RICS guidance note

RICS professional standards and guidance, Australia

RICS and global cost and commercial management of construction

1st edition, September 2018

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Definition and scope

RICS guidance notes set out good practice for RICS members and for firms that are regulated by RICS. An RICS guidance note is a professional or personal standard for the purposes of RICS Rules of Conduct.

Guidance notes constitute areas of professional, behavioural competence and/or good practice. RICS recognises that there may be exceptional circumstances in which it is appropriate for a member to depart from these provisions – in such situations RICS may require the member to justify their decisions and actions.

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In regulatory or disciplinary proceedings, RICS will take account of relevant guidance notes in deciding whether a member acted professionally, appropriately and with reasonable competence. It is also likely that during any legal proceedings a judge, adjudicator or equivalent will take RICS guidance notes into account.

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Document status defined

The following table shows the categories of RICS professional content and their definitions.

Publications status

Type of document	Definition
RICS Rules of Conduct for Members and *RICS Rules of Conduct for Firms*	These Rules set out the standards of professional conduct and practice expected of members and firms registered for regulation by RICS.
International standard	High-level standard developed in collaboration with other relevant bodies.
RICS professional statement (PS)	Mandatory requirements for RICS members and regulated firms.
RICS guidance note (GN)	A document that provides users with recommendations or an approach for accepted good practice as followed by competent and conscientious practitioners.
RICS code of practice (CoP)	A document developed in collaboration with other professional bodies and stakeholders that will have the status of a professional statement or guidance note.
RICS jurisdiction guide	This provides relevant local market information associated with an RICS international standard or RICS professional statement. This will include local legislation, associations and professional bodies as well as any other useful information that will help a user understand the local requirements connected with the standard or statement. This is not guidance or best practice material, but rather information to support adoption and implementation of the standard or statement locally.

Glossary of terms

This guidance note will consider the commercial management process in terms as generic as possible. For the sake of clarity, certain standard terms will be adopted, as defined here.

Activity	An item of work within a project or contract (see also **WBS**).
Budget (also 'budget to build' and 'post-tender budget')	An evolution of the estimate, updated to reflect information not available when the estimate was first produced; an estimated plan of the cost to complete the project following the contract award, based on actual costs incurred, plus the project team's planned procurement and delivery methods. The budget should be continually updated until project completion.
BoQ	Bill of quantities, or an equivalent detailed measurement schedule, including 'schedule of paid items' or 'builders' bill' measured in accordance to a standard method of measurement.
Common analysis levels	Consistent use of cost elements and activity elements through estimate, budgets, forecasts, valuations, cost reports, cost/value reconciliations, cash flow and risk and opportunity registers.
Consultancies	Organisations acting as consultants for clients, such as architects, quantity surveyors, designers, cost consultants and project managers.
Contracting organisations	Main contractor, subcontractor, specialist contractors, trade contractors.
CTC	Cost to complete: the forecast of the cost required to complete the project from a specified point in time, in accordance with the contractor's obligations, as set out in the contract document.
CVC	Cost/value comparison: see **CVR**.
CVR	Cost/value reconciliation: also known as cost/value comparison (CVC). The project's profit and loss statement, comparing the internal valuation with the costs incurred, including liabilities and accruals for goods and services consumed in the works that have not yet been paid for.
Estimate	An approximation of the cost of a construction project or operation. By its nature, this will almost always be produced pre-construction and usually pre-contract, often to progress the project to the construction phase. An estimate is based on the first principles of labour, plant and material unit rates together with appropriate subcontract quotations.
EVA	Earned value analysis: a method of assessing the work complete and a technique used to forecast final cost and value.
Forecast (margin)	The forecast difference between the forecast revenue that the contracting organisation will receive for the project, and the forecast cost. Pre-contract, the forecast will be the approved revenue less the net cost estimate, but as the project progresses, it will become the approved revenue less the latest forecast cost. The latest budget will be used for monitoring and tracking actual costs as they are incurred, for comparison and analysis purposes.

Forecast final cost (cost at completion (CAC)) (FFC)	The forecast of the final cost of the project, being the cost at a specified point in time, plus the CTC.
GMP	Guaranteed maximum price.
ICMS	International Construction Measurement Standards (*www.icms-coalition.org*). Also see *ICMS Explained* (available on *www.rics.org*).
Internal valuation	Interim valuation of works carried out by a contractor to assess actual work done, for internal accounting and forecasting purposes.
Payment claim	Interim valuation of works carried out by a contractor for the purposes of applying for payment from the client.
Payment mechanism	The way (mechanism) the contractor or subcontractor is paid for the work it undertakes. These include the following mechanisms: • lump sum • bill of quantities, with or without remeasurement • schedule of rates • activity schedule • target sum • cost reimbursement and • guaranteed maximum price.
Programme	A schedule of tasks that must be delivered to produce a desired outcome. In the context of a construction project or contract, the programme will be a detailed schedule, with relevant dates and durations for each task, indicating when each should be carried out and in what order. A programme can be detailed or high-level, depending on the complexity of the work. In some circumstances, the programme is a contract document and can be used as a contractual tool to ensure delivery.
Project controls	Mechanisms to assist the project team in monitoring the key items relating to the delivery of a project or contract. These controls provide valuable data to help the commercial manager forecast whether a project or contract will be delivered on time and on budget.
SoR	Schedule of rates: a list of prices for carrying out defined items of work (see also **BoQ**). An SoR is effectively a BoQ without the quantities.
Subcontractor	A vendor who provides goods or services or both, including site installation or works on site (not just a site survey prior to manufacture).
Supplier	A vendor who supplies goods or services or both to site, including equipment hire.
WBS	Work breakdown structure: a project-specific analysis of where an estimated resource will be used and where actual resources are allocated. Also refers to an item of work within a project or contract (see also **Activity**).

1 Introduction

RICS, as a global professional institution, leads the thinking and development of global standards for the financial management of construction projects around the world. This covers the property, construction and infrastructure sectors and embraces quantity surveying, cost management, cost engineering and commercial management across clients, consultants and contractors.

RICS is proud to be part of the global professional coalition of bodies that has published the first global standard in this area – ICMS (*www.icms-coaltion.org*). ICMS are principles-based international standards that set out how to report, group and classify construction project costs in a structured and logical form.

As property, construction and infrastructure continues to be increasingly global in extent and operation, there is a real need for international consistency in something as fundamental as construction cost classification. Historically, these processes have followed local and regional custom and practice, which has made comparison across the world more difficult, leading to confusion, uncertainty and lack of confidence from key stakeholders.

Each ICMS coalition member has promised to adapt their local and regional standards to accord with ICMS. RICS will, therefore, adapt UK guidance, such as the New Rules of Measurement to integrate with ICMS accordingly. In addition, RICS is developing a global professional statement in cost prediction (i.e. cost estimating and planning) to incorporate ICMS. RICS has also developed a user guide for ICMS, *ICMS Explained*, which is available on the RICS website: *www.rics.org/uk/knowledge/professional-guidance/international-standards/icms-international-construction-measurement-standards/*

What does this mean for different markets and countries around the world, like Australia?

Firstly, the profession can become more globally unified in terminologies and working methodologies, leading to greater confidence in investing in construction in all markets.

Secondly, local market differences in professional practice need to be identified and further market insights obtained to connect local ways of working and international practice.

This guidance note explains commercial management practice in Australia, and plays an important role in furthering this global insight.

Finally, data (enhanced by emerging technologies like BIM and artificial intelligence) will become increasingly critical to prediction, control and forensics in cost and commercial management. Hence, the ability to collect costs in a globally standardised way, linking local markets to international data and vice versa, will become a professional necessity.

1.1 What is a commercial manager?

The role of a commercial manager, and the commercial management functions performed, play a critical part in the commercial and financial success of a construction project or of any other business.

In any industry, the role of a commercial manager is to maximise the potential of a business in terms of profitability. The commercial manager monitors, or controls, internal processes such as production, and manages external relationships with customers, clients and trading partners. At the same time, the commercial manager monitors financial performance (both forecast and achieved) and manages any risks there may be to achieving forecasts, whether these are known from the outset or introduced through changing circumstances.

However, due to the complexity of valuing and costing construction works, commercial management within construction has evolved into more of a technical discipline, largely carried out by a quantity surveyor.

This guidance note outlines the role of commercial management within the Australian construction market, providing a framework of guidance covering the most common tasks that a commercial manager will perform on a construction project. It brings together the quantity surveying skills and disciplines covered in many of the other RICS competencies. One of the key things that differentiates commercial management from general quantity surveying skills is the ability to take an overview of a project or contract. To do this, it is crucial to understand how all the individual quantity surveying skills are pieced together, to commercially manage construction works.

One significant difference between the role of a commercial manager in the Australian market and that of a commercial manager in the UK is that, in Australia, the operations team (i.e. engineers and construction managers) are accountable for the project's budget, cost control, cost over-spends and forecasting of costs. The commercial manager plays a support role, but is further removed from accountability than in the UK context. This is a division of responsibility issue and does not change the overlying principles of cost control, cost variance reporting and forecasting.

This guidance note is aimed at commercial managers working in contracting organisations in Australia and has been written in the context of a project. However, it could equally apply to the overall commercial management of a framework contract within infrastructure or facilities management, as well as to a construction business or divisional unit. In addition, many of the commercial considerations are equally relevant for commercial managers representing clients or consultancies.

1.2 What defines a successful construction project?

In simple terms, a successful construction project is one that is delivered 'on time', 'on budget' and 'on quality': for example, to quality standards defined within the contract documents. These 'project' goals must be balanced against the client's relationship status and reputation, which will affect the longer-term goals of a contracting organisation.

For a contracting organisation, a successful construction project will usually be one that produces or exceeds the anticipated return for that business, with the client relationship maintained or improved as a result. The probability of this outcome rises as the project's commercial controls and commercial management improves. Successful controls are provided through the exercise of mature and practical commercial management techniques, which are closely aligned to traditional quantity surveying skills. These are summarised as follows and form the main areas of this guidance note:

- understanding estimates
- value engineering
- supply chain management
- valuing work
- understanding cost
- cost/value analysis
- cash and cost flow analysis and
- commercial decision making.

1.3 RICS Quantity surveying and construction pathway

Table 1 maps the eight areas of this guidance note to the levels in the RICS Quantity surveying and construction pathway.

Commercial management (of construction works)

This competency covers the commercial management of construction works, including commercial competitiveness balances against profitability. They must have a thorough understanding of the financial processes used to achieve profitability and how these integrate with the overall delivery of the project.

Level 1 Demonstrate knowledge and understanding of the principles of the management of construction projects.	**Mapping to guidance note**	**Level 2** Apply your knowledge to the financial management of construction projects, including regular monitoring and reporting on cash flow and profitability.	**Mapping to guidance note**	**Level 3** Monitor, report and advise on project cash flows and profitability. Evaluate and advise on the financial implications and appropriate management actions.	**Mapping to guidance note**
Examples of knowledge comprised within this level are:		Examples of knowledge comprised within this level are:		Examples of knowledge comprised within this level are:	
Identifying and understanding the components that make up the cost base of the project to the contractor.	Understanding estimates.	Collection of data for reports.	Understanding cost.	Monitoring, analysing, reporting and advising at a senior level on project cashflows and profitability for internal use.	Cost/value analysis. Cash and cost flow analysis.
The effect that the design and construction processes have on the cost.	Value engineering.	Carrying out cost to completion exercises.	Supply chain management. Cost/value analysis.	Evaluating and advising on financial implications and appropriate management actions.	Commercial decision making.
The techniques used to reconcile cost against income.	Cost/value analysis.	Preparing cashflows.	Cash and cost flow analysis.		
The techniques used to manage subcontractors and suppliers.	Supply chain management.	Preparing reports such as liability statements, cost to complete and cost/value reconciliations.	Cost/value analysis.		
Understanding the use of cashflows.	Cash and cost flow analysis.	Applying value engineering processes.	Value engineering.		
		Preparing and submitting cost data for in-house and/or external use, in relation to areas such as cost of preliminaries, comparative cost of different construction techniques and taxation allowances.	Understanding estimates.		

Table 1: Examples of likely knowledge, skills and experience at each level

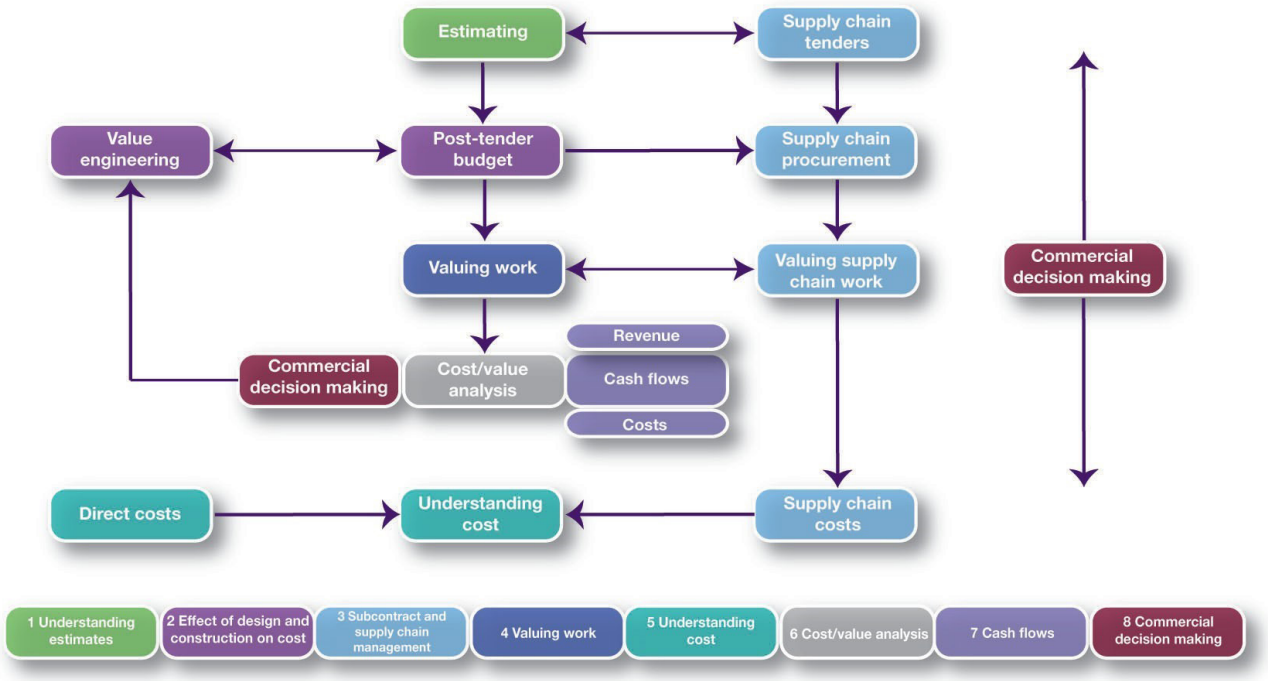

Figure 1: The flow of processes and associated data from an estimate

As this guidance note forms part of the RICS QS and Construction Standards (the Black Book), it follows the standard structure, dividing the guidance into three chapters:

- General principles (Level 1: knowing)
- Practical application (Level 2: doing)
- Practical considerations (Level 3: doing/advising).

The eight main areas are discussed within these three chapters, with the commentary divided between them as appropriate.

To further clarify the relevance of the eight areas to the RICS Quantity surveying and construction pathway, Figure 1 shows the flow of processes and associated data from an estimate through to cost/value analysis and commercial decision making.

Although they are displayed linearly in the diagram, the processes are in fact iterative and cyclic in their nature. Commercial decision making should be taking place throughout the process, while impacts on the cost to complete forecast, following cost/value analysis, should be fed back into value engineering and the post-tender budget processes.

A detailed estimate is usually produced at the initial stages of a project, prior to construction. This becomes the basis for the project budget and associated forecast, which will inform all other commercial management activities and should be updated continuously as the project progresses and the iterative processes noted are followed. Further decisions on how resources are deployed, on procurement strategy and on the methods of valuing work may then be adopted.

1.4 Taking an overview

The ability to take an overview of a project or contract, together with an understanding of how all the quantity surveying skills are linked, are vitally important skills for a commercial manager. In addition, there are two 'enablers' that appear as common themes throughout this guidance note:

- **Use of common analysis levels:** the consistent use of analysis coding allows for ready analysis of all commercial and financial information in a consistent format. More importantly, it provides for analysis against consistent heading levels, permitting comparisons to be readily made and variances identified more efficiently. The common levels will usually be the activities of work involved in a project or contract, often referred to as 'elements' or as the 'work breakdown structure' (WBS). In the context of this guidance note, these phrases are interchangeable. If a commercial manager has information relating to the estimate, allowances, cost, value or performance readily to hand in a comparable format, pertinent issues can be addressed quickly, and the commercial position of the organisation represented more readily maximised. Examples of common levels are provided throughout this guidance note.

- **Risk and opportunity management:** the commercial manager must be conversant with all the risks, opportunities and contingencies made in relation to a project or contract. The commercial manager should particularly understand contingency amounts – where they are included and at what stages they can be released, should the risk or opportunity fail to materialise. This practice will be commonly linked to the risk and opportunity register (see 3.8.1). If the contingency amounts can be identified against the common analysis levels previously described, then this exercise becomes more transparent and simpler to track and manage as the project or contract progresses.

1.5 Alternative forms of construction procurement and payment mechanisms

In the modern construction industry, works are procured through a variety of methods and alternative forms of contract; these offer alternative ways a contractor may be paid or reimbursed for the works carried out, which in turn result in a range of different ways that work should be valued.

In addition, each contract form and associated payment mechanism provides the commercial manager with alternative challenges in terms of how the original estimate is produced, how the work is valued, and how change is managed and valued as the project progresses. The RICS guidance note *Developing a construction procurement strategy and selecting an appropriate route* (2013) contains specific guidance on alternative procurement routes in construction. Reference should be made to this if further detail is required. The following list provides an overview of the most commonplace procurement and payment mechanisms, with notes on practical application, for commercial managers:

- **Lump sum contracts:** where a fixed price (subject to contractual variations) is tendered and agreed for a contracting organisation to deliver a project. The fixed price is usually arrived at through the computation of an estimates or activity schedule.
- **Remeasurement contracts:** where work cannot be adequately quantified at the time of tender, a schedule of rates (SoR), or estimated, approximate or provisional quantity arrangements, can be entered into. The contracting organisation is paid for the actual quantities of work undertaken. It should be noted that lump sum and target sum contracts (see above and opposite) can also include provisions for remeasurement if elements of the work cannot be accurately or fairly measured at the time of tender.
- **Target sum contracts:** where a target sum (subject to contractual variations) is tendered and agreed for a contracting organisation to deliver a project. The target will usually be built up in a similar way to the calculation of a fixed price in a lump sum contract. The final target (including contractual variations) will then be compared with the actual costs incurred by the contracting organisation. The difference (both overspend and savings, usually known as 'pain and gain') will be split between the client and contracting organisation, using calculations and proportions agreed in the contract.
- **Guaranteed maximum price (GMP) contracts:** these are sometimes like target sum contracts, but with a contractual guaranteed maximum price agreed in the contract. However, GMP can also exist as a variant to a lump sum arrangement, with limited opportunities for the lump sum to be increased for change. The contractor will not be entitled to any additional money should the GMP be exceeded, unless this is due to a contractual variation, the opportunities for which will often be much lower than for any of the alternatives previously noted.
- **Cost reimbursable contracts:** where the contracting organisation is paid the actual costs incurred in delivering the contract, plus an agreed (usually tendered) profit fee.
- **Management contracts:** where a contracting organisation, or sometimes a consultancy, is paid to manage the delivery of a project through the engagement of a series of trade contractors. Either a percentage fee, a fixed fee or a time charge fee will be paid by the client.

2 General principles (Level 1: knowing)

2.1 Understanding estimates

2.1.1 Estimates and budgets

Almost all construction projects require a budget. This forms the basis of the financial plan, which sets limits on the amount of money available to be spent. Very few project funders, whether private individuals or institutional investors, will proceed without an agreed budget.

In construction, 'estimating' is the calculation of the likely final cost for any given project. This will form the basis of the budget for that project at all stages. A budget can be produced for any stakeholder in the construction process who requests or needs one. The stage the project has reached will determine how detailed it is and how much time and effort it will take to produce the estimate.

At the 'feasibility stage' the recipient is likely to be the developer or client, who simply wants a guideline 'high level estimate' figure for a business case, to decide if they will take the project to the next stage. With the 'appraisal stage' so early in the project's life, it is unlikely that there will be sufficient construction detail, in terms of drawings and specifications, for the estimate to be calculated in detail.

