Built Environment Procurement Practice:
Impediments to Innovation and Opportunities for Changes

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Executive Summary and Recommendations

Information for this report has been drawn from an extensive review of various international and local reports. In addition, selected experts based Australia were surveyed to obtain their views regarding key areas relating to procurement in the construction industry. A semi-structured interview format was adopted for the survey which included experts from a broad sector of the Australian construction industry including designers, contractors, consultants and government organisations. (Refer Appendix A for a summary of the Expert Group surveyed.) The aim of the survey is to ground the findings from the literature review and provide a focus on Australian infrastructure. Results from the survey are included in breakout boxes in relevant sections of the report.

Traditional procurement, a process by which the infrastructure is delivered, (in the broadest sense of the term) is still the most commonly used and constructors are compelled to tender with increasingly tighter margins to satisfy falsely aligned economic drivers. There are many cases in which a traditional method of procurement remains appropriate. For example, a ‘simple’ building (e.g. a toilet block) where there is little or no opportunity for design innovation, the likely costs is known in advance and there are any number of builders with the expertise to deliver the project so a competitive tender for construction based on a standard design seems appropriate. However, there are situations where alternative procurement methods to open or competitive tendering should be considered, as the latter can waste a considerable amount of time and resources in certain circumstances. Recent research suggests that there is a need to develop a more holistic approach to project delivery processes that drive sustainable innovation and there is a pent up need to move from traditional procurement delivery models (in their various guises) to new methods that are able to incorporate innovative change processes that are required to address sustainable outcomes.

Recently it has been suggested that Alliances and its relational style represent an appropriate method of project delivery; they have received notoriety as a method to deliver complex projects, meeting targets and stakeholder’s goals and expectations i.e. delivering best value. The lack of understanding and an inability to articulate this value in a meaningful (or quantitative) way through the hierarchy of public sector organisations is constraining their use.

Market cycles have changed dramatically causing project champions to question the viability of alliance and relationship type projects. Evidence from the UK in recent months suggests that clients are once again pursuing hard money (traditional) contracts on the basis of a power shift in the economics of the procurement transaction. Despite these short sighted reactionary approaches to project delivery in challenging times, alliance and relationship procurement underpinnings has the ability to significantly reduce transaction costs associated with capital infrastructure project procurement and deliver best value to the public purse of State and Federal governments in the short term and significant enhanced value to infrastructure stock in the medium to long term.

A number of themes repeatedly emerge as having high impact on innovation in procurement. Primarily the skills and abilities of the industry as a whole, and skills and abilities of clients in particular, recur as an issue in all four sectors of the research. In addition, design, risk management, and regulation were repeatedly highlighted as issues. It is of interest to note, that in most cases, all of these influencing factors could, in fact, work either for or against encouraging innovation in the procurement of building works in the current Australian construction industry. For example, data from the survey carried out for this project show that the majority of interviewees were in favour of early contractor involvement (ECI). However, some contractors thought that the process gave away their competitive advantage.

1 In order to aid readability in this Executive Summary and Recommendations, citation of sources has been removed. These are included in the main body of the text.
Equally as important as the common threads of analysis are the ‘outliers’ in the data received from the survey. Environmental requirements, for example, were considered by some interviewees to have no impact on impeding innovation, little impact by others and actually aiding innovation by some respondents. Similar responses were received in relation to industry relationships and in surveys carried out by the Australian Bureau of Statistics.

In addition, the fact that the number and type of procurement methods used by the organisations interviewed does not seem to be tracked and analysed for effectiveness and possible adoption suggests scope for further analysis.

A lack of consistency in defining and classifying procurement approaches per se causes confusion in the industry. While considerable variations of approaches to procurement exist and are likely to be expanded, it would assist all stakeholders if definitions and terms relating to the main areas of procurement could be agreed upon and standardised. The three main areas/terms being – Procurement Methodology (i.e. the overall approach to procurement including the procurement strategy and procurement system.) Procurement Strategy – (i.e. the key means by which the objectives of the project are to be achieved, including contracting arrangements for design, construction, maintenance or operation activities and subcontract arrangements.) Procurement System (sometimes known as delivery system) – (i.e. An organisational system that assigns specific responsibilities and authorities to people and organisations, and defines the various elements in the construction of a project.)

Innovative procurement

The fragmented nature of the construction industry is held to inhibit innovation in the construction sector. One reason for this is that traditional procurement hinders contractor input regarding planning and technical solutions, which hampers innovation and buildability. Likewise the separation of designers from the construction process reduced opportunity of innovation. Overall, the adversarial nature of the industry acts against innovation and sustainability.

Recent research by the Australian Bureau of Statistics on innovation in Australian industries identified a number of barriers to innovation within these firms. Construction firms cited lack of access to funds, cost of development of innovation attitude of staff towards change, lack of access to technology, market conditions, government regulations, and in particular labour as key issues in the lack of innovation.

The role of government

The argument that regulation is a major inhibition to innovation is highly prevalent throughout the literature. However, such a view seriously underestimates the role of government and the influence that it can have on innovation. Some researchers argue against a simplistic and negative perspective on regulations, suggesting instead that there is something of a paradox between regulation and innovation. This is supported in research by the Australian Bureau of Statistics. While noting that construction firms cite government regulations as an impediment to innovation the same research also found that reducing environmental impacts of construction in response to government standards could also be a driver for innovation.

Thus, while regulation can inhibit innovation, it can also provide the incentive to innovate – it is largely a matter of how the regulation is implemented or possibly interpreted. By moving from prescriptive to performance based regulation can improve the relationship between innovation and regulation.

Some researchers argue that government is the single most influential party in supporting the achievement of sustainability targets through its position as the largest client of the construction industry, its capacity to offer fiscal incentives and ability to ‘move the goalposts’ by undertaking a review of building regulations. This is a relatively understudied area, and needs to be better understood.
'Government' thus has a critical role in the development of innovation in sustainable procurement. Through its roles as client and regulator government can influence the outcomes of procurement activities by addressing the impediments to innovation and fostering the enablers of innovation. Strategies include encouraging performance based approaches to sustainability in procurement projects, offering incentives to firms to innovate in sustainable procurement, and encouraging collaboration amongst innovative firms.

**Enablers of innovation**

An obvious and straightforward enabler for innovation is that of investment in research and development (R&D). In a recent survey it was established that there are four main areas which drive innovation: environmental pressure, technological capability, knowledge exchange and boundary spanning.

For innovation in sustainable procurement, mechanisms need to be found which foster collaborative approaches to procurement, these include a move away from procurement models that encourage litigation which indicates a general lack of trust which then inhibits innovation in procurement.

A number of researchers argue that building a collaborative culture is seen as key to developing innovation in construction. It is argued that long term collaborative networks provide opportunity for improved trust and enhanced innovation and that collaborative team work is necessary in order to promote collaborative learning and innovation. While formal business relationship programs are important to fostering innovation information knowledge sharing and strategies are also important.

**Inappropriate contract procurement and delivery methods are commonly being used**

Professionals involved in procurement process are typically conservative and reluctant to implement change relying too heavily on previous experience in a sector, rather than the particular characteristics of the project in question. Against this, professionals can also be the champions of change. Likewise, clients who are prepared to be involved in judicious risk taking can be drivers of innovation.

The principals (clients and consultants) and constructors often hold different views on how best to procure major infrastructure projects. This suggests a lack of understanding between the two parties and therefore scope for improvement.

**Poor scope management is a major problem**

A contributing factor to client's approach to procurement may relate to scoping of the project. Key findings in a report of a recent survey indicate that there is a high prevalence of deficient scoping. 52% of respondents said that the project they were involved in was not adequately scoped by the time the project was submitted to the market. These issues were reflected industry wide with the majority of respondents in the survey claiming the problem was getting worse.

As well as an increase in deficient scoping, the majority of scoping inadequacies (64%) were discovered far too late in the life of a project rather than being identified at the more manageable phase before contracts are signed. There are significant consequences for inadequate scoping. More than 60% of respondents said that inadequate scope documents resulted in a cost overrun, with more than half of those overruns costing more than 10% of the value of the project and a third more than 20%. There was also a high frequency of disputes and delays to projects which were attributed directly to poor scoping, with almost half of the respondents who reported a delay saying it lasted for at least four months. The unifying aspect of each of these effects is inefficiency in the delivery of various projects in Australia.

**Selection of procurement strategy**

The efficient procurement of a building project through the choice of the most appropriate procurement strategy has long been recognised as a major determinant of project success and a
failure to select an appropriate procurement approach as the primary cause of project dissatisfaction.

Conventional procurement selection criteria are based around the concepts of time, cost and quality. While the use of such criteria can be used as a guide to assist decision-makers with an initial understanding of the basic attributes of a particular procurement system, they should not be used as a basis for selecting the procurement method. This is because of the underlying complexity associated with matching client needs and priorities with a particular method, the contradictory nature of these performance criteria, and the lack of agreement as to how to properly define and measure these criteria.

It can be argued that the concept of cost certainty is a fallacy in the context of traditional approaches that are based upon full drawings and bills of quantities. This approach should provide a client with a firm, fixed price for construction but in practice very few projects are actually completed within the tendered price. Given the lack of cost certainty in many projects, the matter of how to estimate a suitable contingency for projects has become a matter of concern for many clients.

Additionally, when government attempts to achieve procurement, there are often additional policy outcomes which need to be considered, apart from the typical project performance criteria of cost, quality and time. Some of these policy outcomes include, job creation, economic stimulus, regional development, apprentice training, and even public art in public works. These additional ‘social policies’ create additional challenges for the procurement process, as effectively public works agencies are delivering policy outcomes through the procurement process. In particular governments of all persuasions are seeking to deliver jobs, and economic stimulus through the procurement of public works projects.

Fundamentally, the major difficulties associated with procurement selection include:

- no single person or knowledge ‘czar’ has been found who is familiar with all primary procurement methods;
- no consensus has been found between experts which easily systemises procurement selection;
- complexity caused by multiple and sometimes conflicting performance criteria, and
- no mutually exclusive sets of criteria uniquely and completely determine the appropriate procurement method for a specific project.

**Tools and techniques for selection of procurement system**

Despite the difficulties associated with procurement method selection, a number of structured methodologies, tools and models have been developed. The approaches developed range from simple to highly complex. It is important, however, that method selection is done logically, systematically, and in a disciplined manner by the clients’ principal adviser.

No specific technique has gained widespread acceptance. However, forms of ranking and weighting of specific client priorities against the attributes of a particular procurement method is the most popular technique that have emerged from the review undertaken. While pragmatic and easy to use, this technique is deemed to have many flaws as specific characteristics of the client, project, and external environment are often not taken into account. Notwithstanding this, the determination of ‘generic’ client criteria is deemed to be the most difficult task in procurement selection process. Criteria such as NEDO have been used extensively, but have been identified as being fuzzy in nature and doubts have been cast over using a limited number of selection criteria. Another major issue that faces decision-makers pertains to the definition procurement selection criteria, as they can consist of an amalgamation of various sub-parameters unique to a project and its stakeholders.

There is a need to develop a pragmatic framework that clients’ can use to select an appropriate procurement. A procurement framework should be able to guide the decision-maker rather than
provide a prescriptive solution. More research is specifically required to examine the dynamic and changing needs of clients and to understand why and how a particular procurement is chosen.

It is recommended that the following research be undertaken to assist with the development of a framework to determine an appropriate procurement method for a specific project:

- a comprehensive survey of procurement methods and client needs;
- an evaluation of the effectiveness of various procurement selection methods; and
- mapping of current procurement selection processes using case studies to identify and develop areas for improvement.

**Lack of skills and abilities**

Client education is critical to successful and innovative delivery of infrastructure projects.

There is a widely held view that in many cases clients' knowledge regarding appropriate procurement strategies is lacking and the problem is getting worse.

Recent research identifies a particular need to develop a pragmatic framework that clients' can use to select an appropriate procurement solution. A procurement framework should be able to guide the decision-maker rather than provide a prescriptive solution, which the author's consider an appropriate strategy to undertake.

It would be naive to believe that the supply side of the construction industry are fully versed in procurement strategies and systems. Recent research which focused on government clients established that in WA at least, there was a perception that the marketplace does not have the management experience to effectively embrace innovative forms of procurement.

There is little published research on the learning requirements of the supply side of the industry. A number of reports, notably the Egan Report, have pointed to the need for more training in the industry.

**Learning alliances**

Inter-organisational learning could provide benefit in the procurement process. It is argued by a number of researchers that relationship based procurement leads to mutual benefit in construction business-to-business dealings and provides benefits over traditionally fragmented supply chains both within projects and across projects. Project alliances are a particular kind of relationship procurement system that rely on ‘virtual organisations’ generating new knowledge enabling teams to solve interrelated problems in a complex environment.

Recent research demonstrates that human capital can be built from delivering projects using a relationship-based approach by offering an argument that collaboration prompts the formation of projects teams becoming effective learning alliances. The literature suggests that effective supply chain management can contribute to this effort and can be further advanced through forming communities of practice (COP) that work together to deliver superior project delivery performance. Researchers contend that the development of human capital be measured and recommend the introduction of a developed framework which measures social (human) capital development.

**Knowledge Management**

Knowledge has become the source of innovation, growth and performance improvement. Hence, in today’s world, it is absolutely critical to build, preserve and leverage organisational knowledge for learning and making organisational performance improvements. Effective knowledge management (KM) ensures people with needs can find people who can meet those needs within the organisation. It also ensures that the knowledge held by employees is amplified and internalised as part of an organisation's knowledge base.
KM ensures that best practices and lessons learnt are available organisational wide. The goal is to (re)use this knowledge in order to avoid reinventing the wheel each time. This type of knowledge has been shown to result in cost savings of about 15 to 20 per cent. Knowledge allows work to be carried out efficiently while employees’ expertise, skills and competencies can be used to do the work effectively. This in turn results in improving quality of the organisation.

**Dealing with risk**

The Victorian Government point out that value for money is maximised by allocating risk optimally. In very general terms, this means allocating each risk to the party best able to manage that risk. In theory, this reduces individual risk premiums and the overall cost of the project, because the party in the best position to manage a particular risk should be able to do so at the lowest price.

The critical determination of project costs and price undertaken by clients in the feasibility phase of the tendering process, and by contractors in the bidding phase, relies upon accurate assessments of risk to ensure best value procurement for both contractors and clients. A systematic, comprehensive and rigorous identification and effective utilisation of appropriate knowledge are required to optimise the accuracy of risk assessments and provide best value outcomes. Risk assessments should also be undertaken systematically utilising appropriate methodologies.

In addition to the above there is increasing pressure for organizations to reduce corporate risk through adopting ethical procurement practices. Initiatives, organisations and tools that are relevant to ethical procurement of building products include the following:

1. A greater number of product suppliers need to undertake ethical initiatives such as developing and implementing sustainability policies and adopting the Ethical Trading Initiative’s (ETI’s) base code.
2. An independent research organisation (or organisations) needs to carry out a regular, detailed review of the ethical performance of construction products and suppliers.
3. Robust ethical labelling schemes need to be developed for a wider range of construction products.
4. A detailed definition of ethical trade / procurement should be developed and agreed for the construction sector.

At present, construction industry purchasers have only a limited amount of information to determine the ethical credentials of the products that they buy. Information regarding for example, the sustainability of production methods for certain materials and products, the use of child labour etc is not readily available. While it is possible, to some extent, for purchasers to collect this information themselves (e.g. using the sustainable supply network management techniques), this is time consuming and costly, which partly explains why few companies are attempting to implement ethical procurement.

**Inappropriate risk allocation**

A number of reports assert that risk allocation is currently weighted in favour of principals. With principals enjoying the advantage of establishing the risk allocation they wish constructors to accept in the competitive tender process, constructors are often exposed to some risks over which they have little or no control. Indeed, 69% of constructors admit that some risks have been inappropriately allocated to them, but say they continue to participate in these projects, albeit reluctantly.

In this regard, it is not only up to the principals, but also the constructors to drive a more appropriate risk allocation. If over two thirds of constructors accept risks which they identify as inappropriate to secure work, albeit unwillingly, principals may see that there is little incentive to proffer a more equitable method of risk allocation during the market request phase.

According to a recent survey the three most common risks, which constructors believe they should not be compelled to carry, are:
• delay events (44%)
• site conditions (35%)
• approvals (30%)

A recent survey found that constructors are much less inclined to engage external consultants to assist with identifying project risks (12% compared to private principals 53%). Instead, constructors appear to rely almost exclusively on internal review (86%).

In terms of procurement methods, novated design and construct contracts are considered the most likely to have risks allocated wholly or substantially by the principal (77% of all respondents), followed closely by design and construct contracts (62% of all respondents). Conversely, alliance contracts are identified as those most likely to involve a more equitable allocation of risk. However, less than 10% of projects are procured in this way.

