CAPTURING AND MAINTAINING THE CLIENTS REQUIREMENTS

Case Study

RE-ENGINEERING SCOPE MANAGEMENT

Harry Carrick
CEO Rawlinsons Group

INTRODUCTION

This paper addresses the management of scope in construction projects and proposes a change to scope management processes to reduce cost over-runs caused by scope 'creep' and deliver a completed construction project to clients' quality expectations.

Our industry faces a significant problem with the management of scope and the containment of budgeted costs in both public and private sector projects.

This has led to client dissatisfaction with project outcomes in terms of quality and scope, and cost over-runs which impact on budgeting and project profitability.

In the public sector, governments have less to spend on infrastructure and in the private sector clients are disinclined to invest in construction projects when their returns are uncertain.

BACKGROUND

Scope 'creep' – *a progressive growth of project quantum and quality over that provided in the project cost budget* – is a major cause of cost-overruns and client dissatisfaction with project outcomes. The project cost budget arrived at by applying analysed historical cost data to a building function, quantum and quality, is a finite number.

Changes to the function, quantum or quality of the building have a direct impact on the project cost budget. To effectively control the project budget, scope must be clearly defined at the outset and managed throughout the design and delivery stages.

Over the past 15 to 20 years, the way we design and deliver projects has changed significantly but there has not been a corresponding change in scope management practices. Projects are now designed using CAD. Cost risk is transferred from Client to Contractor at an earlier stage, when the definition of scope is open to a much wider interpretation by both parties. This has resulted

in increased conflict of both cost and quality expectations as the project progresses.

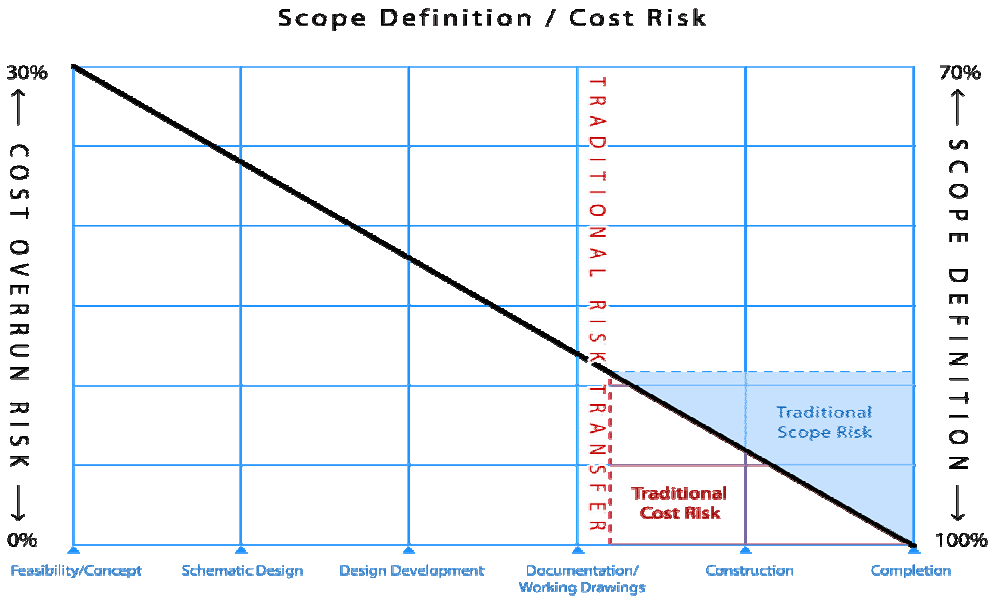

Figure 1 – Cost Risk Transfer - Traditional

Under traditional contract systems the cost risk was transferred through a tender process. This process comprehensively defined project scope in a priceable market form. Bills of quantities were prepared using a standardised measurement format, from detailed design drawings and comprehensive specifications. Effective management and interpretation of clients' requirements and scope definition was required to arrive at this level of documentation. The documents issued to tenderers, while not 'for construction' drawings, allowed a comprehensive commercial statement of the project requirements to be tendered.