Later in the process, once further design has taken place, a tender for the project's construction may be issued out to competition, on a lump sum fixed-price basis, with a full design, specification, and BoQ. In this case, the estimate will be put together by an estimator, working for a contracting organisation, who will produce the most accurate net price for the delivery of the project on behalf of the contracting organisation. The contracting organisation will need to know the estimated final net costs as accurately as possible, to make the appropriate adjustments for risk, contingency, overhead and profit, before submitting a tender.

The estimate is an integral part of the baseline budget for a project, whether used by a contracting organisation or a client.

2.1.2 Types of estimates

The RICS New rules of measurement (NRM) contain specific detailed guidance on estimates, types of estimates and rules for measurement. This guidance note therefore provides only an overview. The NRM suite comprises the following three volumes and should be referenced for further detail:

- **NRM 1:** Order of cost estimating and cost planning for capital building works
- **NRM 2:** Detailed measurement for building works
- **NRM 3:** Order of cost estimating and cost planning for building maintenance works.

Various types of estimate can be produced depending on the level of accuracy required, together with the availability of information about the project.

As discussed in 2.1.1, and as laid out in the NRM suite, the type of estimate produced will usually change as the project moves through its natural stages from inception to completion. There are many different names given to each type of estimate. In addition, in different organisations across the world, hybrids of the main estimating methods detailed within the NRM suite will exist, with different names.

Each estimate, starting with the order of cost estimate (used to set a budget) will require some level of detail, to allow it to be put together. As the project progresses through its life cycle, estimates will evolve, making use of amended or more complete design information, up to the stage of a detailed estimate.

In Australia, the Australian Standard Method of Measurement (ASMM) is commonly referred to and used. In addition, in July 2017, the ICMS Coalition issued the 1st edition of its *International Construction Measurement Standards – Global consistency in presenting construction costs*. This document provides a structure and format for classifying, defining, measuring, analysing and presenting construction costs, including estimates, that will provide consistency and transparency across international boundaries.

2.1.3 Detailed estimates

The detailed estimate is the most accurate type of estimate, but it is also the most time-consuming, requiring the most information to complete. It is usual for a detailed estimate only to be produced when contracting organisations are in the advanced stages of tendering for work. Depending on the chosen procurement route, however, this may not always be the case.

In general, to produce a detailed estimate the estimator will have a complete set of contract documents, which, depending on the client's chosen procurement route, may or may not include a BoQ. Only when full details, design and specification are available is it possible to produce an accurate detailed estimate. If, due to the project programme, procurement route or some other restraint, a detailed estimate is required when certain elements of the estimate are not fully detailed, it may be necessary to include provisional items or contingency amounts. Alternatively, the detailed estimate may be qualified in some way. If this is the case, all parties must understand that due to the lack of necessary information, the accuracy of the estimate will be compromised. The estimate amount should include some risk and contingency allowance to reflect this.

Once a project has reached the appropriate stage, the contracting organisation will use the detailed estimate to produce its budget. This will be used to manage expenditure, tracking this against what the organisation will earn from the project. This is an important fact to bear in mind when the estimate is being structured and put together.

Ideally, in a detailed estimate, each item will be priced in accordance with the measurement rules. The price will include everything that is required to complete the item, such as labour, plant, materials and subcontractors, along with allowances for insurance, bonds, site overheads, risk and contractors' profit. There are usually two stages to a detailed estimate:

- **Stage 1:** production of an estimate, in which every item of work that is needed to complete the construction is measured using a formal method. The method will define the 'coverage' of each item, noting what is measured separately and what is deemed to be included in the measured items.
- **Stage 2:** pricing of the estimate, where each item of work is given a rate (or priced) in line with the 'coverage' rules within the method of measurement. The rate for each item will be produced using a breakdown of the labour, plant, materials and any other resources required to deliver it. Alternatively, a subcontract price may be included where a specialist contractor will deliver an item; or perhaps a hybrid, where part of the rate is from a subcontractor and part is provided by the organisation producing the detailed estimate.

Each piece of work to be completed by the contractor has a distinct labour and plant requirement. This should be estimated, dividing the cost of the required labour and plant by the number of units of the measured item that can be achieved over a defined period, such as an hour or a day. The quantities of materials needed to deliver a unit of the measured item should include an estimated allowance for wasted or leftover materials. There should then be allowance for minimum quantities that suppliers will supply, in terms of transport loads, pack sizes and unit sizes of individual commodities, as well as consideration of any materials lost to the cutting-out of individual commodities, such as lengths of rebar, sheets of plasterboard or ceramic tiles. Not every estimate can be produced with this level of detail, but in general, accuracy will be increased if the estimate is calculated at a detailed level.

Items to be delivered by subcontractors must also be defined and priced. Care must be taken to ensure the basis for the subcontract price is understood and that there is an agreement detailing this. For example, an agreement may cover whether a subcontractor is simply to install, or to supply and install certain items, as well as noting who is providing attendances such as cranes and scaffolding. The person producing the detailed estimate is responsible for making sure that the scope of work is divided among the contractor and subcontractors, so that there are no overlaps or gaps in the individual scope of works.

In summary, the detailed estimate must establish the estimated quantities and costs of the materials, the labour, plant and equipment costs based on estimated durations, and the items required for site overheads. The cost of each item must be considered, together with the amount of profit desired (usually converted to a percentage), accounting for the investment, the time to complete, and the risks associated with the project.

2.1.4 Identification of the components

Whatever route a project has taken, some form of detailed estimate will almost always be in existence by the time it reaches the construction stage. Without a detailed estimate, there is little substance on which to base a contract price with a contracting organisation, to monitor actual progress and costs or to develop a budget and produce cash flow.

The various components of a detailed estimate and how those components should be used as part of the budget, to track and manage procurement, as well as to inform cash flow projections, earned value, and the contracting organisation's forecast are considered here and illustrated in Figure 2 overleaf.

There are various forms a detailed estimate can take, depending on the extent of detailed measurement and rate build-ups. The most familiar forms are:

- A detailed estimate, measured in accordance with the NRM, or the recently published ICMS standard, with item rates built up from first principles, outputs and resource usages, or item rates from previous experience. The key benefit of this method is that as it follows a published standard, it will be obvious to any professional stakeholder what is included in each item.
- A 'builders' bill' again using rates from different sources. This is like a detailed estimate, but does not follow published standard measurement rules, relying instead on the same person producing the quantities and pricing the items, or on a very close coordination if the two activities are performed by different parties.
- A series of composite items, where, for example, there may be a lump sum price, such as 'for the roof coverings based on ABC drawings and specification', measured superficially and priced with composite rates.
- Any hybrid of the former, perhaps with some items measured in detail and others composite.
- Irrespective of the format of the detailed estimate, it is important that it can be collated up to and analysed by the common analysis levels, as discussed in 1.3. The estimate allowances and associated values can thus be collated and analysed as needed in this format as the project or contract progresses.

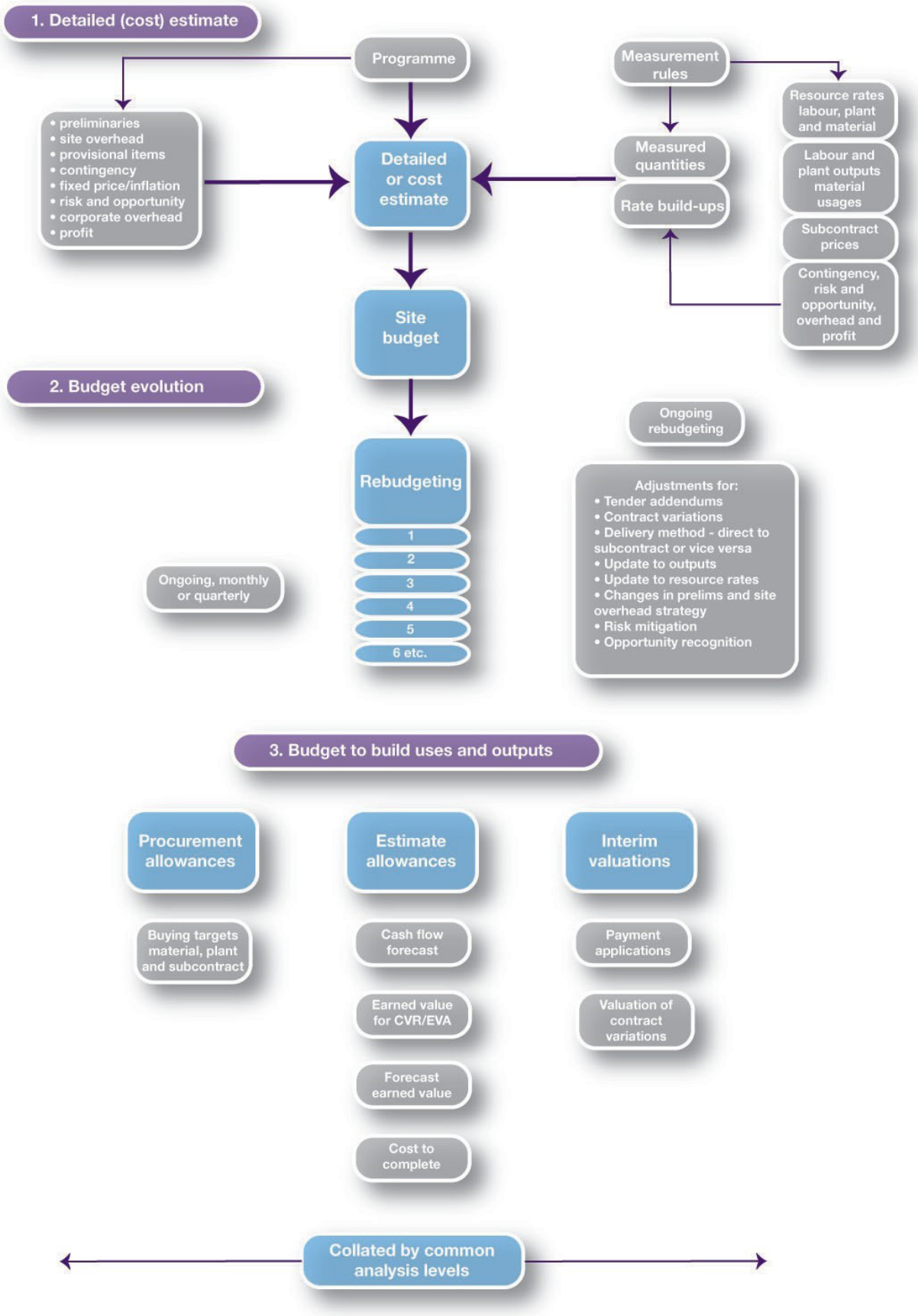

Figure 2: Components of a detailed estimate

2.1.5 Use of information technology

As the use of computers in business developed, estimators, like other professionals, began using spreadsheet applications such as Lotus 1-2-3 and Microsoft Excel to duplicate the traditional tabular (column and row) format and to automate the laborious mathematical formulae and calculations.

As more and more estimators came to rely on spreadsheets, and the formulae within them became more complex, formulae and cell-referencing errors became more frequent. At this point, commercial estimating software began to develop. As well as forcing a process to be followed, this software had the benefit of hard-coded formulae that eradicated these referencing errors (assuming the formulae had been thoroughly tested). Other benefits included the use of standard databases for bill item descriptions, headings, item rates, resource costs and other data, as well as consistent report formats. Speed and accuracy were also improved. As proprietary estimating solutions developed, other features, such as the ability to copy estimates, the provision of specialist libraries for different sectors, the inclusion of flexible resource libraries, and trade-specific calculations (for example, for asphalt surfacing), were added, along with integrated take-off and pricing packages providing options for visual estimating and quantity take-off.

The evolution of cost planning solutions has run a similar path to estimating. A simple requirement can be fulfilled using spreadsheets; however, the integrity of data and formulae cannot always be guaranteed. As such, proprietary cost planning databases have also been developed to assist in this area.

Further developments in estimating systems have supported integration with planning, procurement, costing and post-contract management, as well as multi-user systems to enable collaborative work on multiple estimates and projects. The evolution of BIM (building information modelling) has also led providers of systems to concentrate on this area, particularly on the auto-extraction of quantities from designs.

As clients, consultancies and contracting organisations move towards advanced cost-estimating and management systems, it would now be unusual for a company to purchase an estimating system that did not allow for the comparison of supplier and subcontract prices, as well as for the automatic comparison of estimates, Microsoft Office-style copy and paste, and estimate-cloning.

2.2 Value engineering

2.2.1 Applying value engineering processes

Value engineering is a process designed to maximise value through either improved design, enhanced function, reduced cost, reduced risk or reduced whole life cost of the asset being constructed. It is carried out to improve the 'value' of a product – in construction terms, this could mean large parts of a project or any individual element of it.

The term 'value' in this instance is what would be the most economically advantageous price for the optimum product, taking into consideration the overall cost of ownership of the end-product, including maintenance and replacement costs.

From a commercial management perspective, value engineering relies on the project estimate and budget as a starting point; otherwise, considerations have no basis for comparison. To maximise the benefit derived from value engineering, it is best undertaken between the stages of project inception and detailed design. It is important that the assessment is of a holistic nature, considering all aspects and the implications of all alternatives. For example, the initial cost of one option may be less, but the cost of maintaining it post-construction may be so much greater as to eliminate that initial benefit. Or, the use of an alternative product may provide savings, but the time spent installing it on site may be more, resulting in increased labour costs and possibly higher preliminary costs too.

The client's brief should be used to define both priorities and value. Knowledge and understanding of client value is intrinsic to the value engineering process, during which the commercial manager should apply technical knowledge (including alternative construction techniques and cost data comparison) to offer informed solutions.

2.2.2 Knowledge of construction techniques and materials

To maximise the benefits and opportunities and minimise the risks of value engineering, practitioners should have a robust knowledge and understanding of alternative construction techniques and of the options for using different materials.

A well-used example is the comparison made between precast and in-situ concrete. Consideration of the two options should include the following factors:

- Precast concrete is constructed in a controlled environment, so should result in a higher quality product.
- When installing precast concrete, it is usually necessary to install joints between the units. This can cause technical difficulties on site (for example, in a water-retaining structure).
- The installation of precast concrete units will increase complexity in terms of delivery and storage arrangements, particularly if the units are not to be installed as they arrive. Even if installation happens upon arrival, enhanced logistics will be required to avoid issues of storage and movement when the sequence of installation does not synchronise with the sequence of deliveries.
- As with any fabrication off-site, there are significant potential gains to be made regarding the programme (which in turn attract savings in preliminaries costs), as the off-site work can be undertaken concurrently with the preparatory site works.

- Time may also be saved if there is no need to wait for concrete to set before beginning the next stage of construction.
- In-situ concrete is better used in complex and bespoke situations whereas precast concrete is generally more beneficial when used for repetitive and high-volume units.

If an in-situ, rather than a precast concrete method is selected, there are still decisions to be made: for example, whether the concrete is poured using a pump, or whether labour is used to move, spread and lay it on site.

Other examples of value engineering activities and decisions could include:

- A steel frame construction, compared with a reinforced concrete frame, can take significant time out of the construction programme, thus reducing preliminary costs. However, it requires a longer off-site period and earlier completion of design. These factors should be compared with the additional cost and alternative performance properties of steel frames over concrete frames.
- The off-site fabrication of bathroom pods (for a hotel or other multi-bedroom development) can take significant time out of the construction programme, reducing preliminary costs. It can also lead to improvements in quality but may have a capital cost increase above that of traditional construction, when looked at without consideration of the programme and preliminaries.
- The use of wall tiles throughout a bathroom compared with a mixture of tiles and paint may cost more in the construction phase but could result in a saving on life-cycle costs, due to reduced maintenance expenditure.
- The installation of blinds to reduce solar glare and solar gain in the summer could save on air-conditioning installation and running costs but may create an aesthetic issue.
- In the road maintenance sector, a full road reconstruction will cost more than a thin surfacing treatment. However, the full reconstruction may have a life of ten years, compared with three or four years for the thin treatment, possibly resulting in long-term cost savings.

Expanding on the previous example, illustrating how design could materially affect the price or cost of a project, concerns a scenario in which the superstructure of a building is changed from a steel frame to an in-situ concrete frame. In this scenario, the most significant effects would be in:

- Potential direct cost implications of the cost of steel versus the cost of concrete and reinforcement, in terms of raw material costs and labour costs for erection.
- The speed of construction, and resulting indirect costs, such as preliminaries and other overheads.
- Design or engineering parameters and implications on other parts of the design (for example, the substructure).
- Fire resistance or earthquake properties.

2.3 Supply chain management

2.3.1 Commercial management of subcontractors and suppliers: an overview

For successful delivery, any construction project will require the involvement of a supply chain, which may consist of subcontractors or suppliers. Most of the detail in this guidance note refers to subcontractors, but most of the references could equally apply to complex supply only, or to a consultancy package for professional services.

The importance of the supply chain to a project varies for each individual business, depending on its available in-house expertise and resource. For most contracting organisations, however, the procurement of goods and services, and the management of the supply chain, will be of vital importance to the successful running of their projects, their work-winning activities and their whole business.

However simple or detailed the approach to supply chain management, certain basics remain common, including the commercial arrangements, the contractual agreements, the techniques for valuing works, products delivered, or services provided, and the rules for how these will be reimbursed. It is therefore imperative that the commercial manager understands how to manage the supply chain effectively, covering:

- vendor management:
  - database management
  - performance management
- procurement and pre-contract:
  - identification of requirements
  - production of enquiries
  - returned price comparisons
  - commercial negotiations and contractual agreement
  - production of contract documents
- contract administration:
  - record keeping
  - correspondence and instructions
  - assessment of work done or delivered (for the calculation of liabilities)
  - administration and management of change/ variations
  - verification of works and variation values
  - certification
  - payment
- final account:
  - preparation of final account documentation
  - agreement of the final account
  - negotiation and dispute resolution.

2.3.2 Vendor management: an overview

Vendor management, or the 'upfront' management of the supply chain, is the overarching management of all contacts, service offerings and performance and trading history records of any organisation that provides products and services to the business.

It can be as simple as maintaining a list of trades, names and telephone numbers, or as complex as a full end-to-end process for the assessment of suitable businesses, backed up by comprehensive trading agreements and regular performance management reviews. Maintaining the data and keeping it up-to-date is important and should cover everything from contact details, to up-to-date insurance policies, company registrations, GST registrations and, at least, annual performance reviews.

2.3.3 Procurement and pre-contract: an overview

Procurement is not an activity unique to construction, although the nuances of the industry mean that, especially regarding subcontractors, there are more factors and considerations to account for. By its nature, construction is made up of a series of disparate projects in different geographical locations. Most of the services provided, therefore, are delivered away from the subcontractor's controlled environment. This provides additional complications in many areas, such as supervision, delivery of the programme, quality control and health and safety.

The first step in the procurement stage of supply chain management is to establish and define a list of packages for the project or contract in question. It is then necessary to identify different vendors from the vendor database who can deliver that package.

After this is achieved, requests for prices should be sent to each suitable vendor. Once received, they should be analysed to identify which is the most commercially favourable, so that negotiations can commence. Time, quality and past performance should be taken into consideration along with the cost. Ultimately, formal engagement will be achieved, with approved and signed subcontract documents in place. Note that up to the point of negotiation, many of the required activities (described in section 3.3.2) may already have taken place during the tender stage.

2.3.4 Contract administration: an overview

The ongoing commercial administration of a supply chain package is a function that very much mirrors the life cycle of a project, as detailed throughout this guidance note (including valuing work, such as variations, and cost/value analysis, as well as cash flows and commercial decision making regarding each package).

The administration of a subcontract package covers everything from understanding the contract and its terms and conditions, to record-keeping from the site or any other source; the reliable filing of correspondence, and the measurement of works carried out, monitoring that these are in line with other indicators of project progression.

As covered in section 2.3.3, each project will consist of a series of packages which, once aggregated, will constitute the whole project. Attention to detail on each package will provide the granularity needed to understand the whole project and to be able to accurately manage and forecast the final position.

2.3.5 Final account: an overview

The finalisation, or final account of a package, is a significant stage. It enables the contractor to finalise its liabilities to the subcontractor, thus providing a surety in the forecast of the cost to complete.

It is good practice to deal with outstanding matters as soon as possible, while they are fresh in the memory. Contemporaneous agreement and resolution of issues to expedite final account settlement is encouraged as good practice, to minimise exposure to potential claims and to aid forecasting. For ongoing framework contracts, final accounts for completed individual packages, schemes or annual works should be agreed with subcontractors in the same way.

It is also in the subcontractor's interest to finalise the package and fulfil all its deliverables, including the submission of operation and maintenance manuals, or as-built drawings, which may involve the release of performance guarantees or retention amounts.

