



CRC Construction Innovation
B U I L D I N G O U R F U T U R E

Report

Building Procurement Methods

Research Project No: 2006-034-C-02

The research in this report has been carried out by

Project Leader Peter Davis

Researchers Peter Davis
Peter Love
David Baccarini

Project Affiliates Curtin University of Technology
Western Australia Department of Housing & Work
Royal Melbourne Institute of Technology

Research Program: C
Deliver and Management of Built Assets

Project: 2006-034-C
Procurement Method Toolkit

Date: June 2008

Disclaimer

The Reader makes use of this Report or any information provided by the Cooperative Research Centre for **Construction Innovation** at their own risk. Construction Innovation will not be responsible for the results of any actions taken by the Reader or third parties on the basis of the information in this Report or other information provided by Construction Innovation nor for any errors or omissions that may be contained in this Report. Construction Innovation expressly disclaims any liability or responsibility to any person in respect of any thing done or omitted to be done by any person in reliance on this Report or any information provided.

© 2004 Icon.Net Pty Ltd

To the extent permitted by law, all rights are reserved and no part of this publication covered by copyright may be reproduced or copied in any form or by any means except with the written permission of Icon.Net Pty Ltd.

Please direct all enquiries to:

Chief Executive Officer
Cooperative Research Centre for Construction Innovation
9th Floor, L Block, QUT, 2 George St
Brisbane Qld 4000
AUSTRALIA
T: 61 7 3864 1393
F: 61 7 3864 9151
E: enquiries@construction-innovation.info
W: www.construction-innovation.info

Table of Contents

Table of Contents	i
List of Figures	i
EXECUTIVE SUMMARY	1
1. INTRODUCTION	2
2. PROCUREMENT STRATEGY	3
2.1 Independent Advice	4
2.2 Identification of Risk	4
3. FACTORS INFLUENCING PROCUREMENT STRATEGY	6
4. PROCUREMENT SYSTEMS	7
4.1 Traditional Procurement	8
4.1.1 Lump sum	8
4.1.2 Measurement	9
4.1.3 Cost reimbursement	9
4.1.4 Key points to consider with traditional procurement	10
4.1.5 Advantages and disadvantages of traditional procurement	10
4.1.6 When should traditional procurement be used?	10
4.2 Design and Construct Procurement	11
4.2.1 Key points to consider with design and construct procurement	12
4.2.2 Advantages and disadvantages of design and construct procurement	13
4.2.3 When should design and construct procurement be used?	13
4.3 Management Procurement	14
4.3.1 Management contracting	14
4.3.2 Construction management	15
4.3.3 Design and manage	15
4.3.4 Advantages and disadvantages of management procurement	15
4.3.5 Key points to consider with management procurement	16
5. REFERENCES	17

List of Figures

Figure 1	Risk apportionment between client and contractor	7
Figure 2	Traditional Procurement Structure	8
Figure 3	Pre and Post Novation Contracts	11
Figure 4	Construction Management Procurement Arrangements	14

EXECUTIVE SUMMARY

A plethora of methods for procuring building projects are available to meet the needs of clients. Deciding what method to use for a given project is a difficult and challenging task as a client's objectives and priorities need to marry with the selected method so as to improve the likelihood of the project being procured successfully. The decision as to what procurement system to use should be made as early as possible and underpinned by the client's business case for the project. The risks and how they can potentially affect the client's business should also be considered.

In this report, the need for client's to develop a procurement strategy, which outlines the key means by which the objectives of the project are to be achieved is emphasised. Once a client has established a business case for a project, appointed a principal advisor, determined their requirements and brief, then consideration as to which procurement method to be adopted should be made. An understanding of the characteristics of various procurement options is required before a recommendation can be made to a client.

Procurement systems can be categorised as traditional, design and construct, management and collaborative. The characteristics of these systems along with the procurement methods commonly used are described. The main advantages and disadvantages, and circumstances under which a system could be considered applicable for a given project are also identified.

1. INTRODUCTION

Strategies for the procurement of building projects have not changed significantly in the last 25 years, though time and cost overruns are still prevalent throughout the industry (Smith and Love, 2001). In a response to reduce the incidence of time and costs overruns, the disputes that may often arise, and the likelihood of project success, alternative forms of procurement method such as partnering and alliancing have been advocated (Love *et al.* 1998). Not all forms of procurement method, however, are appropriate for particular project types, as client objectives and priorities invariably differ (Skitmore and Marsden, 1988; Love *et al.* 1997). The objectives and priorities of a client need to be matched to a procurement system. To do this effectively, it is essential that the characteristics of various procurement systems and selection methods available are understood by clients and their advisors before a procurement method is selected. In this report, the characteristics of the most *common* procurement systems and methods are presented. In conjunction with this report the reader should also refer to the material developed by the New South Wales Government (2005) 'Procurement Methodology Guidelines for Construction' and the Western Australian Department of Housing and Works 'Local Government Procurement Guide' (2006).