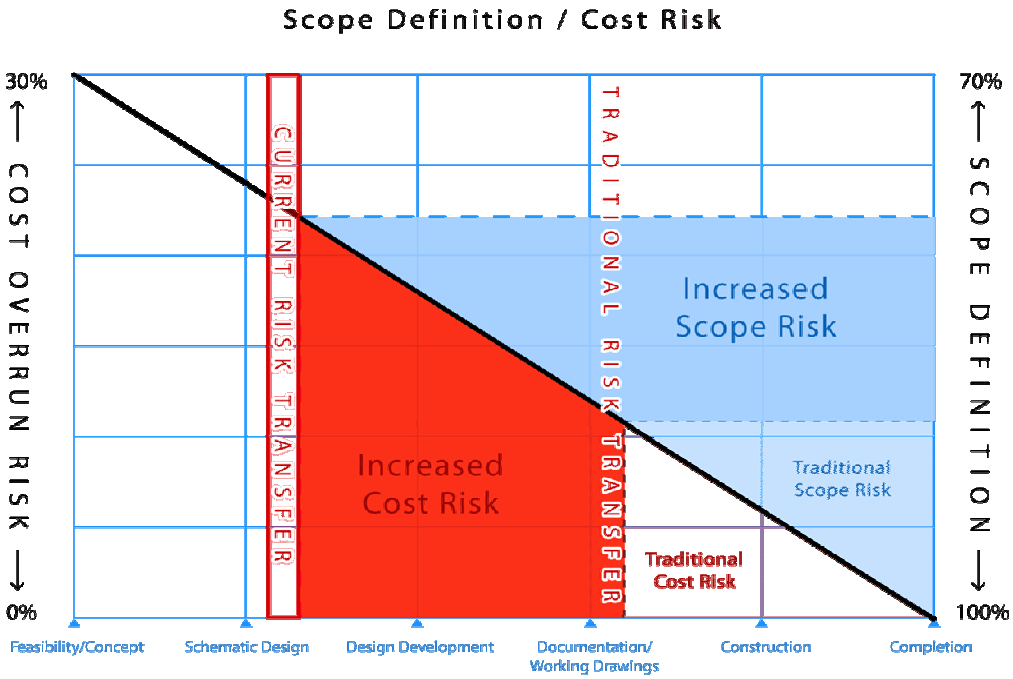

Figure 1 – Cost Risk Transfer – Current

Budgets are increasingly being set on limited scope information to meet program demands with the doubtful assurance that the cost risk is being effectively transferred.

With cost risk transferred Client to Contractor at an earlier design stage, when scope is less defined, conflicts in expectation on quantum, quality and cost are inevitable.

At this early stage the Clients' fixed cost expectations as expressed in the budget figure are too often in conflict with the contractors' costing and interpretation of the scope and quality required.

Accepting that the industry is unlikely to rapidly change its tendering and commercial management practices, a new approach to managing scope is needed to achieve better outcomes.

THE SCALE OF THE PROBLEM FOR CLIENTS

There is widely reported evidence of substantial cost overruns in construction projects in both the public and private sectors. Scope 'creep' is a major contributing factor to cost overruns.

There is also widespread concern and dissatisfaction among stakeholders with the ineffectiveness of current practices and failures in scope management practices.

While the scale of the problem is difficult to accurately assess – as many are reluctant to admit to it and others can't keep track - there are abundant examples in parliamentary and media reports of projects sustaining cost overruns of from 20 to 50% and more. Ineffective scope management is a major contributing factor to cost overruns. The problem is serious and one which the whole industry must confront and overcome.

A recent construction industry forum on *The Declining Standard of Documentation in the Construction Industry*, hosted by Engineers Australia, was presented with evidence of 12% cost overruns across a series of public sector capital projects in Queensland. The projected impact was $1billion per annum on public capital expenditure in Queensland alone.