When faced with imposed or inappropriately allocated risks, constructors appear to back these risks down onto their subcontractors, some of whom have no idea of the consequences. Several principals also identify this as a significant cause for concern. In contrast, as one constructor notes: “One of the most positive impacts on a project is an informed client or clients who do not have unrealistic expectations and who do not try and offload all the contractual risk to the builder.”

One solution put forward by a respondent is to “Look for the ‘fourth option’: one that is not the client’s demand; nor the contractor’s demand; nor the obvious compromise, but one which deals with the risk and issue in a considered manner for the benefit of the project.”

Risk of litigation

A recent examination of legal cases revealed that litigation by contractors against owners/ principals regarding disputes in tendering fairness, have been successful. The courts decisions reinforced the importance of integrity and fairness in the bidding system and the court rulings have insisted that these features must be protected under law of contract. A number of cases centred on the issue of owners accepting ’alternative tenders’ i.e. a tender that did not conform to the conditions stated within the original invitation to tender. This has raised doubts about the ability of owners to seek alternative bids when negotiating innovative alternative solutions, for example.

Future Options

• All participants need to recognise that wholesale transfer of all risk to another party does not necessarily lead to the delivery of a successful project. There needs to be an attitudinal change to the preparation of contract documents. Accordingly for each project, there needs to be a critical examination of risks that may arise, and these risks must be allocated fairly.
• Principals should arrange a workshop for key stakeholders to identify the likely risks and then establish a fair risk matrix before going to market.

Alternative approach to project delivery

In a recent survey of pressure points in Australian construction and infrastructure projects, respondents were found to adopt a conservative approach when selecting a project delivery method, relying too heavily on previous experience in a sector, rather than the particular characteristics of the project in question. The survey suggests that while prior experience is an important consideration, project participants should be cautious of choosing a delivery method out of habit, rather than as a result of critical analysis in the context of the project. In fact, 20% of respondents say the procurement method adopted is not the most appropriate choice.

SUMMARY OF RECOMMENDATIONS

A common language

A lack of consistency in defining and classifying procurement approaches causes confusion in the
industry. While considerable variations of approaches to procurement exist and are likely to be expanded, it would assist all stakeholders if definitions and terms relating to the main areas of procurement could be agreed upon and standardised.

**Effectiveness of procurement methods**

Further research is required to ascertain the type and effectiveness of procurement methods used by the organisations.

**Develop a framework to help clients select appropriate procurement approach**

There is a need to develop a pragmatic framework that clients’ can use to select an appropriate procurement method. A procurement framework should be able to guide the decision-maker rather than provide a prescriptive solution. More research is specifically required to examine the dynamic and changing needs of clients and to understand why and how a particular procurement is chosen. Learning from previous experiences with regard to procurement selection would provide clients such as the State Government with knowledge about how to best deliver their projects.

It is recommended that the following research be undertaken to assist with the development of a framework to determine an appropriate procurement method for a specific project:

- a comprehensive survey of procurement methods and client needs including the multiple policy outcomes and performance criteria that are often sought to be achieved through the procurement process;
- an evaluation of the effectiveness of various procurement selection methods; and
- mapping of current procurement selection processes using case studies to identify and develop areas for improvement.

**The effect of regulations on innovation**

Further research is required into the impact of regulations, (prescriptive and performance based) on innovation in procurement.

**Enhance government’s role in developing innovation in sustainable procurement**

Government has a critical role in the development of innovation in sustainable procurement. Through its roles as client and regulator government can influence the outcomes of procurement activities by addressing the impediments to innovation and fostering the enablers of innovation.

It is recommended that Government should be encourage enhance its role as a champion of innovation. Suggested strategies include encouraging performance based approaches to sustainability in procurement projects, offering incentives to firms to innovate in sustainable procurement, and encouraging collaboration amongst innovative firms.

**Foster collaboration**

For innovation in sustainable procurement, mechanisms need to be found which foster collaborative approaches to procurement. These include a move away from procurement models that encourage litigation which indicates a general lack of trust which then inhibits innovation in procurement.

**Ethical procurement**

At present, construction industry purchasers have only a limited amount of information to determine the ethical credentials of the products that they buy. Information regarding for example the sustainability of production methods for certain materials and products, the use of child labour etc is not readily available. While it is possible, to some extent, for purchasers to collect this information themselves (e.g. using the sustainable supply network management techniques), this is time consuming and costly, which partly explains why few companies are attempting to implement ethical procurement.
It is recommended that a database is developed to assist the industry to make informed decisions regarding ethical suppliers.

**Inappropriate risk allocation**

It is widely reported that value for money is maximised by allocating risk optimally. In very general terms, this means allocating each risk to the party best able to manage that risk. In theory, this reduces individual risk premiums and the overall cost of the project, because the party in the best position to manage a particular risk should be able to do so at the lowest price.

It is recommended that methods are developed to encourage all participants that wholesale transfer of all risk to another party does not necessarily lead to the delivery of a successful project. In this regard there needs to be an attitudinal change to the preparation of contract documents. Accordingly for each project, there needs to be a critical examination of risks that may arise, and these risks must be allocated fairly. This could be assisted through workshops for key stakeholders to identify the likely risks and then establish a fair risk matrix before going to market.
PART 1 - Current Procurement Practices

1. Introduction

Governments represent major players in the procurement of buildings and infrastructure. The Commonwealth Government alone represents around 13 per cent of the commercial office market, while the States and Territories and Local Government are estimated to bring that figure closer to 25 per cent. This, together with the continued upgrade of health and education buildings and infrastructure by State and Territory Governments, and the community buildings and urban spaces managed by Local Governments, represents considerable market power and an opportunity to use procurement practices that will drive innovation and sustainability in the commercial building sector.

Acknowledging emerging market drivers such as climate change policies, and infrastructure investment programs, governments may be in a position to take innovative approaches to procurement in the built environment sector. The infrastructure and building industry in Australia faces enormous challenges in the coming decades as it deals with an historic economic downturn, skill shortages, and the pressures of rising energy costs and population growth (KPMG, 2008; Love, 2009). In addition, there is an unprecedented demand for infrastructure, and increasing expectations by the community for facilities to be developed and managed sustainably. This is likely to be compounded by greatly increased costs and complexities arising from demand and financing issues, as well as the implications of policies to stem climate change (KPMG, 2008).

To meet these challenges clients and practitioners of the built environment need to re-think the way they deliver projects. This, however, will be a challenging task as the construction industry has been unable to effectively respond to calls to improve its poor performance and productivity (e.g., NPWC and NBCC, 1990; Gyles, 1991; CIDA, 1994; APCC, 1997; DISR, 1999; Cole, 2002). For example, Blake Waldron Dawson (2006) suggested that there was a need for considerable scope for improvement. Specific problems identified by Blake Waldron Dawson (2006) were inadequate scoping, unrealistic time and cost objectives, poor risk allocation and inappropriate procurement methods. A common denominator contributing to the aforementioned findings by Blake Waldron Dawson (2006) relates to the procurement approach adopted for a given project.

The following section outlining current procurement practices draws upon various international reports and is based on the report prepared by Davis et al (2008) under Program C ‘Deliver and Management of Built Assets’ for the Cooperative Research Centre of Construction Innovation. In addition results from a survey of Australian practitioners, carried out as part of the research for this report, are included to provide an Australian perspective. (In Part 1 the survey results are grouped together before the Summary. In Parts 2 and 3 the survey results are incorporated within the text where appropriate). In conjunction with this review the reader should also refer to the material developed by the New South Wales Department of Commerce (2006) ‘Procurement Method Selection Guidelines’ and Department of Housing and Works ‘Local Government Procurement Guide’ (2006). Subsequent sections of the report identifies issues relating to impediments to innovation and sustainability (Part 2 of the report) and examines alternative approaches to procurement (Part 3 of the report). The information provided has been gleaned from international reports and results from the survey of Australian practitioners.

2. Definitions

*Procurement* in construction can be defined many ways (McDermott, 1999). Moshini and Davidson (1989:p.86) state that procurement in construction is ‘the acquisition of new buildings, or space within buildings, either by directly buying, renting, or leasing from the open market, or by designing and building the facility to meet a specific need’. Lenard and Moshini (1998:p.79) define procurement as ‘a strategy to satisfy the client’s development and/or operational needs with respect to the provision of constructed facilities or a discrete life cycle’. According to Palaneswaran et al. (2003) procurement
refers to the process of acquiring or obtaining material, property or services, and begins with the determination of a need for a property or service and ends with the completion and close-out of a contract. Construction procurement in particular, has been defined by the *Counseil International du Bâtiment* (CIB) Working Commission (W92) ‘as the framework within which construction is brought about, acquired or obtained’.

**Definition of terms**

Hibberd (1991) has argued that no standard definition and classification of procurement approaches have been acceptable as there are no formal structures or agreements on terms. However, the terms *contractual arrangement*, *project delivery system*, and *procurement system* are often used to describe the type of process that is adopted to procure a construction project and are often considered to be synonymous, though definitions vary widely.

For ease of understanding and clarification the following definitions are used in this report.

*Procurement Methodology* – The overall approach to procurement including the procurement strategy and procurement system. 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.

*Procurement Strategy* - A procurement strategy outlines the key means by which the objectives of the project are to be achieved (NSW, 2005). It will include contracting arrangements for design, construction, maintenance or operation activities and subcontract arrangements. (New South Wales Department of Commerce 2006:p.2)

*Procurement System* (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 proliferate within the Australian industry (Love et al., 1998). ‘Novation’, ‘design and manage’ and ‘Alliancing’ are some examples.

**3. Procurement Practice**

There is a consensus that there is one procurement method that is in some sense ‘better’ than all others for an individual project, but that no one procurement method is likely to be better than others for any project (Love et al., 1998). The selection of an appropriate procurement method could also
reduce construction project costs by an average of 5% (Gordon, 1994). While an appropriate procurement system may enhance the probability of project success (Naoum, 1994; Luu et al., 2005), some decision-makers may encounter difficulties in ascertaining the suitability of various procurement approaches because it is virtually impossible for them to capture a diverse continuum of procurement options, client characteristics and needs, project characteristics and external conditions through their own experiences of prior projects (Kumaraswamy, and Dissanayaka, 2001).

A plethora of techniques have been developed to assist decision-makers in reaching an informed decision about what is the most appropriate procurement method for a given project. The decision as to what procurement method to adopt has become a complex and challenging task for decision-makers as the number of methods available within the marketplace has proliferated in recent years (Mortledge et al., 2009). The State Government of New South Wales Department of Commerce (2009), for example, has developed a procurement selection guideline to assist in obtaining best value for money and managing procurement risk. The approach seeks to obtain an effective use of both government and private sector resources, and balance critical factors such as:

- value for money;
- cash flow rate;
- timeliness;
- quality of design; and
- quality of construction.

Similarly, in Western Australia (WA), the Department of Housing and Works, has developed a system for selecting a procurement method as it considers the procurement method an integral factor leading to a successful project outcome. While the use of objective methods for procurement selection is important, and can provide a formalised evaluation process for considering an array of procurement options, the embedded culture of a client organisation may override the procurement selection process, thus rendering it void. For example, Love et al. (2008a) revealed that an inherent culture of ‘uncertainty avoidance’ prevailed within public sector clients as the default ‘traditional lump sum’ method was used in almost all of their projects, even though it may not have been the most appropriate approach to use. Despite the widespread criticism of traditional forms of procurement (e.g., poor time performance and greater propensity for disputes), they tend to predominate in the Australian marketplace and are particularly a favourable method with many State Government clients (Love et al. 2008a).

In States such as New South Wales, Victoria and Queensland however there has been a tendency to shift away from the use of traditional methods and embrace design and construct, management forms, alliancing and hybrids thereof for major infrastructure and building projects. In New South Wales and Victoria, for example, Public Private Partnership (PPP) have been used extensively to procure roads, prisons, and hospital projects because they are considered to provide better value for money, time performance and an innovative outcome for government (Allen Consulting Group, 2007). While the PPP in Australia is beginning to mature in some States, others such as WA and the Commonwealth Government have yet to wholly embrace this procurement approach (Regan, 2007).

### 4. Procurement Selection (policies and procedures)

Mortledge et al. (2006) states that the selection of an appropriate procurement strategy has two components:

1. **Analysis** – assessing and establishing priorities for the project objectives and client attitude to risk.
2. **Choice** – considering possible options, evaluating them and selecting the most appropriate.
The efficient procurement of a construction project through the choice of the most appropriate procurement strategy has long been recognised a major determinant of project success (Bennett and Grice, 1990) and the failure to select an appropriate procurement approach as the primary cause of project dissatisfaction (Masterman, 1996). Newcombe (1992) suggests that the selection of a procurement method is more than simply establishing a contractual relationship as it involves creating a unique set of social relationships whereby forms of power within a coalition of competing or cooperative interest groups are established. Differing goals and objectives and varying degrees of power within a project team are often the underlying conditions for triggering adversarial relations (Love et al., 2004).

In an attempt to overcome the adversarial nature of construction, partnering, whether it is strategic or project-specific in nature has been used as a mechanism for stimulating collaboration between parties so as to attain mutual goals (Li et al., 2000). Yet, in Australia the use of partnering has had a lengthy and somewhat chequered history, principally due a number of parties attempting to exploit the concept in a rather cynical (or adversarial) way (Uher, 1999; Morledge et al., 2006). Noteworthy, partnering is not considered to be a procurement method per se as it is often used as an ‘add on’ to pre-existing construction contract forms with the fundamental transactional nature of the contract remaining the same. In most cases the partnering agreement is separate from the legal contract and the partnering charter that is established is little more than an informal statement of intent to cooperate. While partnering in part fills a gap in current practice (if used as an add-on), it is no more than a form of programmatic Band-Aid (Howell et al., 1996) unless it embedded within part of the procurement strategy.

*If partnering is to be used by clients’ then formal relational based contracts must be used and address issues such cost reimbursement, performance based fees and incentives, and seek the inclusion of key subcontractors in the agreement.*

### 4.1 Nature of Clients

Clients who are experienced are able to select a procurement approach that has worked for them before, or which they know will be suitable taking into account prioritised objectives and their attitude to risk (Mortledge et al., 2006). Inexperienced clients, on the other hand, will need to seek advice from experienced professionals to assist them through the process.

Clients are diverse in terms of their construction related experience and this in turn influences their ability to select an appropriate procurement system (Masterman and Gameson, 1994). Blackmore (1990) suggests that there is no one definition of a client and that it is often difficult to identify who the actual client is when dealing with large corporations.

Newman et al. (1981) identified 18 different client types including; private commercial, industrial, developers, leisure, education, hospitals and public authorities. There are also different client sectors such as public and private. The public sector concerned with a range of construction and employ in-house professionals to assist and monitor projects and therefore such clients are therefore experienced in nature. While experienced, public sector clients are distinct with their need for public accountability and so there has been a tendency to use forms of contract such as traditional lump sum where direct comparison facilitates “accountability” (Turner, 1990).

Higgin and Jessop (1965) state that when the client decides to build, decisions made during the earliest phase will determine the approaches made to members of the industry. Higgin and Jessop (1965) identified two types of client ‘sophisticated’ and ‘naïve’. With regard to naïve clients, Higgin and Jessop (1965) suggested that they would seek some advice but their initial move would be made from a point of ignorance. Nahapiet and Nahapiet (1985) suggested that their level of expertise and
degree of experience would influence the needs of clients. Masterman and Gameson (1994:p.80) proposed the following taxonomy for clients:

- **Primary constructors** are clients such as property developers whose main business and primary income derive from constructing buildings.
- **Secondary constructors** are clients for whom expenditure on constructing buildings is a small percentage of their total turnover.
- **Experienced constructors** are clients who have recent or relevant experience of constructing certain types of building, with established access to construction expertise either in-house or externally.
- **Inexperienced constructors** are clients who have no recent or relevant experience of constructing buildings, with no established access to construction expertise.

When these set of characteristics are considered together, the following alternatives for client types are produced: primary experienced, primary inexperienced, secondary experienced and secondary inexperienced. This classification for clients has been used in a number of studies that have sought to determine an appropriate procurement method (e.g. Love et al., 1998; Luu et al., 2005).

Love et al. (1998) state that client experience continually changes, as every project is unique. Consequently, Love et al. (1998) argue that there are no ‘experienced’ clients in the strictest sense, although clients may acquire a degree of knowledge and understanding of the environment within which a project is being procured.

Sharif and Morledge (1997) have found that most clients are small and occasional. Even when large corporate organisations and governments form the client base most are departmentalised, regionalised or subdivided in such a way they fall into this sector. The level of experience a client possesses will influence the method they use to appoint an advisor to assist in the development of their building requirements and ultimately the procurement method. Sharif and Morledge (1997) suggest that even when advisors are regularly involved with the selection a procurement method for their respective project, many do not learn from the experiences they have acquired.