2. PROCUREMENT STRATEGY

New building or renovation/adaptation of an existing building is necessary only when no other building exists or appears to exist that will meet or appears to meet the needs of a client (Turner, 1990). A building project is one way of delivering a solution to the particular business needs of clients, whether for investment, expansion or improved efficiency. When a new build solution is selected, rather than renting, leasing or purchasing existing real estate, there is usually the need for a bespoke solution that aims to meet particular objectives. Identifying these objectives and prioritising them can be a difficult task considering the array of stakeholders typically who may be involved within the client organisation (Smith *et al.* 2001). As a result, adequate consultation and dialogue between stakeholders needs to have been undertaken before project objectives are prioritised (Smith and Love, 2000).

New build projects are invariably unique one-off designs and built on sites that are also unique in nature (Turner, 1990). Thus, when considering a strategy to deliver a project, a client should be made aware of the complex array of activities and processes that are involved with the procurement process so that they can be appropriately managed (Gordon, 1994). The New South Wales Government (2005) states that the selection of a procurement methodology essentially involves establishing:

- the most appropriate overall arrangements (or delivery system) for the procurement;
- a contract system for each of the contract or work packages involved as components of the chosen delivery system; and
- how the procurement will be managed by the agency (or management system), to suit the delivery system and contract system(s) selected.

A plethora of procurement strategies have been developed to deal with the need to successfully deliver building projects (e.g., RICS 1996). A procurement strategy outlines the key means by which the objectives of the project are to be achieved (NSW, 2005). NEDO (1985) identified seven steps to successful building procurement:

1. Selecting an–house project executive
2. Appointment of a principal adviser
3. Care in deciding the client’s requirements
4. Timing the project realistically
5. Selecting the procurement path
6. Choosing the organisations to work for the client
7. Designating a site or building for remodelling

The NSW Government (2005), for example, have developed a very detailed and comprehensive procurement strategy, which comprises of ten stages:

1. Identify and quantify a service demand for a genuine delivery need in an outcomes strategy.
2. Identify service delivery options for meeting the need with stakeholder and preliminary risk analysis.
3. Justify proposed option with option evaluation, some financial/economic appraisal and strategy report.
4. Define preferred project with brief, risk/benefits analysis, business case and authority to proceed.
5. Define/select project procurement strategy with brief, risk/benefits analysis and risk management plan, initial methodology report and later strategy report.
6. Define project specification with tender documents, estimate and tender evaluation plan for each contract.

7. Call/close evaluate tenders for each contract and recommend/approve/engage best project suppliers.
8. Project implementation with supplier(s) carrying out contract work and asset delivery
9. Asset operation/maintenance and then disposal after supplier(s) completes asset delivery.
10. Project evaluation during/after delivery comparing outcomes sought and achieved, and using lessons learnt.

In this report, we are concerned only with the procurement options available. A detailed review of the techniques that can be used to select a procurement method can be found in Love *et al.* (2006) However, selection of the procurement method must be integrated with a procurement methodology that addresses the stages identified by NEDO (1985) and the NSW Government (2005).

The procurement method chosen in 'steps 5' above will influence the degree of integration and collaboration that will take place between project team members, particularly the contractor. The greater the integration between project members the more likely a project is in achieving a successful outcome (Dissanayaka, 1998). Noteworthy, the procurement method that is chosen for a given project will influence the degree of integration that occurs between project team members, as this will depend upon the point in time when the contractor is appointed in the procurement process. The selection of an independent advisor can assist a client with the identification of risks associated with the procurement process.

2.1 Independent Advice

From the outset of a project clients want to ensure that they can achieve the solution they require within their established budget and by an acceptable date in the future. This may be best achieved if the client seeks independent advice on these matters from the outset from an experienced construction professional, such as a consultant project manager (Love and Mohamed, 1996). In meeting the needs of the business case, where there is particular focus on building function or running costs, or speed to completion or capital cost, an experienced independent project manager can align these needs to an appropriate procurement strategy (Love and Mohamed, 1996).

2.2 Identification of Risk

The establishment of a procurement strategy that identifies and prioritises key project objectives as well as reflects aspects of risk, and establishes how the process will be managed are keys to a successful project outcome (Al-Bahar and Crandall, 1990). The unique and bespoke nature of building projects means that clients who decide to build are invariably confronted with high degrees of risk. These risks include completing a project that does not meet the functional needs of the business, a project that is delivered later than the initial programme or a project that costs more than the client's ability to pay or fund. All of these risks potentially could have an impact on the client's core business. Consequently, a procurement strategy should be developed that balances risk against the project objectives that are established at an early stage.

The nature of the client's business and the business case for a specific project should be used to underpin the basic need for certainty in time and cost. The identification of the factor(s) that will constitute the greatest risk to the business if they fail to be achieved will assist in the development of a weighted list of priorities and the overall procurement system to be considered.

The establishment of an appropriate project team to deliver a project at the right time, for the right cost given the adopted strategy is a vital role for the client, who again should take independent advice (Morledge *et al.*, 2006). During the selection of the project team, better outcomes are achieved when 'value' is considered over and above the price for the service that is being offered (Holt *et al.*, 2000). When running costs for the building are deemed

important or the design itself is complex or given importance, then procurement methods that enable a high degree of integration and collaboration between project team members are deemed to be desirable.