This 12% cost overrun figure related only to the impact of scope changes/variations from working drawings to completion. Assuming a similar pattern of cost overruns exist in other states, the total impact of cost overruns attributable to scope creep could be in the order of $4+ billion per annum nationally.

The problem of scope management and resultant cost overruns also has a negative commercial impact on private sector clients. Poor scope management weakens confidence in the construction industry's ability to deliver on budget and reduces the attractiveness of investing in property developments because of the uncertainty of cost outcome.

IMPACT ON THE WHOLE INDUSTRY

Clients

Problems with scope creep usually start with poor project definition by the client and/or inadequate project budgeting processes. Definition of project scope and cost is fundamental to project success and is the cornerstone of the business case for the project whether social or commercial.

If the brief definition and the cost budget are inadequate, function is compromised. Issues such as ecological sustainability and energy rating become esoteric if the basic foundation of the project is unsound.

Clients need a transparent process that locks in function, quality and cost, allowing them to see what they are getting for their money as the project proceeds. With this security of functional and cost outcome, decisions on ecological sustainability energy ratings and whole-of-life impacts can be made with greater confidence.

The problems of scope creep and the resultant cost blow-outs must be addressed if the forward vision of the industry is to stand a chance of being translated into building reality.

On top of the direct impact on Clients and the security of their investment, scope 'creep' has a flow-on effect on the whole construction industry.

Contractors

With earlier risk transfer, Contractors are entering into contracts based on concept design drawings with only an outline specification. The translation and interpretation

of the concept/schematic design information into working drawings for construction usually results in the addition of significant volume of items which have not been allowed for in arriving at the tender price. Anecdotal evidence from a range of senior estimators from major contracting companies judges the impact of this 'scope creep' to be in the order of 2.5% to 4% between early tender stage and package lettings.

Taking account of contractors' margins, a 'scope creep' of this magnitude can significantly erode or wipe out profitability. In the past, contractors have sought to recover the 2.5%-4% from the sub-contractor's price to recover the margin. In the current buoyant market their only recourse is to seek recovery from clients.

Sub-contractors

Sub-contractors pricing on concept or early schematic designs are faced with even greater difficulties. As trade contractors, their pricing capabilities are based on receiving a detailed trade definition of quantum and specification. It is now almost common practice for them to be faced with taking risks on quantity and specification because the design information is not sufficiently articulated to allow them to price in detail.

In recessionary times, subcontractors may be prepared to wear the risk. But in boom times they will load their prices or decline to tender on inadequate documentation, leading to sharp increases in sub-contract prices. In the current boom in the Queensland market, substantial rises in sub-contract prices are in part a reaction to the losses suffered in leaner years from these crude tendering processes.

Architects and designers

The cost of re-design work necessitated by cost overruns resulting from scope creep has a major impact on design resources and prejudices good design outcomes. Design resources are being wasted re-designing buildings back to budget because 'scope creep' has not been adequately managed.

There is no doubt that much of the criticism levelled at the declining standard of documentation arises from the early use of the documentation for purposes for which it was never intended. Schematic and concept design drawings are being issued to secure fixed trade prices and design development drawings are being issued for construction.

The time needed to adequately define scope to the project stakeholders, including sub-contractors and specialists, is often not made available because of the pressure to commence and proceed with construction. It is inevitable that if design is playing catch-up with the construction process, without the necessary co-ordination, research and checking, then additional scope will creep in with its resultant cost overrun.

Costing Techniques

As cost overruns appear to be the most measurable result of poor management of scope, it is appropriate to examine the cost techniques currently in use.

Costing techniques and processes have not met the challenge of the changing industry and have fallen far behind in responding to design.

Traditional costing techniques depended on a quantifiable basis of defining work capable of being priced at trade level by the market after working drawings and bills of quantities had been prepared. Thanks to earlier cost risk transfer, shorter program times, and a decline in documentation standards, traditional costing techniques have become ineffective in controlling cost outcomes.