2.4 Valuing work

2.4.1 Assessing the value of work complete

The RICS guidance note *Interim valuations and payment* details the overall process of valuing work and the associated making of payment. The principles contained in that guidance note apply equally in the context of a commercial manager acting for a contracting organisation. The term 'valuing work' in the context of a construction project or contract relates to a monetary assessment of how much work has been carried out at a given point in time. Work is valued on construction projects or contracts for two main purposes:

1 To assess the value of work done against the project budget, for comparison with costs incurred to date (see 3.6.1). In contracting organisations, this is often known as the 'internal valuation'. It is also used to forecast the final cost, final account and ongoing profitability of the contract, as well as to determine what profit can be declared in the contracting organisation's management accounts.

2 To allow the contracting organisation to be paid for the work done, as an interim or final payment. In contracting organisations, this is usually known as the 'payment claim'.

Valuation usually takes place monthly, although sometimes at shorter intervals. As best practice, all values should be calculated cumulatively for the project or contract in question, so that any period movements are calculated by taking the previous cumulative from the current cumulative.

The impact of contract variations, and the valuing of these, will be considered separately, although most references made could equally be applied to variations to the original estimate. Unless stated otherwise, variations will be valued in the same way as the works within the original estimate. There are implications as to how value is calculated, depending on the status of each variation, for example, 'under negotiation', 'agreed' or 'not agreed'.

The methods of assessing the value of work completed (the 'internal valuation') will vary, depending on the way the original estimate and subsequent budgets were prepared (see 2.1); the way the contract was procured and the contracting organisation's payment mechanism. However, the most commonly used ways can be summarised as:

- a measure against each estimate item
- an assessment of the percentage complete at programme activity or element level
- values at specific project milestones and
- valuation methods associated with earned value techniques (see 4.4).

In many cases the payment claims and internal values will differ on a month-by-month basis as the payment claims reflect the contracting organisation's contractual entitlement to payment, whereas internal value is an assessment of the work that has been done against the estimate. These are unlikely to be the same.

The method of assessing the contracting organisation's entitlement to payment will be contract-specific. As a simple summary, however, there are a few frequently adopted options:

- If the contract is based on a lump sum or estimate model, the same methods could be adopted as for the internal valuation.
- If the contract is based on a cost reimbursable model, in most cases the payment claim will use the contractor's actual cost incurred as its basis. Reference to the sections on cost reporting (2.5, 3.5 and 4.5) should be made if a cost reimbursable model is used.
- If the contract is based on a target sum model, interim payments will often be based on a similar basis to the cost reimbursable model. However, in some cases, the contract requires interim payments to be based on actual work done against the current target. Final payment is usually based on a calculation comparing the original target with the actual cost, with the difference shared as stipulated in the contract.
- If the contract is based on a guaranteed maximum price (GMP), in most cases the external valuation is also based on a cost reimbursable model up to the ceiling of the GMP. However, it is equally possible that an assessment against a breakdown of the GMP could be used.

2.4.2 Valuing variations: an overview

It is important to recognise the impact of change on the valuation of construction works. Generally, this guidance has referred to how work is valued using the contract sum or original estimate as the basis. Realistically, the valuation of work will be against the original estimate plus or minus agreed variations. It may also account for other variations that are known about but not yet agreed.

To track this, a rolling contract final account should be maintained, taking the original estimate, plus or minus agreed variations, and a percentage likelihood of variations that have not yet been agreed.

2.5 Understanding cost

2.5.1 Cost reporting

For further information on cost reporting, see the RICS guidance note *Cost reporting* (2015).

A simple cost report will show the costs incurred to date on a project or contract. A base cost report from a contracting organisation's financial accounting system will, as a minimum, show the costs incurred to date, by cost type, analysed by a five-column split (labour, plant, materials, subcontract and other) in line with the following first five bullet points. Ideally, it will also present the same costs analysed by the common analysis levels that align with how the estimate was produced.

Cost reports and cost forecasts for a contracting organisation will usually be a detailed breakdown of all the direct and indirect resources employed on the contract, captured using methods like the following:

- People: operatives and staff. Captured using timesheets against employee records, assessing hours worked, call-outs and pay codes.
- Equipment: owned and hired plant, equipment and vehicles. Captured using plant hire orders, on/off hire recording, plant accruals, plant timesheets and noting plant swaps, losses and breakdowns. Invoice matching should be undertaken, using accruals to approve supplier invoices.
- Materials purchased for the contract works. Captured using purchase orders, goods received notes, accruals and invoices, as well as stock management, allocation and costing information. Invoice matching should be undertaken, using accruals to approve supplier invoices.

- Subcontract and subcontract services. Captured using subcontract purchase orders, accruals and applications for payment or invoices (as detailed in 2.3, 3.3 and 4.3). Again, invoice matching should be undertaken, using accruals to approve supplier invoices.
- Other: indirect costs that do not naturally come under any of the previous headings, such as utility bills, stationery, photocopier costs, and other ancillary site overhead purchases that will not be used within the works. These are usually captured and processed as purchases in a similar way to materials.
- Payments to employees and suppliers approved or certified in the financial accounting system.
- If the contracting organisation has a project accounting solution that allows a cost ledger to be set up or configured for each project to accommodate the common levels of analysis, this will allow the cost types described to be allocated to the point at which they were incurred. If this is the case, time must be set aside to configure this at the start of the project (this is covered in more detail in 4.1.3). This time will allow costs captured to be reported in a meaningful way.

By contrast, a client's cost report will often be simply a summarised analysis of the contract estimate, noting what has been paid to the contracting organisation, with a forecast of the final account by contract element. It is important to note that cost reports produced by a contracting organisation for their own internal management purposes will be much more detailed than cost reports produced for the client, and that these will be in a different format.

2.6 Cost/value analysis

2.6.1 Understanding cost/value analysis

The cost/value analysis carried out for construction works is, in its most simple terms, the profit and loss statement for the project, whereby the contracting organisation calculates the amount of work done to date, as discussed in 2.4, and the amount of cost incurred to date, as discussed in 2.5. The two are then compared, with the difference being the amount of profit or loss made at that point in time. This is then investigated and explained as necessary, taking each of the common analysis levels in turn.

The production of a comparison of cost to date versus value to date, and a comparison of the final cost and value, are some of the most important aspects of commercial management, and the culmination of many of the other activities detailed within this guidance note. The calculation is sometimes simply known as the 'cost value': an abbreviation of 'cost/value comparison' (CVC) or 'cost/value reconciliation' (CVR). Different contracting organisations also have their own names for it. In this guidance note, for consistency, the calculation is referred to as the CVR.

2.7 Cash and cost flow analysis

2.7.1 Understanding and preparing cash flows

The RICS guidance note *Cash flow forecasting* (global, 2012) covers this subject in detail. This section provides only an overview, noting specific matters that a commercial manager should consider, to enhance the position of the organisation represented.

A cash flow is a significant part of the financial and commercial management of any business. It is used to manage income and expenditure, to ensure that there are enough liquid funds in the business to keep it running. It provides a forecast 'early warning' of any future point in time when there may not be sufficient liquid funds, to enable mitigation strategies to be put in place and decisions to be made, such as arranging alternative funding.

While making a profit on contracts is important to any business, having a positive cash flow is equally so, as it ensures the payment of liabilities without the need for expensive borrowing; allows investment in other areas that may provide improved returns or business expansion (high interest bank accounts, for example, or acquisitions); and provides liquidity to improve the value and strength of the company's balance sheet.

On a theoretical basis, and at a business level, a strong cash position is important to a contracting organisation as it:

- allows the organisation to pay its expenses when they become due, thereby permitting it to continue trading
- provides the money to make investments that will save money later: for example, to purchase items previously hired at high rates
- illustrates security to lenders for credit, meaning that additional funds will be available if needed and at the best terms available
- provides contingency for unexpected issues with income and expenditure.

The monitoring and forecasting of cash is an important element in managing any business, particularly in construction, where contracting organisations are generally paid in arrears for the work performed. To prepare accurate and logical cash flows, it is necessary to understand the basic constituent elements of income and expenditure: that is, when debts will be received (from a debtor) and when payments will need to be made (to a creditor).

The key elements to monitoring cash balances are an understanding of:

- the valuation, submission, assessment and certification processes contained within the head contract, so that values can be accurately determined
- any under- or over-valuation of works (intentional or unintentional) and the effect this may have on cash flow
- the contractual payment process, so that contractors' payments can be accurately profiled
- month-end dates for payments of salaries, leases and other fixed costs
- an understanding of any payments that are made on alternative payment cycles, for example, for employees paid weekly, annual rates or quarterly accounts for utilities
- credit arrangements with subcontractors and suppliers and
- payment dates of direct and indirect costs, such as staff and labour salaries, plant and equipment hire or leases, supplier agreements and subcontract agreements
- all these points are conditional upon the relevant and most current Security of Payment legislation.

2.8 Commercial decision making

2.8.1 Making decisions

In the context of this guidance note, commercial decisions are decisions made in response to risks and opportunities identified and the related contingency amounts allowed in estimates, budgets and forecasts.

Commercial decisions are made throughout a project's life cycle. Most frequently, they are made with due regard to things that are anticipated from experience, or that simply might happen, and that will have a commercial impact one way or the other.

These decisions will be made by a contracting organisation as early as the business development stage of a contract, while the organisation is still deciding what sort of clients they want to work for. When a potential contract opportunity is identified, further commercial decisions will be made in response to risks and opportunities during the tender stage, through the production of the estimate, and into the process of early supply-chain engagement. They will also be closely linked to value engineering decisions, if the contracting organisation is involved while these are taking place. Post-tender commercial decisions revolve around the decisions made during the tender stage and while further supply-chain engagement continues, as well as through the valuation of work, carrying out the cost/value analysis and producing a cash flow.

3 Practical application (Level 2: doing)

3.1 Using a detailed estimate

A detailed estimate will be used by the contracting organisation to produce its tendered fixed price, guaranteed price or target sum: the precise name will depend on the procurement route and contractual payment mechanisms. It is achieved by using the net cost of the works from the estimate together with composite items as a basis. The contracting organisation should also produce a project programme, as a cross-check of the resources required. To assess the time required to undertake the project (usually measured in weeks), the contracting organisation will need to price its site overhead costs (commonly referred to as preliminaries, or indirect costs). These costs will generally include all time-related items, such as staff costs, the costs of temporary buildings (fixed or time-related), cranes and other general plant and equipment, security costs, temporary fencing costs, utilities costs and the cost of consumables, as well as anything else specifically needed to support the delivery of the contract. In addition, other variables will be adjusted for, including:

- Risk identified in the tender documents. For risks that are quantifiable, an appropriate contingency will be included, dependent on exposure to risk. Amounts to be included for unquantifiable risks will be based on the management perception of the situation. This may sometimes result in a qualification or exclusion or, in extreme circumstances, in the contracting organisation withdrawing from the tender process. A commercial view on the monetary value of risks should be taken and the appropriate contingency adjustment made. This subject is covered in more detail in 4.8.
- Estimated price escalation for anticipated price increases: allowances for projected increases due to inflation or other external factors.
- Estimated adjustments for foreign-exchange fluctuations if the work is in a country with a different currency or if any packages are to be procured from a country with a different currency. In larger organisations, this is a variable that is sometimes managed outside of the project itself and is a risk that can be mitigated by hedging currency (for example, by forward-buying the foreign currency in question at the current or other agreed rates).

Values included in tenders that emanate from the consideration of variables such as risks and opportunities, price escalation (price increases) and foreign-exchange risk are known collectively as 'contingency sums'. These are considered further in 4.8.

Once the detailed estimate, including preliminaries and other variables, is established, the contracting organisation will carry out a peer review, often referred to as a 'bid review' or 'tender review'. Some contracting organisations undertake these regularly through the tender period. Such a review will often be undertaken for governance reasons, and to obtain an outside view from seasoned professionals. A review will usually involve either a separate independent team, or the team that produced the detailed estimate, together with one or more of the executives of the contracting organisation.

The purpose is to review the programme and preliminaries and to finalise the price (fixed, guaranteed maximum or target), to carry out the works, accounting for any further adjustments to the net cost and noting other variables, including the risks and opportunities already detailed. Company overhead recovery (discussed further in 4.1.2) will also be considered, as will the profit margin, or even, on some occasions, commercial discounts, which are commonly calculated and then expressed as a percentage of the net cost.

In addition to providing the basis for the tender price, the contracting organisation will wish to use the information contained in the detailed estimate for other purposes as the project progresses. These purposes include the following:

- procurement allowances
  - material buying targets
  - subcontract package buying targets
  - plant hire rate buying targets
- internal monitoring of progress for comparison with actual costs
  - cash flow forecast
  - internal valuation for cost value and earned value comparisons
  - preliminaries monitoring
  - productivity monitoring
  - cost to complete forecasting
- interim valuations
  - payment claims (if paid on progress versus estimate)
  - valuation of contractual variations and claims.

To meet these requirements, the detailed estimate should be produced using first principle build-ups and structured to allow for analysis of the individual rate allowances. The extent to which the analysis can be carried out will be dependent on the degree of detail generated in the estimate. If the detailed estimate is simply a series of composite items with lump sum prices, it will not be possible immediately to analyse quantities of material, such as cubic metres of concrete, or man hours by trade.

However, if the detailed estimate is built up from a structured resource library, it will be relatively simple to obtain this type of detail. Estimators' tools for these calculations are well-developed and represent best practice in the calculation of unit rates from first principles.

A basic 'five-column split' analysis (as introduced in relation to cost reporting in 2.5.1) is the conventional level of analysis in construction, whether this is the level at which the estimate was built up or a collation of resources. In addition, and irrespective of the format of the build-up, the contractor should summarise or collate the estimate values to the common analysis levels, for example, by element or activity (which could include phasing or construction phasing), to suit the need.

This analysis may be straightforward and align easily to the structure of the estimate, or it may not. It is advisable though, that the structure of the common analysis levels is well thought out, as this can greatly assist in the ongoing management, forecasting and tracking of the estimate and budgets (see 4.1.3 for further detail). It also assists in the process of matching the estimate to a project plan format, in producing a forecast and in carrying out cost/value reconciliations (CVR) as the project progresses.

Ideally, this structure would be considered at the earliest stages of the project, so that the activities used to manage the project on site could align all the way back to the elements used in the cost plans. This would also have the benefit of providing valuable feedback for any future tendered projects.

The contracting organisation's cost estimate is, in effect, its internal estimate of how much it will cost to deliver the project. The initial estimate will be used for internal monitoring purposes from this point and should be converted into the initial budget after the contract price has been submitted and the project awarded. This initial budget is often referred to as the 'project budget', because it then becomes owned by the project team, whose job it will be to deliver the project and to do so within the budget allowances set by the cost estimate. As implied, the cost estimate and the ongoing budgets may differ from the detailed estimate, subject to each organisation's policies, for the following reasons:

- allowances will be net of overhead and profit
- allocation of any executives' adjustments will be separate from the items they were included against in the detailed estimate, so that they can be monitored
- the same will apply to the allocation of inflation or fixed price allowances
- costs will be split by packages instead of elements, to reflect changed methods of delivering the project
- preliminaries and elements will be allocated into packages: labour, plant, materials, and so on.

3.2 Value engineering: implications of a design change

The implications of a design change can be wide and varied. The impact will be highly dependent on the project stage, location and accessibility, and on how well-developed the design and procurement of the project, and the packages it affects, are. Generally, the earlier design changes are made, the lesser the impact on other elements and on the procurement process. The later changes are made, the greater potential there is for impact. In addition, if numerous other elements need to be redesigned due to a change, and if materials for these have already been procured or fabricated, the greater potential costs will be, offsetting any savings.

Figure 3 illustrates how the cost of changes rises exponentially as the timeline develops.

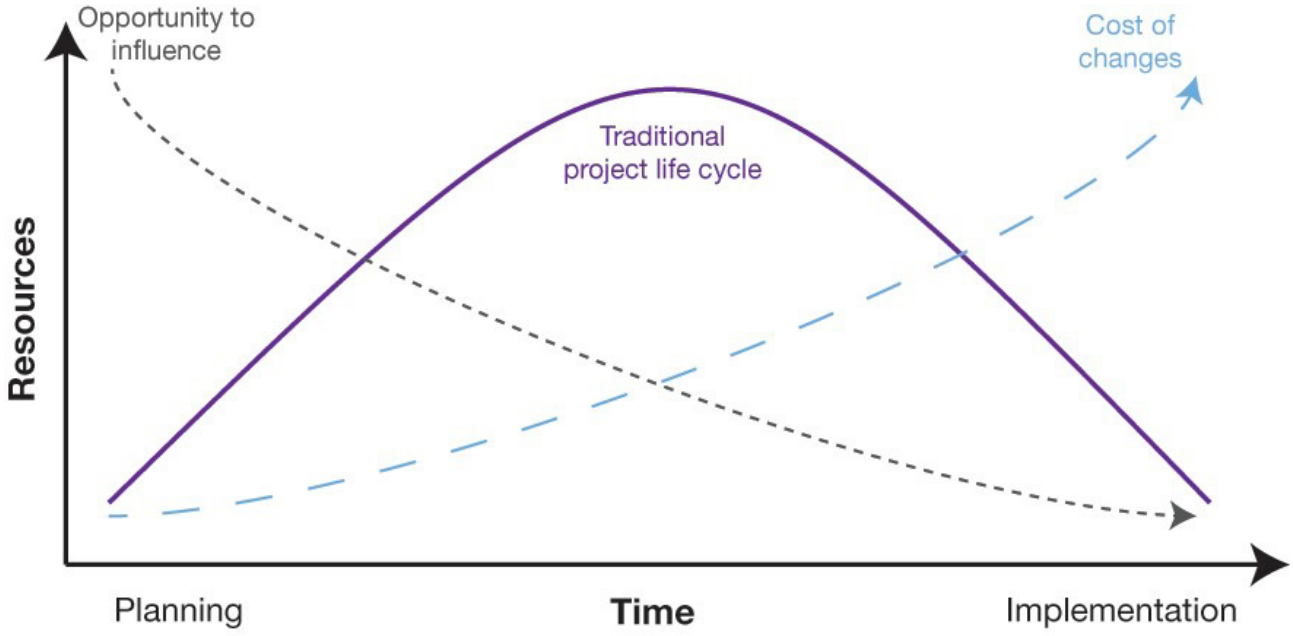

Figure 3: The cost of changes rises exponentially as the timeline develops

Two examples of types of value engineering may be of interest at this point.

Example 1: Contractor-identified value engineering

A design change identified by the contractor may be well planned and communicated. Unfortunately, however, too often such a change is made but not formally communicated. For contractor-identified changes, the comparison of drawing revisions is an extremely valuable discipline. Once a design change has been identified, there should be engagement with the design team (if this has not already happened), and if appropriate, the supply chain, to give an understanding of the implications to them and any knock-on effects. It is important to take knock-on effects specifically into consideration: there is little point in implementing a design change to make a saving if it brings additional costs or unacceptable complications elsewhere.

Once the implications are understood, and an assessment has been made, formal notification in accordance with the contract conditions is required. This is covered in detail in the RICS guidance note *Valuing change* (2010), along with the impact and assessment of change.

Depending on the contract conditions, a formal approval of the change will be required by the contract administrator, together with a revised value/cost and any time-related variances, adjusting either the latest estimate, or the contract sum if a contracting organisation is involved.

Example 2: Client- or consultant-led value engineering

An alternative scenario could be as follows:

- A consultant proposes or instructs an alternative design, method or materials to the contracting organisation.
- The contracting organisation estimates the cost of the alternative and advises of any time effect, possibly in the form of a quotation.
- From this, the consultant and the client can consider the benefit (through a cost benefit analysis).
- If this is acceptable, the client or its representative will instruct the change and agree time and cost effects.
- The construction programme and contract value, for payment purposes, are then adjusted as appropriate under the terms of the contract.
- The commercial manager and his or her wider team, can contribute to the value engineering process by providing structure and governance to the process, for example, by maintaining a register of elements and activities that could attract additional value. These can be individually identified, managed and tracked until the detailed design is complete and the benefits have been realised, with the results then fed into the estimate, budgets and forecasts.