Most private sector clients are inexperienced and tend to approach an architect when they require advice. As a result, an architect will often recommend the use of a traditional procurement method because they are likely to gain a higher fee for pre and post contract services (Sharif and Morledge, 1997). This ‘procurement catch’ could explain the high usage of traditional lump sum contracts with small and occasional clients. If clients are to use the most appropriate procurement method, then they must be better informed about the variety of systems that are available and there characteristics.

The traditional method is often chosen as a primary procurement route because it may be a reflection of a lack of skill an experience by those making the procurement decision (Franks, 1984; Nahapiet and Nahapiet, 1985; Morledge et al., 2006). DISR and NatBACC (APP, 1998) revealed that the selection of a procurement system among Australia clients was based on familiarity. Clients were aware of problems with particular systems but stated they preferred to stick with the ‘devil they know’ than try something new.

According to Bowen et al. (1997) few construction industry professionals fully understand the differences between various procurement systems and are unable to make a sensible recommendation as to which system would be most appropriate for a specific project. The complexity associated with procurement selection is compounded by the sheer number of methods available. For example, it has been noted by Holt et al. (2000) that 200 different types of procurement method
have been used in the UK construction industry. Similarly, Dulaimi and Dalziel (1994) identified 59 variations of design and build methods alone in existence.

The nature of clients’ impacts significantly on the procurement/delivery system adopted. Client education is critical to successful and innovative delivery of infrastructure projects. Education is one limb of the innovation and sustainable package proposed.

5. Overview of non-traditional procurement systems

5.1 Design and Construct Procurement

Design and Construct procurement (sometimes referred to as ‘Design and Build’) can be described as using a single contractor to act as the sole point of responsibility to a public sector client for the design, management and delivery of a construction project on time, within budget (taking account of whole-life costs) and in accordance with a pre-defined output specification using reasonable skill and care (Achieving Excellence in Construction Procurement Guide).

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 to 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.

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 cost to the clients.

• 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.

**Figure 1: Pre and Post-Novation Contracts**

**5.1.1 Key points to consider with design and construct procurement**

• In theory in design and construct contracts there is usually a single point of responsibility. The client therefore has the advantage of only one firm to deal with – and one firm to blame if things go wrong. In practice, the client’s requirements are detailed to the extent that the contractor’s design contribution, and liability, is diminished.

• The client 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 client 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 client’s requirements can affect the contract sum, and are likely to prove costly.

• It is always advisable to ask for information about which designer the contractor intends using as adequate professional indemnity insurance should always be a requirement.

• The client should be advised to appoint consultants to provide advice on 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 a 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 working closely together. The contractor’s awareness of current market conditions and delivery times can ensure that a contract runs smoothly, economically and expeditiously.

5.1.2 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

5.1.3 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 looses 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.

5.2 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.
5.2.1 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.
5.2.2 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.

5.2.3 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.

5.2.4 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).

5.2.5 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 that 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.
5.3 Collaborative procurement (Relational)

Collaborative forms of procurement require the development of relationships between the various parties. According to Davis, (2004) this is an iterative and evolutionary learning process with three important characteristics being, commitment, trust and cooperation. Relationship development encompasses partner selection, when the purpose of the relationship is defined, boundaries establishment and finally value creation and maintenance.

Relationship contracting is the identification, establishment and maintenance of particular relationships with project stakeholders, commercialised and governed so that the objectives of all parties involved are met. This is done through trust building/ maintenance, whole life project commitment, and generation/ evaluation of mutual goals (Davis 2005)

Davis and Walker (2009) suggest that relationship based procurement leads to mutual benefit in construction business-to-business dealings and provides benefits over traditionally forms of procurement with fragmented supply chains both within projects and across projects.

A relationship-based procurement approach can take many forms. Walker and Hampson (2003) describe some of these as enterprise networks, partnering and alliances with alignment of objectives towards a common business objects as being a common thread. They liken relationship-based procurement to supply chain management (SCM) with “…a strategic network of upstream and downstream organisations that collectively processes activity and information flows to efficiently produce enhanced value products for the ultimate customer (Akintoye, McIntosh et al. 2000; Vrijhoef and Koskela 2000). They suggest that relationship-based arrangement forms virtual organisations; a term that is use to describe consortia that are founded on relationship based procurement (Kornelius and Wamelink 1998; Vrijhoef and Koskela 2000).” They point out that relationship-based procurement requires an approach that differs from traditional systems and requires a managed approach that includes:

- Having longer joint planning and monitoring horizons;
- Corporate philosophies that must be compatible with key relationships - in other words actors share essentially the same strategic vision;
- Risks and rewards are shared over a long term;
- A rationalised supplier base allows increased coordination and reduced transaction costs;
- A propensity for information sharing; and,
- A focus on total costs and a desire to leverage technology.

Public Interest Considerations

The basic assumption underlying the movement towards collaborative working is that it will drive down costs and improve the quality of infrastructure. But the flip side of this assumption is that it could in time create cosy relationships and erect barriers to market entry. In the UK, such concerns have already been raised regarding allegations of cartels and secret anti-competition agreements in the automobile and retail industries, which have been held out as the exemplars of supply chain integration. The adequacy of any protective measures against this risk needs investigation. (Ndekugri and Corbet.2004)
5.3.1 Partnering / Public private partnerships

There are numerous definitions of PPP’s. The following is offered by Duffield (2008): ‘Public-Private Partnerships’ (PPPs) are defined as a contracting arrangement in which a private party, normally a consortium structured around a Special Purpose Vehicle (SPV), that takes responsibility for financing and long term maintenance or operation of a facility to provide long term service outcomes. This may involve the private entity taking responsibility for the design and construction of a component of new infrastructure; and/or taking over a long-term lease or concession over existing assets; and/or the development of a new long term contract to operate and manage the infrastructure. Typical forms of procurement include: Design, Build, Finance and Operate/Maintain (DBFO/M), Build-Own-Operate and Transfer (BOOT) or Build-Own-Operate (BOO). A key component of such arrangements are that there is a requirement to pay only for defined assets or services when they are delivered.

PPP’s in Australia

In Australia Public Private Partnerships (PPPs) are more commonly used for large civil engineering projects such as motorways or tunnels. It is argued (Love et al, 2007) that because PPPs are more focused on financial arrangements rather than on procurement delivery they should not be considered as a procurement system or sub-system. However others have defined PPP’s as a contracting arrangement that often involves the private entity taking responsibility for the design and construction of a component or project and accordingly, the term “PPP” does not denote innovative finance as such, but instead, innovative procurement of major capital projects in which private capital is invested.

Structured in multiple forms, PPPs vary generally according to the scope of responsibility and degree of risk assumed by the private partner with respect to the project. In each case, the private partner assumes financial risk in some form - for example, through an equity investment, liability for indebtedness, a fixed priced contract or a combination thereof. It is important to note that not all innovative contracts referred to as PPPs adopt the principles of PPP project delivery. (Report to US Congress, 2007).

According to Chan et al, (2009), in Australia, public-private partnerships (PPP’s) in connection with building and infrastructure procurement, “…..are increasing and now constitute around 5 per cent of investment in public infrastructure, more in New South Wales and Victoria which have been the main users of this financing vehicle. This growth is due in a large part to the scope to bring in private sector management skills, the opportunity that bundling design, construction and operation, or parts thereof, provide to improve efficiency and the ability to bring forward the provision of the infrastructure service. There can also be less scrutiny from off-budget financing.

The potential to lower total costs through alignment of incentives to manage project risks with capacity to do so is considerable. Contract design and management are important to ensure that only risks that can be better managed by the private sector partner are allocated to them. It is also important to ensure that public underwriting of user charges and committed payments for services do not undermine these incentives. Trying to extract the last ounce of rent can also create contingent liabilities for government if it increases the probability of failure.

There is evidence that private sector partners are more realistic in their estimates of construction time and costs than public agencies. Private partners have an incentive to develop a realistic financial model that takes into account all costs and revenue flows. The quality of this information is likely to be superior to that of public sector agency where the proponent has less experience in the area.

While PPPs may assist in improving productive efficiency they are no guarantee that the investments are optimal, and the off-budget treatment of future funding obligations related to some PPPs might reduce the scrutiny applied to the investment.
Public-private partnerships work best where government has considerable skill in contract negotiation and management, and where there is adequate competition for the projects. The costs of tendering, negotiating and managing contracts can be considerable – with tendering costs alone estimated at up to 3 per cent of the project cost. And while risks may be transferred to private partners, the cost of risk will be factored into the cost of finance. The main advantage of PPPs comes from the scope for lowering the total cost of the project through improving project risk management. And while contract negotiation can be lengthy, PPPs provide a more flexible, and potentially more timely source of finance for important infrastructure investments that might otherwise be constrained by public debt pressures.”

Chan et al (2009) also note that PPPs offer considerable potential to reduce project risk, but are costly to transact. If such transactions are off-budget, this may inhibit the scrutiny needed to ensure efficient investment.

Variety of partnership models

There is a variety of partnership models available depending on the particular circumstances. The Victorian Government (2008) point out that the combined response to the three core questions — core services, value for money and public interest — determines the underlying model for the project.

In a hierarchy from maximum to minimum retention of service delivery by government, the various models may be expressed broadly as follows:

(i) public sector delivery of services (considered to be core services) with private parties providing infrastructure-related services only;

(ii) public sector delivery of services (considered to be core services) with private parties providing infrastructure-related services and related ancillary services (for example, a prison accommodation services project);

(iii) public sector delivery of services (considered to be core services) with private parties providing infrastructure and related ancillary services, together with some services to the community (for example, a sporting facility linked with a government educational facility);

and

(iv) private sector delivery of a full range of services to the community including infrastructure (for example, particular road and rail projects).

Related ancillary services, in the above contexts, may cover a number of operational services including information technology services, accommodation services resulting from the infrastructure, building-related services such as maintenance and some support services. In some cases, such as certain transport projects, the privately provided services may extend to the delivery of services to end-users.

Points to consider about PPP’s

On 17 December 2008, the University of Melbourne released a National Benchmarking Study (Duffield (2008) commissioned by the National PPP Forum. It covered 67 traditional and PPP projects, making it the largest number of projects ever to be included in a benchmarking study.

Its major conclusions are:

- PPPs overall performed 28.2% better on cost than traditional projects, providing 31.5% better cost certainty (actual cost vs. estimated cost).

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• Similarly, 16.7% more PPP projects were completed within the original expected cost estimate than was the case for traditional projects.

• PPP contracts had an average 4.3% cost increase post contract execution, compared to 18.0% for traditional projects.

• There is very little time performance difference between PPPs and traditional projects:
  • PPPs tended to suffer more delays (average 14.8%) prior to project execution, but only 2.6% further delay once financial close was reached.

The Study concluded that PPP contracts were well developed prior to release to market.

  • In comparison, traditional projects were overly optimistic in timing, with an average delay of 25.9% during construction.
  • PPPs are improving on their time performance faster than traditional projects.

Results from the above Study demonstrate that PPPs are a more cost effective means for governments to procure major projects. As the private sector matures further and delivers better time performance, PPPs will cement their position as being the most efficient means of infrastructure development. (Blake Dawson. 2009).

The relative time and cost performance for PPP projects and traditionally procured projects are indicatively represented in the summary diagrams Figures S1 and S2 below (From Duffield, 2008)

Figure 3: Cost performance over project initiation and delivery (Duffield 2008)
Larocca (2004) suggests that governments are turning to PPP's for the following reasons:

Traditional procurement for projects is:

- Focused on procurement of assets not services
- Spend depends on budget available
- Assuming risks that be better handled by private sector

Whereas -

Properly structured, PPPs can:

- Incentivise whole-life cost approach
- Result in optimal risk allocation
- Incentivise early completion
- Offer certainty of budget
- Realisation of Government equity

In describing Australian PPP recent trends Larocca (2004) points out that:

- There is movement away from investment bank-led models.
- An introduction of property elements.
- A reduction in bidding consortia.
- A standardisation of approach.
- Development of an equity market, albeit slowly.
- Competition for funding – bank and capital markets.
- Development of discrete asset classes – toll roads, social infrastructure

Note - The Government of the State of Victoria (2008) has produced a booklet providing a very informative, comprehensive explanation of Partnering arrangements in that state.

**Figure 5 – Impact of credit crisis on PPPs From (Blake Waldron Dawson 2009)**

**CHALLENGES FOR PPPS**

The crisis in financial markets, which has intensified in recent months, raises several challenges for public private partnerships, namely:

- Funding availability is limited, due to the contraction of the debt capital markets, the withdrawal of the monoline insurers, and reduced liquidity for lenders.
- Where private finance is available for infrastructure projects, it is at a higher cost.
- Reduced competition in several aspects of PPPs, particularly in respect of financing, is likely to impact both the procurement process and project outcomes.
- In the current financial environment, some of the more robust lending practices, which have underpinned the growth in the PPP market in recent years in Australia, will no longer occur. Underwriting periods and tenors are shorter, market disruption and market flex are standard and risk appetite has reduced.
- Generally, financial structuring is likely to be more conservative, with reduced leverage and less reliance on “bullet” repayment structures, which also has cost implications.
- There is more emphasis on the credit quality (and exposures) of all parties involved in PPPs.

**In Brief**

Given that governments are under pressure to deliver backlogs of infrastructure, as well as increasing budgetary constraints, PPP structures may need to be adapted to attract private finance to allow projects to be implemented in the near future.
5.3.2 Alliances

Project alliances are a particular kind of relationship procurement system that rely on virtual organisations generating new knowledge enabling teams to solve interrelated problems in a complex environment. (Davis and Walker. In press 2009)

According to Love et al (2009), the concept of alliancing is now considered a way of procuring projects and has been used successfully by the private and public sector (Hampson et al., 2001). Davis (2005) catalogued thirty-four Australian relationship style projects with an average value of $150 million. Specific noteworthy examples are the National Museum of Australia project with a total budget of A$155.4 million (Walker and Hampson 2003), the WA21 Alliance project in Western Australia with a total budget of A$150 million (Whiteley 2004; Whiteley 2004) and Sydney’s Northside Storage Tunnel project having a total budget exceeding A$460 million. Recognising the merits and limitations of alliancing and the potential of such a procurement strategy for effectively delivering certain project types, the Victorian Government states that “alliance based methods should only be considered in the delivery of complex and high-risk projects, where risks are unpredictable and best managed collectively” (Victorian State Government, 2006).

Definition of Alliance

A typical definition of an alliance follows:

“An alliance is an agreement between two or more entities, which undertake to work cooperatively, on the basis of a sharing of project risk and reward, for achieving agreed outcomes based on principles of good faith and trust and an open-book approach towards costs.” (Cullen et al. 2005)

- Alliancing is the identification, establishment and maintenance of particular relationships with project stakeholders, commercialised and governed so that the objectives of all parties involved are met. This is done through trust building/maintenance, whole life project commitment, and generation/evaluation of mutual goals (Davis 2005)

The common features of an alliance are:

a. Risk is shared between customer and supplier,

b. The alliance contract typically contains a ‘no-disputes clause’ with no liability between participants (except for wilful default),

c. The customer and supplier share common goals for project success,

d. All transactions are of an ‘open book format’, (Cullen et al. 2005) and

e. All participants win, or all participants lose, depending on the outcomes actually achieved (incentivised cost reimbursement).

Furneaux et al (2009) point out that a key distinction between alliancing and traditional approaches, is that all the members of the construction team are involved in the planning of the project. The involvement of constructors in the design phase of the project, can provide important early advice on the ‘buildability’ of a given design, and thus reduce changes to plans and contracts, and therefore costs and time overruns. Additionally, the establishment of the alliance may be through open tender, the pre-qualified supplier arrangements, or through bids by invitation – which together involve a less competitive approach than compulsory competitive tendering.
In summary, these two approaches sit at opposite ends of the institutional engagement of agents in procurement systems. Table 1 summarises these contrasts:

Table 1 - Comparison of traditional and alliance forms of contracts (Furneaux et al 2009)

<table>
<thead>
<tr>
<th>Procurement system</th>
<th>Traditional</th>
<th>Alliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of competition initially</td>
<td>Typically high</td>
<td>Low to Medium (depends)</td>
</tr>
<tr>
<td>Level of collaboration once the</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>contracts are awarded</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview of Alliancing:

The rise in popularity of alliancing has resulted in a number of major clients producing guidelines to assist the various stakeholders. The following is extracted from the Queensland Government’s ‘Relationship Procurement Options – Alliance and Early Contractor Involvement Contracts’ (2008):

Alliances are collaborative arrangements where parties jointly work together to deliver the outcomes of a project. They are characterised by risk sharing and a no-disputes/no-blame regime. This suggests that since alliances are typically used for high risk projects with high levels of uncertainty, (For example the Acton Peninsula National Museum Alliance,) alliances are rarely used for building construction – instances have been documented; for example the XX (convention centre) project in South Australia.