This is largely because the foundation for cost planning and high-level estimating is a detailed, priced Bill of Quantities. It provided the basis for analysing market costs on a trade, elemental and whole of building basis. Few projects are being let on a detailed Bill of Quantities basis so analysed cost data is hard to come by.

The other main failing of current estimating and cost planning practices is that they do not relate to the current design medium of the industry – CAD – and still rely on manually applying scale rules to printed drawings with manual input to spreadsheet or database estimating packages.

A number of software packages allow digitising or on-screen polylining/tracing over CAD drawings, but provide no direct link between the CAD design and the cost. The process of quantification, which must be carried out prior to costing, is overly time-consuming and severely limits the ability to quickly respond to design changes and developments, allowing scope to creep unchecked.

If cost exercises reveal a cost overrun due to scope creep, the process of redesigning back to budget has a major impact on time, design direction and team morale This is further complicated as design has continued to progress during the time the cost exercise was being undertaken.

Because of the impact of these ‘after the event’ costings on program time, there has been an increasing tendency, particularly in the private sector, to limit the number of cost exercises, thereby eliminating one of the best available scope management tools.

A change in costing processes and techniques, which integrates costing with CAD, is needed to service the needs of a faster moving industry.

Improving the Process

Some of the root causes of scope management problems - declining standards of documentation in the industry, constantly decreasing time programs, letting contracts early on limited information, a shortage of skilled and experienced people to manage and design projects - are deeply embedded in the industry and are not going to be easily solved in the short or medium term.

However, the scale of the scope creep problem is so large - more than $4 billion per annum - that action is needed now. The challenge is to accept the current weaknesses of the industry and selectively re-engineer those processes that are

likely to have the biggest short-term impact to improve scope management practices and reduce cost overruns.

Costing processes and techniques offer the best opportunity for improvement and re-engineering through the adoption of new technology directly linking cost to CAD design.

Techniques have changed little in the past 50 years apart from automation in calculation and data sorting through the application of spreadsheet and database programs.

In considering the change in costing processes we need to look at the relationship of cost to scope.

Scope Management Objective

The Scope Management objective is:

To start with a defined scope and approved budget and deliver that scope on budget.

Although at outset project scope is only expressed in outline terms, the capital cost budget is expressed in a finite $ number arrived at by a process of definition and calculation. As the budget is finite so is affordable scope.

This capital cost budget figure is a cornerstone of the business case for the project, whether social or commercial. It is the starting point for managing scope and cost. It is also the point against which the success of the design and delivery process will be measured.

With the price fixed, there is a direct relationship between quantum and specification as follows:

The Scope Management Equation

Scope = Quantum X Quality/Specification

Scope X Market Price = $ Project Cost

Improved Scope Definition Conventions

Traditional scope management practices defined scope progressively through development of the design, confirmation with owners and users, detailed documentation and translation through quantification to priceable items before commitment.

Current scope definition terminology is loose and open to too wide an interpretation by all parties involved. There is a sufficient body of knowledge available across a full

range of building types to allow scope to be better defined even at early design stages. Building efficiencies and cost geometry (*Quantum*) can be established at concept stage with typical specifications (*Quality*) used to express quality expectations and set benchmarks for affordability. (*Price*)

By combining CAD and cost technologies scope definition practices can be developed to standardise the process of defining scope through each risk transfer point. To ensure adherence to budget, it is important to maintain the transparency of scope definition to all project stakeholders.

An industry agreed standard on extent and quality of information to be provided at the various design stages would assist in aligning expectations of all stakeholders. A common set of basic CAD protocols would also allow better understanding and more effective use of the information provided.

Improved transparency between cost and scope will allow contractors and sub-contractors to compete on market prices and management/time factors and not a 'guess the scope' basis.

Alliance Contracting has shown that scope is better managed with affordable budgets when scope definition is a more open process.

Quantum

For a particular building type there are inherent relationships in the geometry of its design that directly impact on its cost –its "cost geometry". These relationships are defined at the earliest design stages and are the framework upon which the project scope is built.