3.3 Supply chain management: further considerations

3.3.1 Vendor management

Vendor management is briefly introduced in 2.3.2. More specifically, it should cover the following key areas:

1. A definition of the trades or categories that will be used to sort and analyse providers: for example, what categories of products or services are to be procured, from what types of business?
2. A database of potential providers, sorted by trade or category, and containing status attributes for each provider (for example, 'approved', 'preferred', 'do not use', and so on). The database should include details and copies of trade licences and certificates, as well as details of insurance (levels of cover, expiry dates and electronic copies of certificates). The database could also include credit rating details, enterprise bargaining agreements and other data pertinent to the risks of engaging with other businesses.
3. Performance management of the subcontractors and suppliers within the database, to understand if they should be used in future, or engaged in preference to others. This management should be based on the experiences of previous engagements, addressing questions such as:
   a. **Health and safety:** did they work safely and comply with health and safety legislation to our standards and their own safety procedures?
   b. **Quality:** was the quality of work up to standard?
   c. **Remedial work:** Were there any defects or anything that required remedial work?
   d. **Programme adherence:** did they deliver the work on time, performing to the agreed programme?
   e. **Administration:** was their record-keeping adequate?
   f. **Commercial:** were there any commercial issues regarding interim applications or the final account?

Vendor management is a time-consuming exercise, requiring concerted efforts to keep the data up to date: trades, locations, key staff, certifications, insurances, classifications and accreditations can be out of date as quickly as they are recorded. As a result, this task is sometimes outsourced to third parties who specialise in vendor management. In other cases, contracting organisations take an approach that puts the emphasis on the supply chain to update their own records.

3.3.2 Procurement and pre-contract

Sourcing and contracting with the most appropriate subcontractor or supplier is critical to effective procurement. Alongside an effective vendor database, the starting point for supply chain management should be a delivery strategy aligned to an operational delivery plan, i.e. a plan showing operationally how the project in question is going to be delivered. Once this is set, procurement of the necessary packages and elements can commence. The following matters should be considered when putting together a delivery strategy:

- Is the work of a specialist nature, requiring specialists to be engaged?
- Is there a risk that should be incorporated into a subcontract, or transferred to a subcontractor who is better placed to manage the risk?
- Are there potential productivity issues that should be transferred to or considered in a subcontract?
- What is the availability of resources (people, equipment and materials) to self-deliver?
- Are there subcontractors willing and available to carry out the work and will they accept the risks?

Once these matters have been considered, the next steps should be the production of the following:

1 A procurement schedule, in the form of a full schedule of packages and budget allowances, which should be brought through from the estimate and updated to reflect the latest version of the budget. In addition, the procurement schedule should be linked to the programme, so that it is clear which packages need to be procured first, due to the on-site requirement or to extended mobilisation timescales, owing to long lead-in times for materials or equipment.

2 A requisition or similar, providing a clear definition of the scope and specification of the goods and services, as well as clearly laid out pricing schedules (to facilitate the price returns in (4)), and the proposed contract and other conditions that the successful bidder will be required to sign up to prior to subcontract award (see draft subcontract in point 6).

3 Robust documentation to send as an invitation to tender (or tender enquiry) to the subcontractors and suppliers selected from the database. The purpose of this is to ensure that all tenderers price on the same basis and to improve the accuracy of tender returns. Enquiry documentation will usually take the form of:

   a. a covering letter stating basic information, such as project location, consultant details, dates for return, general description of the package, key dates for the works, insurances and insurance levels required, attendances to be provided on site, and pricing information such as fixed or fluctuating price, method of calculating fluctuations and retention details

   b. instructions to tenderers

   c. a note of the programme, start window, durations and key dates

   d. main contract provisions and proposed draft subcontract conditions (see (6))

   e. details of any requirements for performance bonds and/or parent company guarantees

   f. specifications

   g. drawings

   h. other technical documents pertinent to the package, such as steel reinforcement bending schedules, or similar

   i. an estimate or other pricing schedule document, for return

   j. a statement that tenderers should not change the original documentation, nor qualify their tender in any way. It should be noted that in certain circumstances, such as early contractor involvement (ECI), or other arrangements when innovation or savings are being encouraged, the supply chain partner may be encouraged to propose amendments and innovate. However, in a straightforward tender, these should be avoided, as they make it more difficult to carry out the following stages.

4 Tender return template: tender returns are significant in themselves, as top-level figures, but it is advisable to analyse the detail behind them, to ensure that the returns have been provided on a like-for-like basis. Often, tenderers return their bids in a variant format to the document sent out: for example, in a lump sum, or as rates only, or may even fail to price all the items. It is therefore good practice to provide a template to ensure that the price returns are in a consistent format, which can be easily compared and from which variances can be identified.

This could be in a simple spreadsheet form, with items and quantities on each row; a list of tenderers in each column, with their rates below; and formulae calculating the total amount of each item, as well as overall totals. This would provide a clear comparison of prices from all bidders, alongside the budgeted allowances, to enable their bids to be assessed.

It would also provide a format for making adjustments for omissions and qualifications, using techniques such as 'plugged rates', which allow the commercial manager to insert either the budget rate, an average rate, or the highest rate returned, in place of anything not priced by any tenderer, to obtain a transparent analysis and comparison. In addition, it provides a basis for the movement of budget allowances for comparison purposes, to cover attendances and temporary works should any variant tenders be received.

Once the tendering schedule returns are received and adjusted (including for discounts), they can be compared and analysed to evaluate which is the most favourable for acceptance. The analysis should also include the original supply chain partners used to produce any pre-existing estimates.

This process will initially take place at the time of tender for the main contract, as well as during the construction phase. However, some contracting organisations do have a policy of divorcing the process at the estimating stage from post-contract procurement, and effectively 're-tender'. Additionally, it should be noted that some clients' procurement strategies contractually return any benefit from such a process back to them.

Even if the post-contract process starts with what was done at the time of tender, the commercial manager is advised to re-evaluate all packages to account for changed factors, such as expired bids, late bids, new bids received from subcontractors who priced for (or even as) competitors originally, and any changes in market conditions.

From this evaluation, a negotiation can take place with one or more subcontractors or suppliers. Anything identified at this point, such as variances, or adjustments made in comparisons or anywhere else through the procurement process, should be recorded on the risk and opportunity register and appropriate contingencies made in the forecast.

5 Standard and bespoke forms of agreement for entering into contracts with chosen providers. These agreements may be for a specific project, or for a given geographical area, for a given period. The use of standard forms of agreement is efficient, avoiding 'reinventing the wheel': however, bespoke agreements will often be required to ensure that back-to-back risk-transfer arrangements can be undertaken where the main contract has specific nuances or obligations that need to be passed down the supply chain.

6 A draft subcontract: at this point, a draft subcontract can be produced, incorporating the elements described, together with minutes from the pre-contract meeting (which is held to agree the final price, retentions, payment terms, contact details, programme, phasing, number of visits and attendances). To avoid disputes later, it is advisable that the records of any other pertinent documents and discussions are kept throughout the tender process, with these either incorporated directly within the subcontract agreement, or revisited at the pre-contract meeting, to ensure that they are incorporated by all parties. It is good practice to adjust the documents to include post-tender amendments, rather than rely on incorporating notes from meetings and general correspondence, which can end up in conflict if the precedence of documents does not operate as intended.

3.3.3 Contract administration

3.3.3.1 Monitoring, assessment, valuation and payment

Once an agreement is made and a subcontract has been placed, the administration, monitoring, assessment, valuation and payment of the works are parts of an ongoing cycle of activities, with a focus towards the month-end CVR procedures, in the same way as they are for the main contract.

The monitoring and assessment of the package is undertaken as an ongoing review of the work carried out by the subcontractor, including a review of progress on site against the original tender, variations and the formulation of an add and omit schedule. The exact nature of this will depend on how the subcontract package was procured and placed: for example, as a lump sum item, an estimate (with or without remeasurement), a target sum or, in some circumstances, under an open book 'cost plus' arrangement.

As important as any other aspect (and often overlooked) are general administration, record-keeping and correspondence management. Without good records, it is difficult to make or challenge any claim, whether for time or money, received from a subcontractor, or to substantiate a claim passed up the supply chain to the client. Records are also fundamental for the substantiation of costs under target sum or cost plus arrangements, as they drive the calculation of value. Without substantiation, they can easily be dismissed.

The requirements for record-keeping should be reviewed in the context of the contract and with due regard to internal business governance. Records can be kept in hard copy or electronically ('soft copies'); either way, they are key to managing subcontractors on site and a subcontractor should be contractually bound to provide them.

Clear, organised correspondence is also vital to good subcontract management. Packages are rarely managed by one individual, so it is important that those who may need to assist can quickly understand all information and the correspondence relating to it. Good practice should include:

- creating a standard structure for filing, for either 'soft' or hard copies, or for both, using the same structure for both
- circulating contact names for the client, contracting organisation, subcontractor and other stakeholders to all concerned
- using standard templates wherever possible for notifications, for example, for payment schedules, change instructions, and so on
- clearly issuing notices of delays, of additional works, of any defects caused by the subcontractor or of incomplete works
- issuing timely sectional (where appropriate) and final completion certificates
- compliance with contractual reply durations – if no contractual durations are specified, then replies should be made in a timely manner, so as not to compromise the contracting organisation's position in any future dispute
- considering where issues included in correspondence to a subcontractor should also be included in separate correspondence to the client.

In almost all circumstances, the valuation will calculate the contracting organisation's liability to the subcontractor at the end of the month. (It should be noted that it is advisable and good practice to include a monthly payment calendar to clarify this in the subcontract agreement.) This will affect the cost taken into the month-end accounts and is linked closely to the payment. The payment will usually take place at some stage in the following month, depending on the contractual arrangements made in the subcontract and in Security of Payment legislation.

If possible, the valuation of work will take place as a back-to-back exercise, ensuring that the value taken by the contracting organisation is aligned with the liability, using the same underlying measures, or other assessment format, for work within the original package, as well as any variations.

The total liability can be defined as the total cumulative amount that would be due to that subcontractor for that package of work up to the period end-date, if no further work was to take place either on- or off-site. It can include amounts that have not been proven as contractually due, but for which a prudent allowance (subject to the contracting organisation's policies) should be made in the liability. An accrual is the difference between the total liability and the amount already paid to the subcontractor: this is an accounting function, to ensure that the total costs in the financial accounting system are accurate and can be analysed in terms of what has already been paid and what is due to be paid.

3.3.3.2 Cumulative measurement

Good practice defines that all measurement, including measurement for subcontract liability calculations, is managed cumulatively on a project or within a package of work. In this way, there is always a reference point to which to return. When managing cumulatively, the commercial manager calculates the amounts in the period by deducting the cumulative cost up to the end of the previous period, meaning that any minor errors are progressively and continuously rectified. The principle of calculating amounts cumulatively and deducting previous cumulative to calculate period values is one that can equally be applied to cost reports as it can to measurement values.

The measurement or calculation of the cumulative liability should be assessed as accurately as possible and should be relevant to the payment mechanism. For example, if the arrangement is traditional, the assessment will be based on an accurate measure or a 'percentage complete' assessment. If more appropriate, however, the assessment could instead be based on milestone achievement, or, under cost reimbursable or target sum payment mechanisms, an assessment of subcontract costs. Irrespective of whether the subcontractor has made a detailed payment claim, an independent assessment should be made, and, if appropriate, cross-referenced closely and amended as necessary by the commercial manager.

3.3.3.3 Payment

Payment assessment to subcontractors should be in accordance with the subcontract agreement and the relevant Security of Payment legislation. The subcontract liability is dealt with in 3.3.3.1, and in principle, should represent the amount that the contracting organisation would be liable to pay the subcontractor at that point in time. Any notice to subcontractors confirming the amount they will be paid should be issued in line with the timelines and using the templates noted in the relevant Security of Payment legislation. This is covered in more detail in 4.3.3.4.

To ensure robust assessment of any subcontractor payment claim is undertaken, the following methods should apply to these payment mechanisms:

- For subcontracts based on lump sum or remeasures: progress to date should be measured and agreed with operational managers.
- For subcontracts based on cost reimbursable and target sum payment mechanisms: the payment for these will be directly related to the substantiation provided with the payment claim. Cost data submitted by subcontractors should be assessed in accordance with the appropriate contractual definitions of actual and defined costs.

'Contra charges' are covered in more detail in 4.3.3.3. They should be clearly identified on any payment schedule, along with any other deductions, which should be made in accordance with contract conditions and substantiated or evidenced. Reasons for deductions can include, but are not limited to:

- late delivery, where detailed in the contract conditions
- non-performance, where detailed in the contract conditions
- key performance indicator (KPI) failure
- liquidated and ascertained damages (LADs)
- supply of materials
- damage to other trades.

3.3.4 Final account

3.3.4.1 Producing a subcontract final account

The minimum information required to produce a subcontract final account can often be found within the specific contract form. It should generally be geared towards (and, in the absence of any other specific requirements, should include):

- the original subcontract agreement, including the estimate or alternative pricing document
- all records and correspondence with the subcontractor (as discussed in 3.3.3.1)
- the latest subcontract application for payment (or final account if submitted)

- details of all variations or changes, with full substantiation
- any remeasures (if applicable)
- full substantiation of any cost-based elements.

It is good practice to build up the final account as the package progresses, including agreeing any remeasures (if applicable), together with any changes to the original price. This will simplify the finalisation of the account. However, this process is not always followed, meaning that, at best, time needs to be taken going back over historical documents and records. At worst, records may not be located, meaning that negotiation and dispute resolution procedures could be required.

Once the final account has been agreed, a joint agreement detailing the total value should be signed by both parties and held on file. It is likely that this will be required under the specific contract form; if it is not, it is still good practice to ensure that this is undertaken.

3.4 Valuing work: further considerations

3.4.1 Assessing the value of work complete

The quantification of construction works is a core quantity surveying skill and will usually be in line with one of the standard methods of measurement. However, while not best practice from a quantity surveying perspective, in some instances the original estimate may not have been based on a standard method. This may be the case, for example, where a contracting organisation has produced the estimate itself, and is to be paid a lump sum, with the value of this based on project milestones or percentages of key elements.

The quantification of works for an interim valuation should be carried out in accordance with the relevant standard method, providing the most accurate reflection of the amount of work done on site. It must not be forgotten that certain works, such as preliminaries and temporary works, are time-related, with the calculation of value based on the number of days, weeks or months elapsed.

Other factors to consider, which may or may not be related to the measured works, include the following:

- materials on site
- materials off site
- calculation of retention
- the valuation of additional entitlement from variations or any other source
- the assessment of set-off and abatements, including LADs
- GST.

Further detail on the measurement of construction work can be found in the following RICS competencies:

- project financial control and reporting
- quantification and costing of construction works.

Irrespective of the methods used to assess the value of work carried out, it is important that the individual elements of a valuation can be readily collated up to the common analysis levels that have been adopted for the project, to facilitate the commercial management of the project cost, value and forecasts. If this has been carried out as described in 3.1, this analysis should already be in place (see 4.1.3 for further discussion of this).

The difference between the external and internal valuations effectively tells a contracting organisation where the valuation of work is ahead or behind execution, so that due allowance can be made later in the cost/value analysis. The ability to analyse the external valuation versus the internal valuation will thus allow a contracting organisation readily to monitor and understand 'where it is' regarding its cash flow forecasting, and the reasons why. The difference between the payment claims and internal valuations is usually referred to as 'over/under claim', although accountants will tend to describe it as positive or negative 'work in progress' (WIP).

If the contracting organisation is reimbursed based on one of the actual cost models introduced in 2.4, there will usually be a requirement in the contract to present the actual costs in a specific format for the interim valuation, and to provide substantiation in the form of timesheets, invoices and payment claims. It is good practice to agree this prior to the first valuation; any lack of clarity or transparency could result in a delay in the certification and payment, with a negative effect on cash flow. These requirements should be considered when identifying cost reporting requirements, which are covered in 3.5.1.

3.4.2 Valuing variations: considerations

The adjustment of the contract sum or original estimate to include appropriate variations is one of the most important matters underpinning the commercial management of construction works. Special consideration should be given to the following factors:

- Contractual entitlement should always be assessed considering coverage and measurement rules, and contractual procedures, as well as any time restrictions or time bars.
- Revenue recognition rules set by the contracting organisation's internal governance should be accounted for. Many organisations will have published rules and guidelines on what revenue can be taken in the internal valuation of variations that are yet to be agreed.
- Prudence is the key to minimising risk, but risk should not be understated. A conservative approach to valuing risk is broadly advised.

3.5 Understanding cost: further considerations

3.5.1 Cost reporting

Depending on the systems used by the contracting organisation to manage the project, and its financial accounting system, it may only be possible to identify the costs of payments made. However, for an up-to-date view of goods and services consumed, it is beneficial to include:

- accruals for goods and services received, but not yet paid, from delivery notes, and detailed records of subcontract accounts
- a forecast of costs, from orders placed, but where the goods or services have not yet been received – these are known as 'commitments' and are extremely useful when forecasting.

If these are not automatically produced from the contracting organisation's systems, it may be necessary for the commercial manager to obtain or maintain his or her own liability statement (a register of commitments and accruals), so that these can be readily consolidated with the paid costs, to provide a full picture of costs to date and forecast costs.

Similarly, depending on the systems used, it may be necessary separately to allocate and analyse the costs, for the purposes of comparison against the common analysis levels. No matter how the costs are collected and captured, it is important to ensure that the amounts can be collated up to the same common analysis levels as the values assessed in terms of work breakdown structure (the type or activity of work) and the cost element (the type of cost, for example, labour, plant, materials and subcontract). This is a core commercial management principle.

As described in 4.1.3, setting up the cost element and common analysis levels at the start of the project or contract is crucial to its smooth commercial management. Ideally, the contracting organisation's project or financial accounting system should be configured by a project controller, or similar, to produce a consistent coding structure for cost/value and forecasting. The system will then directly reflect how the project or contract is being managed.

If this does not happen automatically, the commercial manager will need to develop a separate robust process of tracking and allocating costs as they are incurred, or of re-analysing costs once they are published, so that they can be used for the purposes of cost/value reporting, forecasting and earned value analysis (EVA, as detailed in 3.6.3), using a database or Microsoft Excel spreadsheet to analyse the costs against the appropriate headings.

This is not the preferred option, as both manual tracking or re-analysing will require reconciliation back to the financial accounts. This delays the publication of meaningful information and provides a high level of risk of inaccuracy in the cost data, due to mis-keying or other human error.

It is also possible that the systems employed will be a hybrid of these two situations. A contractor may have systems that provide some useful analysis, but not enough to make a ready comparison with the estimate or project forecasts. If this is the case, extra care and resources should be engaged to ensure that any human intervention is closely reconciled.

In addition to direct and indirect costs, the contracting organisation's overhead costs will be collected centrally. These will include the cost of any head offices, together with their staff, and other items, such as marketing costs, IT costs and recruitment costs. Just as these may have been expressed as a percentage in the tender (see 4.1.3), they will often be shown in the same way in the cost reports. Less frequently, they may be apportioned to the contract based on some other function, such as the number of staff on site or the site weeks in the programme. This is often the case if any specific overhead costs can be recovered through the contract payment mechanisms. A similar approach is often taken by contracting organisations regarding contingency for costs not yet incurred, if the associated revenue has been recognised.

3.5.2 Collection, analysis and presentation of data

Depending on the systems and processes used to capture the project costs, different approaches can be taken regarding the collection of data for cost reports. Costs can either be captured and allocated to the common analysis levels at source, as part of the contracting organisation's core business processes, or, if the business has neither the systems nor the appetite to implement such processes, it can take what it does have and retrospectively allocate costs. The latter approach, however, is both time-consuming and will delay the publishing of reports. It is also risky, with the potential for duplications, omissions and other calculation errors.

To capture and allocate costs accurately, a project-accounting solution with supporting processes is required. These will deal with the capture, allocation and reporting of all elements of project costs: labour, plant, materials and subcontract.

A flexible project ledger, which allows each contract to have its own bespoke cost-capturing facility and reporting hierarchy, is good practice.

The system should also support business processes for the capture of costs, helping to ensure that these are properly incurred, in accordance with documented business processes and corporate governance.

3.6 Cost/value analysis: further considerations

3.6.1 Techniques used (CVR/CVC)

As detailed previously (2.6.1), the cost/value calculation is usually referred to as the CVR (cost/value reconciliation). It can also be known by similar terms, such as the cost/value comparison (CVC).

To carry out a CVR, the most important things to understand are the two key elements: namely, the cost and the value.

The 'cost' element of the CVR will have been calculated through the processes described in 3.5, and the 'value' element from those set out in 3.4. The reconciliation element is heavily reliant on the use of the common analysis levels discussed in these two sections.