3. FACTORS INFLUENCING PROCUREMENT STRATEGY

For any given project a client can adopt a collaborative strategy, such as partnering irrespective of the procurement method used. Such a strategy has been often used by clients who have series of projects to undertake. The performance of both contractors and consultants can be monitored using pre-defined indicators for each of the projects they are involved with and then compared. This approach is particularly useful to monitor and evaluate disbursement of incentives where appropriate (Morledge *et al.*, 2006). Once the primary strategy for a project has been established, then the following factors should be considered when evaluating the most appropriate procurement strategy (Rowlinson, 1999; Morledge *et al.* 2006):

- *External factors* – consideration should be given to the potential impact of economic, commercial, technological, political, social and legal factors which influence the client and their business, and the project team during project's lifecycle. For example, potential changes in interest rates, changes in legislation and so on.
- *Client resources* – a client's knowledge, the experience of the organisation with procuring building projects and the environment within which it operates will influence the procurement strategy adopted. Client objectives are influenced by the nature and culture of the organisation. The degree of client involvement in the project is a major consideration.
- *Project characteristics* – The size, complexity, location and uniqueness of the project should be considered as this will influence time, cost and risk.
- *Ability to make changes* – Ideally the needs of the client should be identified in the early stages of the project. This is not always possible. Changes in technology may result in changes being introduced to a project. Changes in scope invariably result in increase costs and time, especially they occur during construction. It is important at the outset of the project to consider the extent to which design can be completed and the possibility of changes occurring.
- *Cost issues* – An assessment for the need for price certainty by the client should be undertaken considering that there is a time delay from the initial estimate to when tenders are received. The extent to which design is complete will influence the cost at the time of tender. If price certainty is required, then design must be complete before construction commences and design changes avoided.
- *Timing* – Most projects are required within a specific time frame. It is important that an adequate design time is allowed, particularly if design is required to be complete before construction. Assurances from the design team about the resources that are available for the project should be sought. Planning approvals can influence the progress of the project. If early completion is a critical factor then design and construction activities can be overlapped so that construction can commence earlier on-site. Time and cost trade offs should be evaluated.

4. PROCUREMENT SYSTEMS

A procurement system (or sometimes known as delivery system) “is an organisational system that assigns specific responsibilities and authorities to people and organisations, and defines the various elements in the construction of a project” (Love *et al.* 1998:p.222). Procurement systems can be classified as:

- traditional (*separated*);
- design and construct (*integrated*);
- management (*packaged*); and
- collaborative (*relational*)

Sub-classifications of these systems have tended to proliferate in a response to market demands. Holt *et al.* (2000) state that there are so many variables to each of the commonly adopted procurement strategies, notwithstanding the commonly adopted nomenclature, there is a very wide range of strategies available. For example, the NSW Government (2005) in their procurement guidelines identifies more than eight variants of the design and construct system. However, there are a range of commonly adopted procurement system and contract methods and each of these is described below.

Collaborative forms such as alliancing will not be described in this report as they are typically used for high complex projects. A detailed description of their characteristics and the conditions for using such forms of collaborative arrangement can be found in the Victorian State Government (2006) ‘Project Alliance Practitioners Guide’.

The decision as to what procurement system to use should be made as early as possible and underpinned by the client’s business case for the project. The risks associated with each procurement system and how they can affect the client should also be considered. With this in mind, Figure 1 provides an overview of the ‘speculative risk’ (i.e. risk that can be apportioned in advance as decided by parties in a contract) to a client and contractor for specific procurement methods.



Figure 1 Risk apportionment between client and contractor

In design and construct forms of procurement the contractor predominately assumes the risk for design and construction of the project. Design and construct variations exist where the level of design risk can be apportioned more evenly, for example, novation. With traditional lump sum contracts the intention is that there should usually be a fair and balance of risk between parties. The balance can be adjusted as required, but the greater the risk to be assumed by the contractor, the higher the tender figure is likely to be. With management forms of procurement the balance of risk is most onerous for the client as the contractor is providing only 'management expertise' to a project. However, under a design and manage method a high of risk can be placed on the contractor for design integration.

4.1 Traditional Procurement

In the traditional approach, the employer accepts that design work will generally separate from construction, consultants are appointed for design and cost control, and the contractor is responsible for carrying out the works. This responsibility extends to all workmanship and materials, and includes all work by subcontractors and suppliers. The contractor is usually appointed by competitive tendering on complete information, but may if necessary be appointed earlier by negotiation on the basis of partial or notional information.

The traditional method, using two-stage tendering or negotiated tendering, is sometimes referred to as the 'Accelerated Traditional Method' – this is where the design and construction can run in parallel to a limited extent. Whilst this allows an early start on site, it also entails less certainty about cost. There are three types of contract under the traditional procurement method:

1. *Lump sum contracts* - where the contract sum is determined before construction starts, and the amount is entered in the agreement.
2. *Measurement contracts* – where the contract sum is accurately known on completion and after re-measurement to some agreed basis.
3. *Cost reimbursement* – where the contract sum is arrived at on the basis of the actual costs of labour, plant and materials, to which is added a fee to cover overheads and profit.

