quarter will start to rise and if inflation goes down, the index number will fall – the reason that the indices do not start at zero! To construct an index requires a reasonable amount of data – statistically significant is the phrase used – and the BCIS certainly have that amount available even to the extent that they can provide a firm index up to about 3 – 4 quarters ago, a fairly good index to the present quarter and then a forecast or extrapolation of how they expect the index to behave over the next 2 – 3 years. This is required to predict the future costs of the building taking into account the duration of construction which can span several years after the date of preparing the first estimate. The indices prepared by BCIS are *weighted indices* and are normally current for about 10 – 12 years. A new base year is selected towards the end of that period and a new index constructed and the old and new run in parallel for about 2
years. The calculation is very basic arithmetic – a simple proportion exercise. To find current cost from data in the BCIS database:

\[
\frac{\text{Database cost} \times \text{Current index number}}{\text{Index number of database cost}}
\]

To forecast what that cost will be at the proposed tender date:

\[
\frac{\text{Current cost} \times \text{Index number at Tender date}}{\text{Current index number}}
\]

The BCIS indices are set taking into consideration the UK economy. Other countries will have different indices to project future costs. The quantity surveyor may take into consideration only the cost of inflation for example which is generally published by the government or the central bank. Alternatively some financial institutions would have their own indices and factors for each individual country. What is important is for the quantity surveyor to understand where he can get reliable data to reflect the true impact of time on cost.

2.3.5 Risk

A major part of cost planning is estimating the cost of a building and the cost of various elements within that building. The fact that we need to forecast costs that will happen in the future brings with it the reality that the future remains unknown to us. The process of construction is a highly complex process that relies on the decisions of a large number of people whose behaviour is unpredictable. For example we cannot predict what decisions the design team will make and how good their design will be. Construction is also influenced by a large number of external factors such as the weather, the economy, politics etc. Since we cannot predict with any amount of certainty what will happen in the future we have to find ways of dealing with these unknowns. We do this by including sums of money to cover the occurrence of events that can result in an increased cost – a contingency or insurance.

Three sums of money can be included in any cost plan for:

1. Price risk
2. Design risk
3. Contingencies.

2.3.5.1 Price Risk

We have already factored in the impact of inflation on prices through the time index. But there is also the chance that there will be certain events that can give rise to prices beyond inflation. These events are generally more political than purely economic. The Israeli-Arab wars of the 1960s and 1970s have affected the price of oil worldwide. A rise in the price of oil is known to result in an increase in the price of everything due to the costs of transportation spreading across the economy. A quantity surveyor in the UK maybe far and detached from
all this but he knowing that the west relies on middle eastern oil can give a good indication that prices may rise. Another example comes from 1970s the white led Government of Southern Rhodesia (now Zimbabwe and again suffering economic sanctions) was arguing with Britain about the enfranchisement of the native black population. Things got out of hand and Southern Rhodesia made a unilateral declaration of independence. Britain retaliated by bringing economic sanctions to bear and blockaded the country – no imports, no exports. Unfortunately one of her principle exports was copper ore and as Britain could no longer obtain that ore at favourable prices it was forced to buy ore from the world markets. This was in competition for a finite source of supply so naturally the price of copper rose. This had a drastic effect on the price of electrical cable and goods and on plumbing pipe and fittings. The amount allowed depends on how the views the risk of some national or international incident occurring. Only if he/she keeps abreast of current affairs in the political as well as the financial world can such an assessment be made. No one could have missed the global financial crisis that still leaves the world reeling from its effect. With a large number of projects abandoned worldwide and a lack of supply the price of material has actually reduced.

2.3.5.2 Design Risk
This reflects the chance that the client, architect or other professional will make a radical change to the design which would seriously affect the original cost limit. The amount for design risk would be based on the confidence we have on the design; or the possibility of cost increase due to changes to the design. The amount would depend on the several factors. First we need to consider the complexity of the building where we assume a highly complex building would be subject to design changes. This is logical since high complexity indicates that there may be issues that cannot be clarified without the presence of a detailed design. Additionally in case a new technology would also need to be considered because its impact cannot be known until the design is complete. The type of client should also be factored or more appropriately the confidence in the stability of the client’s requirements. If the quantity surveyor may sense that the client is likely to change his mind. In some cases the nature of the client’s business may indicate the possibility of change because they operate in a highly volatile market. Finally the design team itself maybe a source of design risk. A team that has a lot of experience designing similar types of building is less risky than a team that is new to the sector.