The process should be carried out in the following stages:

- Comparison of the overall cumulative project cost versus the overall cumulative project value, taken to the same point in time (date), which is usually an accounting period month-end for reporting purposes. It is very important that the 'cut-off' dates for each element are the same, or the values will not be directly comparable. For this reason, it is good practice to develop a monthly commercial calendar focusing on the cut-off date, reporting dates and key tasks that contribute information used in the CVR, to ensure that all members of the project team are always working to the same timetable.
- Review of the period movement for value and cost: a high-level check that there is not an unexpected swing in either. The period movement should be easily calculated by taking the previous cumulative from the current cumulative amounts.
- A cross-check that all internal value has been accounted for, including work in progress; that this aligns with subcontract measures or liabilities; and that all costs, including accruals and provisions for known liabilities, are included, to produce the overall cumulative project cost and value.
- Comparison by common analysis levels (work breakdown structure, element or activity), reflecting the levels at which the estimate and project forecast were produced. It is at this point that it becomes clear just how important it is for costs to be accurately allocated and captured, and easily analysed against the elements or activities used to build up the original estimate.
- Comparison of cost elements: rudimentary checks that the values for labour, plant, materials, subcontract and other all feel realistic and that the monthly movement of each is in line with the previous month or is as expected.
- Identification of variances in cost and value against each element or activity. It may be possible to narrow the variance down to a specific cost head, for example, labour, plant, materials or subcontract.
- Once the basic reconciliation result is arrived at, the consideration of risk, contingency and other executive's adjustments can be made.

When these high-level checks have been carried out, and any adjustments made for misallocated or missing costs or value, or for over-value, a detailed line-by-line review of each activity of work can take place, both cumulatively and in the reporting period, looking at cost, value and margin. A comparison can be made with the initial budget and the latest forecast to pick up variances and unexpected results.

Each variance should be investigated, corrections made where necessary, and a 'lessons learned' log maintained, to prevent the same matters arising again.

3.6.2 Risk and contingency allowances

The inclusion of risk and contingency allowances, briefly mentioned in 3.1, concerns allowances made for 'unknowns', or for things that may happen through the life of a project or contract that cannot be fully quantified or understood at that time. When the estimate is finalised, the quantification and valuation of these elements will often be subject to market forces. Budgets and forecasts are then re-evaluated during the CVR process, which may result in amounts being released as margin or further allowances being made.

In simple terms, if a contingency or risk allowance is included with the initial estimate, and taken through into the budget and forecast, when the project or contract is complete, and the matter that the amount was included for has not occurred, that amount can be released as additional margin. The same logic can be applied regarding contingencies or to risk allowances that apply only to a specific activity or phase of the project.

What requires more consideration is how contingencies and risk allowances are accounted for while the contract, project or individual activities are still ongoing. This topic is covered in more detail in 4.8.3 and 4.8.4, where the trigger for release or partial release based on commercial decisions or strategy is discussed.

For the commercial manager, what is most important is how risk is quantified and valued. A risk and opportunity register should be maintained by a 'risk manager' (who may or may not be the commercial manager) throughout any project or contract. This register (an example is included in Appendix C) will include matters such as health and safety risks or reputational risks, which will not necessarily be the direct concern of the commercial manager, however, it would be unusual for any identified risk or opportunity not to have some commercial impact. Therefore, the commercial manager should be concerned with how each risk and opportunity manifests itself within the estimate, budget and forecasts, and how it then affects the CVR.

3.6.3 EVA and cost/value analysis

A further nuance of the cost/value reporting and forecasting processes is the adoption of earned value analysis (EVA) techniques. In its most simple terms, EVA is an extension to the CVR, as it brings the project programme into the equation, linking cost, value and time. The additional dimension of time is used to assist in forecasting and to provide a cross-reference to operations as a further indicator of performance and delivery output.

Whereas the CVR compares the value of work done to a point in time with the costs incurred to the same point in time, EVA compares what value of work would have been done and what costs would have been incurred, at that same point in time, if the works had been on programme.

It also uses current performance, in terms of actual cost and value, versus programmed cost and value on each element or activity, to forecast future performance and to highlight potential cost overspends and time overruns. With the introduction of time into the equation, the use of the common analysis levels becomes even more important. As the project programme is naturally broken down into activities or elements, however, this should be relatively straightforward.

Each of the ingredients of EVA – cost, value and progress – is as important as any other. The original estimating, capture and reporting of project costs, and the calculation of value earned to date, are, for example, as important, but not more important, than the project plan. They should be analysed together, using the common analysis levels as part of a wider project controls approach. Where this is not recognised, the results will not be as accurate or meaningful. On a wider scale, the consistent adoption of project controls and EVA techniques will become more difficult to establish.

Earned value calculations are relatively complicated if considered in isolation. However, they can be explained in a straightforward manner, focusing on the true cost performance, or, to put it simply, 'what we got for what we spent'. The concepts of earned value are based on the relationship between:

- the scheduled or planned costs at any point on a project
- the actual costs that have been expended to date
- the value of the actual work achieved to date.

3.6.4 Cost to completion (CTC) exercises

Most organisations will forecast their final position on all projects, and for their business overall, for the lifetime of each project and for the current financial year. This forecast final position is, essentially, the forecast revenue less the forecast cost, to produce the forecast margin, but should be calculated by reporting period to enable tracking with the actual data from each CVR.

It is the commercial manager's responsibility to play an integral part in the production of the forecasts and then to deliver the project in line with the forecast, tracking variances as the time and the project progresses.

Many contracting organisations operate a CTC process alongside the CVR, to produce their forecast. In the same way that the CVR is an analysis of the contract performance at a given point in time, analysed by the common analysis levels, the CTC process takes the original tender, in the same format, analysing the forecast revenue and forecast cost, to predict the contract performance at the end against the same common analysis levels.

As the project progresses, where a CTC approach has been adopted, it will be updated for each activity or element as the CVR is worked through, firming up the revenue recognised and the costs booked to that point in time, then projected forward to project completion to forecast the final margin.

The forecast revenue will account for the original estimate, plus or minus variations, using an agreed strategy for recognising the value of any variations. A prudent approach is advisable to avoid 'over-trading' and will be subject to the policies of each contracting organisation. These may include the following:

- revenue is only fully taken where the variation is agreed and paid
- a reduced percentage is taken as value if it is paid on account or has been agreed, but not yet paid
- a further reduction is applied if the variation is neither paid nor agreed, based on experience of how the client or its representatives have responded.

The same prudent approach should be taken regarding any other additional payments or revenue, such as claims. It is good practice for a contracting organisation to document its approach to recognising revenue whether that be for the purposes of forecasting or the cumulative internal value figure traded within the CVR and management accounts.

The forecast cost will take the costs already incurred, including accruals for costs not paid (as detailed in 3.5), and use various techniques to forecast costs to come, summarised as follows. This exercise will be simpler on contracts delivered using mainly subcontractors, which will involve only items 4 and 5 in the following list, than those involving a mix of subcontractors, together with a contracting organisation's own resources, which will involve all five elements.

For each element of cost, alternative methods of forecasting should be used:

1. Direct labour will be based on the number of operative days required to complete the balance of an activity at current cost rates, adjusted, where appropriate, for known factors such as wage increases or productivity variances.
2. Plant and equipment will be based on the number of hire days required to complete the balance of an activity at current cost rates, adjusted, where appropriate, for known factors such as price increases or depreciation rates, and where possible, will include fuel.

3 Materials will be based on estimated quantities, until firmed-up by take-off from construction drawings, using estimate rates or current buying rates, adjusted, where appropriate, for known factors such as price increases, bulk discounts and rebates.

4 Subcontractors will be evaluated package by package, using the order value to the subcontractors as the basis for plus or minus variations. Wherever possible, subcontracts will be managed back-to-back in terms of key conditions of contract, method of measurement, payment mechanisms and any other matter that could result in additional risk to the contracting organisation. (There may, however, be circumstances where the advantages of not being back-to-back outweigh the risks, in which case a commercial decision should be made.)

5 Preliminaries will be forecast in the same way as overheads would in any other business, with fixed and variable costs, using a combination of methods 1 to 4 most applicable to the item in question.

Note that if this detail has been used in calculating cost forecasts, the cash flow calculations, dealt with in 3.7, will be made easier and will be simpler to reconcile with actuals.

Decision making with reference to the CTC is therefore based on the following key issues:

- Accurate collection and reporting of historical data (cost to date).
- A record of commitments made that have not yet been costed (see 4.3.2.1).
- Accurate forecasting based on construction methodology: for example, how is the job being built? Are there other ways to do it? What is the trends analysis (based on historical data and market analysis)?
- Current programme position and guidance provided by programme reviews, alongside any EVA calculations.
- Probability analysis of the worst, best and likely cases regarding items on the risk and opportunity register, to inform the level of the contingency amounts included.

3.6.5 Preparing and submitting cost data

Most contracting organisations estimate new work based on historic cost information built up from libraries of resources, costs and outputs. Where the data within estimating libraries can be verified or updated from the costs captured on projects, this can only be of benefit.

A further benefit of using the common analysis referred to throughout this guidance note is that actual cost information can be extracted and used to benchmark and update the data within the contracting organisation's estimating libraries.

The deeper the level of detail reached in the common analysis levels, the more detailed the feedback to other stakeholders can be. For example, if cost can be accurately collected against an individual bill item, then the way that bill item or similar items are priced can be adjusted, moving forward. This, however, will often not be realistic – for costs to be captured at the very lowest level, every operative on site would effectively need an administrator recording everything they did all day and noting precisely what equipment and materials they used. Accordingly, it is important that the common level of analysis is set at the most appropriate level that can be achieved without requiring an army of administrators, but equally, without compromising accuracy. If mechanisms are not in place to capture cost allocations accurately, at the levels set by the common analysis within the project accounting solution, then the allocation of resources will be spread and averaged, taking away the benefit of the detail.

3.6.6 Use of IT

Over the past decade, IT has become an essential tool in the commercial management of construction due to the level of analysis it can deliver, adopting the principles of the common analysis referred to throughout this guidance note.

The key elements of the CVR are the cost and the value, which should be comparable at the lowest common analysis levels. If the costs are captured and the value calculated in different systems, this analysis can be carried out at the lowest common level in a Microsoft Excel spreadsheet. However, if a contracting organisation's IT system allows the cost and value to be managed in the same system, any variances and discrepancies can be more easily reviewed and interrogated.

The project-accounting functionality that allows costs to be allocated to activities, supporting a common analysis approach, has become more widely covered by IT solutions providers. Solutions range from potentially full enterprise resource planning (ERP) solutions, from providers such as SAP and Oracle, able to manage every aspect of a business – to those such as Sage, which is widely used across all industry sectors and can be configured to the needs of a contracting organisation. Construction-specific solutions providers, such as COINS, Integrity, Causeway, EasyBuild, CHEOPS and RedSky, provide systems that are more 'out of the box' and developed specifically for contracting organisations (please note that the list of solutions is indicative and not intended to be comprehensive).

The management of value is less well catered for. Although the ERP systems can be configured to manage all aspects of the construction process, and while one or two of the construction-specific providers offer solutions, this functionality is often simply delivered through an extension of the estimating system, in a bespoke system or in a Microsoft Excel spreadsheet.

3.7 Cash and cost flow analysis: dealing with cash flow

The generic benefits of having a stronger cash flow are detailed in 2.7. In addition to these, a strong cash flow will strengthen the trading and negotiating position of a business, which may ultimately improve margins. In many cases, the same can be said for a more predictable cash flow too – being able to forecast when cash will be going out and coming in is important, as it can allow decisions to be made that may improve margins. The following examples illustrate this point:

- When taking decisions on which work to tender: is it necessary to take on work at low margins to obtain or improve cash flow?
- When negotiating a subcontract package or other supply chain arrangement: is it possible to offer the supply chain guaranteed or shortened payment terms, to obtain a better deal than competitors?
- When negotiating a client variation: is the need for payment, and thus for an agreement, urgent? If so, must expectations be lowered further than if it were possible to hold out and let the negotiations take their course?

Many aspects must be analysed carefully when dealing with cash flow. Generally, contracting organisations are paid substantially in arrears for works carried out on site; the key objective, therefore, is to apply for and receive income under the head contract as early as possible, and to release payment for any liabilities as late as possible (all in accordance with agreed contractual terms).

In practical terms, the production of the cash flow should follow on from the data used to produce the cost forecast, as detailed in 3.6.4. If this can be achieved, not only will the same base information be used, but the natural split between cost types will make the profiling of when cash will leave the business a more transparent task.

To improve their cash position, contracting organisations often employ subcontracted labour, plant, equipment and services, to avoid the investment of capital on these. By subcontracting, there is an opportunity for payment terms to be negotiated that satisfy the objective previously set out.

If the contracting organisation has its own workforce, it is essential that cash is available to pay the workforce weekly, fortnightly or, preferably (in cash flow terms), monthly. By contrast, if the contracting organisation makes use of subcontractors, the money can usually be held for longer, awaiting a monthly invoice, and paying one or two months later. However, it should be remembered that a contracting organisation's expenditure is a subcontractor's income. Legislation is in place to prevent unscrupulous contractors from abusing the supply chain.

The financial structures of construction companies are highly dependent on cash flow patterns. When forecasting cash flow, it is vital that the relationship between financial structures and payment regimes is understood and fully considered by the commercial manager and other senior management in a contracting organisation.

The following practical considerations provide some guidance on what needs to be considered when setting up a cash flow profile and forecast for a project:

- Advance payment:
  - Is there any advance payment provision in the contract? If so, to what value?
  - Is there an appetite from the client to make advance payments?
  - Are bonds required as security for an advance payment?
- Mobilisation: how much cash will be needed to mobilise the project or contract? The following must be considered:
  - preliminaries and set-up
  - people (operatives and office/supervisory staff)
  - equipment (own or hired)
  - materials (do you need to purchase before you can bill?)
  - advance payments to subcontractors
- Contractual provisions:
  - Are the terms set down in the contract regarding being paid understood?
  - How are the works to be valued?
  - Has this been considered in any down-stream subcontract or supply agreements?
  - If not the main contractor, are the main contractor's payment terms understood?
  - Is there entitlement to be paid for materials off site, or not installed? Will security be required? If so, will off-site materials need some form of vesting certificate before payment is made?
  - Are there clauses in this about paying subcontractors (see Supply chain)?
  - When is the first valuation due, and from that, when will the first progress payment be received?
- Supply chain:
  - Will it be possible to set up subcontractor and other supply chain arrangements to defer the timing of payments?
  - Are there obligations regarding paying the supply chain in the main contract?
  - Will the client pay slowly? Is there a process parallel to the contract that needs to be used to get the cash into the bank?

  - Do the client's representatives and staff understand the contract and their own processes? Do they have competent staff to process your applications and invoices?
- Programme: the programme drives the work, and the work drives the valuation. In turn, the payment claim generates the cash flow. Based on this, the following should be clear regarding the programme:
  - Do you understand the work schedule and programme, for example, when work is scheduled to start, stop and start again?
  - Is there a process to ensure that all delays are tracked?
  - From the programme, how much work will be done each month?
  - Is there a milestone payment schedule, or is this based on actual work carried out?
  - If the latter, how much of the work can be valued?
  - How and when will retention be released?
- Credit: will cash flow be negative at any point? If so, when will it be necessary to use a line of credit? When will cash flow be positive again, making it possible to pay down the line of credit?
- Variations: is there continuous monitoring to validate whether the work you are doing should be a variation? Consider the following:
  - If there are excess resources (people, material and equipment), then unless there is a variation, this will result in a negative effect on the margin, as well as the cash flow.
  - If it is a variation, when can it be claimed?
  - Have the payment dates for liabilities, including subcontracts, suppliers, staff and labour, plant, and equipment leases, been correctly interpreted?
  - People and systems: if the systems match the processes and contractual requirements, do the staff (on site and at head office) know how to document and input the information into the systems to get paid?

3.8 Commercial decision making: further considerations

3.8.1 Risk and opportunity register

Commercial decisions should be entered onto the risk and opportunity register (discussed in 3.6.2). It is best practice to quantify and value each decision. Depending on the stage of the project or contract, an allowance or contingency may be included within the estimate or, if post-tender, within the budget and the forecast. This may then be monitored and tracked until the event occurs or is no longer likely to occur.

The risk and opportunities register allows commercial decisions and other matters to be proactively managed. As a minimum, it should record status, estimated value and the likelihood of occurrence. In addition, it should have the facility to record agreed actions and to track them, to ensure that risks are mitigated and the opportunities maximised. A sample risk and opportunity register template, covering key items identified in each section of this guidance note, is included in Appendix C, and the subject is discussed further in 4.8.1.

3.8.2 Commercial decisions at the tender stage

Once the documents relating to the tender are received, the head contract will be reviewed, and all commercially-related issues considered. Some key considerations and questions relating to this stage are:

- Is there any requirement for security to or from the client?
- What requirements are there in terms of bonds, collateral warranties and parent company guarantees?
- Are there any third-party rights requirements?
- What are the funding arrangements for the project? Are there any third-party financing conditions, such as public-private partnerships (PPPs)?
- Are there any process design/full function point (FFP) risks? Can the proposed levels be accepted, or can they be 'backed off' to a third party, such as a design consultant? Will insurance cover the process risk?
- Are there any delay and liquidated damages provisions? Are they to be capped, or is the rate so low that even a long delay would not reach the margin level? Are they high enough that they could be challenged as penal if they did occur?
- Are there any consequential loss provisions?
- What is the position regarding any general damages?
- Are there any joint ventures or consortiums to be considered?
- What, if any, insurance provisions are in the contract? Are there any minimum levels of cover?
- Are there any provisions that will affect cash flow?
- Is there any mention of a project bank account?

Various options and strategies need to be considered, with decisions made at the tender stage as to the risk profile that the company is willing to offer and accept. If the client's procurement route allows, these may well proceed through the negotiation stage.

Contracting organisations will make assessments of risk and opportunities while pricing and finalising their tenders for projects and contracts, as discussed in 2.1 and 3.1. Strategies and adjustments may be deeply embedded into the pricing, or alternatively, could simply be single-line alterations to the margin added to the net estimate. Whatever way the adjustments are made, they should be clearly stated on internal documents, so that those responsible for delivering the work understand what the key drivers are to achieve the expected returns for the contracting organisation. Examples of where commercial decisions could be made include:

- movement of resources and associated sums, between items that are considered over- or under-measured
- adjustments to specific packages or activities
- adjustments for forecast buying gains or losses, post-contract
- bottom-line adjustments to the margin added to the net estimate
- adjustments to people or equipment rates
- adjustments for the recovery of sums from third parties or services that can be obtained at no cost or paid for elsewhere
- adjustments for omissions or ambiguities in the contract documents
- adjustments for gaps between the method of measurement, the specification, the drawings and any estimates or schedules of rates (SoR)
- potential efficiencies or inefficiencies, such as the sharing of preliminaries or other overhead costs, with other contracts secured
- value engineering and alternative methods, such as off-site fabrication.

3.8.3 Post-tender commercial decisions

Once the tender is submitted, the negotiations and clarifications have taken place and the contract has been secured, the focus becomes the initial forecast. As covered earlier in 3.1, this takes the estimate and turns it into a budget and a forecast, which can then be tracked and monitored as the contract or project progresses. This will involve carrying forward the items discussed in 3.8.2, monitoring them and tracking their financial and commercial implications.

Once the initial baseline forecast and a related cash flow are produced, commercial attention focuses on further engagement with the supply chain, on valuing work (for internal and external purposes), on analysing costs and on the CVR process tracking against the forecast and the cash flow. Further updates to the forecast, and the need for additional commercial decisions, will be driven by the progression of these factors, and by how the matters that emerge from them give rise to additional or evolving risks and opportunities.

4 Practical considerations (Level 3: doing/advising)

4.1 Understanding estimates

4.1.1 Evolving budgets

With the adoption of the common analysis levels, a budget should always be comparable to the cost estimate, ensuring that there is a reconciliation. Nevertheless, if managed correctly, a budget will continually evolve due to various alterations in factors and circumstances. Some examples of these are highlighted here:

- **Tender addenda:** depending on the procurement route, it is possible that a client may issue changes to a contract after a site budget has been produced, but before the contract has been signed.
- **Contract variations:** throughout the contract, there will be changes to manage. These may have an impact on the contract price and on the budget.
- **Value engineering and changes in delivery method:** a detailed estimate may have been priced in a specific way, but when the job is underway, it may be necessary to deliver the works in another manner. For example, concrete pumps might be used to save on labour and reduce time on site, or a decision may be made that a package that was priced to self-deliver will now be subcontracted, or delivered using a labour-only subcontractor with materials supplied by the main contractor. Other examples are covered in 2.2.
- **Changes in outputs:** similarly, there may be alterations if, for instance, a key item cannot be delivered in the way in which it was priced, or perhaps, can be delivered much more quickly.
- **Updates to resource rates:** there may be changes in the actual price of key resources, such as local labour, or in key materials, such as concrete, possibly due to market conditions or changes in legislation. These may be recoverable through the contract change mechanisms.
- **Subcontract package-buying gains and losses:** it may not be possible to procure certain packages for the rates in the tender, or, following the insolvency of a subcontractor carrying out the works, it may be impossible to source an alternative at the same rates. Alternatively, discounts may be negotiated, resulting in savings.
- **Changes in site overhead and preliminaries strategy:** changes in staff levels, or the number of key elements of the establishment, or a change in the programmed number of weeks on site, may result in forecast savings or in additional cost.
- **Changes in, or reviews of, the risk and opportunity register:** these may result in changes to the assessed contingency amounts.

