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**COST CONTROL DURING THE CONSTRUCTION PHASE OF THE
BUILDING PROJECT:
- THE CONSULTANT QUANTITY SURVEYOR'S PERSPECTIVE.**

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Successful projects are those that are delivered safely to the required quality standards, on time, and within budget. The effective management of costs is a vital element in achieving these objectives. Clients rightly expect that the final cost of their projects should not exceed the approved budget, and indeed for some, cost certainty may be their main priority.

In 2015, Cunningham published a study entitled '*Cost Control during the Pre-Contract Stage of a Building Project – An Introduction*'¹ which discussed the process of controlling costs during the design stage of a 'traditionally' procured building project, prior to works commencement. This current study extends that investigation into the process of controlling costs during the **construction** phase of the project.

The underlying challenge in controlling costs stems from the fact that many clients have limited funds, and budgets are often set at the limit of what is affordable. Cost overruns during the construction phase may seriously over-extend the client financially, to the point where the project may not be finished to the expected standards, or may even have to be abandoned. Clients who have to pay more than they expected to are likely to be (very) disappointed; this is a poor outcome. Cost control must be focussed on preventing this from happening. Quantity surveyors (QS) are employed to manage the financial aspects of the construction process. This study investigates the challenges, approaches and techniques used by quantity surveyors to control costs during the construction phase of a traditionally procured building project.

Cost overruns

The primary aim of cost control is to prevent cost overruns.
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¹ Available at: <http://arrow.dit.ie/beschreoth/49/>

Cost overruns are commonplace on construction projects.

Construction projects are dynamic and risky ventures where outcomes are often uncertain. The industry is characterised by the construction of one-off bespoke buildings on sites whose conditions and constraints are highly variable. Each project involves unique design and construction challenges which are typically undertaken by temporary organisations assembled for the particular project; - lessons learned are difficult to capture in these environments. Projects often take a long time to complete and invariably there are tensions between the priorities regarding quality, time and cost. In addition, the construction market is highly cyclical with consequent pressures on resources (Department of Finance, 2008).

During the pre-contract phase of the project the QS is primarily concerned with ensuring that the emerging design remains within budget. This process largely focusses on monitoring the design team's proposals and advising the team on the various cost issues and problems as they arise. This can be a challenging task, and is one that continues into the construction phase. The task of controlling costs during the construction phase, however, takes on a whole new dimension with the entrance of the contractor. Contractors are commercial enterprises whose priority is to make a profit. In Ireland most building projects are procured using 'traditional' competitive tendering arrangements to appoint contractors. This approach has the effect of suppressing the profit margin contractors can charge in seeking to win the tender. Indeed, in recessionary periods, contractors may be driven to tender negative margins in order to generate cashflow and to secure scarce work. It is a given, that where 'a job is losing money' that the contractor will seek to recover their losses from the client by other means. Insolvency is a distinct possibility if they do not. Cost control in these situations can become a very demanding task.

Risks are inevitable and cannot be completely eliminated (Hughes, Champion and Murdoch, 2015). No matter how well the project has been planned, events *will* occur that complicate or change the basis on which the project was originally planned and priced. Many of these events will give rise to additional costs in completing the works. Ultimately, somebody pays for this. The employer typically pays for the additional costs incurred by the contractor which have been caused by the issue of certain types

of the contract administrator's instructions. The employer also pays if he/she or his/her consultants delay completion of the work and/or disrupt the contractor's progress. Additional costs resulting from 'excusable' events beyond the control of the parties lie where they fall and frequently both parties may suffer loss. Contractors must absorb the additional costs of difficulties occurring within the supply chain or from risks which have been allocated to them. When risk eventuates or uncertain events occur cost overruns are likely and may also delay completion of the project.

A companion paper '*What Causes Cost Overruns on Building Projects? - An Overview*' which investigates common causes of cost overruns has been prepared in conjunction with this study. In summary, it examines how the client's priorities and decisions regarding quality and the project duration can undermine cost certainty. The actions of the client's consultants are identified as key factors in either causing or preventing cost overruns. The building process, itself, is uncertain, particularly in relation to ground conditions. Large, complex and innovative construction projects containing a substantial element of specialist work are identified as those which are particularly prone to cost overruns. The study outlines the impact of procurement decisions on cost certainty, noting, in particular, the likely difficulties to arise if the contractor under-prices the work. Incomplete / poor design and poor tender documentation are identified as serious procedural failures which typically result in excessive requirements for variations. Similarly, failure to provide adequate cover for possible problems, inflation, and market factors may also lead to overruns. Poor performance of management tasks, administrative duties, and slow decision making were also discussed in the context of creating difficulties in controlling costs.

Cost overruns reduce the effectiveness of investments and require additional finance to be raised. On public works contracts cost overruns divert funds from other projects, creating negative knock-on effects in the wider economy. In the private sector the additional funding must be sourced from reserves or borrowed. In contracting organisations, poor cost performance reduces or eliminates profit margins. In extreme cases this may lead to project or company failure (Hongtao, 2014). Cost overruns, therefore *are* a major problem among construction clients, project managers and construction companies alike. They cause disputes, frustrate project objectives, and

strain ongoing business relations. Preventing cost overruns, therefore, is a key objective during the execution of construction projects.

Cost Control during the Construction Phase

'The focus of cost control must be balanced with the importance of value in terms of what is being provided for a client' (Ashworth and Hogg, 2007, p.121).

For the purposes of this study, cost control is considered to apply to the stage after the contract has been awarded to carry out the building work. The emphasis is on the cost control function from the consultant quantity surveyor's perspective. Avoiding cost overruns requires an effective plan which recognises the sources of common construction related problems and exploits the ability of the quantity surveyor to effectively manage them.

March (2009) refers to Pareto's Law which he summarises as: *'In any series of elements to be controlled, a selected small fraction of items in terms of number of elements almost always accounts for a large fraction in terms of effect.'* March claims that the principle indicates that *'20 per cent of your decisions will affect 80 per cent of your business.'* The so-called 80:20 rule applied to construction suggests that 80 per cent of construction costs is related to 20 per cent of its content; with the remaining 80 per cent of the content relating to only 20 per cent of the cost. The principle implies that it is unproductive to spend an equal amount of time controlling each element, and that emphasis should be concentrated on controlling the key elements. Figure 1 illustrates this point.