2.3.5.3 Contingency
Finally a sum needs to be included to take in all other possible risks that can result in the project costs increasing during the construction stage. This can be things such as site
conditions whereby the site is found to be contaminated and requires an expensive cleanup process or the nature of soil demands more costly foundations. Any delays during construction can increase project costs because the contractor would then need to put in extra hours to complete within time. Delay can also result in the contractor having to run the site for a longer period than anticipated resulting in increased costs. Finally it is not uncommon for the client to change his mind and require redesign to certain parts of the building. Setting a contingency sum to take care of all these risks is not an easy task and should not be taken lightly. A proper risk management exercise needs to take place in order to identify and analyse all the possible risks and their impact should they occur. Again the type of project, the confidence with which time, cost and quality levels were determined and the type of client would give an indication of the amount of risk that is involved. It has to be noted that the contractor when preparing his tender figure will factor in all these risks such that the client will end up paying for them. In fact one of the reasons for the tenders to come in much higher than the estimated budget is an understanding by contractors that there is a high degree of risk involved which they will require a premium for. It is therefore necessary for the quantity surveyor to factor in the appropriate contingency to reflect the riskiness of the project. The quantity surveyor might be tempted to maximise the amount of contingency to make sure that the final project cost remains within his budget. However we need to remember that the client will base his decision to sanction the building on the initial estimate. If the quantity surveyor unnecessarily inflates the costs then no project will be sanctioned. Risk management is not within the scope of this module but students need to understand that a properly structured risk management exercise needs to be taken to assess the amount of contingency that will be considered.

2.3.6 Amounts

It is usual to express the amount included for all three factors as a percentage of the first estimate. Price and design risk are usually lumped together as they only concern the design team at pre-tender planning stage. They are shown as a cost target in the initial cost plan. The sum can be used to cover deficiencies in other targets as the design develops and the risk is reduced. Contingencies are expressed as a percentage of the first estimate pre-tender and the sum is rounded and included as a sum of money in the bill of quantities (or other tender documentation) at tender stage.

At this stage the initial cost plan is ready with cost targets set for the various elements and an overall project cost that is approved by the client. It is important to identify all inclusions and exclusions such as professional fees, taxes, VAT etc so that the client is aware of what he is paying for. The cost plan however is a live document that is continually modified with
the developing design. As the design develops the quantity surveyor is adding in all new
details to include their impact on the cost. If the cost of any element exceeds the target then
the element can be redesigned to return to the original cost. Alternatively the cost can be
spread across other elements if possible or increase the overall cost with the agreement of
the client.

As the detailed design evolves the elemental cost plan develops into the bill of quantities. At
this stage the quantity surveyor will start to prepare the appropriate documentation to
commence the tendering process. If the cost plan was appropriate the tenders will come in
close to the overall cost limit and ideally lower. The tendering process will be discussed in
the next unit.

2.3.7 In summary

This section identified a number of unknowns whose affects the quantity surveyor must be
able to reduce or eliminate so improving the accuracy of the first estimate and also giving a
‘cushion’ against the worst affects of some.

1. Price and Design Risk: A percentage is added to the first estimate.
2. Contingencies: Although a post tender risk, a percentage is added at the cost
   planning stage.
3. Quantity and Quality: Effects can be reduced by basing the cost plan on a building as
   similar to the proposed one as possible.
4. Price Level: Use of BCIS Cost indices to bring historic prices up to date and then to
   forecast tender date price.
5. Location: Use of BCIS Location Factor to bring costs to a common level, usually the
   locality of the proposed building.

Self Test Questions

1. You are dealing with a design team led by an architect with the reputation of being a
   bit of a maverick. How do you ensure the integrity of your cost plan?
2. The time for taking in tenders is fast approaching and the client has asked the design
   team to incorporate an additional storey into the building. What do you do?
3. In the current environment how would the current financial crisis affect your cost
   plan?
4. A further 30 years reserves of oil and natural gas have been discovered in the
country where you live. What effect will this have on your cost plan?