Alliance classification

There are no fixed formats of an alliance contract. Nevertheless there are ‘classes’ of alliances to cater for the unique needs of projects and the specific risk management strategies of government. There are two methods by which alliance tenderers are selected. The first and most common method is the single TOC (Target Outturn Cost) alliance. The second method is the two TOC alliance, also referred to as the Multiple TOC alliance or Competitive TOC alliance. where typically, cost overruns and underruns are shared on a 50/50 basis between alliance participants. (Victorian Government, ‘Project Alliancing Guide’ 2006; Stephenson 2000).

These selection methods only describe how alliance tenderers are selected and does not provide any description on how the alliance operates after contract signature. Post contract signature, alliances may be classed as either pure or hybrid.

Target Outturn Cost (TOC)

The TOC is a jointly determined estimate by all alliance participants of the total capital expenditure required to deliver the agreed scope of works. A TOC includes the direct project cost estimates of each NOP for their respective portions of work within an alliance, as well as the direct project costs estimated to be incurred by an alliance’s client/owner in participating as part of an alliance’s project team. A TOC also includes the estimated ‘limb-2’ corporate overhead and profit fees payable to NOPs. During the delivery of an alliance, NOPs are reimbursed their actual, direct project costs according to those expended to date. When combined with NOPs’ ‘limb-2’ corporate overhead and profit fees, this allows for the Actual Outturn Cost (AOC) of an alliance to be calculated (Department of Treasury and Finance and Ross 2006). Comparing the actual cost incurred in delivering a project alliance (AOC) to the initial targeted cost (TOC), allows for the project’s cost underrun/overrun to be determined.”

Pure alliances

Pure alliances are the most common form of alliance contract. The pure alliance adopts unanimous decision making processes (with no deadlock breaking mechanisms), retains no process for distribution of liability between alliance partners (except for wilful default), and requires all project risks to be shared. All pure alliances involve a single TOC selection process.

Pure alliances promote greater collaboration than other alliance models. This is because pure alliances align the goals of all participants during the alliance itself.
While the pure alliance is the most common form of alliance used in Queensland, alliance owners have pursued deviations from the pure alliance to cater for some of its shortcomings. Common variations include retention of liability, the use of deadlock breaking mechanisms and allocating risks rather than sharing risks. The adoption of one or several of the above principles results in the use of hybrid alliances.

**Hybrid alliances**

While there is no settled terminology for alliances that deviate from pure alliance principles, common titles include, ‘impure’ or ‘hybrid’ alliances (Stephenson, 2000). These hybrid alliances typically deviate from pure alliance principles by:

a. adopting deadlock breaking mechanisms using binding arbitration, swingman (final offer arbitration) clauses or other non-consensual methods;

b. capping the total project costs for government, that is, adjusting alliance ‘painshare’ arrangements to limit the alliance owners liability to a fixed amount;

c. allocating specific project risks to one party rather than sharing all project risks;

d. creation of an ‘alliance contractor’ responsible for delivering project outcomes (with little or no input from the alliance owner); (Cowan and Davis. 2005) and

e. excluding negligence from the alliance no-disputes clause or the cost of rework due to errors by non-owner participants.

A hybrid alliance with any of the features listed above may adopt tender selection along single TOC or two TOC models.

**Single TOC alliances**

Most alliances involve the selection of tenderers via a single TOC process. In single TOC alliances, tender selection is primarily based on non-price criteria (Ross, 2003 pp19-20). Nevertheless, price competition is used for the selection of suppliers and sub-contractors in the TOC development. The cost of preparing an agreed TOC is borne by the alliance owner.

Single TOC alliances facilitate faster tender selections and encourage maximum industry participation in requests for tender when compared to two TOC alliances that have two parties competing in TOC development. Single TOC alliances also are more likely to align alliance owner and non-owner goals after contract signature since the target cost is developed collaboratively.

**Two TOC alliances**

A desire to place greater emphasis on price competition in alliance tender selections has created a class of alliance dubbed the ‘Two TOC (Target Outturn Cost) Alliance’ sometimes referred to as a competitive alliance or multiple TOC. (Vic Govt. 2006; Cowan et al. 2005). Whereas the single TOC alliance requires selection of alliance partners based primarily on non-price selection criteria and high level value for money criteria, the two TOC alliance introduces direct price competition into the selection process.

Typically, the alliance owner funds the design activities of short-listed tenderers to develop concept designs for the project. This enables tenderers to submit bids for the project target cost and schedule. As the alliance owner funds the design activities in a two TOC alliance, all foreground intellectual property associated with the design is transferred to the alliance owner, including designs from losing tenderers.
The reliance on direct price competition eliminates several of the value for money concerns of single TOC alliances albeit at the expense of reduced collaboration. The two TOC alliance also introduces large sunk costs to the alliance owner, as the design effort of the losing tenderer requires reimbursement from client. The two TOC alliance also requires a much higher owner resource in developing TOCs than the single TOC alliance.

Program alliances

Though not a form of alliance itself, a program alliance is an option available to procurement agencies. A program alliance involves sub-dividing an agency’s forward program of work into discrete parts. Each of which is treated as a separate project. In a program alliance, a single tenderer is selected to deliver every project within the whole program. The selection process for the alliance program participants uses similar non-price selection criteria to the pure alliance.

For the first project in the alliance program, the alliance develops target costs in the same manner as they would in a single TOC alliance. After completion of this first project in the alliance program, the second project uses the actual outturn cost of the first project as the target costs for the second stage and so on for further projects. This effectively bootstraps or validates the alliance target costs and key performance indices between projects. In this arrangement, after the first alliance project is complete, the alliance owner is provided with better demonstration of value for money than they would have in a single TOC alliance. That is, subsequent alliance projects in the program provide greater certainty that the target cost is set fairly. There have been 48 alliances initiated in Queensland with a total value exceeding $5billion. The majority of these alliances have been pure alliances.

Alliance compensation models

The mechanism by which alliance remuneration operates is a key feature of alliancing. Most alliances adopt a three limb reimbursement model. (Vic. Govt. 2006) Limb one comprises project direct costs and project specific overheads. Alliance non-owners are guaranteed reimbursement of limb one independent of alliance performance. Limb two costs comprise normal profit and corporate overheads. Limb three comprises an agreed share of pain or gain contingent upon alliance performance against cost and non-cost pre-agreed targets. Both the limb two and limb three components are at risk.

Chevis et al (2009) point out that “The primary purpose of an alliance compensation model is to provide a fair and equitable performance-related payment mechanism to alliance partners, such that it aligns project delivery objectives and behaviours of non-owner alliance partners (NOPs) with that of objectives set by an alliance’s client/owner (Department of Treasury and Finance and Ross, 2006). The compensation model provides the sole commercial mechanism by which an alliance’s client/owner pays NOPs for their effort, work and services performed in delivering a project. A compensation model typically comprises of ‘3-Limbs’:

- ‘Limb-1’ – Reimbursement of NOPs’ Direct Project Costs: All NOPs are reimbursed 100% of costs and expenses that they incur directly in an alliance, including any project-specific overheads and preliminaries. Such ‘limb-1’ reimbursements to NOPs are typically in relation to a NOP’s direct project costs associated with labour, construction plant and equipment, materials, engaged sub-contractors, specific risk contingencies, mobilization and de-mobilisation expenses, etc. Generally, any costs or expenses deemed to be incurred directly by NOPs, and/or as mutually agreed amongst all alliance participants during initial commercial negotiations and subsequently drafted within any formal documentation, such as an Alliance Agreement, can be reimbursed to NOPs as ‘limb-1’ payments.
• ‘Limb-2’ – NOPs’ Corporate Overhead and Profit Fees: A fee is paid to each individual NOP by an alliance’s client/owner participant as a contribution towards the recovery of a NOP’s non-project specific overheads, i.e. corporate overheads. In addition, a NOP’s “limb-2” fee also comprises a fair and equitable profit margin for a NOP’s project input, given a “neutral performance” outcome for an alliance. The monetary amount of a “limb-2” payment is calculated by applying a ‘limb-2’ fee percentage agreed upon by a client/owner, to a NOP’s direct project costs. The direct project costs can either be those estimated at the beginning of a project alliance for a NOP, or based on actual direct project costs that a NOP incurs during an alliance.

• ‘Limb-3’ – Risk/Reward Performance Incentive Payment: NOPs receive a performance-related bonus payment or penalty based on actual performance outcomes achieved, compared to pre-agreed performance targets in a project alliance’s key result areas (KRAs). Often termed risk/reward, “pain/gain” or “pain share/gain share”, these risk/reward payments are shared equitably amongst NOPs through pre-determined sharing percentages, and provide NOPs with a performance-based incentive payment, whether it is a bonus (reward) or a penalty (risk).

Under a ‘3-limbed’ compensation model NOPs are typically entitled full reimbursement of their direct project costs, regardless of an alliance’s performance outcome(s). Risk, in the ‘limb-3’ performance-based risk/reward payment, is normally capped for NOPs at the maximum loss of their entire ‘limb-2’ payments.

5.3.3 A word of caution regarding collaborative procurement arrangements

While the general consensus is that collaborative procurement and risk risk/reward arrangements are advantageous there are some who question the financial effectiveness of such arrangements. For example Kennedy and Wilson (2004) point out that while “…the potential for substantial cost savings has always been the headline benefit and these savings have been confidently predicted by numerous authorities over the years the reality is often quite different. They point out that in the UK, even the most versed partnering practitioners are struggling to realise hard savings amounting to as much as a fraction of the 30% or so that has been estimated as being realisable by many industry experts. For example, one pre-eminent UK main contractor, recognised for its progress in this area, is proud to be working towards bottom-line savings from partnering amounting to just 2.5% of overall contract value (nonetheless, a laudable objective with average main contractor net margins currently hovering around the 2-3% mark). Moreover, while the pursuit of more integrated working is undoubtedly providing some supply chain parties with worthwhile benefits there is little hard evidence to suggest that real collaborative working is being widely adopted across the industry. Much of what is passed off as ‘partnering’ is little more than a sham and what penetration does exist is almost totally concentrated at the ‘client-end’ of the supply chain. On the other hand, examples of real ‘top-to-bottom’ integration are conspicuous only by their absence.”

5.3.4 Essential differences between partnering and alliancing

In alliances there is a joint rather than shared agreement to the acceptance of risk in partnering. The non-owner participants declare and agree with the client all their costs above direct costs (typically head office overhead and profit) beforehand and then place these at risk. Because risk is then jointly assumed, should any one party fail to perform, all parties are at risk of losing their rewards and, importantly, even jointly distribute losses according to the agreed painshare / gainshare model.

The joint assumption of all risk in alliances is the key factor that ensures that the commercial terms of the arrangement are aligned with project objectives. This cannot be achieved in a partnering agreement where it is possible for a party to ‘lose’ at the same time that another ‘wins’. The ‘win-win’ or ‘lose-lose’ outcome enjoyed by all alliance parties is the fundamental characteristic of alliance and drives the behavior of all parties. (Adapted from MacDonald. 2004)
5.3.5 Private Financing Initiative (PFI)

It can be argued that PFI’s are purely a financial strategy and are not a procurement system or sub-system. However, because the intrinsic link between PPP’s and PFI’s it is appropriate that the process and system of PFI is described in this report.

The PFI process involves competing private sector consortia, often joint ventures created for the purpose, comprising: construction contractors, facilities management contractors, architects and design teams as well as construction, legal and financial advisors. They submit bids to design, build, finance and manage public buildings, usually on a 25-year contract in return for an annualised or ‘unitary’ charge (a DBFO contract). They invest typically around 10 per cent of the project value as equity and secure backing from funders for the remainder. (CABE, 2005)

PFI is often an intrinsic part of PPP’s and many PPP projects can be seen as ‘serial PFI’: after the selection of the private sector partner (PSP) by a method based on the PFI selection process, a long term contract is signed between the public sector client body and the PSP for delivery of as-yet unidentified projects. This creates a chance for fuller collaboration between the private and public sectors, unfettered by the constraints of the competitive process. In their post-contract stages, PPPs avoid some of the problems with straight PFI projects. (CABE 2005)

The increased complexity of the PFI process brings together a range of issues that are generally separated in more traditional forms of procurement. Furthermore, these issues all have to be addressed within a very short bidding period.

Definition of PFI

“Where the public sector contracts to purchase quality services, with defined outputs from the private sector on long-term basis, and including maintaining or constructing the necessary infrastructure so as to take advantage of private sector management skills incentivised by having private finance at risk.” (Achieving Excellence in Construction Procurement Guide)

The advantages of PFI to government

The advantages of PFI to government are that:

- it transfers risk from the public to private sector preventing cost over-runs from being passed on to clients
- it guarantees maintenance over the building’s lifetime
- it offers increased speed of construction and increased likelihood that projects will be completed on time
- it encourages building construction that is easy and efficient to maintain and manage, built using materials and techniques that will stand the test of time because the responsibility for the long-term maintenance of the facility rests with the contracting consortium.
- it promotes the consideration of whole-life. (CABE 2005)

In practice however such a virtuous feedback loop to inform the design and specification is far from the norm in PFI projects. This is partly the result of the PFI process itself and partly because of the limited capacity shown by the facilities management industry to participate fully in the design phases of projects.
Limitations and drawbacks of PFI (CABE, 2005)

- Many public sector clients are inexperienced and have never procured a building before. As a result they are unprepared for the complexities of PFI and often lack both an understanding of the need for high-quality design and the skills necessary to ensure quality is delivered.
- The nature of the PFI process and the make-up of the consortia means that contractors dominate in discussions with the client. As a result, and in particular because of the limitation of time, bidding consortia’s design teams have only limited opportunities to work closely with the client during the bidding process and to explore different solutions to the clients’ service requirements. This happens despite the rhetoric of consultation that appears in bid documentation.
- Clients frequently set unrealistic budgets, based on historic data fixed in the outline business case, which is often overoptimistic.
- Despite revised guidance, clients can fail to invest properly in feasibility and option studies, while value for money considerations remain desk-top exercises that take little account of site constraints, surveys, planning constraints and other qualitative issues.
- There is little or no incentive for the private sector to innovate or take risks on issues regarding service delivery (the cost of which continues to be carried exclusively by the public sector). As a result, quality of life issues and service efficiency do not form part of the discussion, though this is where public sector outcomes are most likely to be improved. The result is at best ‘value for budget’ rather than real value for money for the public purse.
- The PFI process fails to take account of how service delivery, and therefore the way in which buildings are used, will change over the course of a PFI contract and beyond. This often results in inflexible and unsustainable buildings that may become redundant long before the contract expires.
- Design is still often under-weighted in the evaluation process that determines what constitutes best value. Only when a market settles in a relatively narrow band in terms of financial and competency issues, can the design emerge as a differentiator. So far, high-quality designs promising better whole life value have only rarely outweighed cost differentials.
- The stop-start nature of the PFI process requires architectural practices to assemble large teams to prepare bids; these teams then need to be re-assembled at each stage during the bidding process and again at the start of the construction phase. This makes it difficult to have continuity of designers throughout the project.
- The complex nature of PFI means that the initial stages of the process are extremely protracted. During these stages all private sector bidders are working at risk, creating barriers to entry to market and reducing the pool of talent from which the public sector could benefit.
- Once contract signature has been reached design teams are under pressure to produce detailed designs for an early start on construction, thereby minimising financing costs for the consortia prior to occupation. Combined with the pressure of ‘value engineering’ after financial close has been reached, this regularly compromises overall quality.

Points to consider regarding PFI

In a report on the outcomes of an international study Chan et al (2009) report that “...general government investment in infrastructure (information is not available to assess whether this is true for public investment more generally) has fallen in recent years for most of the countries studied, including Australia. Nevertheless, overall investment in infrastructure has remained fairly steady in recent years, although volatile in some countries.

Total Australian investment in infrastructure has rebounded in recent years to just below 6 per cent of GDP in 2006-07. Sub-national governments undertook 76 per cent of public infrastructure investment, with government trading enterprises accounting for around half of this.
With the global financial crisis, governments are looking to infrastructure investment as a way of stimulating the economy. But financing options have also been constrained by the crisis.

Financing decisions are separate from the investment decision and can be made independently. Financing differs from public funding: the latter being the commitment of public revenue to meet any gap between the costs of infrastructure provision and the revenue from user charges. Funding decisions carry an opportunity cost and deadweight loss of raising taxes.

Budget appropriations, financed on a pay-as-you-go basis or from public debt, remain the major form of financing for government investment in infrastructure (63 per cent in 2006-07). Specific-purpose bonds, where repayment is linked to the performance of the asset, are a major source of finance in the United States and Canada, but were phased out in the 1980s in Australia.

Public-private partnerships (PPP), where the government contracts a private partner to variously finance, design, build and operate infrastructure assets for a fixed period, are growing in use. Used extensively in the United Kingdom, in Australia they made up 6 per cent of public investment in 2006-07 — higher in New South Wales and Victoria.

Some approaches used to finance public infrastructure can improve efficiency and lower the life-time project cost through:

- Better management of project risk by aligning incentives for risk management with the capacity to manage the risk
- Improvements in information, contract negotiation and management and other transaction activities that pay-off in better risk management and cost savings

Bringing greater market or other scrutiny to bear on the investment, and imposing the costs on potential beneficiaries to better reveal their willingness to pay.