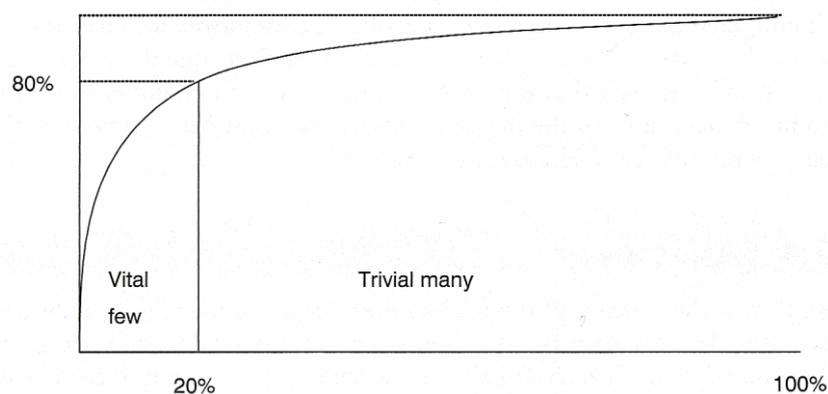


Figure 1 Pareto's Law – Source March (2013) p. 204

March comments that overly complex cost-control systems may result in situations where the cost of controlling costs becomes disproportionate to the benefit derived. He recommends that it is better to concentrate on the key elements.

Many of the principles and techniques used by quantity surveyors to control costs during the design phase are equally applicable during the construction stage of the project. These are examined in the following discussion.

The Control Cycle

‘Our goals can only be reached through a vehicle of a plan, in which we must fervently believe, and upon which we must vigorously act. There is no other route to success’. - Pablo Picasso

The objective of a plan is to set out an individual’s or a company’s goals and to design the means by which these goals can be best achieved. Carlidge (2017 p.47) comments that *‘planning is only half of the story and once a project commences on site there is a need to control cost targets ... to ensure that costs do not spiral out of control.’* When the plan is implemented it is essential to monitor actual performance against the plan and react swiftly when variances are observed so that effective control measures are taken in order to restore the plan’s position and objectives. Cooke and Williams (2009) illustrate the control cycle in Figure 2

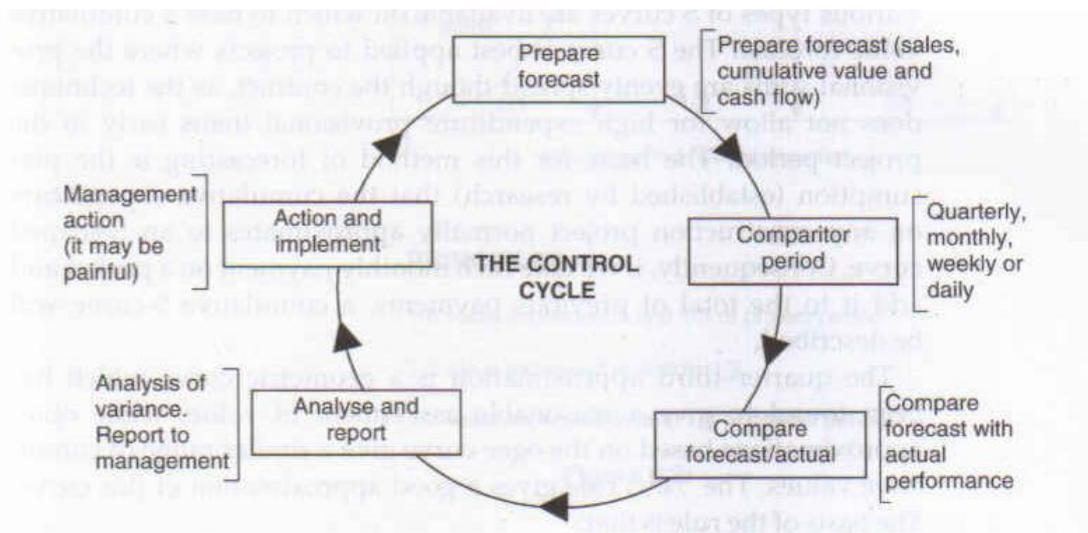


Figure 2 Stages in Controlling a Budget (Cooke and Williams, 2009)

In the quantity surveying context, the cost control process involves ensuring that the budget is not exceeded without prior client approval. In this context, the budget is the contract sum plus the contingency sum. The contract sum on substantial projects is often broken down in a priced bill of quantities, which in turn is related back to the original cost plan. Contingency sums are also often related back to the cost plan, but on many occasions the contingency is not made known to the contractor and remains confidential to the client, architect and quantity surveyor.

Actual progress is monitored, measured and regularly compared to the cost plan and cash flow forecasts. The intervals between interim (monthly) payments forms a convenient comparator period for this process. The contractors' payment applications provide quantity surveyors with detailed feedback about the evolving position of variable aspects of the account. Analyses of variances within PC (prime cost) sums, provisional sums, variations and claims may reveal that corrective action is required to maintain budgetary control. The QS reports the current budgetary position and anticipated final account to the client and design team usually on a monthly basis. The client's reaction to bad news may be 'uncomfortable' for those involved.

Budgetary Control

The 'generic' cost control procedures employed during the pre-contract phase of the project are continued following the commencement of the works. Figure 3 below illustrates these procedures. The basic premise is that the contract sum establishes the limit within which the project must be completed and this should not be exceeded without the client's approval. Post contract proposals which would cause the contract sum to be exceeded should be rejected under the principle of restraint - 'don't touch what you can't afford.' If the client insists on including the proposal then either additional money must be made available, or savings must be found from elsewhere in the project. Ideally savings can be made within the particular element involved - a 'robbing Peter to pay Paul' approach. Similar actions may be necessary to control the other cost variables within the final account: viz. prime cost sums; provisional sums; variations and/or contractors claims for additional reimbursement. A cost review or 'back to the drawing board' action is usually successful in solving many situations. Major cost overruns, however, often cause serious problems, - 'nightmare' scenarios

may force the client to abandon the project which, in the context of that particular project, is disastrous for everybody involved.