4.1.2 Inclusion of company overheads

The recovery of company overheads and their inclusion within an estimate is mentioned in 3.1. The amount of company overhead recovery is generally determined by expressing the budgeted annual overheads as a percentage of budgeted turnover and applied as a proportion of the cost of individual contracts.

If the company is competing and trading as forecast, the overheads percentage will probably not be adjusted within a financial year. However, it may be reduced to win a specific contract, or increased, if failure to win the contract would not affect the organisation (although in this case, it is more likely that the profit percentage would be increased). During a tender review, when the aim is to win a contract or to increase the returns from a project, the overheads and risk margins are subject to adjustment based on market conditions. It is important to note that the estimating of these elements is a highly sensitive and confidential issue for contracting organisations.

4.1.3 Contract administration and project controls

The way a contracting organisation incurs its costs on a project or contract will never be the same as that calculated within the detailed estimate. The more complex a project, the more likely this is to be true, and the more differences there will be.

As a result, the budget to build and the post-tender adjusted estimate, not to mention the cost/value reconciliation, can bear little resemblance to the original estimate. Internal tracking mechanisms for cost and value management controls, including the common analysis levels, should therefore be set up so that adjustments are as transparent as possible. This includes the need to establish an internal budget to manage cost and value, providing the 'day one' reference point.

The way that internal tracking mechanisms or project controls are set up will have a major impact on how transparent the commercial management of a project will be, and on how much time and effort it will take to provide up-to-date information on an ongoing basis for commercial decision making. The time invested during the mobilisation period will reap an equivalent amount of savings in time every month, or every time a reforecast is required.

Shortcuts should not be taken without understanding the full implications and knock-on effects to the project controls.

The five-column labour, plant, materials, subcontract and other split displayed on the horizontal axis in Table 2 shows the total of the estimate and budget costs, analysed by what is known as the 'cost type element'. The 'row based' elemental or activity structure is displayed on the vertical axis. It is the combination of the two that creates the common analysis levels, allowing values relating to the project or contract to be analysed and compared in a consistent format. Without both the cost type and the activity elements, the ability to identify and forecast issues is limited. For example, if the estimate is prepared in one format, and the valuation in another, and the costs simply summarised to the contract total, this further hinders effective commercial management.

The activity element analysis should have an intuitive structure aligning the way the estimate was produced with the way the costs are to be captured. This should relate to how the project plan will be, or has been, put together. This example is taken from a simple project with a single phase and a single structure; however, the number of activities and layers can be refined to reflect the complexity of a project or contract, and the ability to capture that data, particularly actual costs, at granular levels. Other simple examples are included within Appendix B. Generally, best practice is to follow an elemental analysis akin to the way the estimate was put together. For building works, it is sensible to follow the works sections detailed in section 3.3 of the RICS New rules of measurement, volume 2 (NRM 2): Detailed measurement for building works.

The cost type element structure is usually governed by the general ledger coding structure within the financial accounting system of a contracting organisation. However, the reporting and detail of the five-column split can vary, depending on which cost elements are most critical to a contracting organisation or an individual project. It is this analysis that defines 'what the cost is', for example, of 6m^3 of concrete, or eight hours of an excavator, or 7.5 hours of a bricklayer. This example shows the standard split, but it is not uncommon for 'Labour' to be further divided into 'staff' and 'operatives', or 'Plant' into 'hired plant' and 'owned plant'. Even 'external purchases' could be a combination of 'Plant', 'Materials' and 'Subcontract'. Whichever option is chosen, the analysis will usually be produced by collating one or more cost type elements.

It is this combined analysis that defines the use and allocation of the resources. If such a structure is adopted and is consistent between the estimate, the budget and forecast analysis, the cost analysis and the programme elements, then commercial management and the project commercial controls will be more transparent – and variances more readily identifiable.

4.2 Value engineering

4.2.1 Value engineering: who derives the benefit?

The purpose of a value engineering exercise is to find the best value solution: the one providing the most value, for the least costs. However, the question as to which party or parties will derive the benefit – financial or commercial – from the effects of design changes will vary, depending on the form of contract and the payment mechanism within the contract form. For example:

- On cost plus or cost reimbursable contract types, any change is reimbursed, so although the change may affect time and cost, the client generally takes the risk and, by the same token, benefits from any savings.
- By contrast, on fixed price or lump sum contract types, any design changes instigated by the client are subject to valuation in accordance with the contract. Those instigated by the contractor are generally at the contractor's risk and work both positively and negatively in that regard.

Activity	Labour	Plant	Materials	Subcon.	Other	Total
Contract total	17,471	2,571	9,342	9,090	4,500	42,974
Prelims	10,220	920			4,500	15,640
Underpinning				8,050		8,050
Earthworks	2,112	928				3,040
Drainage	414	723		810		1,947
Concrete works	4,725		9,342	230		14,297
Cladding						-
Roof						-

Table 2: The five-column labour, plant, materials, subcontract and other split

- Alternatively, there may be clauses in the contract relating to cost savings and value improvements, as well as others regarding fitness for purpose, or performance specification. If this is the case, and the contractor carries out a value engineering process resulting in cost reductions, then so long as performance is maintained, the contractor is entitled to keep any savings (while remaining responsible for satisfying the fitness for purpose obligation). Even in these circumstances, if the change is instigated by the client, the contractor is generally entitled to 'cost and time'.
- On a target sum contract, the spoils of savings are shared. Dependant on the status of the changes regarding contractual change provisions, there is therefore incentive for both parties to find efficiencies and savings.
- Finally, there may be a defined methodology in the contract for how savings are implemented, and the benefits shared, or incentives relating to the successful implementation of savings and efficiencies.

4.2.2 Value engineering: design growth

Design growth is the reverse of value engineering: it is effectively 'scope creep'. It is important to be aware of this growth, which relates specifically to changes as design evolves, and is often incremental. It can take place on any project, but it is on a fixed price design and construct project that the implications to the contracting organisation are most significant.

Under this type of arrangement, it is even more important that the valuable discipline of reviewing all design changes and drawing revisions takes place as soon as possible on receipt of updates.

As part of this process, drawings should be quantified as and when they are issued from the design team or consultant, with the quantities then priced based on market data.

Under this arrangement, the design manager should be responsible for issuing and coordinating the design, with the commercial team in charge of quantification and repricing. The commercial manager will be responsible for reporting and, if necessary, for instructing changes or revisions.

Without a proactive discipline within the commercial team, additional costs resulting from design growth may not be picked up and affect the profitability of the project for the contracting organisation. This, in turn, may result in disputes with the client.

4.3 Supply chain management

4.3.1 Vendor management

4.3.1.1 Insurances and indemnities

Insurances were initially covered in 3.3.1, with reference to the insurances and level of cover a vendor holds as a matter of course, and those required for a specific contract. This is a significant issue, which should be managed between contracting organisations and their supply chain. Without any supply chain involvement, the main contractor takes on the risks for the projects it undertakes in their entirety; however, when the supply chain has insurance at a specific level, this effectively indemnifies the main contractor for this amount for the works undertaken within the wider project, subject to the terms of the policy. Ensuring that the supply chain is properly insured, and that the main contractor has the latest insurance details, is therefore critical. It is also an arduous task: each vendor will have different insurances, with different expiry dates. Unless the administration of these is dealt with in a controlled manner, it will result in significant uninsured risk remaining with the main contractor.

It is important to understand the precise distinction between insurances and contractual indemnities, and their relevance to supply chain management.

A contractual indemnity is an agreement by one party to reimburse another party for any loss suffered due to specified items that the indemnity covers, thereby transferring the risk to the party providing the indemnity.

Insurance is a separate contract (usually called a policy), taken out with a third-party insurer after the payment of a premium. It provides a party with certain costs and expenses to cover a legal liability that the party may owe to another party, or to cover the party's own costs and expenses suffered due to a specific event. The risk in this case is transferred to the insurer.

Indemnities are generally wide and can be fault- or non-fault-based. Public liability and professional indemnity insurance policies, on the other hand, will generally only respond if the party concerned has a legal liability for the relevant loss. They do not necessarily cover losses that are assumed under contract (although this type of insurance can be obtained). Usually, costs and expenses recovered under an insurance policy need to be proven and verified by a loss-adjuster before an insurer will pay out under a policy. The question as to what should or can be covered by insurance is a commercial decision, and will go some way to protecting the insured under the policy from liabilities arising from any indemnities that are in place. It is important to note that insurance policies generally have exclusions for events and losses that are not covered by the policy, so cannot be relied on as a fail-safe to cover all potential losses that may be suffered. Contracting parties should decide on who accepts the residual risk of the gap in insurance coverage.

4.3.2 Procurement and pre-contract

4.3.2.1 Pre-contract considerations

The key steps that should be undertaken when procuring construction goods and services are detailed in 3.3.2. However, there are some additional areas to consider at this stage:

- **The programme:** it is worth stressing that programme requirements and dates should be documented and accepted prior to finalising any further agreement. There is little point in engaging the most commercially advantageous tenderer, if that tenderer is unable to meet the programme – consideration should be given to the resources they have available, as well as to any other commitments they have made. The commercial manager should investigate these issues and make as many enquiries as necessary, as it is unlikely that the facts will be readily volunteered. This can be undertaken by detailed questioning, testing the understanding and logic of the tenderer, or by comparing alternative submissions. The mobilisation and lead-in time for equipment and materials should also be considered regarding the programme.
- **Attendances:** it is worth reconfirming and checking attendances. There will be a cost implication if there is any confusion, and a potential impact on the programme if the attendance items are not readily available. In addition, if the subcontractor likely to undertake the work is different from the one used at the time of tender, the requirements may also have changed.
- **Risk register:** each subcontract package should have a risk register, recording all decisions made through all four of the stages of supply chain procurement and management (as summarised in 2.3.1), indicating the risks and opportunities identified and noting the transfer of risk between the parties.

Contracting organisations usually have a process to govern the sign-off of financial and contractual commitments. This covers the recommendation for award and the approved signatories on the subcontract agreement, together with any other official instruction, such as a purchase order. Only once this step has been completed can a contract be entered into and executed by officers of the company.

Where such a process exists, the approvals and sign-offs are governed by a delegated authority matrix, which is commonly based on value, complexity or risk. Each employee with delegated authority will appear on the matrix, which will identify what they are approved to sign off and whether any other employees are required to countersign.

Similar procedures exist for other commitment and payment hold points regarding supply chain and other external party transactions.

For a sign-off to take place, a document should be presented for signature, along with the workings that were used to calculate the amount or to make the decision that needs formally signing off. These workings will provide the signatory with evidence that diligence has been undertaken and company procedures followed.

For a subcontract agreement, this could be the comparison sheet used to analyse the returns against the budget, clearly indicating any buying margins or losses, together with a copy of the enquiry letter and the subcontract agreement itself. For a subcontract payment, this could be a copy of the subcontract application for payment, showing the checks and balances undertaken, with site measures and any adjustments made to either the application or the site measures.

In addition to the subcontract agreement, some contractors will issue an official purchase order to record the financial commitment within their project accounting system. This also facilitates the liability and payment process, as well as providing a record of the commitment to create an audit trail regarding the sign-off.

4.3.2.2 Insurances and indemnities: commercial decisions

A commercial decision should be made when there is a gap between the level of cover required for a specific contract and the level of insurance that a subcontractor holds. Although it seems obvious that the vendor should simply increase its insurance cover, this may not always be possible, and in some cases not economically viable. If this is the case, the main contractor may decide that it is better placed to cover the difference between the amount insured and the required level of cover.

The contractor should also consider the uninsured element of each claim, sometimes referred to as the 'excess', and how (or whether) the risk of this is passed to the supply chain.

Indemnities are onerous liabilities for contractors, especially when control of the risk that could lead to an indemnity being triggered is outside their authority. Commercial managers should be aware of insurance policies that can be procured to cover certain risks that exist under the umbrella of indemnities. However, insurances rarely cover all such risk. Commercial care is imperative in identifying and procuring the level of cover considered necessary, balancing that against the cost of covering against such risk.

4.3.2.3 Performance bonds and parent company guarantees

It was noted in 3.3.2 that a tender enquiry may include provisions relating to performance bonds or parent company guarantees. Both are common forms of security requested by employers to protect them from the potential default of a contracting organisation in terms of performance or insolvency.

A performance bond is provided by a financial institution and will provide the employer with a guaranteed payment in the event of a loss due to the contracting organisation's failure to comply with its contractual obligations.

A parent company guarantee is provided by the contracting organisation's holding company, or ultimate parent company within a group of companies, to ensure that the contract as entered will be performed or delivered.

It is important to note that a performance bond will usually involve a cost to the contracting organisation, while a parent company guarantee is less likely to do so.

4.3.3 Contract administration

4.3.3.1 Cumulative accounts

Cumulative measurement is introduced in 3.3.3.2. If a member of the supply chain produces invoices or applications containing only the monthly movement, or only work not previously invoiced, then the commercial manager should request that they revert to producing cumulative documentation (ideally, this will have been written into the subcontract documentation). If this is not adhered to, and no resolution can be found, the commercial manager should maintain his or her own cumulative analysis of invoices or applications received, to ensure that there is no double-counting and that nothing is missed.

4.3.3.2 Accruals

Subcontract liabilities are explained in detail in 3.3.3.1. Accruals are made in the financial accounting system of a contracting organisation to represent the difference between the total liability assessed as owed to a subcontractor and the amount already paid to that subcontractor. Accruals are 'aged' by the finance department of contracting organisations (and, for that matter, most businesses), to assess how likely it is that the amounts accrued will ever need to be paid out. Statistically, the older an accrual, the less likely it is ever to be paid.

4.3.3.3 Contra charges

Contracting organisations can issue 'contra charges' to subcontractors for a variety of reasons. Such charges give notice that amounts will be deducted either for work from their package not undertaken, or for damage to other property, equipment or work by other trades. Contra charges should only be made if they are in accordance with the contractual agreement with the subcontractor. Some examples of contra charges are detailed here, together with a short commentary on known issues:

- Damage: charges for damage should be accompanied with photographs or other evidence. Contra charges should be raised for any damage caused by a subcontractor to the client's property, third party property, or to the contracting organisation's property or equipment.
- Materials provided by the contracting organisation: it may be best to issue materials free of charge to the subcontractor, then exclude these from the subcontract package price.
- Services and equipment supplied, such as pedestrian or traffic management, scaffolding, or other temporary works provided by the contracting organisation or other subcontractors: contra charges may apply either due to the scope of the supply or to the poor performance of this. Any delays caused directly by the subcontractor should be collated and charged against the subcontractor's account, using a formal notification process. Any cost for delays should include the cost of acceleration or overrun, management overheads, temporary works, traffic management, and so on.

It is good practice to agree the level of deduction with the subcontractor prior to deduction and to ensure the correct treatment of GST is applied. This matter is frequently overlooked. If necessary, advice should be sought from finance professionals.

4.3.3.4 Subcontract payment timescales

Payment to subcontractors must be made in accordance with contractual obligations and legislation. The key area that should be considered is the relevant security of payment legislation.

4.3.4 Final account

In most cases, the agreement of a final account will be routinely achieved. However, sometimes agreements are difficult to conclude, and negotiations are required. It is at this stage that accurate and timely record-keeping throughout the contract becomes useful.

If negotiations prove unsuccessful, some form of dispute resolution may be necessary.

4.4 Valuing work: further techniques

In addition to the methods of valuing construction works discussed in 3.4.1, there are two further techniques relating to internal value that are worth discussion within this section.

Earned value analysis (EVA) is discussed in detail in 3.6.3, in relation to cost/value reporting and forecasting. It is a technique used to forecast the final financial position of a project, using the current work in progress value as its basis. In its simplest terms, the technique compares the current progress achieved with the planned progress at a point in time, against a comparison of current costs with planned costs.

The introduction of EVA techniques brings alternative methods of calculating the work in progress value of a project. These include factors such as 'man hours expended' or any other metric that can be used as a common measurement of the tasks involved in the project. Earned value is usually based on the programme, so can be founded on allocating value off a fully resourced programme or a detailed task plan, with a percentage associated with each task.

Another method relates to the application of a forecast final margin percentage to the costs incurred. This is most often used by contracting organisations as part of the calculation of internal value to be included within the cost/value reconciliation (CVR). The calculation of this margin requires accurate forecasting of final forecast value and forecast final cost. This method should only be used when accurate forecasting can be carried out.

Additional entitlement, as covered in 3.4.1, relates mainly to claims and variations. Claims differ from variations in that a variation is just that – the works have been 'varied', perhaps through a change to the scope of work or through amended quantities, items of work, specifications or similar. Variations usually involve only rate or measurement issues. A claim, by contrast, relates to a more fundamental change, which disrupts the contracting organisation's working arrangements or method of delivery, meaning that it will be claiming additional time or overheads. It is worth remembering that any variation has the potential to become a claim if it delays or disrupts the contract.

4.5 Understanding cost: capture and allocation

The key to capturing costs accurately is to ensure that the underlying processes, summarised in 2.5.1 and 3.5.1, are robust and are supported by the project or financial accounting systems in operation. The processes are likely to be ongoing, with costs captured and allocated as they are incurred.

For accurate cost capture, it is important to establish a system of checks and balances – this can highlight errors as they occur or identify cases in which costs are not recorded and allocated incrementally. Such a system, for example, would note a case in which an order was placed for a specific value, for a specific quantity or at a specific rate, but where there was more delivered than ordered, or additional charges on the invoice. This system could also ensure that operatives are cost-allocated for their contractual hours, or could identify instances in which plant has not been cost-allocated for the full hours on site. The system would allow variances, where they existed, to be fully understood. Any errors and misallocations identified should of course be corrected promptly, to maintain confidence in the accuracy and integrity of the system.

Some costs automatically lend themselves to being allocated with other costs – for example, the fuel used in plant and equipment should be allocated in the same proportions as the plant and equipment in which it is used. To achieve this, contracting organisations can allocate the fuel to a code set up for the plant and equipment, then include an allowance in the rate they use to allocate the cost of plant and equipment. Similar approaches can be adopted for operative and staff payroll costs, which are included in the hourly or daily rate used to allocate their costs, and other plant costs, such as repairs, damage and tyres, which are included in the plant and equipment rates. In all cases where this approach is taken, it is important that the debit and credit costs in the codes set up to manage these types of costs are constantly reconciled.

This is particularly important in a payment mechanism in which the contracting organisation is reimbursed for its actual costs, where it is critical that the organisation claims the correct amounts.

If implemented well, the common analysis levels provide another basis for identifying incorrectly allocated costs allowing a list of standard exception reports to be developed that will make the identification of issues more transparent. For example, an element or activity of work that has costs, but no value, will indicate an area of the project or contract where costs have been allocated incorrectly – or possibly, where the opportunity to take revenue has been missed. It would be equally important to investigate this discrepancy if it were in reverse, with no costs but value taken. A further example could occur where there are elements or activities of work with plant costs but no costs for labour; this would indicate either that the plant costs have been wrongly allocated or that the labour costs have been missed.

4.6 Cost/value analysis

4.6.1 CVR data

The production of timely, transparent CVR data is highly valuable to the senior management responsible for the profitability of contracts. In its simplest form, the CVR should be used to identify if a contract is making or losing money at that point in time. It also plays a more proactive role in informing and supporting the commercial strategy that plans and monitors performance, to achieve cost control and maximise value.

CVR data allows the commercial manager to make decisions on people and equipment resource levels, construction methods, programme and preliminaries, as well as to develop recovery strategies in terms of contractual claims or procurement. It is only when armed with the most appropriate and timely information that decisions can be made without taking even greater risks.

If the data indicates that spending is more than what is being earned at a certain point in time, then senior management should enquire further, with the main emphasis being a comparison with the forecast. If the results of this enquiry vary from the forecast results, then deeper investigation should take place, to analyse where this occurs and why. An analytical, detailed focus on each activity of work, package and element of cost should be undertaken to find the answers, which may not be immediately obvious.