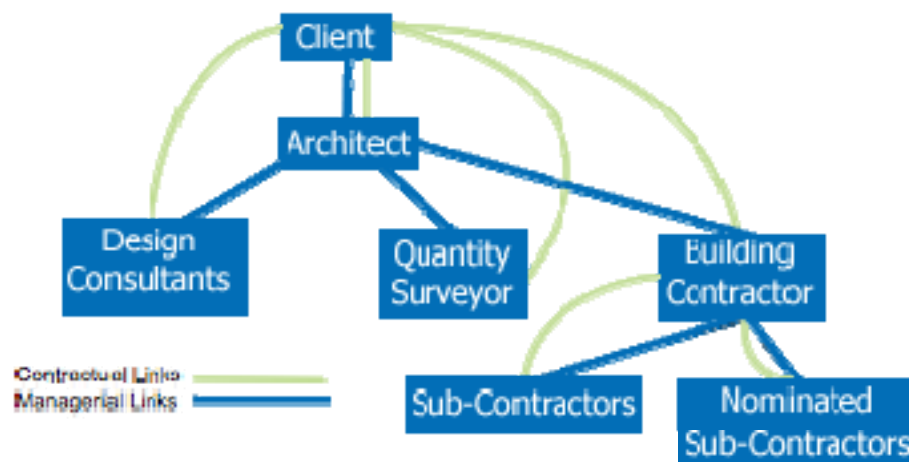


Figure 2 Traditional Procurement

4.1.1 Lump sum

The contractor undertakes to carry out a defined amount of work in return for an agreed sum. This can be a fixed amount not subject to recalculation, in which case there would be no opportunity for the employer to make variations. The sum is likely to be subject to limited fluctuations, usually to cover tax etc changes not foreseeable at the time of tendering. The sum may be subject to fluctuations in the cost of labour, plant and materials – the so called fluctuations provision. Recovery may be use of a formula, or by checking invoices.

Lump sum contracts with quantities are priced on the basis of drawings and a firm bill of quantities. Items which cannot be accurately quantified can be recovered by an approximate quantity or a provisional sum, but these should be kept to a minimum.

Lump sum contracts 'without quantities' are priced on the basis of drawings and another document. This may simply be a specification of a descriptive kind, in which case the lump sum will not be itemised, or one that is detailed to the extent that the contract sum is the total of the priceable items. The job might be more satisfactorily described as a 'Schedule of Works', where the lump sum is the total of the priced items. In the latter cases, an itemised breakdown of the lump sum will be a useful basis for valuing additional work. Where only a lump sum is tendered, then a supporting 'Schedule of Rates' or a 'Contract Sum Analysis' will be needed from the tenderer.

Tenders can be prepared on the basis of notional quantities, but they will need to be replaced by firm quantities if it is intended to enter into a 'with quantities' lump sum contract.

4.1.2 Measurement

Measurement contracts are also referred to as 're-measurement contracts'. This is where the work which the contractor undertakes to do cannot for some good reason be accurately measured before tendering. The presumption is that it has been substantially designed, and that reasonably accurate picture of the amount and quality of what is required is given to the tenderer. Probably the most effective measurement contracts, involving least risk to the employer, are those based on drawings' with approximate quantities.

Measurement contracts can also be based on drawings and a 'Schedule of Rates' or prices prepared by the employer for the tenderer to compete. This type of contract might be appropriate where there is not enough time to prepare even approximate quantities or where the quantity of work is very uncertain. Obviously the employer has to accept the risk involved in starting work with no accurate idea of the total cost, and generally this type of contract is best confined to small jobs.

4.1.3 Cost reimbursement

These are sometimes referred to as 'Cost Plus' contracts. The contractor undertakes to carry out an indeterminate amount of work on the basis that they are paid the prime or actual cost of labour, plant, and materials. In addition, the contractor receives an agreed fee to cover management, overheads and profit. Hybrids of the cost reimbursement contracts include:

- *Cost-plus percentage fee* – the fee charged is directly related to the prime cost. It is usually a flat rate percentage, but it can also be on a sliding scale. However, the contractor has no real incentive to work at maximum efficiency, and this variant is only likely to be considered where the requirements are particularly indeterminate pre-contract.
- *Cost-plus fixed fee* – The fee to be charged is tendered by the contractor. This is appropriate provided that the amount and type of work is largely foreseeable. The contractor has an incentive to work efficiently so as to remain within the agreed fee.
- *Cost-plus fluctuating fee* – The fee varies in proportion to the difference between the estimated cost and the actual prime cost. The assumption is that as the latter cost increases, the contractor's supposed inefficiency will result in a fee which decreases. This approach depends upon there being a realistic chance of ascertaining the amount and type of work at tender stage.