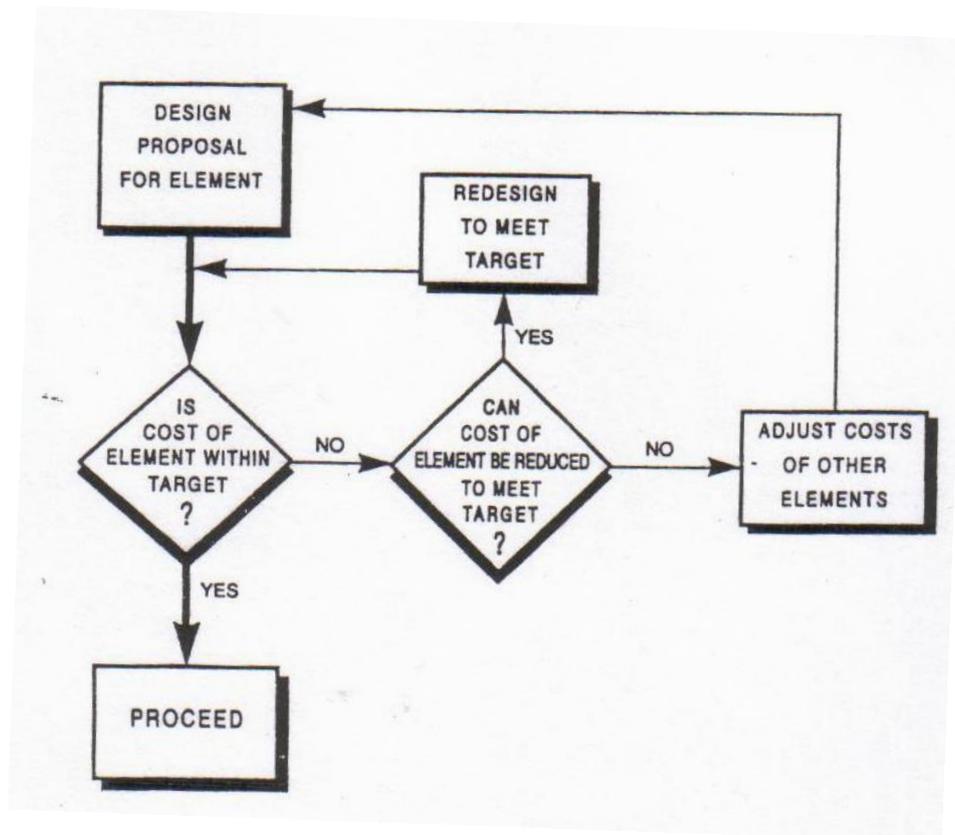


Figure 3 Budgetary Control on Building Projects (Source ERU, 1993)

Controlling the Variables within the Account

Seeley (1996 p.197) describes the function of the QS following work commencement on site as one of ‘*project financial control.*’ He stresses the importance of ensuring that ‘variations, claims or extras do not raise the likely final account figure above the cost limit.’ He also indicates the need to *monitor the effect of variations and these should, ideally, be costed by the QS before they are issued.*

The reliability of the contract sum typically reflects the degree to which the design process has been finalised at tender or contract award stage. Ideally, the designs will have been comprehensively developed and, will have been fully and accurately documented in a bill of quantities measured in accordance with ARM4 (2009). If this is the case, the client can be reasonably confident that the final account should not differ

significantly from the contract sum. Nevertheless, as noted above, events *will* change matters, and these complications often lead to additional costs. The devil is in the detail.

Ideally, the project quantity surveyor will have been heavily involved in the compilation of the tender documentation, and in particular, the production of the bill of quantities. Seeley (1996) comments that the QS must, in any event, have familiarised him/herself with the project and ‘*scrutinised the priced bills, schedules of basic rates, insurances and other relevant documents.*’ This exercise may reveal areas which have been over provided for. It is quite possible that where the design information was incomplete, that the QS may have made conservative assumptions or taken a cautious approach in measuring ‘vague’ or non-existent details. In this regard Brownlee (2005) noted that cost *underruns* occurred on Irish public sector projects where ‘*the tender documentation took [a] worst case scenario*’ and where a ‘*unique and unfamiliar form of construction [was] seriously over-estimated.*’

It is worthwhile noting, however, that neither the RIAI ‘Yellow’ (Royal Institute of the Architects of Ireland, 2012) nor the PW-CF1 (Office of Government Procurement, 2016) Forms of Contract are **not** re-measurable *per se*. ARM4 however, provides that where works cannot be defined in advance that such works shall be covered by a *provisional sum* or, alternatively, be included as *provisionally measured work*, whose quantum is established on completion of the work on site. Incorrect quantities under the ‘Yellow’ Form constitute a discrepancy between the contract documents and such discrepancies, if discovered, are corrected by means of an Architect’s Instruction. Over-measured quantities are also covered by this rule, however, it may be embarrassing for the QS to seek an instruction to correct these, particularly if the contractor claims to have discovered the discrepancy while pricing the bill, and has used the excess to discount the tender price. Savings may be difficult to negotiate in these instances. Undefined work, should therefore, always be identified as *provisional*. It should be noted in this regard that the Public Works Contracts do not permit the use of provisional sums or quantities.

Quantity surveyors often organise final accounts into the following headings for cost control purposes.

Prime Cost Sums

A number of disadvantages associated nominated sub-contractors can be reduced or avoided by including procedures which enable these subcontracts to be arranged on a domestic basis.

Prime cost (PC) sums may be used under the RIAI Forms of Contract to appoint specialist subcontractors and suppliers, selected by the architect, but who are employed by the contractor. The use of PC sums has gained a reputation for being difficult to control and the area is often identified as one in which cost overruns are likely to occur. The use of PC Sums is not permitted under the Public Works Contract Forms.

Ideally, the amounts included as PC Sums in the bill of quantities will have been based on reliable budget estimates provided by specialist subcontractors to the QS or the relevant design consultant. The specialist subcontract appointments should ideally be finalised at contract award stage. Occasionally, however, a number of nominated subcontractor appointments will remain to be made during the construction phase.

Tenders for nominated subcontract packages are frequently procured on a drawings and specification basis. In these instances, the QS will be keen to ensure that the designs and specifications for the works packages are comprehensively developed before tenders are sought in order to minimise the level of variations during construction. The QS should prepare a detailed contract sum analysis (ideally a 'mini bill' of quantities which includes the main contract preliminaries) in order to facilitate the evaluation of the tenders and to form a detailed basis for valuing work in progress and variations should they be required. Tenders should be sought from a minimum of three specialists. The use of provisional sums should be avoided, if at all possible, within these packages.

Design-build arrangements may also be appropriate for specialist packages. This approach provides for competition in both the design and the pricing aspects of the package, and often delivers economic capital cost solutions. The approach is also identified with strong cost certainty as the contractor must finalise the design within the quoted price (i.e. design to cost). However, the approach requires fully developed employer's requirements in order to brief the contractor. Should the client subsequently seek to change the contractor's proposals the resulting variations are likely to cost (significantly) more than would be the case under traditionally procured projects.

The QS may also be involved in selecting a panel of subcontractors to tender for the outstanding works packages. The QS will be concerned that competent sub-contractors who are willing and able to carry out the work are selected. This input may help to secure a keen price for the package.

The control of specialist areas, in theory at least, is no different to controlling other 'architectural' aspects of the building with which the quantity surveyor is familiar. The effective control of specialist work, by its nature however, requires the QS to possess a working knowledge of the particular specialist technology, the experience to recognise economic alternative design solutions, the skills to document the work accurately, the awareness of what comparable work should cost, and the expertise to advise the client and architect as to how best to procure the work. Detailed cost databases are vitally important in this process. Larger quantity surveying practices may possess sufficient resources to deploy specialist quantity surveyors to control specialist elements. What is essential, in any event, is that the QS develops a close working relationship with the consultant responsible for the design of the particular specialist work in order to capitalise on the differing strengths and abilities each can contribute to the cost control process.