For example – gross floor areas, building envelope ratios, internal wall ratios, footprints, functional areas, units, treated areas. From this prime cost geometry flow the related elemental items e.g. floor tiling, number of entry doors, air-conditioning volumes, number of WCs.

Project budget cost is set using analysed historical cost data (rate/m2 of GFA, cost per unit) for a similar facility having similar cost geometry and relationships.

So by starting with the basic $/m2 or cost/unit a cost model for the building type can be generated in an elemental format, reflecting the typical cost geometry for a building of its type and a similar quality standard.

Using industry first software called CostX, developed by Exactal Pty Ltd www.exactal.com.au detailed cost geometry can be extracted from the earliest CAD designs and quickly applied to the cost model for the building type. The software can generate a project specific cost model which defines project scope at an elemental level. The Exactal website includes a demonstration of the CostX software.

QUALITY/SPECIFICATION

While the detailed specification is not available at concept or schematic stage, the expectation of quality is firmly set in the minds of clients and users. Their perception

of quality is derived from their knowledge of comparable constructed buildings of defined specification. By incorporating these specifications into the scope definition a benchmark for affordability can be easily set and be understood by all parties.

PRICE

By drawing down cost data from an external cost library of typical elemental specifications for similar building types, a detailed affordable scope definition to element unit level can be generated. By using an elemental cost library, which derives elemental cost from market trade prices across a range of material specifications, the cost model becomes a usable cost plan to manage and control project scope, thereby reducing the risk of cost overrun.

Because the building quantum is directly linked to the CAD drawings and the specification quality is articulated in the cost plan based on market prices, affordable scope is defined.

CAD-BASED COST PLANNING

Having defined the scope initially and fixed a budget/tender price it is critical that the link between scope and price be maintained and managed. As the design develops in CAD and the specification selected, the cost plan can be quickly regenerated using CAD based cost planning software and the cost implications of changes immediately identified and acted on as necessary to keep the project within budget.

Because the link between design and cost becomes transparent, accountability for decisions affecting scope and/or cost is made easy.

The new process quickly and accurately defines affordable scope at market prices.

The benefits of the new approach include:

Reduction in cost overruns

Greater certainty of scope outcome for clients

Definition of scope and cost is transparent to all project stakeholders

Reduced price risks for contractors, sub-contractors and suppliers

Continuous real-time updating of costs with design

Reduction in redesign work for architects, engineers

More creative use of design resources

Savings in program time for design, client approvals, package lettings

Transparency of scope and cost decisions

Greater accountability in management of projects

DESIGN INFORMATION QUALITY STANDARDS

Critical to establishing and managing the scope cost link is the quality of design information. There has been debate and general agreement on the declining standards of documentation in the industry (Engineers Australia Conference – May 2004).

Arguably though, this appears to be a timing issue as there is general agreement that the quality of the final documentation is higher than 10 years ago. In the absence of a standard for information quality and a re-engineering of current processes to match design information quality with intended use, the perception of declining documentation is likely to worsen.

An independent assessment of the design information against an agreed standard would help curtail inappropriate use of design information (e.g. detailed fixed prices being sought using schematic design information; design development information being issued for construction.) Much of the criticism of the poor quality of design relates to the frustration of the parties trying to use the information for pricing purposes.

A defined standard for scope and design information with an independent assessment would provide a solid foundation for the management of scope. It would also provide an audit trail for accounting for scope changes.

Such an auditable process would provide a powerful tool in managing project scope.

CONCLUSION

By harnessing new technology and setting common standards for scope definition and design information quality, scope management practices can be effectively re-engineered to reduce cost overruns and increase client satisfaction with project outcomes.

With greater transparency, clients will be able to see what they are getting for their money and pay a fair price and contractors and sub-contractors can compete on price and management skill and expect a fair return.

The proposed process change is not re-inventing the wheel. It is about creating better transparency in commercial relationships and making the cost wheel spin at the same speed as the design wheel.