The commercial manager should be able to take a 'top level' view of the summaries available, yet also be meticulous in identifying and explaining anomalies. Throughout, the commercial manager should be mindful of the 'bigger picture' – able to take the results of detailed analysis and apply them back to the summaries – this is what makes it so important that the forecast and the CVR are collated at the most appropriate level of detail for each project or contract.

In such a review, all the individual elements should be accounted for, including:

- Change management schedules: what entitlement there is, what has been recovered, and what revenue has been taken for change that has been delivered, but not yet agreed.
- The plant on hire lists: ensuring that there is neither anything on hire that should not be, nor anything being charged for that is not actually on hire.
- Other time-based charges: these should be reviewed in the same way.
- The staff lists: are internal charges for staff as forecast and accurate?
- Operative costs: are these being charged to the project or contract as expected?
- Subcontract liabilities and commitments against certifications and payments, as well as other accruals within the finance system. This includes other commitments, accruals and payments for items such as materials, either on- or off-site. Have these been included in the valuation and has the appropriate revenue been taken?
- Risk, opportunity and contingency amount review.

If variances prove to be real, some areas for improvement should be looked at, to minimise costs and maximise revenue. In terms of costs, this will include a review of preliminaries and of local overhead costs, renegotiation of deals with the supply chain, a review of hired equipment and a review of the levels of stock materials.

From a revenue perspective, another review of the contract and method of measurements should be undertaken, as well as a remeasurement exercise, if that might result in an increase in value (depending on the form of contract). In addition, the change management register should be reviewed, and detailed action plans put in place, to ensure that all entitlement, additional to the original contract or otherwise, is recovered.

4.6.2 Cost-forecasting and trend analysis

Cost to completion (CTC) is covered briefly in 3.6.4. Along with a thorough grasp of the project or contract, the work packages, the estimate build-up, budget calculations and the delivery method, any cost forecasting and, particularly, trend analysis, require a good understanding of more complex issues, including:

- What risk and opportunity contingency is included in the figures being analysed?
- What has already happened and is the data accurate?
- Moving forward, are there historical trends that can be extrapolated? Do adjustments need to be made to these trends to account for factors that may or may not happen in the future? Did anything happen during the previous period to affect costs, meaning that they should not be extrapolated? For instance:
  - Was there unexpected inclement weather?
  - Was there a shortage in any materials integral to the project, such as asphalt or steel?
  - Did a company (supplier, contractor or consultant) involved in the project fall into administration?
  - Was there any industrial action or other matter caused by a third party?
- An understanding of construction technology is important here, as different methods of construction, and the lessons learned log (as introduced in 3.6.1), when constructing certain elements, can affect future cost trends.
- Once forecast, how much contingency (see 3.6.2 and 4.8.2) should be included to account for risks that could occur in the future?

4.6.3 Delivery of reports

The delivery of reports is often an IT function. However, as the end user of much of the information produced the commercial manager should have some input into how reports are produced and delivered. Cost/value reporting and other commercial management reporting through the kind of propriety reporting tools mentioned in 3.6.6 can produce reports in a variety of formats. Some examples of good practice are summarised as follows:

- In a traditional row and column format, as in the example shown in 4.1.3, with cost elements on the horizontal axis and activity analysis on the vertical axis.
- With collated numbers at the top level that can be drilled into if the underlying data is available.
- With consistent formats, especially with regards to decimal places and thousand comma separators.
- With conditional formatting, showing numbers outside the expected ranges in different colours, or in red/amber/green (as traffic lights), to indicate where results need attention, need watching or are acceptable.
- As a graphic, showing the comparison of cost versus value, forecast versus actual, or the evolution of results. As with tabular data, graphs can also be interrogated if the underlying data is accessible. Types can include:
  - bar charts
  - pie charts
  - line graphs
  - dashboard reports.

4.6.4 The development of IT to enhance CVR collation and production

The development of IT to support an integrated CVR, bringing cost and value together, and the development of EVA as part of a project controls philosophy in construction, are still at a relatively early stage. There are many reasons for this, including the historic and inherent barriers to the full use of IT within the construction industry. However, if the correct approach is adopted and a consistent vision maintained, it is possible to implement and use systems effectively.

Where it is possible to manage cost and value in the same system, the benefits will include the following:

- Ready access to the data for recalculating the results. When working through the CVR (and other snapshot reporting), an interim result is often needed to provide 'flash figures' for management, as well as to provide some idea of the key areas on which to concentrate. If the information is in different systems, time can be lost, and efforts repeated to obtain the data.
- Alignment for cost and value: the use of common analysis levels is reliant on consistent cost element and activity structure hierarchies on each project or contract. The only way to ensure that hierarchies remain aligned for cost and value is to maintain one set of master data. The best way to do this is in a single system.
- Interrogation of variances and discrepancies: if analysis is carried out at the top level from extracts or reports out of the different systems used to manage cost and value, then every variance and discrepancy will need to be referenced back to the relevant source system. If, however, the same system is used, and the CVR is simply a reporting function sitting on top of it, it should be possible to interrogate through the data to the source documents.
- Microsoft Excel, and spreadsheets generally, are excellent tools for the presentation and analysis of reports. However, for large volumes of data, they can become slow and unwieldy, especially when they include formulae to look up data from one worksheet into another, which would be necessary for the CVR. In addition, excessive data-entry is prone to keying error. Unless key cells, the layout and calculations are protected, a spreadsheet is open to error and abuse.

A 'halfway house' approach adopted by some businesses is the use of a 'data warehouse', or a CVR database, which can incorporate all the data from both the cost and value systems, updated on an overnight transfer, or immediately, if the technology allows, thus providing access to the necessary information.

4.7 Cost and cash flow analysis

4.7.1 Cash flows: improving cash flow

Any advance, mobilisation or other pre-contract payments for contract set-up or mobilisation will improve cash flow. These types of options are occasionally made available and are rarely accounted for in a client's comparison model of bids. Unless specific information to the contrary is known, contracting organisations should, wherever possible, use such facilities and consider negotiating them into their contracts.

Another strategy to improve cash flow sometimes adopted by contracting organisations is to extend the payment terms to their supply chain. This is mentioned here for purposes of awareness: it is certainly not best practice. To avoid the extension of payment terms, some construction clients, particularly those that are government-led, include terms in their head contract stating the payment terms for the contracting organisation's supply chain, and audit their contractors to ensure that they comply with them.

A final factor is the impact of GST. In Australia, GST is applicable to most construction works and is included within cash received by the contracting organisation, because it is applied to the payment claim. This is known as 'input tax'. As the contracting organisation makes payments to a GST-applicable and GST-registered supply chain, the input tax is paid out at the same time. However, a large proportion of the amount, known as 'output tax', is not paid out until the end of the financial quarter period-end, when it is accounted for in the contracting organisation's Business Activity Statement (BAS) return to the Australian Tax Office (ATO). At this point, the balance is paid to ATO. The contracting organisation will have had the cash flow benefit of this balance for the intervening period.

It should be noted that the precise circumstances of each country, project and supply chain member regarding GST will affect this calculation.

4.7.2 Cash flows: monitoring, analysing, reporting and advising

This guidance note has covered the considerations of cash flow relating to the areas influenced and managed by a commercial manager. To understand the subject more deeply, it is beneficial to have an overview of how a management accountant would look at cash flow and an idea of the metrics they would use.

The following list is a practical example of the important factors for a management accountant in terms of cash flow. This is intended to show how cash flows are viewed with management accounts at company level. The statistics are known as ratios.

- Current ratio = current assets divided by current liabilities: measuring a company's ability to cover its current liabilities with its current assets.
- Cash ratio = (cash + cash equivalents + invested funds), divided by current liabilities: measuring a company's ability to cover its current liabilities with its most liquid current assets.
- Working capital turnover = sales divided by working capital: measuring how a company's working capital is being leveraged to produce revenue.
- Debt to equity ratio = total liabilities (debt) divided by equity: measuring how a firm's equity capital is being leveraged.
- Working capital = current assets – current liabilities: indicating a company's liquidity.

See the worked example in Table 3.

	Sample contractor's financial information			
A	Current assets	$4750,000.00		
B	Current liabilities	$530,000.00		
C	Total liabilities	$660,000.00		
D	Equity	$180,000.00		
E	Sales	$2,000,000.00		
F	Cash, cash equivalents and invested funds	$145,000.00		
	Key financial ratios	**Example ratio**	**Expected contractor's ratio**	**Expected subcontractor's ratio**
G	Current ratio: A/B	1.42	1.1+	1.5+
H	Cash ratio = F/B	0.27	0.2+	0.35+
I	Working capital turnover = E/K	9.09	10.0 to 20.0	6.0 to 10.0
J	Debt to equity ratio = C/D	3.67	3.0 to 6.0	1.5 to 3.5
K	Working capital = A-B	220,000		

Table 3: Important factors for a management accountant in terms of cash flow

4.8 Commercial decision making

4.8.1 The basis for commercial decisions

Data collection, data analysis and data reporting are fundamental to the commercial decision-making process.

By its nature, this data will be predominantly historical (for example, notes of retrospective costs incurred or trends that have occurred). However, committed costs, such as work ordered or capital expenditure (CAPEX), should also be included. Timely, accurate, transparent cost and progress information provide the cornerstones for the collection, analysis and reporting disciplines. Without accurate information, any commercial decisions made will be potentially flawed.

Forecasting without a robust foundation is, effectively, speculation. As detailed in 3.6.4, it must be based on the analysis of different forms of data.

Forecasting, and commercial decision-making generally, can be based on existing estimates or forecasts, the programme, procurement to date, trends in cost indices and other market data or market advice, trend analysis of costs incurred already, or general experience of what may happen, given a set of circumstances. For decision-making purposes, this data may be calculated in a 'best, worst, likely' series of scenarios, providing the decision-maker with 'book-ends' for any decision made. Probabilities can be included, to indicate the likelihood of certain events happening, giving context and depth to a decision. This is a key way in which risk and opportunity schedules are quantified and valued.

4.8.2 Cost mitigation strategies

If the forecast is not in line with expectations, or the cost/value or cash flow reporting processes show that performance is not in line with the forecast, an investigation should be undertaken. The following options should be considered in relation to the delivery of the project or contract:

- Delivery strategy:
  - consider a change of construction methodology (such as subcontract or self-deliver)
  - carry out a review of material specification (for example, is masonry or steel cheaper than concrete?).
- Financial or funding:
  - consider hedging materials prices (for example, locking out steel, copper, asphalt or aggregate by forward-purchasing to mitigate escalation)
  - consider hedging of foreign exchange, if purchasing from overseas
  - consider paying up front for off-site goods and materials or unfixed plant and equipment to avoid price fluctuations.
- Procurement:

consider re-tendering subcontract and material packages, looking for economies of scale by using suppliers company-wide, rather than just per project.

- Resources:
  - consider the question of leasing versus purchase of equipment: will the leasing cost exceed purchase costs over time?
  - utilities: consider temporary power versus permanent power in a cost benefit analysis
  - conduct time in motion studies (can the plant and equipment be used more effectively and efficiently)?
  - consider implementing just in time (JIT) delivery, to reduce storage charges
  - carry out a review of programming, to deliver improved efficiency of resources
  - conduct a review of staffing and supervision levels, to gain efficiency.

The analysis of site overheads and fixed costs is monitored by producing a model that compares tendered allowances against actual costs using a common analysis levels approach. Forward forecasts are thus transparent, allowing efficiencies to be visible, to reduce time-related costs. The following are examples of commercial decisions that can be made if the analysis of forecast versus actual costs is transparent:

- Challenge to staff costs, including a review of staff quantum and durations, as well as the structure and cost of each post. Is it better to hire permanent staff, with upfront recruitment costs, or interims?
- Comparison of the cost of temporary power over the period of the contract through leasing generators and buying fuel, with that of permanent power, which has a high capital cost, but zero leasing costs thereafter. Usually, long-term rental costs are higher than permanent power, but a cost benefit analysis must be carried out to ascertain this, with all preliminaries.
- Consideration of purchasing site offices and then booking a residual value at completion, compared with renting offices.
- Consideration of the need for additional junior administrators, compared with one more expensive administrator, with a part-time assistant. Alternatively, consideration of the use of part-time or centralised resources in lieu of full-time site allocation.

4.8.3 Risk and contingency strategies

The 'risk profile' covers the 'risk position' contained in the terms and conditions of the main contract (the tender documents). This includes issues such as latent conditions risk, inclement weather risk, consequential loss risk, general liability risk, pollution, indemnities, warranties, bonds, insurance, liquidated damages, and so on.

All parties, clients and contractors, should decide on what risk profile to set and agree to, based on the facts of the project. If all the risks are placed on the contractor, the contractor will either price the risks or will qualify them (exclude them), and this should be considered. Most would agree that the risk should lie with the person best positioned to manage it.

Once certain risks are agreed, the contractor will make plans to mitigate or eliminate each with these being priced. If the risk is uncontrollable (for example, wet weather) adequate allowances should be made within the price and programme to compensate for it. This can be priced against the risk item or allowed for within a 'contingency' amount that covers general risks.

During tender, a risk and opportunity management plan should be developed, capturing all potential risks and opportunities. The resulting risk and opportunity register should be reviewed on a regular basis throughout the bid phase and, if successful, into construction. The risk profile changes as a project moves through the construction phase, with the resultant potential cost of such risks likewise changing, making contingency or risk management particularly important.

4.8.4 Risk and contingency release

The allowances or contingencies made on the risk and opportunity register should be assessed each time the budget and forecast are updated, and as a minimum, at each CVR. As the contract or project progresses, contingency allowances should be reviewed, and can be released if the risk has not crystallised. There are two categories of contingency:

- **Allocated contingency:** an allowance of likely cost, over and above estimated costs that can be allocated to a specific element or activity, for example, assumed wastage, inclement weather or low productivity. This is sometimes known in the building sector as 'trade reserve'.
- **Unallocated contingency:** an allowance for additional costs that have not been specifically identified, but which experience has shown 'may happen' and cannot be accurately predicted.

As the project progresses, the project stage, activity or task that a specific risk related to will pass. The risks then diminish, although some do occur, and additional costs may be incurred. As risks lessen, the contingency associated with them can be incrementally removed from the forecast final cost amount. In the same way, cash flows can be revisited and re-analysed, and decisions made to reduce these, aligned to adjustments to forecasts.

Two things are particularly important when making decisions regarding releasing contingency:

- transparency in the information being analysed, in terms of the forecasts and performance to date (this is exponentially improved through consistent use of the common analysis levels covered throughout this guidance note)
- familiarity with the processes, together with skill and judgment, and a thorough understanding of all the technical quantity surveying competencies described within this and other related guidance notes.

Familiarity, skill, judgment and understanding come under the umbrella of 'experience': it is this, as much as an academic understanding of the pertinent issues, that makes a successful commercial manager. While this guidance note provides a framework of advice on the most common issues facing a commercial manager, there is little substitute for 'on the ground' experience, in what is an increasingly complex and rapidly developing sector.

Appendix A: Practical guide to contract administration for a cost/value reconciliation (CVR) and forecast model

The cost/value reconciliation reporting and forecast processes are covered in detail in 2.6, 3.6 and 4.6. The main aim of the processes in any business is to reconcile cost and value, and to calculate the forecast of final cost and value on each project.

The key information and methods of calculating the most common indicators will usually be consistent from business to business. In this Appendix, a generic example of a contracting organisation's CVR, forecast and forecast projection is used to explain the key principles behind the process.

Good practice requires a contracting organisation to have a consistent layout for the output documents from the CVR process, as well as defined rules for how the key indicators are calculated. To ensure consistency, the core cost and value figures will be automatically produced from a centrally managed business system or database.

In this example, the CVR process is referred to as the 'contract review' and is presented in a series of tables, which could be system-driven reports or Microsoft Excel workbooks, depending on the systems used by the contracting organisation.

As can be seen from this example, ideally, all the reports in a suite or a reporting pack will have consistent layouts and methodologies, to improve ease of use. It is also vital that all reports reconcile, are consistently rounded and, where equivalent numbers are provided, that they are the same.

The main CVR workbook is focused on the current cost versus value position, with an eye on the final forecast. The project forecast workbook, meanwhile, is solely aimed at providing a framework for the commercial manager to consider each area of the common analysis levels (both cost type and activity type) and to use the data available (as detailed in 3.6.4 and 4.6.2) to enter a forecast cost to complete the project or contract.

Note: the following worked examples are for illustrative purposes only and do not constitute technical advice or methodology.

A1 Main CVR – contract review workbook

The CVR workbook looks at the current position of the project or contract, but also includes data from the project forecast. This allows comparison with the forecast final position, and data from the cost transfers worksheet, which is dealt with later in the Appendix.

A1.1 Contract overview

This is a project or contract front sheet. It should provide basic information about the project, contract sum, contract form, client details and consultant details, as well as the current external valuation, internal valuation, costs to date and other key financial indicators, such as cash received and any insurance claims. There will also be room for a summary commentary on the project and the key risks or opportunities.

Table 4: Contract overview

Project details		Financial				Claims		Progress			Key assumptions	
Description of project	Pre-consultation services, enabling and piling works of 5+ design area basement		External application	Certified by employer/client	Cash received	Insurance claims		Time	Weeks	Date		
		Application no.	16			Excesses inc. in EFC		Contract start date		01-Apr-14		
Form of contract	NEC3	Work up to	31-Aug-15			Cost recovery in EFC		Contract prog. allowance	70			
		Cum. contract works	213,129,428	213,129,428				Contract completion date		31-Jul-15		
Contract sum	£535,693,184	Variations				Contractual claims		Actual time elapsed				
		Materials on site				Applied external (final)		Progress to date ahead/(behind)				
Employer		Total application	213,129,428	213,129,428								
		Retention						Extension applied			Key risks/opportunities	
Project manager	Contracting organisation	Deductions (LADs etc.)				Certified to date		Extension certified				
		Cum. net amount	213,129,428	213,129,428	158,079,118			Extension certified with loss and expense				
		Advance			36,036,527	LADs inc. in EFV						
Architect	Architect consultancy	Claims						Anticipated completion				
		Sundry accounts				Plant credits		Practical completion certified				
Lead engineer	Engineering consultancy	Sundry debtors (excl certs)				Applied from plant						
		Net value	213,129,428	213,129,428	194,115,645	Agreed with plant		LADs per week				
M&E engineer consultant	M&E engineering consultancy	Payment date		21-Sept-16		Assumed internal EFC		Defects liability				
		Cash due		55,050,311		Credited to date		Period (months)		0		
Clients' quantity surveyor		Cash paid out			157,567,347			Progress comments				
Project leader		Net cash flow			36,548,297			Design				
		% actual cash balance			23.20%			Procurement				
Commercial manager		Variance: cost to date x EFM% vs actual cash received			(46,991,993)			Construction				
								Other				

A1.2 Financial summary

This analysis looks at the contract or project at the highest level. It shows applied and certified values, as well as cash received, against costs at a contract level. Costs are split by type, using a high-level five-column split of labour, plant, materials, subcontract and other.

This will clearly show any variance between applied and internal values, along with adjustments to ledger costs.

In addition, there is a section for commentary on key assumptions made, as well as for risks and opportunities.