The recent Office of Government Procurement mandate requiring the use of full bills of quantities and overall cost control on public sector building projects is widely seen as a driver for quantity surveyors to acquire further specialist cost control skills, particularly in the areas of mechanical and electrical engineering systems.

In many cases it may be prudent to advise the client to retain a particular contingency to cover the final detailing and integration of the specialist work into the overall design. The level of such contingency should reflect the extent of the outstanding design development and may be based on the differences between cost plan budgets and accepted tenders for the specialist works. Caution should be advised where tenders for nominated subcontract work packages are received which are noticeably lower than the prime cost provision.

Provisional Sums

“A sum provided for work or for costs which cannot be entirely foreseen, defined or detailed at the time the tendering documents are issued.” (ARM4 2009).

The extensive use of provisional sums can be largely avoided by finalising the detailed design in advance of commencing the work.

Provisional sums are often used on fast-track design programmes and are also used to provide contingency sums to cover situations where additional or unforeseen work may be required. Provisional sums are adjustable in final accounts, and if the cost of the work exceeds the amount provided, the excess will be added to the contract sum. The QS will be concerned, therefore, that the amounts included in the bill of quantities for the various provisional sums will be sufficient to cover the cost of the particular work.

The valuation of provisional sums, where not otherwise agreed, are settled in accordance with conditions of the particular contract. In the RIAI ‘Yellow’ Form of Contract, these are set out at Clause 13 *Ascertainment of Prices for Variations*. Payment for work covered by provisional sums is often claimed by contractors on a cost reimbursement basis (dayworks) basis. This approach is viewed by many consultants as being open to abuse. Keane (2001) comments that daywork accounts are not popular with architects because of the difficulty of verifying the correct amounts, particularly in relation to hours worked. There is also little incentive for contractors to be efficient when carrying out dayworks. The RICS (2010) advise that the approach should be restricted to short duration, limited scope activities. They recommend that dayworks should only be used as a last resort and warn that *‘care should be taken that a daywork valuation is not covering the payment of resources that are already being recovered via the valuation of other variations or loss and expense.’*

Hughes *et al.* (2015) point out that a decision as to whether or not dayworks should be used to value work is made by the architect (usually advised by the QS). It is not for the contractor to insist on valuation by dayworks. Cartlidge (2017) comments that as dayworks *‘has distinct advantages for the contractor, the recording and monitoring of dayworks must be strictly controlled.’*

Standard forms of contract set out procedures regarding the operation and valuation of daywork claims and the QS must ensure that these are strictly observed. The procedures typically require contractors to produce 'vouchers', more widely known as daywork sheets, specifying the time spent on the work, the names of the workers employed on it, and details of the plant and materials used. All of these vouchers should be given to the architect promptly after the work is executed. Where a clerk of works is employed he/she would usually agree these with the contractor and should then sign and submit them to the architect. The QS must ensure that the work claimed for is covered by an Architect's Instruction and must carefully check the sheets are correctly completed and duly signed. Each sheet should be checked to verify that:-

- The labour hours, material and plant are reasonable for the work executed.
- The rates included are correct.
- The calculations are arithmetically correct.
- The sheets are duly signed.
- The full description of the works is entered and referenced to an Instruction.
- All parts of the sheets are fully completed e.g. operatives names, trade, plant are adequately described etc.

It should be noted that a daywork sheet is merely a record of the resources used to carry out the works. It does not represent an Architect's Instruction, nor does it imply that the works will be reimbursed on a dayworks basis. The QS may dispute a contractor's claim to value the works in this manner where in his/her opinion rates in bills of quantities can be fairly applied or adapted to reflect the particular circumstances.

Provisional Quantities

These are a variant on the provisional sum where the kind of work is known but the extent is not. Provisional quantities are widely used and are often viewed as a more effective alternative to provisional sums. They are, in effect, quantified provisional sums. They are widely used in substructure and repair work for example dealing with

poor ground loadbearing conditions, breaking out rock, removing contaminated ground, or replacing areas of defective plaster. Such works are measured on completion and valued at the rates tendered by the contractor.

The QS should ensure that provisionally measured work and the expenditure of provisional sums is kept fully up to date. The quantity surveyor is responsible for measuring provisional work promptly, and this must be done before it is covered up. The contractor must also be given the opportunity to witness and verify these measurements. The agreed site measurements should then be promptly signed off with the contractor's QS.

Variations

'If the cost control is to be effective, then any changes that might affect the contract should be costed prior to instructions being issued to the contractor. Ashworth and Hogg (2007 p.127)

Changes are inevitable on site due to the nature of the construction process. Therefore, both the RIAI and Public Works Contracts provide for the issuing of variations and change orders. Variations, however, compromise the cost and time certainty of the project, and in compiling the tender and contract documentation the QS will have encouraged the design team to complete the design as fully as is possible in the particular circumstances. The QS as part of a post tender analysis will also have endeavoured to discover and rectify any discrepancies between the contract documents, discrepancies with statutory requirements, and errors and omissions in the bills of quantities.

The extent to which variations are needed during construction depends largely on the degree to which the design has been finalised. The QS will be concerned that the outstanding design is completed as soon as possible. In this regard, Hongtao (2014) quotes a QS: *'if all the changes are made at the start of the project then we can usually cope and deal with them [the variations].'* In particular, the QS will seek to prevent situations where a large number of, or conflicting variations are issued in quick succession. Hongtao comments that these situations have the capacity to seriously

complicate matters on site and delay and disrupt the contractors work programme and consequently *'all kinds of difficulties can be expected'*.

The early resolution of costs arising from variations (and potential variations), therefore, is a key element in managing this aspect of the account. Cost control is best maintained where the QS is able to agree the cost of the variation *before* the work is carried out. The wording *'unless previously or otherwise agreed.'* in Clause 13 of the RIAI Form permits the advance agreement of the cost of variations.

Section 10 of the Public Works Contract is particularly emphatic on the need for early cost information regarding potential variations. Section 10.4 entitles the employer's representative to require the contractor to submit a detailed quotation for a change order. If the employer's representative agrees to the contractor's proposal, a formal change order will be issued and contract sum will be adjusted accordingly. If the employer's representative rejects the contractor's proposal, the change order may still be instructed but will be valued in accordance with the contract's valuation rules. In this event Section 10.3 requires the contractor to promptly notify the employer's representative of any claim for any adjustment to the contract sum and supply further (full) details within 20 working days. Failure to provide such notice extinguishes the contractor's entitlement to claim an adjustment of the contract sum.