The most efficient financing vehicle will depend on the nature of the investment, the degree of asymmetry of information, the potential for competition, and the skills of the government as negotiators and contract managers.

The potential for governments to shift risk onto private partners may be limited, and any non-diversifiable risk assumed by the private sector will be reflected in their required rates of return.”

Recent patterns in public infrastructure investment and methods of financing (From Chan, at al. 2009)

The use of particular financing vehicles by governments varies considerably across the countries studied. While history may explain much of this variation, other reasons are differences in:

- infrastructure characteristics — affecting the user profiles and revenue-raising capacities of particular assets
- fiscal and macroeconomic conditions — potentially restricting use of particular financing vehicles because of their budgetary consequences
- institutional arrangements — defining the legal and regulatory framework as well as the intergovernmental relationship within which public infrastructure assets are operated and financed
- perceptions of the role of government — and voters’ expectations for the involvement of government in delivering specific services and managing the economy.
Trends in use of financing vehicles (From Chan, at al. 2009)

Australian and overseas governments alike have increasingly been drawing on capital markets to finance public infrastructure. This partly reflects the impact of financial innovation on financing efficiency, as well as changes in the attitudes of government to debt and ownership of infrastructure assets. In Australia, the corporatisation of government trading enterprises (GTEs) during the 1980s and 1990s included utility and transport services that traditionally owned major infrastructure assets. While GTEs can finance investment from retained revenue, or budget appropriations (equity injections) or debt, there has been a trend toward greater use of the later. For some GTEs, this appears in part to be due to rebalancing the capital structure to raise the debt to equity ratio. The 1980s and 1990s also saw a trend toward privatisation in some infrastructure industries, reflected in the higher private sector share of investment. The trend continues with a greater reliance on PPPs in some Australian states, notably New South Wales and Victoria. Nevertheless, within those states, PPPs account for a small percentage of public investment in infrastructure (10 and 9 per cent respectively in 2005-06). Moreover, their share fluctuates from year to year.

The global financial crisis has seen a sharp reduction in the availability of credit, and increased caution about innovative financial products utilised in some PPP financing arrangements.

Trends in public infrastructure investment (From Chan, at al. 2009)

Comparisons of public infrastructure investment across countries are difficult, principally due to potential inconsistencies in defining what constitutes infrastructure investment. In addition, public investment is not consistently broken down into infrastructure assets and other fixed capital formation. While caution must be exercised therefore, in drawing any conclusions, some general trends are apparent:

- For most of the countries, the level of total (public and private) investment in social and economic infrastructure industries on average remained fairly constant in real terms over the past three decades, although some experienced slight declines. In 2006 investment was marginally below 4 per cent of GDP for most countries. In Australia, where investment had traditionally been relatively high, it experienced a downward trend. This was reversed after 2000, and in 2006 was just below 6 per cent of GDP.
- General government investment (which excludes public corporations) as a proportion of GDP has fallen in most countries over the past four decades. In Australia it stood at 2.4 per cent of GDP in 2005-06. This could reflect the pattern of corporatisation of GTEs as well as privatisation over the period.
- In Australia, national government investment has fluctuated between 1 and 2 per cent of GDP over the past four decades. In the 1980s and 1990s the decline in government investment appears to be largely due to declines in sub-national levels of investment, whereas in the 2000s growth in sub-national public investment has more than offset declines in national level public investment.
- In Australia, sub-national governments (and their public corporations) are responsible for the majority of investment, currently making up three-quarters of the total of public investment of 4.1 per cent of GDP. This split is similar to the United States.

6. Procurement systems and project performance

A considerable amount of research has examined the performance of various procurement systems using the key criteria (e.g. NEDO, 1983; NEDO, 1985; Bresnen et al., 1988; Watkinson, 1992) and it has been revealed that there is no significant difference in cost performance of various procurement methods (Walker, 1994; Love, 2002). Bresnen et al. (1988) and Love et al. (2005) have revealed that non-traditional methods tend to lead to improved time performance because of the overlap of design
and construction activities. Noaum and Coles (1991) found that management contracting methods performed better than traditional methods in terms of time and were more suited for use in complex projects.

Time and cost have been traditionally used as the criteria to examine project performance in Australia because cost has been considered to be a good predictor of time performance (e.g., Bromilow, 1969; Bromilow et al., 1980; Ireland, 1983; Bromilow et al. 1988; Yeong, 1994; Ng et al. 2001; Skitmore and Ng, 2001). Contrary to this, Love et al. (2005) have revealed that cost is a poor predictor of time performance and suggest that gross floor area (GFA) and the number of floors are more suitable predictors.

While researchers have demonstrated that there is no significant difference between procurement methods and time and cost performance, in practice it is believed that there are differences. Many of these differences stem from social, organisational, cultural, legal, and economic issues that cannot be simply measured and translated in constructs that can be mapped against project performance. Currently therefore there appears to be no definitive answer.

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 4.2 below 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 7: Risk apportionment between client and contractor (Davis et al 2008)**

<table>
<thead>
<tr>
<th>Speculative Risk</th>
<th>Contract Type</th>
<th>Risk</th>
<th>Employer</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN &amp; BUILD</td>
<td>Complete ‘Package’ by supplier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGN &amp; BUILD</td>
<td>Design input by Employer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRADITIONAL - LUMP SUM</td>
<td>Fixed Price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRADITIONAL - LUMP SUM</td>
<td>Fluctuations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRADITIONAL - MEASUREMENT</td>
<td>Bill of Approximate Quantities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRADITIONAL - MEASUREMENT</td>
<td>Fixed Fee Prime Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRADITIONAL - MEASUREMENT</td>
<td>Percentage Fee Prime Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANAGEMENT CONTRACT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 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 higher level of risk can be placed on the contractor for design integration.

6.1 Procurement System Comparison

Appendix C provides a comparison of the generic forms of procurement systems commonly used in Australia. An overview of the of the various procurement types and their characteristics can be found in the NSW Department of Housing and Works 'Local Government Works Procurement Guide' (2006) and the 'Contracts used for Construction Projects' (2006).

Turner (1990:p.60) provides the following advice:

*Traditional* should be used when:
- a programme allows sufficient time;
- consultant design is warranted;
- a client wishes to appoint designers and constructors separately;
- price certainty is wanted before the start of construction;
- product quality is wanted; and
- a balance of risk is to be placed between the client and constructor.

*Design and construct* should be used when:
- a building is functional rather than prestigious;
- a building is simple rather than complex, is not highly serviced and does not require technical innovation;
- a brief for scope design is unlikely to change;
- a firm price is needed in advance of construction;
- a programme can be accelerated by overlapping design and construction; and
- a single organisation is required to take responsibility and risk for design and construction.

*Management* should be used when:
- an early start to construction and early programme of completion, requiring design and construction to proceed in parallel, is wanted;
- flexibility in design is wanted to allow for changes to be made as the process of design and construction are carried out;
- a project by its nature is organisationally complex, probably with a need to manage a multiplicity of client, consultant and contractor organisations;
- a project is technologically complex resulting from often differing requirements for future users;
- a client and his advisers have insufficient management resources; and
- maximum price competition for the works element is wanted.

Methods such as Public Private Partnerships (PPP) and Private Finance Initiative (PFI) have been excluded from the above despite their increasing use. This is because they are invariably driven by a political agenda and require the private sector to operate and maintain the facility. For example, a decision to adopt such a method could be because of a fiscal crisis and as a result other sources of funding are needed to support the procurement of social infrastructure.
Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning current procurement practices. Results relating to this section are given below.

**Exhibit 1 - SURVEY RESULTS**

**Other Procurement Categories Identified By Interviewees**

- Maximum Guaranteed Price
- Commission or % basis
- Share of Savings
- ECI (Early Contractor Involvement) “Similar to an Alliance but you end up with a fixed price”

**Exhibit 2 - SURVEY RESULTS**

**Variations on Procurement Categories Identified By Interviewees**

A number of respondents highlighted that there is, in fact, a substantial amount of crossover between the procurement categories. For example,

“*The project might be a Public Private Partnership but our contract would be in D&C form*”.

“*Consultants are novated to us in every D&C project*”.

“*Do and charge [schedule of rates] is often incorporated into D&C’s*”.

“*Lots of D&C work has components which are novated, especially the use of consultants*”.

“*It might start as open lump sum tender and end up as this [Management contracting]*”.
Exhibit 3 - SURVEY RESULTS - Current trends in procurement

Chart 1. Interviewee Response to Current Trends in Procurement Type

<table>
<thead>
<tr>
<th>Procurement Type</th>
<th># of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lump sum</td>
<td>4</td>
</tr>
<tr>
<td>Measurement</td>
<td>2</td>
</tr>
<tr>
<td>Cost reimbursement</td>
<td>4</td>
</tr>
<tr>
<td>Design and construct</td>
<td>2</td>
</tr>
<tr>
<td>Management contracting</td>
<td>2</td>
</tr>
<tr>
<td>Construction management</td>
<td>4</td>
</tr>
<tr>
<td>Design and manage</td>
<td>2</td>
</tr>
<tr>
<td>Document and construct;</td>
<td>2</td>
</tr>
<tr>
<td>Design, manage and construct;</td>
<td>2</td>
</tr>
<tr>
<td>Novation</td>
<td>2</td>
</tr>
<tr>
<td>Package deals</td>
<td>4</td>
</tr>
<tr>
<td>Schedule of rates</td>
<td>4</td>
</tr>
<tr>
<td>Alliance</td>
<td>6</td>
</tr>
<tr>
<td>Public-private-partnerships</td>
<td>4</td>
</tr>
<tr>
<td>Single select</td>
<td>2</td>
</tr>
<tr>
<td>Other (Early Contractor Involvement)</td>
<td>4</td>
</tr>
</tbody>
</table>
7. Summary of current procurement practices

There is a consensus that there is one procurement method that is in some sense ‘better’ than all others for an individual project, but that no one procurement method is likely to be better than others for any project (Love et al., 1998). The selection of an appropriate procurement method could also reduce construction project costs by an average of 5% (Gordon, 1994). While an appropriate procurement system may enhance the probability of project success (Naoum, 1994; Luu et al., 2005),

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.

7.1 Procurement strategy

NEDO (1985) identified seven steps to successful building procurement:

1. Selecting an in–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

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; Mortledge et al. 2006):

- External factors
- Client resources
- Project characteristics
- Ability to make changes
- Cost issues
- Timing

The NSW Government (2005) has 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.
7.2 Procurement systems

Procurement systems (or sometimes known as delivery systems) can be classified as:

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

**Traditional procurement**

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.

**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.

**Design and Construct Procurement**

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.

**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 client therefore has the advantage of only one firm to deal with – and one firm to blame if things go wrong. In practice, the client’s requirements are detailed to the extent that the contractor’s design contribution, and liability, is diminished.
The client 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 client 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 client'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 client 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.

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

Management Procurement

Management procurement methods are best suited to large, complex, fast moving projects where early completion is desirable.
Several variants of management procurement forms exist, which include; management contracting, construction management and design and manage.

**Key points to consider with management procurement**

- 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.

**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).
7.3 Collaborative procurement (Relational)

Collaborative procurement can take many forms. Walker and Hampson (2003) describe some of these as enterprise networks, partnering and alliances with alignment of objectives towards a common business objects as being a common thread. They point out that relationship-based procurement requires an approach that differs from traditional systems and requires a managed approach that includes:

- Having longer joint planning and monitoring horizons;
- Corporate philosophies that must be compatible with key relationships - in other words actors share essentially the same strategic vision;
- Risks and rewards are shared over a long term;
- A rationalised supplier base allows increased coordination and reduced transaction costs;
- A propensity for information sharing; and,
- A focus on total costs and a desire to leverage technology.

A word of caution regarding collaborative procurement arrangements

Kennedy and Wilson (2004) point out that while “…the potential for substantial cost savings has always been the headline benefit and these savings have been confidently predicted by numerous authorities over the years the reality is often quite different….Much of what is passed off as ‘partnering’ is little more than a sham and what penetration does exist is almost totally concentrated at the ‘client-end’ of the supply chain.”

Public Private Partnerships (PPPs)

In Australia Public Private Partnerships (PPPs) are more commonly used for large civil engineering projects such as motorways or tunnels.

Structured in multiple forms, PPPs vary generally according to the scope of responsibility and degree of risk assumed by the private partner with respect to the project. In each case, the private partner assumes financial risk in some form - for example, through an equity investment, liability for indebtedness, a fixed priced contract or a combination thereof. It is important to note that not all innovative contracts referred to as PPPs adopt the principles of PPP project delivery. (Report to US Congress, 2007).

Variety of partnership models

There is a variety of partnership models available depending on the particular circumstances. The Victorian Government (2008) point out that the combined response to the three core questions — core services, value for money and public interest — determines the underlying model for the project.

In a hierarchy from maximum to minimum retention of service delivery by government, the various models may be expressed broadly as follows:

(i) public sector delivery of services (considered to be core services) with private parties providing infrastructure-related services only;

(ii) public sector delivery of services (considered to be core services) with private parties providing infrastructure-related services and related ancillary services (for example, a prison accommodation services project);
(iii) public sector delivery of services (considered to be core services) with private parties providing infrastructure and related ancillary services, together with some services to the community (for example, a sporting facility linked with a government educational facility);

and

(iv) private sector delivery of a full range of services to the community including infrastructure (for example, particular road and rail projects).

Related ancillary services, in the above contexts, may cover a number of operational services including information technology services, accommodation services resulting from the infrastructure, building-related services such as maintenance and some support services. In some cases, such as certain transport projects, the privately provided services may extend to the delivery of services to end-users.

Points to consider about PPP's

The major conclusions of a National Benchmarking Study (Duffield (2008)) are:

- PPPs overall performed 28.2% better on cost than traditional projects, providing 31.5% better cost certainty (actual cost vs. estimated cost).

- Similarly, 16.7% more PPP projects were completed within the original expected cost estimate than was the case for traditional projects.

- PPP contracts had an average 4.3% cost increase post contract execution, compared to 18.0% for traditional projects.

- There is very little time performance difference between PPPs and traditional projects:

- PPPs tended to suffer more delays (average 14.8%) prior to project execution, but only 2.6% further delay once financial close was reached.

The Study concluded that PPP contracts were well developed prior to release to market.

- In comparison, traditional projects were overly optimistic in timing, with an average delay of 25.9% during construction.

- PPPs are improving on their time performance faster than traditional projects.

Results from the Study demonstrate that PPPs are a more cost effective means for governments to procure major projects. (Blake Dawson. 2009).

Alliances

The common features of an alliance are:

a. Risk is shared between customer and supplier,

b. The alliance contract typically contains a 'no-disputes clause' with no liability between participants (except for wilful default),

c. The customer and supplier share common goals for project success,

d. All transactions are of an 'open book format', (Cullen et al. 2005) and
e. All participants win, or all participants lose, depending on the outcomes actually achieved (incentivised cost reimbursement).

Alliance classification

There are no fixed formats of an alliance contract. Nevertheless there are ‘classes’ of alliances to cater for the unique needs of projects and the specific risk management strategies of government. There are two methods by which alliance tenderers are selected. The first and most common method is the single TOC (Target Outturn Cost) alliance. The second method is the two TOC alliance, also referred to as the Multiple TOC alliance or Competitive TOC alliance, where typically, cost overruns and underruns are shared on a 50/50 basis between alliance participants. (Victorian Government, ‘Project Alliancing Guide’ 2006; Stephenson 2000).

Essential differences between partnering and alliancing

In alliances there is a joint rather than shared agreement to the acceptance of risk in partnering. The joint assumption of all risk in alliances is the key factor that ensures that the commercial terms of the arrangement are aligned with project objectives. This cannot be achieved in a partnering agreement where it is possible for a party to ‘lose’ at the same time that another ‘wins’. The ‘win-win’ or ‘lose-lose’ outcome enjoyed by all alliance parties is the fundamental characteristic of alliance and drives the behavior of all parties. (Adapted from MacDonald. 2004)

Private Financing Initiative (PFI)

Points to consider regarding PFI

Some approaches used to finance public infrastructure can improve efficiency and lower the life-time project cost through:

- Better management of project risk by aligning incentives for risk management with the capacity to manage the risk
- Improvements in information, contract negotiation and management and other transaction activities that pay-off in better risk management and cost savings
- Bringing greater market or other scrutiny to bear on the investment, and imposing the costs on potential beneficiaries to better reveal their willingness to pay.
PART 2 – Impediments to Innovation

1 Definition of Innovation

There are a large variety of definitions of innovation. However, one that has gained some currency in the academic literature is that of Freeman:

“Innovation … is the actual use of non-trivial change and improvement in a process, product or system that is novel to the institution developing the change” (Freeman 1989, cited by Slaughter 1998, 226).