Table 5: Financial summary

	Direct works			Subcontractors	Site staff	Sundries	Defects provision	Risk contingency	Provisional sums	Others (forex, pain gain, etc.)	Total	Gross margin	Net sales value	Client risk contingency/ further potential entitlement	Projected final account
	Labour	Plant	Materials												
Budget															
Tender	29,214,846	31,371,139	173,522,584	217,248,075	23,127,293	12,509,927					486,993,865	48,699,386	535,693,250		535,693,250
Tender to budget adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Approved budget	29,214,846	31,371,139	173,522,584	217,248,075	23,127,293	12,509,927					486,993,865	48,699,386	535,693,250		535,693,250
Budget transfers	0	0	0	0	0	1,911,898	0	0	0	0	1,911,898	191,190	2,103,088		2,103,088
Contingency/design	0	0	0	0	0	0	0	0	0	0	0	0	0		
Provisional sums															
Agreed	0	0	0	0	0	0	0	0	0	0	0	0	0		
Not agreed	0	0	0	0	0	0	0	0	0	0	0	0	0		
Compensation events															
Agreed	0	0	0	0	0	0	0	0	0	0	0	0	0		
Not agreed	1,382,481	5,552,507	2,487,033	29,513,313	2,825,769	3,362,984	0	0	0	0	45,124,087	4,512,409	49,636,496		49,636,495
Cost estimate variance															
Not agreed															
Total recovery	**30,597,327**	**36,923,646**	**176,009,617**	**246,761,388**	**25,953,062**	**17,784,809**	**0**	**0**	**0**	**0**	**534,029,850**	**53,402,985**	**587,432,834**		**587,432,835**
Previous total recovery	92,371,895	93,014,787	190,570,647	503,058,845	64,358,047	14,628,376				7,222	958,009,819	95,800,982	1,053,810,801		1,053,810,801
Change in period	(61,774,568)	(56,091,141)	(14,561,030)	(256,297,457)	(38,404,985)	3,156,433	0	0	0	(7,222)	(423,979,971)	(42,397,997)	(466,377,967)		(466,377,967)
Cost															
Ledger costs	12,605,804	24,441,307	31,188,349	97,400,438	33,215,418	20,261,381	0	0	0	(23,136)	219,089,561				
Other accruals	0	0	0	0	0	0	0	0	0	0	0				
Cost transfers	(75,000)	0	0	0	75,000	0	0	0	0	0	0				
Adjusted cost to date	12,530,804	24,441,307	31,188,349	97,400,438	33,290,418	20,261,381	0	0	0	(23,136)	219,089,561				
Costs to completion	0	500,000	0	0	0	0		0	0	0	500,000				
Forecast final cost	**12,530,804**	**24,941,307**	**31,188,349**	**97,400,438**	**33,290,418**	**20,261,381**	**0**	**0**	**0**	**(23,136)**	**219,589,561**				
Previous forecast final cost	92,371,895	93,014,787	190,570,647	503,058,845	64,358,047	14,628,376	0	0	0	7,222	958,009,820	0			
Change in period	(79,841,091)	(68,073,480)	(159,382,298)	(405,658,407)	(31,067,629)	5,633,005	0	0	0	(30,358)	(738,420,259)	0			
Variance (gains/losses)															
This month	0	0	0	0	0	0	0	0	0	0	0				
Previous	0	0	0	0	0	0	0	0	0	0	0				
Change in period	0	0	0	0	0	0	0	0	0	0	0	0	0		

A1.3 CVR detail by resource group

This report is again collated by the extended high-level five-column split on the vertical axis.

On the horizontal axis, there is a series of values, split into two key areas:

- a commercial analysis of tender, estimate, adjusted estimate and budget, as well as forecast change values to provide a forecast final account value
- the current ledger costs, with adjustments, to provide an adjusted cost to date, and a cost to complete, which is then added to each line to present a forecast final cost and a variance between the forecast final value and forecast final cost.

Table 6: CVR detail by resource group

Group	Description	Tender	Budget to build adjustment	Budget transfer	Contingency approved	Provisional sum	Compensation events	Cost estimated variance	Total recovery	Cost per ledger	Cost transfer	Accrual	Adjusted cost to date	Previous period cum. cost	Period cost	Cost to completion	Forecast final cost	Variance
LN	Non-productive labour	903,061	0	0	0	0	44,649	0	947,710	451,150	(75,000)	0	376,150	259,388	116,762	0	376,150	571,560
LO	Productive - plant operatives	0	0	0	0	0	22,826	0	22,826	128,671	(30,000)	0	98,671	68,030	30,641	0	98,671	(75,845)
LP	Productive - trades	20,753,743	0	0	0	0	996,728	0	21,750,471	9,446,183	30,000	0	9,476,183	5,229,502	4,246,681	0	9,476,183	12,274,288
LS	Productive - support	7,558,042	0	0	0	0	318,278	0	7,876,320	2,579,532	0	0	2,579,532	544,446	2,035,086	0	2,579,532	5,296,787
LU	Productive - utilities	0	0	0	0	0	0	0	0	267	0	0	267	130	137	0	267	(267)
	Total labour	**29,214,846**	**0**	**0**	**0**	**0**	**1,382,481**	**0**	**30,597,327**	**12,605,803**	**(75,000)**	**0**	**12,530,803**	**6,101,496**	**6,429,307**	**0**	**12,530,803**	**18,066,523**
PA	Cranes	14,402,159	0	0	0	0	1,996,275	0	16,398,434	5,282,558	0	0	5,282,558	19,565,640	(14,283,082)	0	5,282,558	11,115,876
PB	Hoists	0	0	0	0	0	0	0	0	164,620	0	0	164,620	45,747	118,873	500,000	664,620	(664,620)
PC	Concreting plant and equipment	1,255,680	0	0	0	0	1,826,856	0	3,082,536	287,316	0	0	287,316	33,900	253,416	0	287,316	2,795,220
PD	Tippers and dumpers	374,105	0	0	0	0	72,189	0	446,294	733,126	0	0	733,126	0	733,126	0	733,126	(286,832)
PE	Forklifts and telehandlers	274,198	0	0	0	0	0	0	274,198	282,366	0	0	282,366	0	282,366	0	69,782	(8,168)
PF	MEWPs	120,946	0	0	0	0	0	0	120,946	69,782	0	0	69,782	2,625	67,157	0	69,782	51,164
PG	Generators, lighting towers	2,717,634	0	0	0	0	596,114	0	3,313,748	3,018,354	0	0	3,018,354	856,936	2,161,418	0	3,018,354	295,394
PH	Excavators	1,387,856	0	0	0	0	83,844	0	1,471,700	1,591,038	0	0	1,591,038	105,590	1,485,449	0	1,591,038	(119,338)
PJ	Rollers and compactors	58,107	0	0	0	0	9,824	0	67,931	125,309	0	0	125,309	37,336	87,972	0	125,309	(57,378)
PK	Vehicles	2,951,792	0	0	0	0	117,417	0	3,069,209	2,906,505	0	0	2,906,505	766,147	2,140,357	0	2,906,505	162,704
PM	Tankers and sweepers	273,290	0	0	0	0	31,950	0	305,240	921,630	0	0	921,630	275,656	645,974	0	921,630	(616,390)
PN	Tractors and trailers	148,448	0	0	0	0	12,880	0	161,328	404,570	0	0	404,570	212,944	191,626	0	404,570	(243,242)
PP	Tools	605,207	0	0	0	0	17,588	0	622,795	457,465	0	0	457,465	39,120	418,345	0	457,465	165,330
PQ	Porta cabins	947,461	0	0	0	0	12,598	0	960,059	565,629	0	0	565,629	147,000	418,629	0	565,629	394,430
PS	Radios	0	0	0	0	0	0	0	0	270,208	0	0	270,208	20,482	249,726	0	270,208	(270,208)
PT	Formwork, falsework and scaffold	1,522,537	0	0	0	0	53,300	0	1,575,837	2,613,858	0	0	2,613,858	281,016	2,332,841	0	2,613,858	(1,038,021)
PU	Pump	0	0	0	0	0	0	0	0	0	0	0	0	1,079,792	(1,079,792)	0	0	0
PZ	Others	4,331,721	0	0	0	0	721,670	0	5,053,391	4,746,974	0	0	4,746,974	0	4,746,974	0	4,746,974	306,417
	Total plant	**31,371,141**	**0**	**0**	**0**	**0**	**5,552,505**	**0**	**36,923,646**	**24,441,308**	**0**	**0**	**24,441,308**	**23,469,931**	**971,375**	**500,000**	**24,941,308**	**11,982,338**
MA	Concrete and aggregates	50,404,206	0	0	0	0	1,175,659	0	51,579,865	14,212,730	0	0	14,212,730	4,259,340	9,953,390	0	14,212.730	37,367,135
MB	Reinforcement and accessories	98,891,220	0	0	0	0	815,538	0	99,706,758	10,415,496	0	0	10,415,496	9,048,174	1,367,322	0	10,415,496	89,291,262
MC	Formwork accessories	1,287,958	0	0	0	0	21,849	0	1,309,807	359,990	0	0	359,990	133,218	226,772	0	359,990	949,817
MD	Timber products	816,807	0	0	0	0	80,543	0	897,350	2,523,528	0	0	2,523,528	633,846	1,889,682	0	2,523,528	(1,626,178)
ME	Bricks	154,058	0	0	0	0	0	0	154,058	171,435	0	0	171,435	629,910	(458,475)	0	171,435	(17,377)
MF	Electrical	165,847	0	0	0	0	0	0	165,847	1,056,165	0	0	1,056,165	130,728	925,437	0	1,056,165	(890,318)
MG	Mechanical/plumbing	333,213	0	0	0	0	0	0	333,213	279,071	0	0	279,071	98,270	180,801	0	279,071	54,142
MH	Drainage	598,596	0	0	0	0	0	0	598,596	320,754	0	0	320,754	23,800	296,954	0	320,754	277,842

A1.4 CVR detail by common analysis activity (WBS)

Typically, this report will be like the previous report (detail by resource), except that the information held on the horizontal axis in that report is displayed on the vertical axis of this one. It will display the same cost/value data, analysed by the common analysis level project-specific activity or WBS.

WBS	Description	Tender	Budget to build adjustment	Budget transfer	Contingency approved	Provisional sum	Compensation events	Cost estimated variance	Total recovery	Cost per ledger	Cost transfer	Accrual	Adjusted cost to date	Previous period cum. cost
01PREL	Preliminaries	86,289,467	0	1,911,898	0	0	12,527,141	0	100,728,506	92,723,193	(125,000)	0	92,598,193	23,690,748
02DESN	Design	0	0	0	0	0	0	0	0	19,440	50,000	0	69,440	1,806,165
03PROC	Procurement	0	0	0	0	0	0	0	0	0	50,000	0	50,000	0
04GRND	Groundworks	49,114,447	0	0	0	0	7,164,683	0	56,279,130	43,233,460	0	0	43,233,460	6,942,715
05PILE	Piling	125,101,167	0	0	0	0	21,943,350	0	147,044,517	52,107,859	0	0	52,107,859	59,142,852
06SUBS	Substructures	88,702,980	0	0	0	0	1,513,856	0	90,216,836	26,582,601	30,000	0	26,612,601	4,443,792
07SUPS	Superstructures	132,667,256	0	0	0	0	1,975,056	0	134,642,312	4,959,105	0	0	4,959,105	395,072
08MEPS	MEP works	2,868,548	0	0	0	0	0	0	2,868,548	92,885	0	0	92,885	186,155
09FINS	Finishing works	0	0	0	0	0	0	0	0	23	0	0	23	0
10ENVE	Envelope	1,500,000	0	0	0	0	0	0	1,500,000	63,218	0	0	63,218	0
11LIFT	Elevators and escalators	750,000	0	0	0	0	0	0	750,000	0	0	0	0	0
12EXWK	External works	0	0	0	0	0	0	0	0	(110)	0	0	(110)	0
13TEST	Test and commission	0	0	0	0	0	0	0	0	0	0	0	0	0
14DLPC	Handing over and completion	0	0	0	0	0	0	0	0	0	0	0	0	0
25DISA	Disallowed activities	0	0	0	0	0	0	0	0	0	0	0	0	0
90UNAL	Unallocated	0	0	0	0	0	0	0	0	(692,112)	(5,000)	0	(697,112)	211,507
	Grand total	**486,993,865**	**0**	**1,911,898**	**0**	**0**	**45,124,086**	**0**	**534,029,849**	**219,089,562**	**0**	**0**	**219,089,562**	**96,819,006**

Table 7: CVR detail by common analysis activity (WBS)

A2 Project forecast workbook

A2.1 Summary by resource group

The purpose of this workbook is to provide a format for the forecast of costs to come, to be entered against each activity and resource type code in a simple grid. For example, an amount of cost to come may be entered against the 'PB' – 'Hoists' resource type and the '01PREL' activity.

The worksheet is then collated. It adds the current costs to date to calculate the forecast final cost by both resource type and activity. These are then transferred into the detail by resource and detail by WBS worksheets, to update the forecasts they each report.

Table 8: Summary by resource group

Group	Description	01PREL	02DESN	03PROC	04GRND	05PILE	06SUBS	07SUPS	08MEPS	09FINS	10ENVE	11LIFT	12EXWK	13TEST	14DLPC	25DISA	90UNAL	Total	Cost to date	Estimated final cost
LN	Non-productive labour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	376,150	376,150
LO	Productive - plant operatives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98,671	98,671
LP	Productive - trades	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,476,183	9,476,183
LS	Productive - support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,579,532	2,579,532
LU	Productive - utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	267	267
MA	Concrete and aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14,212,730	14,212,730
MB	Reinforcement and accessories	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,415,496	10,415,496
MC	Formwork accessories	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	359,990	359,990
MD	Timber products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,523,528	2,523,528
ME	Bricks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171,435	171,435
MF	Electrical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,056,165	1,056,165
MG	Mechanical/plumbing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279,071	279,071
MH	Drainage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	320,754	320,754
MJ	Fixings, etc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106,811	106,811
MK	Ironmongery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,158	3,158
ML	Waterproofing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,542,503	1,542,503
MM	Metalwork/structural steelworks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123,200	123,200
MN	Finishes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73,508	73,508
PA	Cranes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,282,558	5,282,558
PB	Hoists	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500,000	164,620	664,620
PC	Concreting plant and equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	287,316	287,316
PD	Tippers and dumpers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	733,126	733,126
PE	Forklifts and telehandlers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	282,366	282,366
PF	MEWPs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69,782	69,782
PG	Generators, lighting towers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,018,354	3,018,354
PH	Excavators	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,591,038	1,591,038
PJ	Rollers and compactors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	125,309	125,309
PK	Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,906,505	2,906,505
PM	Tankers and sweepers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	921,630	921,630
PN	Tractors and trailers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	404,570	404,570
PP	Tools	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	457,465	457,465
PQ	Porta cabins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	565,629	565,629
PS	Radios	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270,208	270,208
PT	Formwork, falsework and scaffold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,613,858	2,613,858
PU	Pump	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PZ	Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,746,974	4,746,974

A2.2 Summary cost transfer by resource group

Costs are often misallocated within a contracting organisation's accounting system. This worksheet provides the facility for the identified amounts to be entered against each activity and resource type code, in the same simple grid as the project forecast worksheet, so that they can be adjusted within the suite of reports at the appropriate level.

Again, as with the summary by resource worksheet, the amount of cost transfers is then collated by both resource type and activity and transferred into the detail by resource and detail by WBS worksheets, to amend the costs to date they each display.

Further reports can be added to this suite to allow the commercial manager to profile forecast spend across future months for the purposes of cash flow and then if the data is available to also compare forecast spend against historic spend.

The purpose of this is to provide a further cross-check that the numbers being forecast and reported are in line with reasonable expectations. It will highlight any figures that are not in line with past or current trends.

Table 9: Summary cost transfer by resource group

Group	Description	01PREL	02DESN	03PROC	04GRND	05PILE	06SUBS	07SUPS	08MEPS	09FINS	10ENVE	11LIFT	12EXWK	13TEST	14DLPC	25DISA	90UNAL	Total	Cost to date	Estimated final cost
LN	Non-productive labour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	376,150	376,150
LO	Productive - plant operatives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98,671	98,671
LP	Productuve - trades	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,476,183	9,476,183
LS	Productive - support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,579,532	2,579,532
LU	Productive utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	267	267
MA	Concrete and aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14,212,730	14,212,730
MB	Reinforcement and accessories	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,415,496	10,415,496
MC	Formwork accessories	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	359,990	359,990
MD	Timber products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,523,528	2,523,528
ME	Bricks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171,435	171,435
MF	Electrical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,056,165	1,056,165
MG	Mechanical/plumbing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279,071	279,071
MH	Drainage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	320,754	320,754
MJ	Fixings, etc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106,811	106,811
MK	Ironmongery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,158	3,158
ML	Waterproofing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,542,503	1,542,503
MM	Metalwork/structural steelworks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123,200	123,200
MN	Finishes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73,508	73,508
PA	Cranes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,282,558	5,282,558
PB	Hoists	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500,000	164,620	664,620
PC	Concreting plant and equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	287,316	287,316
PD	Tippers and dumpers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	733,126	733,126
PE	Forklifts and telehandlers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	282,366	282,366
PF	MEWPs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69,782	69,782
PG	Generators, lighting towers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,018,354	3,018,354
PH	Excavators	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,591,038	1,591,038
PJ	Rollers and compactors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	125,309	125,309
PK	Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,906,505	2,906,505
PM	Tankers and sweepers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	921,630	921,630
PN	Tractors and trailers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	404,570	404,570
PP	Tools	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	457,465	457,465
PQ	Porta cabins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	565,629	565,629
PS	Radios	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270,208	270,208
PT	Formwork, falsework and scaffold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,613,858	2,613,858
PU	Pump	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PZ	Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,746,974	4,746,974

Appendix B: Example list of common analysis levels for construction works

Infrastructure works		Building works	
WBS	**Description**	**WBS**	**Description**
01PREL	Preliminaries	01PREL	Preliminaries
02DESN	Design	02DESN	Design
03PROC	Procurement	03PROC	Procurement
04GRND	Groundworks	04GRND	Groundworks
05PILE	Piling	05PILE	Piling
06SUBS	Substructure	06SUBS	Substructures
07SUPS	Superstructure	07SUPS	Superstructures
08MEPS	MEP works	08MEPS	MEP works
09BRFN	Bridge finishes	09FINS	Finishing works
11LIFT	Elevators and escalators	10ENVE	Envelope
12SBAS	Carriageway	11LIFT	Elevators and escalators
13TEST	Test and commission	12EXWK	External works
14DLPC	Handing over and completion	13TEST	Test and commission
15UTIL	Utilities	14DLPC	Handing over and completion
16RDFN	Road finishing	25DISA	Disallowed activities
17RETW	Retaining walls	90UNAL	Unallocated
18TWKS	Temporary works		
19LAND	Landscape finishes		
19STST	Structural steel		
20SFLD	Soft landscaping		
20TRCK	Track		
21HDLD	Hard landscaping		
22FNTN	Fountains		
23MOOR	Moorings		
25DISA	Disallowed costs		
90UNAL	Unallocated		

Table 10: Example list of common analysis levels for construction works

Appendix C: Template risks and opportunities register

This Appendix contains a series of generic risks taken from each section of this guidance note to identify places where risks and opportunities should be considered through the iterative cycle of commercial processes covered within the document; all items are purely indicative with reference to the relevant section.

Risk identification				Inherent assessment							Risk management				
No.	Cause	Risk	Effect	Likelihood	Cost	Time	Objective	Reputation	Risk status	ROAG	Management actions taken	Management actions planned	Risk owner	Action owner(s)	Last updated
1.1	Pre-tender risk and opportunity register not fully captured or elevated.	Risks and opportunities not identified or not included within the tender risk and opportunity register.	Minimised transparency in what is handed over to the delivery teams.	95%	90%	50%	50%	50%	67%	67%	Include risk and opportunity management within estimating and handover process.	Follow the estimating and handover process.	Estimating lead.	Estimator.	03-Oct-15
1.2	Not all ambiguities within the documents properly evaluated or considered as a risk and/or an opportunity.	Proper allowance not made.	Inaccurate estimate. Minimised transparency in what is handed over to delivery teams.	50%	50%	50%	50%	50%	50%	50%	Include risk and opportunity management within estimating and handover process.	Follow the estimating and handover process.	Estimating lead.	Estimator.	03-Oct-15
1.3	Ground condition issues not properly evaluated.	Lack of clarity re: risk of ground conditions and who takes the risk?	No evidence that this element has been considered and what appropriate action was taken.	20%	20%	20%	20%	20%	20%	20%	Include risk and opportunity management within estimating and handover process.	Follow the estimating and handover process.	Estimating lead.	Estimator.	03-Oct-15
1.4	Utilities not properly evaluated.	Lack of clarity re: risk of utilities and who takes the risk?	No evidence that this element has been considered and what appropriate action was taken.	20%	20%	20%	20%	20%	20%	20%	Include risk and opportunity management within estimating and handover process.	Follow the estimating and handover process.	Estimating lead.	Estimator.	03-Oct-15
1.5	Weather issues not properly evaluated.	Lack of clarity re: risk of weather and who takes the risk?	No evidence that this element has been considered and what appropriate action was taken.	20%	20%	20%	20%	20%	20%	20%	Include risk and opportunity management within estimating and handover process.	Follow the estimating and handover process.	Estimating lead.	Estimator.	03-Oct-15
1.6	Access issues not properly evaluated.	Lack of clarity re: risk of access issues and who takes the risk?	No evidence that this element has been considered and what appropriate action was taken.	20%	20%	20%	20%	20%	20%	20%	Include risk and opportunity management within estimating and handover process.	Follow the estimating and handover process.	Estimating lead.	Estimator.	03-Oct-15

Table 11: Risks and opportunities register

Confidence through professional standards

RICS promotes and enforces the highest professional qualifications and standards in the valuation, development and management of land, real estate, construction and infrastructure. Our name promises the consistent delivery of standards – bringing confidence to markets and effecting positive change in the built and natural environments.

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