4.1.4 Key points to consider with traditional procurement

- A traditional lump sum contract requires the production of a complete set of documents before tenders are invited. Adequate time must be allowed for this.
- The traditional procurement method assumes that design will be appointed by consultants, and it does not generally imply that the contractor has any design obligations. If this is to be the case, express terms should be included in the contract.
- As the employer appoints consultants to provide advice on all matters of design and cost, they thereby retain total control over the design and quality required.
- The contractor depends heavily upon the necessary information and instructions from the architect being issued on time. There is a risk of claims if they are delayed.
- The employer decides which specialist firms the contractor is to use, although the contractor may require certain safeguards relating to performance.
- All matters of valuation and payment are the responsibility of the employer's consultants.
- If it is impossible to define precisely the quantity or nature of some of the work, it is still possible to adopt a traditional method on the basis of approximate quantities, provisional sums, or cost reimbursement. However, this is less than a perfect solution: the fuller and more accurate the information, the nearer to the relative safety of the lump sum approach.

4.1.5 Advantages and disadvantages of traditional procurement

The main *advantages* of using a traditional approach to procurement are:

- accountability due to a competitive selection;
- competitive equity as all tendering contractors bid on the same basis;
- design lead and the client is able to have a direct influence which can facilitate a high level of functionality and improve the quality in the overall design;
- price certainty at the award of the contract;
- variations (changes) to the contract are relatively easy to arrange and manage; and
- a tried and test method of procurement which the market is very familiar with.

The main *disadvantages* of using a traditional approach to procurement are:

- can be a timely process to produce the full contract documentation. Tenders documents from an incomplete design can be produced but can lead to less cost and time certainty, and may lead to disputes;
- overall project duration may be longer than other procurement methods as the strategy is sequential and construction cannot be commenced prior to the completion of the design; and
- no input into the design or planning of the project by the contractor as they are not appointed during the design stage.

4.1.6 When should traditional procurement be used?

Traditional procurement should be used when (Turner, 1990):

- a programme allows sufficient time;
- consultant design is warranted;
- a client wishes to appoint designers and contractors separately;
- price certainty is wanted before the start of construction;
- product quality is required; and
- a balance of risk is to be placed between the client and constructor.

4.2 Design and Construct Procurement

With design and construct procurement a contractor accepts responsibility for some or all of the design. There should be express reference to this in the contract, and the extent of design liability should always be set out as clearly as possible. Unless the contract states otherwise, it seems that the liability for design is an absolute liability under which the contractor warrants fitness for the purpose intended.

Some design and construct forms limit the design liability of the contractor to the normal professional duty to exercise reasonable care and skill. Independent consultants engaged by the contractor are therefore under a liability no greater than normal. An indemnity or acceptance of liability is likely to be worthless unless backed by adequate indemnity insurance, and this is something that should be checked before a contractor is appointed. If the contractor does not have in-house designers, which is often the case, and the contractor uses external consultants, their identity should be established before a tender is accepted.

The client's requirements might be stated briefly and simply, perhaps little more than a site plan and schedule of accommodation. On the other hand, they may be a document of several hundred pages with precise specifications. The contractor's input might be restricted to taking a scheme design supplied by the client and developing details and production information. It is however better to specify in terms of the performance requirement rather than to prescribe in detail, because this leaves the responsibility for design and selection firmly with the contractor.

Design and construct methods offer certainty on the contract sum and bring cost benefits. The close integration of design and construction methods and the relative freedom of the contractor to use their purchasing power and market knowledge most effectively can provide a client with a competitive price.

With a design and construct method, it is possible ensure a quicker start on site, and the close integration of design and construction can result in more effective programming. Time, however, is needed by the client's consultants to prepare an adequate set of requirements, and time is needed to compare and evaluate the schemes from competing tenderers. Once a contract is signed, any changes by the client can prove costly.

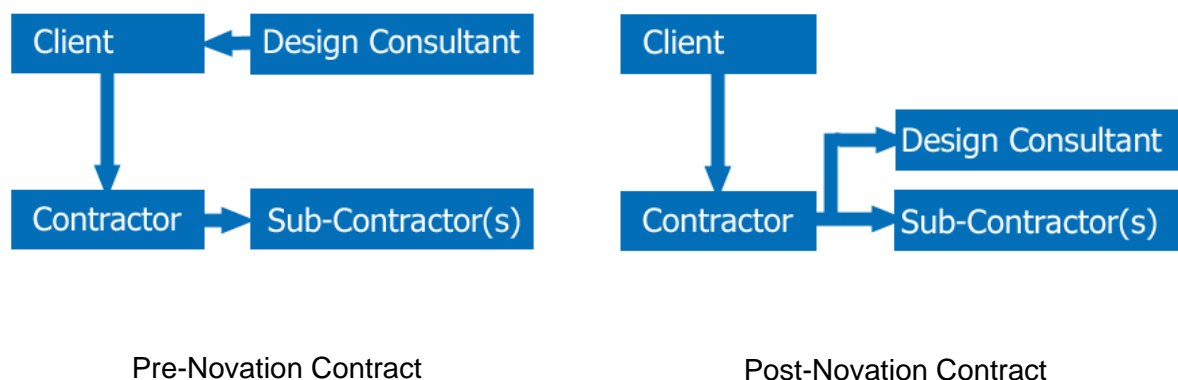


Figure 3 Pre and Post-Novation Contracts

A number of variations of design and construct exist, which include (Turner, 1990):

- *Direct* – in this case no competition is obtained in tenders. Some appraisal of the possible competitors may be made before tendering but only one tender is obtained.