Potts (2008) comments that the approach of agreeing variations in advance is advantageous in that: *'the final commitment, including disruption and extended time, is known prior to the instruction and the majority of risk is transferred to the contractor.'* He adds that contractors also benefit from this certainty, provided the quotation is adequate to cover the likely costs. Regardless of these benefits, the QS must nevertheless assess whether the contractor's valuation of the variation is reasonable and offers value for money. Quotations sought in this manner are not procured through competition and these is the danger that will be 'inflated' as a result. Similar criticisms may be made where a haste to progress the work results in inadequate critical attention being paid to the valuation.

The QS should value variations as soon as possible in accordance with the conditions of the particular contract. Delays in dealing with changes frequently causes greater problems at a later stage. The QS must also ensure that verbal instructions are confirmed

in writing by the Architect as soon as possible. Keane (2001) comments that nothing causes more trouble during the final stages of a contract than alleged or unconfirmed variations instructed ‘*several months or even years*’ previously. A schedule of variations should be maintained which summarises the evaluation of Architect’s Instructions, with a log of unconfirmed variations kept separately. Anticipated variations should also be taken into consideration. It is better to have an estimate of expenditure for a particular unconfirmed or likely item in a Cost Report than no allowance at all.

Fluctuations

Fluctuations relate to the increased / decreased costs of labour and materials arising after the submission of the contractor’s tender. On private sector construction projects this inflation risk, is usually the subject of post-tender negotiations and is nearly always bought out. The Public Works Contracts on the other hand, are fixed price for a period of 36 months. In effect this means that even very large projects will be covered by this provision, and that inflation will only be adjusted on exceptionally large building projects or in the unlikely event of hyperinflation.

Claims for delay and disruption.

Us and Them

Contractors’ claims may be described as requests for the reimbursement of additional costs resulting from certain employer or employer’s agents’ acts, which delay or disrupt the contractor’s progress, and which otherwise would not be recoverable under the contract. They typically arise due to the contract administrators’ instructions, late information, postponement, employer interference and/or other employer’s default. Claims are an almost inevitable consequence where construction projects are procured through competitive tendering procedures based on less than perfect tender documentation.

The settlement of contractor’s claims is often viewed as perhaps the most contentious aspect of the cost management process. The negotiations often exhibit an ‘edge’ as the particulars typically relate to contractors arguing that they have been prevented from

working as originally planned because the employer or the employer's agents did not do what they were supposed to do. The consequence of this is that the work took longer to complete than planned, and, of course, that time is money. Clients, quite naturally, will want to know why they are paying for 'a waste of time', and it is quite likely that counterarguments from the employer and the design team may adopt a 'defensive' stance.

The QS in the first instance will endeavour to prevent the causes of claims from developing, and should attempt to persuade the design team to complete all outstanding design issues and appointments as a matter of urgency, in order to limit or avoid requests for information being sought by the contractor. This process will also expedite the instruction of variations and change orders at an early stage of the contract. Clients must be also advised of their duty to grant the contractor possession of the site and be reminded of their contractual and statutory obligations and duties, particularly those relating to payment to the contractor. Again, prompt and early attention to issues is a vital ingredient in mitigating the potential negative impacts of emerging problems on site.

The QS must be satisfied that the contractor's claim is **valid**. The assumption here, is that the contractor will pursue a 'contractual claim' rather than a claim for damages at common law. Contractual claims must be based on the conditions contained in the particular contract. On private sector projects, for example, the RIAI Contract provides that contractors to be reimbursed for loss and expense where the employer or employer's agents: delay the contractor from completing on time (a prolongation claim), or reduce the productivity levels being achieved by the contractor (a disruption claim). Contractors' contractual claims also arise from: compliance with Architects' Instructions issued under Clause 2, or where the employer fails to provide possession of the site under Clause 28, or where '*any act or default of the Employer delays progress of the Works*' under Clause 29b.

The Public Works Contracts emphasise cost certainty from the outset. Article 4 of the Articles of Agreement states that the contract sum will not be adjusted unless a 'Compensation Event' occurs. These are listed in the schedules to the contract and are identified in Table 1 below. A number of Compensation Events listed on the right side

of the Table may be transferred to the contractor if the employer considers that there is sufficient information contained in the Works Requirements to allow these to risks to be priced by the Contractor. The QS may have an input in advising the employer in making this decision.

Compensation Events	Optional Compensation Events
Change orders	Unforeseeable archaeological finds
Opening up of non-defective works	Unforeseeable ground conditions
Employer suspends the work	Unforeseeable utilities in the ground
Contractor suspends the work	Delays caused by utility providers
Incorrect setting out information	
Early partial possession by Employer	
Late instructions	
Delay relating to providing possession.	
Delay relating to providing a Work Item.	
Interference by Employer's Personnel.	
Rectifying damage due to excluded risks	
Employer's breach of contract	
Incorrect quantities over €500	

Table 1 – Compensation Events under the Public Works Contracts.

It should be note that claims for reimbursement of costs arising from the occurrence of a Compensation Event(s) are subject to the provisions of Clause 10 which requires the contractor to notify the employer's representative of all claims within a 20 day period. Failure to observe this deadline will result in the contractor losing its right to compensation.

Perhaps the most difficult aspect of settling claims involves the financial evaluation of the claim. The Royal Institution of Chartered Surveyors (RICS, 2001) comment that it

is the quantity surveyor's responsibility is to '*determine a proper ascertainment in accordance with the conditions of contract and the circumstances that have prevailed.*' They note that while contractors 'press hard' and sometimes overstate their cases, that the quantity surveyor must not be seen as '*being at the other end of a tug-of-war rope to the contractor*' in an attempt to minimise the reimbursement of such claims. The surveyor, as an official of the contract, must act in a fair manner to both sides and avoid the perhaps natural instinct to minimise fellow design team members' shortcomings.

The evaluation of prolongation and disruption claims is not straightforward. Prolongation claims are sometimes initially claimed on the basis of adjusted preliminaries costs entered in the bill of quantities. This approach is rarely valid, or accurate, and the QS may require the contractor to provide a full itemised breakdown and explanation of how the delay costs were incurred. Disruption claims are even more challenging to resolve as this evaluation relates to the impact of the delay on the *actual* productivity of the contractor's workforce rather than the *planned* productivity which formed the basis of the contractor's tender. The potential for disputes in resolving these claims is clear.

The Public Works Contract, however, has introduced provisions to simplify the resolution of compensation claims. The Programme Contingency relates not only to Delay Events but also applies to Compensation Events. This float period covers delay costs resulting from the occurrence of one or more of the Compensation Events. This measure reduces the employer's exposure to additional costs arising from schedule delays for which the employer is responsible. The contractor only becomes entitled to '*expenses unavoidably incurred*' during a period of delay after the first threshold of the contingency has been exhausted. During the second threshold the contractor will be entitled to be paid half of their expenses. After the second threshold is exhausted the contractor is paid their full expenses. The contract, however also provides an option that allows these delay costs to be valued at the rates submitted by the contractors as part of their tenders. The PWC contract does not provide for the recovery of disruption or loss of productivity costs.