2 Type of Innovation (what is being innovated)

A well established differentiation is made in the literature between product innovation and process innovation. Product innovation involves the improvement of a building component, or technology used to construct buildings. Process innovation is understood by various authors as innovation in the way that innovation in procurement is achieved (Lædre et al. 2006; Tookey et al. 2001) chiefly through innovation in organisational and financial arrangements. An example of this is the introduction of design-build or alliances over traditional procurement approaches. Other authors understand process innovations as new ways of undertaking the construction itself (Fryer 2004).

The Organisation for Economic Cooperation and Development (hereafter OECD) has recently developed guidelines to assist researchers as they seek to collect and interpret innovation data which include the following definitions for different categories of innovation:

- A product innovation is … a good or service that is new or significantly improved with respect to its characteristics or intended uses (OECD 2005, 48) (e.g. new types of materials or products to be used in the construction of buildings)
- A process innovation – is the implementation of a new significantly improved production or delivery method (OECD 2005, 49) (e.g. alliances, PPPs)
- A marketing innovation is the implementation of a new marketing method involving significant changes in product design or in product design or packaging, product placement, product promotion or pricing (OECD 2005, 49)
- An organisational innovation is the implementation of a new organisational method in the firm’s business practices, workplace organisation or external relations (OECD 2005, 51) (e.g. changes to institutional arrangements within government – see Furneaux Brown and Allen (2008) for an overview).

Interviews with SMEs indicate that products, processes, organisational and management practices are all prevalent, although marketing innovation is less well known or understood (Ling 2003; Thorpe, Ryan and Charles 2008). Thus for procurement innovations, it may be useful to distinguish between innovations in procurement processes themselves and innovation which might occur in the processes or products in construction projects. Putting these perspectives together, the following

2 Guidelines for Collecting and Interpreting Innovation Data (OECD 2005).
Table 2 – Type of innovation and procurement

<table>
<thead>
<tr>
<th>Innovation of procurement</th>
<th>Innovation within procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product innovation</strong></td>
<td><strong>Innovation of procurement</strong></td>
</tr>
<tr>
<td>New / improved financial instrument / contractual form</td>
<td>Innovation in components / structures of buildings and infrastructures</td>
</tr>
<tr>
<td><strong>Process innovation</strong></td>
<td><strong>Innovation within procurement</strong></td>
</tr>
<tr>
<td>New / improved organisational forms, structures, sequences, financial arrangements</td>
<td>New / improved processes in construction</td>
</tr>
</tbody>
</table>

3 Scope of Innovation

While innovation can be examined based on what is being innovated, it is possible to also examine the scope, size or impact of the innovation.

Shields (2005) has proposed that the scope or impact of the innovation can be classified in four ways:

- **Incremental innovations** – small improvements with minimal impacts on other systems
- **Modular or product innovations** – improvements within a specific system which requires no changes in other components or systems.
  - Gann et al. (1992) argue that the construction industry has focused too often on these produce innovations as the complexity of the construction industry tends to inhibit innovations in processes.
- **Systems innovation** – the innovation results in sets of new products, practices and arrangements.
  - For example BIM is not just a new technology, it also enables new ways of collaboration between professions and delivering buildings
- **Radical innovation** – completely new concept which renders previous approaches obsolete.
  - An example of this might be prefabrication of building components (Shields 2005) which was a change in product, assembly, approach and conception of the building process.

These typologies are useful in providing a framework to understand and examine what the innovation is and the scope or scale of the innovation. Shields (2005) however, argues that such typologies should actually be treated with a slight caution. The reason for this is that what to a small firm might be a small incremental innovation, may in fact lead to a system change or radical change. Take the example of BIM. For designers and programmers, the move to add various properties of virtual building components (such as time, cost, and composition of materials) in addition to the dimensions as details in an underlying data base, may have been a logical and incremental step. However the end result is a set of technologies which could provide the basis for significant changes in the ways in which engineers, architects, clients, project managers, construction firms interact and go about construction processes, as the technology facilitates considerable collaboration potential (For further details see Furneaux, C.W. and Kivits 2008). Further, in order for such technologies to be adopted, changes are needed legislatively to safeguard the activities undertaken.

Thus innovation can be describes according to the type of innovation, and the scope of innovation. The next section discusses some of the key sources of innovation.
4 Sources of Innovation

March (1991) pointed out the difference between exploitation and exploration in relation to innovation. Exploitation refers to the standard behaviour involved in improving a firm’s current capabilities and performance, particularly in making better use of existing knowledge and resources. Exploitation is critical for innovation as a firm needs to learn from its experiences. Exploration refers to the innovative behaviour itself involved in risk-taking and experimenting with unfamiliar alternatives – developing new knowledge, products and processes.

Brady and Davies (2004) provide a very useful distinction between these two different aspects of innovation – bottom up exploration and top down exploitation (Figure 7 below).

Figure 8: Sources of innovation in project based organisations (Brady and Davies 2004)

Exploration often occurs at the front end of projects (Loewe and Dominiquini 2006) as designers and constructors experiment, innovate and overcome specific challenges unique to each project. Exploration is the incremental adjustment of processes and materials used in the construction process. Exploitation involves the business process of organisations seeking to capture, maintain, codify and utilise the innovations which often happen at the front end of projects.

This is supported through recent research by the Australian Bureau of Statistics which demonstrates that in construction firms, the highest skill source of innovation is through tradespersons, although considerable innovation also occurs through management, finance and marketing activities (see Figure 8 below). Thus both aspects of bottom up and top down innovation can be identified.
Having reviewed the nature, type, scope, source, and skills base of innovation, the next section reviews some of the impediments to innovation – particularly innovation of procurement.

5 Impediments to procurement innovation

Construction and related industries are complex product systems which have many interconnected and customised elements; are nonlinear and have unpredictable qualities, and require a high degree of user involvement in innovation (Winch 1998). Shields (2005) has argued that innovation in construction involves a complex interaction between macro, intermediate and micro levels. Gann and Salter (2000) provide the best depiction of this (Figure 9 below):

Figure 10: Construction innovation as a multi-level system (Gann & Salter 2000: 960)
This complex interplay between various components of the construction industry has been argued to result in reduction in innovation amongst construction firms. This has been supported through recent research into Australian firms, which confirms that construction firms have the lowest rate of innovation compared with other industries (see Figure 10 below).

Figure 11: Percentage of Businesses actively engaged in innovation (Australian Bureau of Statistics 2008)

Thus while innovation can and does occur in construction firms, in Australia, firms from the construction sector are least likely to undertake innovation.

A number of impediments to innovation within construction firms have been identified in the literature and these are discussed in the next section.

5.1 Key issues

A rather large number of elements are held to inhibit innovation in procurement in the academic literature. The following table sets out the most widely cited set of arrangements, and the section that follows provides further discussion on a few of the key elements, particularly regulation, finance, relationships.
Table 3: Location and nature of innovation impediments

<table>
<thead>
<tr>
<th>Location of barrier</th>
<th>Impediments to innovation identified</th>
</tr>
</thead>
</table>
| **Intra firm**     | - short term focus in delivery of construction  
                      - lack of resources  
                      - lack of an innovation champion  
                      - reluctance of private firms to invest in experimentation, R&D for longer term profit  
                      - strong reliance on past experience  
                      - level of caution in the public sector  
                      - lack of capability of the client  
                      - cost involved in adoption of new technologies |
| **Inter firm or project** | - long service lives of facilities and their components  
                              - divided and adversarial view of labour and professionals  
                              - the nature of construction procurement which leads to ‘one-off’ designs  
                              - time pressures in projects limit innovation as the focus is on getting the project completed  
                              - inability to get feedback from customers  
                              - lack of interest amongst clients  
                              - lack of coordination amongst stakeholders  
                              - focus on lowest up front costs  
                              - low codifiability of project based process work, which inhibits learning across projects |
| **Trans-Firm**     | - tort liability, threat of litigation and high cost of insurance  
                      - no single government agency in total charge of construction across all of Australia  
                      - multitude of regulatory codes and standards  
                      - economic cycles in design and construction markets  
                      - procurement policies which emphasise lowest initial cost, rather than best performance  
                      - pervasive public attitude towards construction “not in my backyard”  
                      - lack of champion due to federal system of government |
| **External to specific projects / firms** | |

(Information in this table has been collated from Dubois and Gadde 2002; Furneaux, C.W. and Brown 2007; Gunningan and Eaton 2008; Jones and Saad 2003; Loewe and Dominiquini 2006; Miozzo and Dewick 2004b; Salter and Gann 2001; Slaughter 1998, 18)

Recently the Australian Bureau of Statistics undertook research on innovation in Australian industries and identified a number of barriers to innovation within these firms. Construction firms cited lack of access to funds, cost of development of innovation attitude of staff towards change, lack of access to technology, market conditions, government regulations, and in particular labour as key issues in the lack of innovation. These issues are summarised in Figure 11 below.)
Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning the impediments to innovation. Results relating to this section are given below:
Exhibit 4 - SURVEY RESULTS

Impediments to procurement innovation

The following list of potential impediments to innovation in building procurement was raised with the interviewees.

- Clients skills/abilities
- Manufacturers
- Contractors skills/abilities
- Structure of production
- Relationships between individuals and firms within the industry
- Relationships between industry and external parties
- Procurement systems
- Regulations and standards
- Risk when no specific contract agreement in place
- Time pressures
- Environmental requirements
- Other

Respondents were asked to rate each of these items as having no impact, little impact or significant impact in impeding innovation. Many of the interviewees justified or expanded on their responses suggesting the concept was either:

a) not applicable to innovation in procurement at all;

b) potentially an impediment to innovation, but could also potentially encourage innovation or:

c) only going to aid innovation, not impede it.

With the addition of these categories, the responses are summarised in Table 2.
Exhibit 5 - SURVEY RESULTS

*The other issues raised as having significant impact on impeding innovation in building procurement are listed below.

3. Probity issues.
4. Lack of integration in the supply chain (e.g. designers v. cost consultants).
5. If it is the government sector procuring.
6. Lack of knowledge/understanding of key decision makers.
7. The level of competition in the market.
8. The level of experience in your own staff.
9. The stage of the government budget cycle the project falls in.
### Exhibit 6 - SURVEY RESULTS

**Impediments to Innovation - Summary of interviews**

<table>
<thead>
<tr>
<th>Category</th>
<th>No Impact</th>
<th>Little Impact</th>
<th>Significant Impact</th>
<th>Not Applicable</th>
<th>Can Help or Hinder</th>
<th>Can Aid Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clients skills/abilities</strong></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Manufacturers</strong></td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contractors skills/abilities</strong></td>
<td>1</td>
<td>11</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
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<tr>
<td><strong>Structure of production</strong></td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
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<td></td>
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<tr>
<td><strong>Relationships between individuals and firms within the industry</strong></td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>1</td>
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<tr>
<td><strong>Relationships between industry and external parties</strong></td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td><strong>Procurement systems</strong></td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>1</td>
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<tr>
<td><strong>Regulations and standards</strong></td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
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<tr>
<td><strong>Risk when no specific contract agreement in place</strong></td>
<td>1</td>
<td></td>
<td>4</td>
<td>7</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td><strong>Time pressures</strong></td>
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<td></td>
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<tr>
<td></td>
<td>1.1.1</td>
<td>1</td>
<td>1.1.2</td>
<td>11</td>
<td>1.1.3</td>
<td>1.1.4</td>
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</tr>
<tr>
<td><strong>Environmental requirements</strong></td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
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<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
Client skills and abilities, as well as contractor skills and abilities, and time pressures are the three issues that stand out as being perceived as having significant impact as impediments to innovation in building procurement.

The issue of skilled labour and market demand for goods is currently outside the remit of this report, as procurement is also affected by market forces, and cannot directly influence these factors. Consequently, those key elements which have been identified by multiple authors are presenting the most significant impediments to innovation are discussed in detail below. In particular, the role of government as client and regulator; organisational arrangements; systemic effects of procurement; litigation; and financial arrangements are discussed.

5.2 Role of Government

The argument that regulation is a major inhibition to innovation is highly prevalent throughout the literature. However, such a view seriously underestimates the role of government and the influence that it can have on innovation.

Instead of focussing on regulation, Hood (1983) provides a very useful overview of the various policy instruments available to government:

- Advocacy – educating or persuading, using information available to the government
- Finance – using spending and taxing powers to shape activity beyond government
- Government action – delivering services through public agencies, or contracting other organisations to act on their behalf
- Rules – legislation, regulation, policy and official authority (Hood 1983, 168)

This suggests that government is not just a regulator, but also a key customer (Hobday, Rush and Tidd 2000). Indeed regulation is just one of many instruments available to governments.

This wider set of policy instruments is important to keep in mind in relation to innovation in procurement.

This view of the action of government widens the understanding of the role of government in the construction sector, and helps to provide a more nuanced discussion of the possible impediments or drivers that the various instruments of government have upon innovation.

Regulation

Regulations are generally held to inhibit innovation (Blayse and Manley 2004; Dubois and Gadde 2002), and to inhibit the diffusion rate of innovations in the construction industry (Ostger and Quigley 1977). This is supported in recent Australian Bureau of Statistics (ABS) survey on innovation in Australian businesses, which found the construction the second most likely industry to cite government regulations as a hindrance to innovation (See Figure 12 below).

This view is supported in the expert interviews undertaken as part of this research. The compliance issues can seem to cause some problems for innovation (see results box below).
Seaden and Manseau (2001) offer a slightly differentiated view of this, arguing that in countries with centralised government structure (such as Japan, France, UK) a national construction ministry enables coordination and championing of innovation based policies for construction. However they also argue that in countries with federal constitutions (such as Australia, Canada and the USA), state based responsibility for construction results in there being no single champion for construction innovation at a national level. An example of this is that while certain states encouraged the use of design-build contracts, other states actively prohibited their use in the late 1990s in the United States of America (Molenaar, Songer and Barash 1999).

In contrast to these researchers, Miozzo and Dewick (2004a) argue against a simplistic and negative perspective on regulations, suggesting instead that there is something of a paradox between regulation and innovation. This is supported in research by the Australian Bureau of Statistics (2008). While noting that construction firms cite government regulations as an impediment to innovation (See Figure 13), the same research also found that reducing environmental impacts of construction and in response to government standards can also be a driver for innovation (see Figure 13 below).
Figure 14: Drivers of innovation in construction firms

Drivers of Innovation in Construction

Exhibit 8 - SURVEY RESULTS

Impediments to Suppliers Socially Responsible Practices, Including Compliance with Legislative Obligations to Employees

- As government, we are governed by probity models and cannot go outside those models.
- In some areas, local government requirements might cause problems.
- Lack of information about suppliers
- There is a lack of education in this regard. This is generally only given lip service. They will do what they have to do only.

It would seem that increased regulation of sustainability in construction can in fact lead to innovation – particularly if the regulation was in the form of performance based requirements, and professionals, manufacturers and contractors took the new legislation as a challenge to improve processes and products (Miozzo and Dewick 2004a). This provides a clear link to sustainability in procurement (Australian Procurement and Construction Council 2007), as the goal of sustainable procurement is to reduce the impact of construction activities upon the environment.

Thus while regulation can inhibit innovation, it can also provide the incentive to innovate – it is largely a matter of how the regulation is implemented. As Figure 9 suggests, the relationship between regulation and innovation is not one way – as new processes and products are developed policies and regulations need to be adjusted in order to cope with the changing realities of construction practice. Likewise, by moving from prescriptive to performance based regulation can improve the relationship between innovation and regulation. This is a relatively understudied area, and needs to be better understood, although preliminary investigations in this area are promising (e.g. Furneaux, C.W. and Brown 2006).
5.3 Organisational arrangements

In the latter part of the 20th Century writers such as Tarricone (1992) characterised designers and constructors as adversarial, resistant to innovation and inefficient. This rather unflattering view highlights the conflict laden and fragmented nature of traditional procurement arrangements, rather than the actors involved in such systems.

The fragmented nature of the construction industry is held to inhibit innovation in the construction sector (Dubois and Gadde 2002). One reason for this is that traditional procurement hinders contractor input regarding planning and technical solutions, which hampers innovation and buildability (Eriksson, P.E. and Pesämaa 2007b). Likewise the separation of designers from construction process reduced opportunity of innovation (Miozzo and Dewick 2004a). Overall, the adversarial nature of the industry acts against innovation and sustainability (Anvuur and Kumaraswamy 2007).

This view of construction has been supported by recent research into types of collaborative arrangements in the construction industry. As Figure 14 indicates, around 90% of construction firms do not engage in collaborative arrangements in the industry.