- *Competitive* – tenders are obtained from documents that are prepared to enable several contractors to offer competition in designs and in prices.
- *Develop and construct* – consultants design the building required to a partial stage, often referred to as ‘scope design’, then competitive tenders are obtained from a select list of contractors to develop and complete the design and construct the building. The amount of consultant design can vary depending on the client’s needs.
- *Package deal* – this method is often used where the contractors competing will use a significant part of their own or another proprietary building system or they will be constructing variations of a repetitive theme. There is limited scope for innovation when this method is used. Some contractors may offer to find a site, to sell, mortgage or lease their product, obtain approvals etc at a risk to themselves or at a charge to the client.
- *Novation* – sometimes referred to a *design, novate and construct*. This is where the contractor takes over from the client a previous contract for the design work, completes the design and constructs the work.

4.2.1 Key points to consider with design and construct procurement

- In design and construct contracts, in theory, there is usually a single point of responsibility. The employer therefore has the advantage of only one firm to deal with – and one firm to blame if things go wrong. In practice, the employer’s requirements are detailed to the extent that the contractor’s design contribution, and liability, is diminished.
- The employer lacks control over the detailed design; however, this might be acceptable where broad lines of the scheme are satisfactory and the detail relatively less important.
- Construction work can be started early as a great deal of detailed design can proceed in parallel. However, it is mainly the contractor who benefits from this operational flexibility.
- Responsibility for completing on time rests wholly with the contractor. There should be no risk of claims because of the allegations that information from the employer is late. This obligation on the contractor to be responsible for the flow of their necessary information is one of the most attractive features of design and construct.
- There is greater certainty of cost, even to the extent that, if required, responsibility for investigating site and subsoil conditions can be made entirely the contractor’s. Any changes in the employer’s requirements can affect the contract sum, however, and are likely to prove costly.
- It is always advisable to ask for information about who the contractor intends using as a designer. Adequate professional indemnity insurance should always be a requirement.
- The employer should be advised to appoint consultants to provide advice on the preparation of the requirements; it is important that adequate time is allowed for this to be done adequately.
- The requirements might include specific items or provisional sums, but generally it is prudent to prescribe performance criteria, so that a high degree of reliance is placed on the contractor.
- In the absence of any stipulations to the contrary, the contractor’s design obligations are absolute. However, they are usually reduced in standard forms of contract to those the professional’s duty of using reasonable skill and care.
- It is difficult to evaluate competitive tenders realistically. Tenderers should be informed of the criteria to be used, and whether price is likely to be the prime consideration.
- Benefits can arise from designers and estimators having to work closely together. The contractor’s awareness of current market conditions and delivery times can ensure that a contract runs smoothly, economically and expeditiously.

4.2.2 Advantages and disadvantages of design and construct procurement

The main *advantages* of using a design and construct approach to procurement are:

- client has to deal with one firm and reduces the need to commit resources and time to contracting designers and contractors separately;
- price certainty is obtained before construction commences as client's requirements are specified and changes are not introduced;
- use of a guaranteed maximum price with a savings option split can stimulate innovation and reduce time and cost;
- overlap of design and construction activities can reduce project time; and
- improved constructability due to contractor's input into the design.

The main *disadvantages* of using a design and construct approach to procurement are:

- difficulties can be experienced by clients in preparing an adequate and sufficiently comprehensive brief;
- client changes to project scope can be expensive;
- difficulty in comparing bids since each design will be different, project programme will vary between bidders, and prices for the project will be different for each design;
- client is required to commit to a concept design at an early stage and often before the detailed designs are complete; and
- design liability is limited to the standard contracts that are available.

4.2.3 When should design and construct procurement be used?

Design and construct procurement should be used when a (Turner, 1990):

- building is functional rather than prestigious;
- building is simple rather than complex, is not highly serviced and does not require technical innovation;
- brief for scope design is likely to change;
- programme can be accelerated by overlapping design and construction activities; and
- single organisation is required to take responsibility and risk for design and construction.

The following comments about using novation are provided (Chan, 1996):

For a limited marketplace with insufficient companies who do not have a proven record of designing and constructing - perceived risk of taking over a design deters many would be tenderers.

By accepting a novated design companies accept errors and omissions and other potential problems including a design that may potentially prove unworkable.

The client's right to nominate subcontractors or suppliers is removed under novation, thus the company taking over both design and construction is free to make its own contractual arrangements as it sees fit.

The architect will no longer supervise quality control or exercise sanction once novation occurs. This is difficult for many designers, as their reputation is closely associated with their work, which may be modified in a way that could upset them.

The client loses communication links with the design team once novation occurs.

Once novation occurs, the contractor pays the design team. This may pose a financial risk to the design team if they believe that the contractor is not financially sound.

4.3 Management Procurement

Several variants of management procurement forms exist, which include; *management contracting*, *construction management* and *design and manage*. There are some subtle

differences between these procurement methods. In the case of management contracting, the contractor has direct contractual links with all the works contractors and is responsible for all construction work. In construction management, a contractor is paid a fee to professionally manage, develop a programme and coordinate the design and construction activities, and to facilitate collaboration to improve the project's constructability.