Again, the QS will aim to evaluate the contractor's claims promptly; a task which involves checking and verifying the accuracy of the contractor's claim. In order to

perform this task the QS must be in possession of the facts of what occurred on site. Contemporaneous site records are vital in this regard and include: site diaries; properly dated photographs; minutes of site meetings; the up-to-date as-built programme; correspondence, and daily labour, plant and staffing records. The clerk of works or resident architect may be able to provide such information. Very few situations in life are entirely black or white, and in most cases some compromise will be reached by the parties in resolving these claims. The parties should be mindful that where a claim is not resolved it is likely to become a dispute and these rarely produce satisfactory outcomes, - even for the 'winning' party. It may be diplomatic therefore for the QS to exercise a degree of flexibility where it appears that little progress is being achieved in resolving the claim.

The Contingency Sum

The construction process is uncertain and the client should retain an adequate and realistic contingency to cover unforeseen events. The level of the contingency should reflect the nature of the project. So, for example, 'green field sites' are less risky than refurbishment projects. It should be noted that the purpose of the contingency sum is to provide cover for the cost of general or unlikely risks. It is not intended to cover miscalculations by the design team or further design development during the construction phase.

The State has set a target that cost overruns should not exceed 1 to 2% of the contract sum. This is an ambitious target. The *Report on the Review of the Performance of the Public Works Contract*, (2014) found that the final accounts for some 532 building contracts were agreed at an average of 4.8% above the contract sum (GCCC 2014, Table 11).

Total Building and Civil Engineering Initial Contract Price €		Total Building and Civil Engineering Final Outturn Cost €	
1,216,180,902		1,305,087,592	
7.31% Increase			
Building Contracts		Civil Engineering Contracts	
Initial Contract Price €	Final outturn cost €	Initial Contract Price €	Final outturn cost €
354,483,581	371,388,716	861,697,321	933,698,876
4.8% Increase		8.4% Increase	

Table 11. Contract Price Compared to Outturn Cost for 532 Sample Projects

Given the emphasis that the State places on the provision of a full design in order to generate high levels of cost certainty, it would appear that private (and indeed public sector clients) should regard a 5% contingency as realistic. Larger, more complex, innovative, and refurbishment projects are likely to require a higher contingency than this. As the project proceeds the level of the retained contingency may be reduced as more reliable information becomes available and accounts are signed off. The margin of error regarding the anticipated final account becomes progressively more accurate as the project draws nearer to completion.

The Role of the Quantity Surveyor

Costs must be managed rather than monitored.

Hongtao (2014) investigated various actions and techniques used by quantity surveyors to prevent cost overruns on Irish construction projects. He surveyed the opinions of 55 construction professionals representing a broad range of professional groupings. His respondents ranked the effectiveness of various actions which may be performed by the QS to prevent cost overruns. These actions were rated on a scale of 1 to 3, where 3 was very important, 2 important, and 1 was less important. His results are set out in the following Table 2.

Factor	Very Important	Important	Less Important	Weighting ex 3
Review and checking the accuracy of the bill of quantities and tender documents.	15	38	2	2.24
Accuracy of the building cost estimates.	14	35	6	2.15
Dealing with variations.	15	32	8	2.13
Providing a realistic contingency to cover risks.	13	34	8	2.09
Controlling costs throughout the projects.	16	25	14	2.04
Experienced personnel to run the contract.	10	25	20	1.82
Carry out value management procedures.	2	25	28	1.58

Table 2 Techniques and activities carried out by quantity surveyors to prevent cost overruns: (adapted from Hongtao, 2014)

Hongtao (2014) considered factors with a mean score greater to or equal to two to be important. By his measure, the top five factors (shaded) were considered important and the remaining two factors to be less important. His respondents considered that the reviewing of the accuracy of the tender documentation to be the most important factor in preventing cost overruns.

Controlling the Consultants

The QS needs to maintain the financial discipline within the Design Team

Advising the architect and consultants is a crucial yet diplomatic activity.

Effective cost control involves ensuring that design decisions are made within the overall budgetary constraints – i.e. the contract sum. The QS assumes the financial leadership of the design team and is responsible for ensuring that financial discipline is maintained throughout the design team. The *Code of Project Management* (Chartered Institute of Building, 2002) states that ‘*it is important that the project team is aware that no member of the team has the authority to increase costs on its section or element of the work.*’ Outstanding design development therefore must be carried out within the particular consultant’s own budget allocation. It is important that the individual

designers are aware of the cost targets for their work and continue to work within these limits, and that they do not inadvertently proceed with design proposals which exceeds their budgets. This task may require some tact, as costs may not be the main priority of particular designers. Designers instinctively, and by their training, seek to develop the best possible solutions. Design development often remains on-going during the construction phase and there is a continuing desire to improve the product. The risk of cost escalation during this process is clear therefore.

It must, however, be emphasised that **design is not the remit of the quantity surveyor** and the QS (unless acting in the role of the project manager) has no veto over design decisions. The QS must, nevertheless, react promptly to developments and provide the necessary information in good time in order to enable designers to develop solutions within budget.

Awareness of Change

What's Going On?

The QS must be aware of what is going on around him/her. The QS typically maintains an up-to-date drawing register and checks drawing revisions against the contract drawings and specifications in order to identify potential cost issues. Ideally such revisions will have been discussed with the architect or other consultants before the drawings are issued. The QS will also work closely with the other design team members to become aware of whether they are considering changing their designs. This activity allows the QS to evaluate and comment upon the overall cost, quality and programme implications of the proposals before variations are issued. The valuation of envisaged variations may initially be based on approximate measurements and notional lump sums. So, it is important to update these estimates as detailed measurements and records become available.

The QS should review all correspondence and minutes to identify the potential cost issues. He/she should also be aware of what is happening on site in order to detect undocumented or unconfirmed variations. The QS should also take full advantage of communication opportunities with client's representatives on site. The clerk of works, where employed, and resident architects and/or engineers are particularly valuable

sources of information regarding progress, developments, and issues encountered on site. Developing a good working relationship with the contractor's surveyor is also very worthwhile in order to identify and agree contractors' issues and changes at the earliest opportunity. The QS should make use of the time following site meetings to further ongoing account negotiations with the contractor's surveyor. It is good practice to sign off elements of the final account promptly in a process sometimes referred to as a 'rolling' final account.

The Importance of Communication

A pro-active cost management approach is essential

The QS should adopt a proactive approach towards cost control rather than adopting a monitoring role and allowing the costs to emerge in an uncontrolled manner. There is little point in having the necessary information to prevent cost overruns if this is not communicated to the designers concerned. Recommendations and cost advice must be communicated to the design team and client in a timely manner. Early advice based on incomplete information is much better than late advice based on full information. The QS is a team player and must lead and direct the design team effectively regarding cost issues. He/she must ensure that a lack of awareness of the importance of cost does not develop within the design team. Particular attention should be paid to specialist areas of cost control such as the mechanical and electrical services design. By working closely with specialist members of the design team the QS should become aware of potential budget overruns at an early stage, making effective corrective action much easier to implement.