Figure 15: Collaborative arrangements in the construction industry (Australian Bureau of Statistics 2008)

Systemic effects of procurement

The effects that this highly adversarial and fragmented approach to procurement is gradually becoming understood by practitioners and researchers Dubois and Gadde (2002), for instance argue that the fragmented nature of the construction industry is due to the low cost, high competitive route taken in procurement which separated designers and constructors from collaborating. (Eriksson, P.E. and Pesämaa 2007b). Complex systems theory suggests that there are major structural outcomes which result from repetitive interactions between actors in a system (Furneaux, C.W., Brown and Gudmundsson 2009). Put simply, the pursuing most procurement via a high competitive route results in a fragmented litigious industry; whereas undertaking procurement through relationship based
procurement is likely to result in a tightly coupled closely knit industry (Furneaux, C.W., Brown and Gudmundsson 2009). As Eriksson and Pesâmaa (2007b) argue - the way procurement is undertaken affects the industry.

Innovation needs to take into account the market affects of procurement activities as sustainable procurement market engagement and development (Australian Procurement and Construction Council 2007).

Exhibit 9 - SURVEY RESULTS

Impediments: Value for Money

- The undue focus in construction costs and initial capital costs is a key blockage to innovation in this area.
- The need to estimate risk. If you are a contractor pricing as Design and Construct, you are estimating cost and therefore absorbing the risk.

5.4 Role of the client

In the case of large infrastructural projects where client/owners have an internal technical capacity and thus the ability to absorb technical information and intervene in projects at every stage, those with an engineering design capacity tended to fetter their contractors, resulting in less innovative projects (Shields 2005, 14-15).

Professionals involved in procurement process are typically conservative and reluctant to implement change (Shields 2005). Against this professionals can also be the champions of change (Nam and Tatum 1997; Slaughter 1998). Likewise, clients who are prepared to be involved in judicious risk taking can be drivers of innovation (Manley 2008).

This finding is supported in the results from the survey, which indicated that clients have a significant role in not placing unnecessary demands on constructors.

The interviews undertaken as part of the project also identified a number of issues related to the role of the client (see survey results below)
Role of finance and costs

5.5 Role of finance and costs

Financial arrangements can also affect the outcomes of construction procurement. Focussing on lowest initial cost is one way multiple authors suggest that innovation is limited, as the increased adversarial approach and lower margins reduce the opportunity for constructors and designers to be creative (Dubois and Gadde 2002). Even the use of incentive payments does not in and of itself guarantee innovation.

Most important, performance incentives can work against the objectives of the project organization. With managers making positional commitments to defend or protect the interests of their respective firms, performance incentives can lead to suboptimal outcomes for the project. They encourage a myopic focus on the specified tasks that influence the outcomes to which they are tied, reduce risk-taking behaviour, and hence limit performance quality and innovation (Anvuur and Kumaraswamy 2007, 229-230).

Interviews with key informants undertaken as part of this research (see box below) indicate that taking a whole of life approach to costs can be beneficial as focussing on lowest up front costs can cost more in the long term.

For sustainable procurement innovation the focus in government finance arrangements in procurement needs to shift away from lowest initial cost to value for money and whole of life costs (Australian Procurement and Construction Council 2007). A number of impediments to whole of life cycle costs have been identified from interviews and these are summarised in Exhibit 11 below.

Exhibit 10 - SURVEY RESULTS

Impediments: Avoiding Unnecessary Consumption and Manage Demand

- Commitment by the client.
- The Green Star process can be nebulous as to what it really brings. Procurement processes can be negative.
- Having to quantify items can be a barrier. It can lead to misinformation. Cost can be attached unnecessarily.
- Some prescriptive formulas, which are deemed to satisfy sustainable targets, can be barriers.
- Short sighted view of requirements by politicians and decision makers for clients.
- By not identifying and setting up this issue as a key requirement (i.e. must be included as an objective in the contract).
- The barriers are more political...than anything else.

(Source: Interviews with key informants)
Litigation

Litigation is seen as a key impediment to innovation. Often inappropriate procurement practices (either by the procurer or company making the tender) result in legal action, so particular attention should be paid to the specifications of the service, the criteria for tender evaluation, the criteria for measuring performance, and how well the service provider performs against these criteria (Fat 2008). However, innovation often requires the opportunity to propose innovative design solutions to construction projects, and hence favours procurement arrangements which involve the contractor early in the process (such as design-build or managing contractor) or relational approaches to procurement (Fat 2008). Conversely, approaches to procurement which do not allow for innovation in the design stage tend to inhibit innovation.

There are multiple causes for disputes in the construction industry, and a useful overview of the main elements is provided in Figure 15 below (Love et al. In press).
For innovation in sustainable procurement, mechanisms need to be found which foster collaborative approaches to procurement (Australian Procurement and Construction Council 2007), these includes a move away from procurement models that encourage litigation. This is supported in interview results (noted below) which indicates a general lack of trust which inhibits innovation in procurement, amongst others.

Exhibit 12 - SURVEY RESULTS

Impediments to innovation: Other

- Lack of realistic knowledge in the industry.
- Lack of desire to try something new.
- Lack of understanding of performance requirements by client / decision makers.
- A lack of trust by clients.
- General lack of understanding of issues and remedies by most people involved, especially clients.
- The lack of a common definition of sustainability. It means many things to many people. There is no common language yet, but it is coming.
Enablers of innovation

One straightforward enabler for innovation is that of investment in research and development (R&D). Figure 16 below indicates the high correlation between business investment in R&D and patents, which are one measure of innovation.

Investment in R&D is not the only driver of innovation however. While the focus in the 1980s and 1990s was on the role of innovation champions within firms (e.g. Nam and Tatum 1997), by the late 1990s the focus had shifted to the interfirm linkages which are needed in order to facilitate innovation into complex projects (Shields 2005).

In his survey of the literature Bossink (2004) extends beyond these two well known elements and argues that there are four main areas which drive innovation: environmental pressure, technological

Exhibit 13 - SURVEY RESULTS

Impediments to innovation: Other

- Lack of realistic knowledge in the industry.
- Lack of desire to try something new.
- Lack of understanding of performance requirements by client / decision makers.
- A lack of trust by clients.
- General lack of understanding of issues and remedies by most people involved, especially clients.
- The lack of a common definition of sustainability. It means many things to many people. There is no common language yet, but it is coming.
capability, knowledge exchange and boundary spanning. Further, as can be seen from the table below, these aspects affect different parts of the construction system.

Table 4: Drivers of innovation in the network of organizations (Bossink 2004, 339)

<table>
<thead>
<tr>
<th>Innovation drivers</th>
<th>Trans-firm (e.g. government)</th>
<th>Intra-firm (within the firm)</th>
<th>Inter-firm (between firms)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Environmental pressure:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market pull</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governmental guarantee for markets for innovative firms</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Governmental clients with innovative demands</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Innovation stimulating regulations</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Subsidies for innovative applications and materials</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Technological capability:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product evaluating institutions</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Programmes promoting access to technology</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Finance for pilot projects</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Technology fusion</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Technology leadership strategy</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Technology push</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Knowledge exchange:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stimulation of research</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creation of knowledge networks</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programmes promoting collaboration</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad view of risk</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Integrated and informal R&amp;D function</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Effective information gathering</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Training of workers on the site</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lateral communication structures</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Boundary spanning:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration of design and build</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Involvement of the client</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Mechanisms for sharing financial risks and benefits</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Coordination of participating groups</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Empowerment of innovation leaders</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Empowerment of innovation champions</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Innovations from suppliers</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Explicit coordination of the innovation process</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Strategic alliances and long term relationships</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Key elements of this table, prevalent in the literature are discussed below.

7 Importance of inter-firm relationships for innovation

Relationships in procurement are key to achieving innovation (Keast and Hampson 2007). This finding should be of little surprise given the negative correlation between fragmented highly conflicted delivery systems and innovation noted earlier (Dubois and Gadde 2002).

Building a collaborative culture is key to developing innovation in construction (Eriksson, P.E. 2008; Lædre et al. 2006). Long term collaborative networks provide opportunity for improved trust and enhanced innovation (Miozzo and Dewick 2004b). Collaborative team work is necessary in order to promote collaborative learning and innovation (Jones and Saad 2003). While formal business relationship programs are important to fostering innovation information knowledge sharing and strategies are also important (Manley 2008).
Keast and Hampson (2007, 371) argue specifically that relationship roles which enhance innovation include:

**Table 5: Roles focus and tasks related to innovation management and procurement (Keast and Hampson 2007)**

<table>
<thead>
<tr>
<th>Relational management roles and focus</th>
<th>Task components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activating - Forming membership and accessing resources</td>
<td></td>
</tr>
<tr>
<td>Framing - Shifting orientation from single to collective</td>
<td></td>
</tr>
<tr>
<td>Mobilizing - Securing commitment to whole or collective identity</td>
<td></td>
</tr>
<tr>
<td>Synthesizing - Building and maintaining relationships</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify and select relevant network members</td>
</tr>
<tr>
<td></td>
<td>Access and gain agreement to devote skills, knowledge and resources to the network—the “buy in”</td>
</tr>
<tr>
<td></td>
<td>Establish appropriate structural arrangement</td>
</tr>
<tr>
<td></td>
<td>Introduce new actors and resources to renew interest and change nonperforming dynamics</td>
</tr>
<tr>
<td></td>
<td>Deactivate or disconnect non-contributing members</td>
</tr>
<tr>
<td></td>
<td>Establish values, norms and rules—new terms of engagement</td>
</tr>
<tr>
<td></td>
<td>Introduce and champion new ideas</td>
</tr>
<tr>
<td></td>
<td>Encouraging members to view issues from another’s perspective</td>
</tr>
<tr>
<td></td>
<td>Stressing the benefit of working together</td>
</tr>
<tr>
<td></td>
<td>Establish common vision, mission</td>
</tr>
<tr>
<td></td>
<td>Secure agreement on scale and scope of action</td>
</tr>
<tr>
<td></td>
<td>Forge coalitions and subgroups for specific actions</td>
</tr>
<tr>
<td></td>
<td>Drive action for outcomes</td>
</tr>
<tr>
<td></td>
<td>Identify and foster champions and sponsors</td>
</tr>
<tr>
<td></td>
<td>Check level of involvement and sense of engagement</td>
</tr>
<tr>
<td></td>
<td>Monitor relationships and activities</td>
</tr>
<tr>
<td></td>
<td>Leverage resources toward collaborative advantage and collective benefit</td>
</tr>
<tr>
<td></td>
<td>Establish network and innovation culture</td>
</tr>
<tr>
<td></td>
<td>Deal constructively with conflict</td>
</tr>
<tr>
<td></td>
<td>Build communication processes</td>
</tr>
</tbody>
</table>

Knowledge capture, transfer and learning in project settings rely very heavily on social patterns, practices which can only be achieved when a community based approach to managing knowledge is followed (Bresnen et al. 2003). However, the loosely coupled nature of the construction industry tends to inhibit knowledge sharing and therefore diffusion of innovation (Dubois and Gadde 2002).

Thus, extensive collaboration and extended contracting which have been advocated as ways of promoting innovation (Li et al. 2005; Pakkala ,de Jong and Äijö 2007). Sometimes these collaborations extend through to the sub-contractor level (Shields 2005). However the reality of market based procurement though is that competition will never entirely be for gone, and that a mix of cooperation and competition are likely to remain (Eriksson, P.E. 2008). The challenges for managers are to find the right mix of competition and collaboration.

Over time continued use of collaborative approaches to procurement can address the adversarial nature of the construction industry and ensure that there is a high trust culture prevalent (Anvuur and Kumaraswamy 2007). Such an approach is needed to address the mind set involve in procurement which anticipates and expects negative behaviours. Just as there are effects at the system level from large volumes of highly competitive procurement approaches, so too, there are structural outcomes from collaborative approaches – not just at the project level, but also at the system level (Eriksson, P. and Pesämaa 2007a; Furneaux, C.W.,Brown and Gudmundsson 2009).
Anvuur and Kumaraswamy (2007) provide a very useful overview of these processes in the following diagram:

**Figure 18: Partnering model and affects on project performance (Anvuur and Kumaraswamy 2007, 228)**

A model of partnering and its effect on project performance

<table>
<thead>
<tr>
<th>Causes / dominant conditions</th>
<th>Change / Integration Strategy</th>
<th>Mediators</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Differentiation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Uncertainty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Inter-dependence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fragmentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Competition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Zero sum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Adversarialism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Short-Termism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No innovation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Environmental context</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Industry custom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Law</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Social justice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Previous experience</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Affective priming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cognitive priming</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Partnering**
- Workshops, champions meetings
- Charters
- Alliance agreements
- Team incentives
- Issue resolution / escalation procedures
- Periodic performance assessment
- Training on problem solving and joint decision making (e.g. resource dilemma games)

**Essential factors**
- Equal status
- Cooperative interaction
- Common goals / common fate
- Authority support

**Cognitive / affective effects**
- Perceived group homogeneity
- Perceived similarity to self
- Trust
- Re-categorisation (*“them” to “us”*)
- Positive affect
- Empathetic concern
- Favourable evaluations

**Behavioural effects**
- Cooperation
- Helping
- Individualising behaviours
- Productivity of individual and group

**Improved performance**
- Cost, quality
- Schedule
- Innovation

Currently, however, construction firms exhibit a number of collaborations within the industry as shown in Figure 19 below.
If the intent of the Sustainable Procurement Framework is to be realised, then the issue of collaboration between firms in order to develop sustainable procurement innovations should be addressed and encouraged as part of the procurement process.

Just as a simplistic view of regulation being bad is unhelpful in examining the impediments and drivers of innovation in construction, likewise attempts to promote innovation in procurement should also pay attention to multiple aspects of the procurement model. As Eriksson and Pesämaa (2008) argue:

Our model has verified that early involvement of contractors, limited bid invitation, incentive-based compensation and task-related attributes together affect trust and cooperation in client–contractor relationships. Therefore, partnering approaches based on only one or two of these procedures (e.g. incentive-based compensation) are not suitable. Furthermore, partnering initiated in the construction stage, based on the client’s fixed design, may not be suitable since cooperative procurement procedures are triggered by clients’ desire to integrate design and construction through early involvement of contractors in specification (Eriksson, P.E. and Pesämaa 2007b, 900).

### 8 Summary of impediments to innovation

This section of the report has set out to firstly define the nature of innovation, its types of innovation and scope of innovations. A more sophisticated analysis of the role of impediments and enablers of innovation has been undertaken with a particular emphasis on the various roles that government can have on influencing innovation in procurement and sustainability.

In this respect the following quote best sums up the opportunities government has to influence innovation in sustainability in procurement.

The state … is the single most influential party in supporting the achievement of sustainability targets through its position as the largest client of the construction industry, its capacity to offer fiscal incentives and ability to ‘move the goalposts’ by undertaking a review of building regulations (Miozzo and Dewick 2004a, 75)

Government thus has a critical role in the development of innovation in sustainable procurement. Through its roles as client and regulator government can influence the outcomes of procurement...
activities by addressing the impediments to innovation identified in this section and fostering the enablers of innovation. Strategies identified in this section include encouraging performance based approaches to sustainability in procurement projects, offering incentives to firms to innovate in sustainable procurement, and encouraging collaboration amongst innovative firms.

While many authors argue that construction is plagued by a lack of innovation, other authors suggest this is not the case. Winch (1998) for example argues that construction actually has too much and too little innovation at the same time. While there are plenty of new ideas, products or processes, cultural social and regulatory constraints may restrict the uptake and adoption of innovation (Winch 1998).

So while finance and regulation are often seen as impediments to innovation a more accurate view is that it is a matter of how these two instruments of government are implemented which makes the difference. Gann Wang and Hawkins (1998) provide the best statement of this when they argue that:

“A more progressive approach is possible in which regulations can be used as part of a portfolio of policies aimed at improving performance. In this mode, functional performance specifications can stimulate systemic innovation. A flexible ‘performance-based’ form of standard could provide firms with the freedom, market incentive and institutional frameworks within which to innovate. The process itself could lead to information sharing and cooperation but for this to be achieved, competitiveness and regulatory policies need to be coordinated better. Regulatory objectives and mechanisms for achieving them need to match. Regulations need to accommodate technical change at different levels in the production process, including new product development and systems integration”.