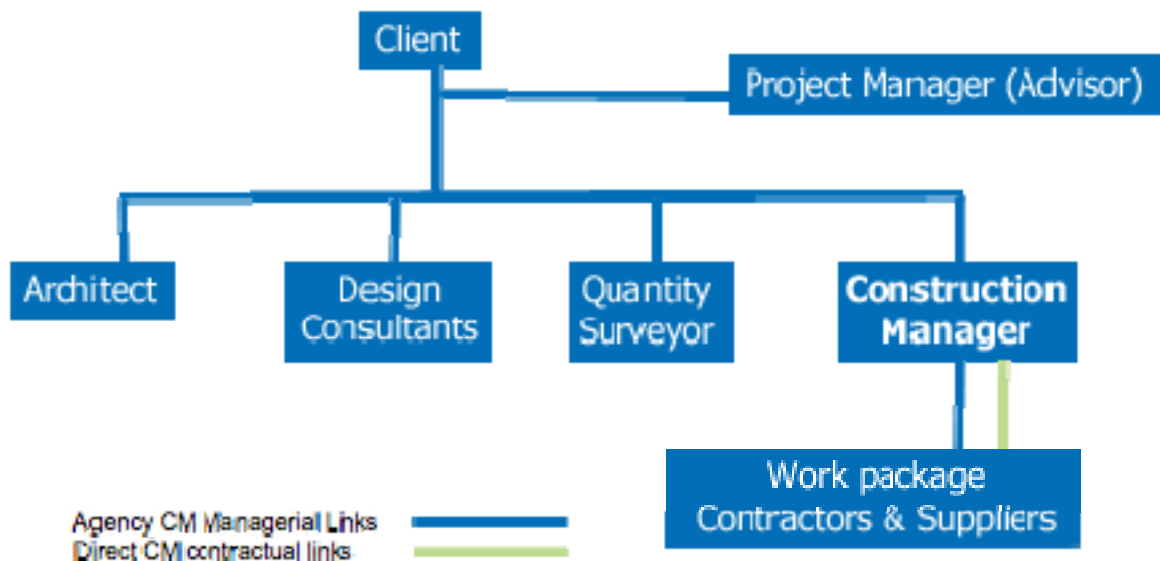


Figure 4: Construction Management Procurement

4.3.1 Management contracting

The client appoints an independent professional team, and also a management contractor. Their involvement at pre-construction stages will be as adviser to the team, and during construction they will be responsible for executing the works using direct works contracts. With this type of contract it is possible to make an early start on-site and achieve early completion. Because of its flexibility, it allows the client to change the design during construction because drawings and matters of detail can be adjusted and finalised as the work proceeds.

For a management contract to be successful there must be trust and good teamwork on the part of the client, the design consultants and contractor. The contractor should preferably be appointed no later than the outline design stage. The contractor can advise on the design programme, tender action, delivery of materials and goods, and construction programmes.

The management contractor will normally make a written submission which includes a proposed management fee, and will be appointed after interviews with the client and the design team. The fee will include for the total management service, expressed as a percentage of the total project cost, and for a service to cover pre-construction stages should the project not proceed to site.

The management contractor undertakes the work on the basis of a contract cost plan prepared by a quantity surveyor, project drawings, and a project specification. The client accepts most of the risk because there is no certainty about costs and programme. Competitive tenders for works packages follow later and they will usually, though not always, will be lump sum contracts with bills of quantities.

4.3.2 Construction management

The management contractor is selected after a careful selection process and is paid a management fee. The basic difference is that works contracts, although arranged and administered by the management contractor, are direct between the client and works contractor. Although in a sense this gives the client a greater measure of control, it also

means that the client accepts a considerable amount of risk. The management contractor is simply an agent, and usually cannot guarantee that the project will be finished to time and cost.

A number of advantages have been identified that can be offered by the CM approach. These may be summarised as follows (Walker 1999);

- Reduced confrontation between the design teams and the team responsible for supervising construction;
- early involvement of construction management expertise;
- overlap of design and construction;
- increased competition for construction work on large projects due to work packaging and splitting the construction activities into more digestible 'chunks';
- more even development of documentation;
- fewer contract variations;
- no need for nominated trade contractors; and
- public accountability

4.3.3 Design and manage

A design and manage strategy is similar to management contracting. Under a design and manage contract, the contractor is paid a fee and assumes responsibility, not only for works contractors, but also for the design team. The common variations of design and manage are (Turner, 1990):

- *Contractor* – a project design and management organisation designs and manages the work, generally for a fee and delivers the project by employing works contractors as its subcontractors to design/or construct.
- *Consultant* – a project designer/manager is the client's agent, who designs and manages the work, obtains subcontract tenders from works contractors who then each enter into a direct contract with the client.