Day-to-day communication is conducted through the normal channels of personal contact, phone, e-mail, and posted correspondence. However formal communication channels are also necessary in order to disseminate cost information to the various project participants through meetings and cost reports. The communication process is a two way process and the QS must keep up-to-date with the correspondence and minutes in order to identify any developing cost issues.

Meetings

The AQUA Group (Hackett, Robinson and Statham, 2007) comment that site meetings *'keep people up to the mark and impart a sense of urgency which is difficult in day-to-day correspondence.'* Regular site meetings are held during the construction period. Site meetings provide a forum for 'round table' discussions regarding developments on site and provide the QS the opportunity to update the cost situation and provide the design team with the necessary information to make effective decisions. The meeting typically involves the QS presenting a review of the financial progress and status of the project, which is recorded in the minutes. Meetings also present an opportunity for the QS to gather further information from the design and construction teams.

The QS should, however, be careful of situations where clients or the design team ask for 'on the spot estimates' for alternative design options or where a major design issue arises. 'Off the cuff' advice in these situations may prove to be seriously inadequate when the full design implications are investigated and the eventual proposals are produced. Over optimism, similarly, must be guarded against.

Cost Reports

The client and the design team should be advised on a regular basis of the current financial situation on the project and what the anticipated final account figure is. To this end, the QS produces cost reports, typically at monthly intervals, and these are usually issued alongside interim valuations. A special report may also be warranted if a major cost issue arises. The reports are circulated to the client, contract administrator and often to the other design team members. Where a cost report indicates significant cost increases, the QS should propose possible solutions to mitigate or eliminate the particular overrun.

The process of reporting regularly to the client is, in itself, a driver for effective cost control and the maintenance of financial discipline on a project. The process requires the QS to find out what the current financial position is from the various design team members and to question the reasons for any variances from the cost plan. Reporting, therefore, brings matters to a head and forces the design team to address the various cost issues at hand.

Cash Flow Monitoring

The QS typically prepares a cash flow forecast based on the contractors programme in order to advise clients of their likely outgoings during the construction period. The cash flow profile typically takes the form of an ‘S’ curve which becomes a useful aid in identifying cost variances. Updated cash-flow profiles enables the actual level of expenditure to be compared with the planned (forecasted) expenditure. Variances between the two profiles can be readily identified and these indicate whether or not the project is running according to plan. Variance analysis often indicates that project is either taking longer, or costing more to complete. The cause for the variance should be investigated in order to identify the source of the problem and to take appropriate action to correct it.

Value Management / Engineering

‘Anything which gives client better value for money.’ (Janssens 1993)

As is somewhat evident from the above discussion, the risk of experiencing a cost overrun on a building project is highly probable. Where this occurs, and further funding is not available, the client and the design team are typically faced with the dilemma of ‘what do we have to leave out’. Worst case scenarios are characterised by project grinding to a halt. Traditional approaches to these situations often featured the QS presenting a list of cost saving measures (cuts) typically in the finishings, equipment and siteworks elements of the project. As noted above this is a poor remedy which results in an unbalanced project outcome. Poorly finished buildings rarely delight anybody and retrofitting if/when further fund become available tends to be uneconomic.

Value management / engineer processes may be worthwhile *whether or not* a project is experiencing cost difficulties. Value Management may be described as a search for improvements through a structured examination of every aspect to of the project in order to reduce capital; running or maintenance costs. The objective is to design better layouts, function, aesthetics, and deliver a better return –It is often regarded as an area of specialist expertise but many QS firms now provide value management services to their clients.

Unfortunately, the value management process, is most effective during the initial stages of the contract. In Figure 4 Kirkham (2014) shows the diminishing potential for achieving savings, the rising resistance to making scope changes, and the cost of such changes as the design development progresses. It is clear that the approach's effectiveness will be greatly limited as the project nears completion – and this is the very point where 'panic' normally sets in. Nevertheless, a fresh review by an independent expert facilitator conducting workshops and convening meetings has the potential to develop creative solutions to what may appear to be intractable problems. Achieving some (considerable) savings in the process is a realistic possibility.

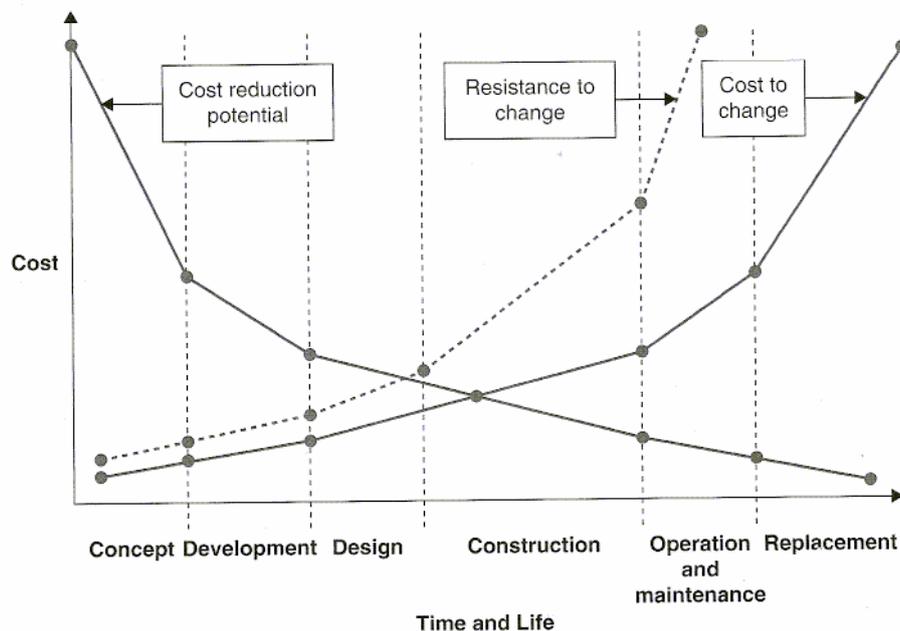


Figure 4 Relationship between cost and opportunity of change through the project life cycle
(Source Kirkham, 2014)

The Quantity Surveyor's Experience and Expertise

It is essential that expert cost advisers are appointed to perform the cost control functions on building projects. Cost advisers must be skilled in all areas of cost management and should have experience of projects of a similar size, nature and complexity to the project in hand in order to carry out the task (DPER, 2011).

The task of controlling costs on projects where contractors have submitted low tenders in order to 'get the job' are likely to be particularly challenging. Difficulties are also

likely to be experienced where the contractor fails to manage the project effectively. The surveyor must be 'up to the job', and be able to stand his/her ground in what may become 'tense' situations. Strong negotiation skills and personal assertiveness are often called for in tough negotiations. Nevertheless, the QS must be aware that intransigence may lead to disputes and these can escalate rapidly. Sound professional judgement and personal attributes such as authority, integrity and ethics, therefore are vital in these situations. The surveyor must be aware other people's money depends on his/her actions, as indeed, does the reputation of the surveyor.

The QS must ensure that the project is adequately resourced in terms of time allocation and expertise. Cost advice is given on many occasions during the construction stage and on all occasions this requires the application of technical competence and due care. The quantity surveyor's advice is, in effect, committing the employer to spend money. It is assumed that the surveyor is conscious of this responsibility and is worthy of it.

Conclusion

Cost overruns are commonplace at all stages of the construction development process. This study has discussed the practice and procedure employed by consultant quantity surveyors in controlling costs during the construction stage of traditionally procured building contracts. The discussion outlined generic cost planning and control procedures and advised practitioners to focus on the main areas of cost risk, these typically arise as a result of incomplete design development. Particular emphasis was placed on the need to control expenditure under PC sums and provisional sums. The study outlined procedures regarding the administration of variations, claims for increased costs of labour and materials, and claims relating to delays and disruption of the contractor's progress. The discussion recommended that an appropriate contingency based on a realistic risk assessment be retained to cover possible shocks experienced during construction.

Achieving satisfactory cost control requires an effective cost plan which takes account of the nature and complexity of the project and exploits the ability of the quantity surveyor to control the process. The QS as lead cost advisor must persuade the consultants to 'design to cost' and must be aware of the day-to-day developments on

site in order to advise his/her colleagues promptly of any emerging cost issues in order that effective corrective action may be taken in good time. The QS will also report regularly on the financial position of the contract and will be (heavily) involved in proposing initiatives and solutions to resolve cost issues. On occasions value management workshops may be undertaken.

The study highlights the importance of completing the design at the earliest opportunity in order to enable the QS to check the adequacy and accuracy of the contract documents. Early action in completing the design may reduce calls for variations, and removes many of the sources which commonly cause contractors to incur extra costs resulting from late information. Controlling costs during the post contract phase is a challenging task and requires the QS to provide timely and accurate cost advice. He/she must also be able to work with the client, the contract administrator, the design team, and the contractor in order to meet this challenge. The measure of the success in performing this function is a happy client and a satisfied design and construction team who would be pleased to work together again.

References

Ashworth, A and Hogg, K (2007) *Willis's Practice and Procedure for the Quantity Surveyor*, 12th ed. Blackwell Publishing, Oxford.

ARM4: Society of Chartered Surveyors and Construction Industry Federation (2009) *Agreed Rules of Measurement* 4th ed. Society of Chartered Surveyors and Construction Industry Federation, Dublin.

Brownlee, J. (2005) *Interim Report, Survey of Cost Performance of Building Work under the GDLA Agreement and Conditions of Contract for the Society of Chartered Surveyors*, Society of Chartered Surveyors, Dublin, on-line <http://www.akc.ie/documents/GDLA%20Survey%20Interim.pdf> [Accessed 10th April 2017]

Cartlidge, D. (2017) *Quantity Surveyor's Handbook* 3rd ed. Routledge, Abingdon, Oxon.

Chartered Institute of Building (2002) *Code of Practice for Project Management for Construction and Development*, Chartered Institute of Building, Ascot.

Cooke, B and Williams, P (2009) *Construction Planning, Programming and Control*, Wiley Blackwell, Oxford.

- Cunningham, T. (2015), *Cost Control during the Pre-Contract Stage of a Building Project – An Introduction*, Arrow, Dublin Institute of Technology, on-line: <http://arrow.dit.ie/beschreoth/49/> [Accessed 10th March 2017].
- Cunningham, T. (2017), *What Causes Cost Overruns on Building Projects? – An Overview*, Arrow Dublin Institute of Technology, on-line <http://arrow.dit.ie/cgi/viewcontent.cgi?article=1070&context=beschreoth> [Accessed 22nd April 2017].
- Department of Finance (2008), *Training Manual TM-CC Public Works Contracts - Contractors*, Department of Finance, Dublin, on-line <http://constructionprocurement.gov.ie/wp-content/CWMFDocs/TM/TMCC.pdf> [Accessed 16th March 2017].
- DPER - Department of Public Enterprise and Reform, (2011) *Capital Works Management Framework Guidance Note Planning and Control of Capital Costs GN 2.2* Department of Public Enterprise and Reform, Dublin.
- GCCC – Government Contracts Committee for Construction (2014), *Report on the Review of the Performance of the Public Works Contract*, Office of Government Procurement, Dublin, on line [Accessed 10th April 2017] <http://constructionprocurement.gov.ie/wp-content/uploads/Report-on-the-Review-of-the-Performance-of-the-Public-Works-Contract.pdf>
- Hackett, M, Robinson, I and Statham, G (eds.) (2007) *The AQUA Group Guide to Procurement, Tendering, and Contract Administration*. Blackwell Publishing, Oxford.
- Hongtao, S. (2014), *Preventing Cost Overruns on Building Construction Projects – An Investigation*, Unpublished Masters Thesis, Dublin Institute of Technology.
- Hughes, W. Champion, R and Murdoch, J. (2015), *Construction Contracts – Law and Management* 5th ed. Routledge, Abingdon, Oxon.
- Janssens, D (1991) *Design-Build Explained*, Macmillan, Basingstoke.
- Keane, D. (2001), *The RIAI Contracts – A Working Guide*, Royal Institution of Architects in Ireland. Dublin.
- Kirkham, R (2014) *Ferry and Brandon's Cost Planning of Buildings* 9th ed. Wiley Blackwell, Chichester, West Sussex.
- March, C. (2009) *Finance and Control for Construction*, Taylor and Francis, Oxford.
- Office of Government Procurement (2016) *Public Works Contract for Building Works Designed by the Employer PW-CF1 v 2.1*, Department of Public Expenditure and Reform, Dublin.
- Potts, K (2008) *Construction Cost Management Learning from Case Studies* Taylor and Francis, Oxford.
- Royal Institute of the Architects of Ireland (2012) *Agreement and Schedule of Conditions of Building Contract*, Royal Institute of the Architects of Ireland, Dublin.

Royal Institution of Chartered Surveyors (2001) *Ascertaining the Amount of Loss and Expense Incurred in Building Projects*, on line at http://0-www.isurv.com.ditlib.dit.ie/site/scripts/download_info.aspx?downloadID=182

Royal Institution of Chartered Surveyors (2010) *Valuing Change*, Royal Institution of Chartered Surveyors, Coventry.