4.3.4 Advantages and disadvantages of management procurement

The main *advantages* of using a management approach to procurement are:

- the client deals with only one firm, which enables improved coordination and collaboration between designers and constructors;
- potential for time savings for the overall project as design and construction activities are overlapped;
- under a *design and manage* form, the contractor assumes risk and responsibility for the integration of the design with construction;
- works packages can be let competitively at prices that are current;
- improved constructability through constructor input into the design;
- roles, risks and responsibilities for all parties are clear; and
- flexibility for changes in design.

The main *disadvantages* of using a management approach to procurement are:

- price certainty is not achieved until the final works package has been let
- informed and proactive client is required.
- poor price certainty
- close time and information control required
- client must provide a good quality brief to the design team as the design will not be complete until resources have been committed to the project (Construction management and management contracting); and
- client loses direct control of design quality which is influenced by the constructors (design and manage).

4.3.5 Key points to consider with management procurement

- Management procurement methods are best suited to large, complex, fast moving projects where early completion is desirable.
- This method of procurement depends upon a high degree of confidence and trust. There is no firm contract price before the work starts on site, and the decision to go ahead usually has to be taken on the basis of an estimate.
- The management contractor is the agent of the client, and should therefore put their interests first throughout the project.
- It is an advantage to appoint the management contractor at early stage, so that their knowledge and expertise are available to the design team throughout the pre-construction period.
- Much of the detailed design work can be left to proceed in parallel with the site operations for some work packages, thus reducing the time needed before the project starts on-site.
- The client has a considerable degree of flexibility on design matters. The design can be adjusted as construction proceeds, without sacrificing cost control. This would not be possible with traditional methods.
- The management contractor can select specialists and order materials with long lead-in times for delivery in good time without any of the uncertainties and complexities which attend traditional nomination procedures.
- The project proceeds on the basis of a contract cost plan, but an independent quantity surveyor is required for effective cost control.
- A competitive tendering element is retained for all works contracts, which usually account for most of the overall prime cost. Tenders for works packages will normally be on a lump sum basis.

5. REFERENCES

- Al-Bahar, J., and Crandall, K. (1990). Systematic risk management approach for construction projects. *ASCE Journal of Construction Engineering and Management*, **116**(3), pp.533-545.
- Dissanayaka, S.M. (1998). *Comparing Procurement and Non-Procurement Contributors to Project Performance*. Unpublished Master of Philosophy, The University of Hong Kong, Hong Kong SAR.
- Gordon, C.M. (1994). Choosing appropriate construction contracting method. *ASCE Journal of Construction, Engineering and Management*, **120**(1), pp.196-210.
- Holt, G.D., Proverbs, D., and Love, P.E.D. (2000). Survey findings on UK construction procurement: Is it achieving lowest cost, or value? *Asia Pacific Building and Construction Management Journal*, **5**, pp.13-20.
- Love, P.E.D., and Mohamed, S. (1996). Project management: the key to procuring fast buildings. *Asia Pacific Building and Construction Management Journal*, **2**(1), pp.1-6.
- Love, P.E.D., Skitmore, R.M., and Earl, G. (1998). Selecting a suitable procurement method for a building project. *Construction Management and Economics*, **16**(2), pp.221-233.
- Love, P.E.D., Gunasekaran A., and Li, H. (1998). Concurrent engineering: a strategy for procuring construction projects. *International Journal of Project Management*, **16**(6), pp.375-383.
- Mortledge, R., Smith, A., Kashiwagi, D.T. (2006). *Building Procurement*. Blackwell, Oxford, UK.
- New South Wales Government (2005). *Procurement Methodology Guidelines for Construction*. Version 1, February, NSW Government, Sydney, Australia.
- RICS (1996). *The Procurement Guide*. Royal Institution of Chartered Surveyors, London, UK
- Rowlinson, S. (1999). Selection criteria. In. Rowlinson, S., and McDermott, P. *Procurement Systems: A Guide to Best Practice in Construction*. E & F Spon, London, pp.276-299.
- Skitmore, R.M., and Marsden, D.E. (1998). Which procurement system? – towards a universal procurement selection technique. *Construction Management and Economics*, **6**, pp.71-89.
- Smith, J., and Love, P.E.D. (2001). Adapting to client needs in construction – a dialogue. *Facilities*, **19**(1/2), pp.71-78.
- Smith, J., Love, P.E.D., and Wyatt, R. (2001). To build or not to build? Assessing the needs of construction industry clients and their stakeholders. *Structural Survey*, **19**(2), pp.121-132.
- Turner, A. (1990). *Building Procurement*. Macmillan, UK.
- Victorian State Government (2006). *Project Alliance Practitioners Guide*. Department of Treasury and Finance (<http://www.dtf.vic.gov.au/projectalliancing>)
- Walker, D., Sidwell, A. & Hampson, K. (1999), *Project Procurement and Alliances - A Continuum of Competition to Cooperation*, RMIT, Melbourne



**Cooperative Research Centre
for Construction Innovation**

9th Floor, L Block
QUT Gardens Point
2 George Street
BRISBANE QLD 4001
AUSTRALIA

Tel: +61 7 3138 9291

Fax: +61 7 3138 9151

Email:
enquiries@construction-innovation.info

Web:
www.construction-innovation.info



Established and supported
under the Australian
Government's Cooperative
Research Centres Program