To make this explicit the ways in which various policy instruments inhibit innovation, and the ways in which this can be addressed are noted below:

**Table 6: Government Policy Instruments and how these influence innovation**

<table>
<thead>
<tr>
<th>Policy instrument</th>
<th>Ways these instruments inhibit innovation</th>
<th>Ways these instruments can be used to promote innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advocacy</td>
<td>Education activities within the professions, trade associations; sponsoring trade shows, conferences, etc. Exemplar projects</td>
<td></td>
</tr>
<tr>
<td>Money and Finance</td>
<td>Focussing on lowest up front cost can inhibit innovation</td>
<td>Providing incentives for firms to innovate in sustainability Taxation reduction incentives for firms which invest in R&amp;D Focussing on best value and whole of life costing in procurement Investing in research centres and activities</td>
</tr>
<tr>
<td>Government action</td>
<td>Procurement activities – promoting high contestability reduces incentive to innovate due to low margins</td>
<td>Procurement activities – promoting collaboration and championing new ways of working with industry Experimenting across a portfolio of projects to find better ways of undertaking</td>
</tr>
<tr>
<td>Policy instrument</td>
<td>Ways these instruments inhibit innovation</td>
<td>Ways these instruments can be used to promote innovation</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Advocacy          |                                          | Education activities within the professions, trade associations; sponsoring trade shows, conferences, etc.  
|                   |                                          | Exemplar projects                                    |
| Money and Finance | Focussing on lowest up front cost can inhibit innovation | Providing incentives for firms to innovate in sustainability  
|                   |                                          | Taxation reduction incentives for firms which invest in R&D  
|                   |                                          | Focussing on best value and whole of life costing in procurement  
|                   |                                          | Investing in research centres and activities          |
| Government action | Procurement activities – promoting high contestability reduces incentive to innovate due to low margins | Procurement activities – promoting collaboration and championing new ways of working with industry  
|                   |                                          | Experimenting across a portfolio of projects to find better ways of undertaking procurement |
| Regulation and Policy | Prescriptive based regulations which do not allow for innovation in process or product | Regulating to increase sustainability requirements (e.g. green star ratings) particularly performance based codes  
|                   |                                          | Amending regulations which inhibit product, process or organisational innovation |

Table 7: Summary of ways in which regulation inhibits innovation
PART 3 - Alternative Approaches to Procurement

1 Introduction

The Australian construction industry has been in a period of intense introspection since the publication of ‘No Dispute’ (NWPC and NBCC, 1990) which highlighted strategies to improve the performance of projects. Primary issues that were addressed included:

- **allocation of risk** where conditions of contract should be viewed as ‘obligations’ rather than ‘risks’;
- **selection of contractors/subcontractors** where emphasis was placed on the tendering system being seen as fair and equitable. It was also suggested that the number of tenders for a project not exceed 6 and that a system of pre-qualification be implemented on large projects;
- **quality of documents** where recommendations for adequate time and resources should be allocated for the design and documentation process, adequate fees for consultants services agreed, single point responsibility to ensure that documentation is properly coordinated, quality assurance and control principles should be applied to the design and documentation process and a documentation freeze should be established prior to the call for tenders; and
- **alternative contract strategies** where recommendations were made for the use of various procurement methods by clients. For example, it was suggested that “Design and Construction contract strategy may be appropriate where the Principal’s brief can be properly identified and expressed in objective performance terms and the Principal wishes Tenderers or the Contractor to develop a suitable concept design and detailed design for the project” (p.xviii).

The above issues remain a nemesis for the industry despite widespread calls for change. For example, Cole (2002) has reiterated that there is a need to re-examine the allocation of risk. Errors and omissions in contract documentation appear to be more prevalent than in previous years and are major contributors to variations, rework and disputes (Tilley and McFallen, 2000; Love et al. 2006). More often than not inappropriate ‘scoping’ and procurement strategy adopted by clients are major contributors to many of the problems that are experienced within projects. Since the publication of ‘Building for Growth’ report in Australia (DIST, 1998), Latham (1994) and Egan (1998) reports in the UK there has been an increased focus on alternative approaches of procurement particularly to attain innovative sustainable outcomes. Key issues that relate to alternative procurement approaches include (Love et al., 2004b): prime contracting, relationship contracting (e.g., alliances/integrated teams); serial contracting in conjunction with continuous benchmarking of project team performance, focus on whole life cycle costing, replace contracts with performance measurement, staged gateways (e.g., design audits, reviews, verifications), incentive/reward payments for consultants/contractors/subcontractors, and reduce the reliance on tendering.

During a project’s operation, benchmarking (e.g., safety, waste, RFIs, variations etc) and continuous monitoring of the project team needs to occur, particularly when alliancing is introduced. This may be viewed as a cumbersome task in the short term, but can enable continuous learning that may be used to rectify problematic issues that arise. In addition, the lessons learned can be transferred to other projects. Alliancing should not be simply used for a specific project but continued after a project is completed. For long-term relationships to be developed they need to be nurtured and maintained so that knowledge transfer can become an on-going process between organizations (Davis, 2004). For such a practice to occur, clients, consultants, contractors and subcontractors will be required to adopt an *endogenous cooperative culture* that is conducive to learning and sharing knowledge with other
firms within the industry. It is through this learning process that innovations are able to come to fruition. An immediate challenge for firms embracing alternative ways of procuring projects is to accept that they have to change their mindsets to one of working in a cooperative and collaborative manner to procure projects successfully. Anecdotal evidence indicates that many firms set out with the best intentions of entering into relationship contracting arrangements. However when something goes wrong and their profit margins begin to erode they begin to revert back to ‘traditional’ adversarial work practices rather working through to solve the problem at hand.

1.1 Inappropriate contract procurement and delivery methods are commonly being used

In Scope For Improvement – a survey of pressure points in Australian construction and infrastructure projects (2006), it is revealed that the survey respondents adopt a conservative approach when selecting a project delivery method, relying too heavily on previous experience in a sector, rather than the particular characteristics of the project in question. In fact, 20% of respondents indicated that the procurement method adopted in the project being studied is not the most appropriate choice.

The survey also revealed that generally the principals and constructors in the survey held different views on how best to procure major infrastructure projects. This suggests a lack of understanding between the two parties. However the survey found some exceptions where the use of inappropriate contract delivery methods appears to be considerably less prevalent. For example respondents from the water industry reported that adequate consideration is given to the choice of delivery method, with the most appropriate method being used in 90% of their projects. The authors of the survey concluded however that there is still some scope for improvement generally.

Crane (undated) proposes the following approach with regard to an alternative approach to procurement:

- Remove reliance on lowest cost-go for value
- Reduce costly competitive tendering
- Replace “contracts” with performance measurement
- Involve all members of the industry
- Establish integrated teams
- Adopt a whole life approach
- Design for construction and use
- Specify by output & outcomes performance
- Client users must get involved; don’t leave it to technical/procurement staff
- Integrate design/construct/maintenance and the teams
- Establish a review process based on feedback
- Keep teams going, partner and provide ongoing mentoring/ facilitation

2 Drivers for implementing alternative forms of procurement

The key drivers for change and implementing alternative procurement forms of procurement are committed leadership, the development of a customer focus strategy, project team integration, a focus on quality and a commitment to people (Egan, 1998). It has been suggested by Egan (1998) that committed clients should undertake demonstration projects to develop and illustrate alternative strategies and work practices. In Australia this occurred when the Federal Government used an alliancing contract for the procurement of the National Museum of Australia in Canberra (Hauck et al. 2004). Such demonstration projects should become a movement for change and innovation, but
unfortunately this has not been the case in this instance. More demonstration projects are required so that the benefits of alternative procurement practices and the subsequent innovations that arise can be presented to the wider community.

2.1 Who is likely to drive innovative procurement?

Recent research (Manly et al, 2009) indicates that certain industry groups are more likely to be ‘encouragers’ of innovation than others. Large/repeat clients, architects, engineers manufacturers building designers and main contractors are found to be the most likely ‘encouragers’ (59% - 43%), with quantity surveyors, funders, government regulators, letting agents and insurers as the least likely (38% - 26%). Other groups such as developers, project managers, one-off clients, trade contractors, other suppliers and organisations that set industry standards rank between the most likely and least likely groups (38% - 26%).

Research carried out for this report indicates that the client, designers (architects and engineers) and consultants can all be drivers of innovative forms of procurement but the client is seen as the likely main driver.

Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning the drivers of innovation. Results relating to this section are given below:

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**Exhibit 14 - SURVEY RESULTS**

**Drivers of Innovation**

- **You need commercial drivers to get people to want to innovate.**
- **Lack of understanding of performance requirements by client / decision makers.**
- **There is a perceived cost and a real cost. There are Short sighted views on cost.**
  - There may be an initial increase in capital cost but less ongoing costs.
- **Lack of information/data plus difficulty in persuading decision makers (tender committees) to agree what is value for money.**
- **In an alliance, you are continually having the discussion with the owner - ‘do you want to spend more up front and get a better outcome from a maintenance perspective?’**
  - With that open dialogue you can create a much better value for money outcome. It might mean they are quite prepared to spend less up front from a capital perspective and do a significant amount of maintenance over time. Or they might want to not have maintenance over time.
Exhibit 15 - SURVEY RESULTS

Drivers of Sustainable Procurement

- We can specify these [consumption] outcomes.
- Traditional D&C, or novation is the best to achieve sustainable outcomes.
- If you have flexibility in the design process than you can take benefit from that.
- The client will get the best price if they give correct documentation. Aiming for sustainable outcomes should make it possible to innovate.
- This is inherent.
- Office builders are providing the big push here as they are often the builders AND the building managers. They see the long term payback in their leases.
- Most contractors are pretty keen on avoiding unnecessary consumption e.g. minimise fuel bills. This makes it an innate incentive (rather than a barrier) to manage that.

Exhibit 16 - SURVEY RESULTS

Comments on the Drivers re. Innovation in Procurement

“I suspect this is according to each project”.

“It needs to come from the top down. Any bottom up push is tokenism”.

“They are all capable of driving innovation”.

“The client has the most powerful position in the food chain”.

“Clients and their advisors. They are often responding to legal firms”.

“[Innovation] is almost universally driven by the contractor”.

“We find generally now that consultants are the least innovative. They leave themselves behind in the knowledge base. They are concerned with superficial things”.

“Cost consultants do have a lot to bring to the table as they have a lot of experience, but are generally very conservative by nature”.

“[Designers] often objure their potential”.
2.1.1 Issues that need to be addressed regarding encouraging alternative approaches to procurement.

Traditional forms of construction procurement where the detailed design is largely completed before the main contractor, sub-contractors and specialist suppliers become involved, limit the opportunities for eliminating wasteful activities and achieving value for money. They should therefore only be used where there is a very clear case that they will deliver better value for money than a more innovative strategy. The primary consideration when developing an alternative procurement strategy is the need to embrace the following principles (Leeds City Council. Undated):

- Building quality into the evaluation processes to appoint the consultants and contractors.
- Avoiding waste and conflict through both the use of team working and partnering arrangements.
- Defining the project carefully at the outset to meet user needs.
- Using value management and risk management techniques.
- Taking account of whole life costs and sustainability.

The selection of an appropriate procurement method can reduce construction costs, (Gordon, 1994) enhance sustainability (KPMG, 2008) and the probability of project success. (Naoum, 1994; Luu, et al, 2005). While the adoption of an appropriate procurement approach may provide advantages in a number of critical areas including the ‘triple bottom line’ of people, planet, profit, there are a range of critical issues that need to be considered and addressed in the procurement selection process.

3 Learning needs and learning alliances

3.1 Lack of understanding of appropriate methods of procurement

It is clear that lack of understanding of procurement methods, strategies and systems can and does result in inappropriate procurement solutions and this lack of understanding is not specific to any one group involved in the process. (Naoum, 1994; Luu et al., 2005). While the client is likely to wield most influence in the choice of procurement route, the input of other key ‘players’ such as consultants, contractors etc can be significant.

It has been pointed out earlier that while professionals can be champions of change (Nam and Tatum, 1997; Slaughter 1998), professionals involved in procurement process are typically conservative and reluctant to implement change (Shields, 2005, 14-15). Similarly level of expertise and degree of experience would influence the learning needs of clients.(Nahapiet and Nahapiet, 1985)

For optimum outcomes therefore it is critical that all parties involved in the decision making process regarding procurement are fully aware of the issues and possible solutions.

Exhibit 17 - SURVEY RESULTS

<table>
<thead>
<tr>
<th>Education and training.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Innovation comes from informed clients&quot;.</td>
</tr>
<tr>
<td>&quot;There is little knowledge or exposure to corporate knowledge. We need a better understanding of the drivers&quot;. &quot;Especially for project managers&quot;.</td>
</tr>
</tbody>
</table>
3.1.1 The Client

There is a widely held view that in many cases clients knowledge regarding appropriate procurement strategies is lacking (ACEA. 2008; Scope For Improvement. 2006) and that inter-organisational learning could provide benefit in the procurement process (Davis et al. 2009; McGeorge and Palmer.1997)

Infrastructure Partnerships Australia (undated) has suggested that “To capture the experiences and learning of government in the procurement of infrastructure, IPA supports the establishment of a central repository of knowledge and skills in each state to manage the procurement of projects using a gateway process that tests the suitability of a traditional procurement and Public Private Partnerships. The gateway process is fundamentally directed at simplifying policy and procedures, and the achievement of greater and better quality upfront planning by agencies. The objective is to assist agencies to make appropriate and informed decisions, particularly in major procurements, without diminishing their accountability for outcomes.”

Parmar et al (2004) points out that “Owner education has always been an issue, and the owner’s low bid mentality and lack of education are perceived to be problems in the construction industry (Post, 2000). Project delivery systems, such as construction management-at-risk and various forms of design-build, have solved some problems and created others (Post, 2001). But the fact of the matter remains that the problems for owners, in terms of projects not being on-time, within budget, and not meeting quality expectations of the owners, have persisted.”

In Modernising Construction (2001) it is recommended that information regarding good practice is disseminate more widely. The report points out that the large purchasers of construction in the UK such as NHS Estates, the Ministry of Defence and the Highways Agency accept the need to improve their procurement and management of construction and have action underway. Other departments and agencies may only have a construction project every few years but most will have an on-going repair and maintenance programme. Many departments also fund building projects indirectly through grants, for example, the Department for Culture, Media and Sport covers a number of bodies which distribute funds for capital projects such as the Sports Council and Arts Council. The extent to which these smaller organisations and those receiving funding indirectly understand and apply good construction practice is variable.

The report points out that procuring and managing construction requires expert and specialist skills as reflected in the Treasury's Procurement Guidance number 1 which sets out the role and skills requirements of project sponsors. It recommends that more staff are trained to be effective construction clients. Additionally it points to the Office of Government Commerce, a training programme for project sponsors - those who represent the department as client in all relations with contractors.

Several reports have indicated that lack of owner understanding of critical issues leads to poor procurement solutions. In a recent report by Blake, Dawson (2009) of a survey concerning PPP’s, in relation to scope management (the client’s responsibility) 52% of respondents said that the project they were involved in was not adequately scoped by the time the project was submitted to the market. These issues were reflected industry wide, with the majority of respondents claiming the problem was getting worse.

Fig 20 below indicates that in 20% of projects, an inappropriate procurement delivery method was used. As this is mainly the clients’ decision it suggests a lack of understanding by the client.

Fig 21 below indicates that in 22% of projects clients were considered to be inflexible. While client inflexibility regarding delivery methods may be as a result of issues outside their direct control e.g.
because of financial restrictions, bureaucracy etc. the magnitude of the problem suggests that action is needed.

**Figure 20: Was it the most appropriate delivery method? (Blake Waldron Dawson. 2006)**

![Pie chart showing the distribution of responses to the question: Was it the most appropriate delivery method?]

- 73% Yes
- 20% No
- 6% N/A or don't know
- 1% Not answered

**Figure 21: If the contract meetings were not effective, why was this? (Blake Waldron Dawson. 2006)**

![Pie chart showing the distribution of reasons why contract meetings were not effective.]

- 27% Not the right people
- 22% Inflexible client/policy
- 3% Inexperience
- 8% Unrealistic expectations
- 14% Too many people
- 19% Not answered
- 8% Other
- 6% N/A or don't know
- 1% Not answered

*Love et al (2008) note that “The decision as to which procurement system to adopt is a complex and challenging task for clients of construction projects. Despite a plethora of tools and techniques available for selecting a procurement method, clients are still uncertain about what method to adopt for a given construction project to achieve success. They report that findings from workshops with senior managers in procurement selection from the Government sectors in WA and Queensland, “...revealed that traditional lump sum methods (TLS) are preferred even though alternative forms could be better suited for a given project. Participants of the workshops agreed that alternative*
procurement forms should be considered for projects but an embedded culture of uncertainty avoidance meant the selection of TLS methods. It was perceived that only a limited number of contractors operating in the marketplace have the resources and experience to deliver projects using the non-traditional methods.”

Love et al (2008) conclude from their research that despite the “plethora of tools” that “… no specific techniques have gained widespread acceptance, particularly by the organisation involved. While forms of ranking and weighting of specific client priorities against the attributes of a particular procurement method are used by public sector agencies in New South Wales and QLD, WA has used a more informal and intuitive approach based on the personal experience of the decision-maker. Because of an innate culture of uncertainty avoidance in WA, TLS methods are the norm and default unless otherwise directed through following a set of guidelines or a specific request is made by a Minister or the Department of Treasury or another agency is made.”

Love et al (2008) research identifies “…a particular need to develop a pragmatic framework that clients’ can use to select an appropriate procurement. A procurement framework should be able to guide the decision-maker rather than provide a prescriptive solution, which the author’s consider an appropriate strategy to undertake. Learning from previous experiences with regard to procurement selection will further provide clients with knowledge about how to best deliver their projects.”

3.1.2 Contractors / the supply side of the industry

While much of the above has focussed on client learning requirements it would be naive to believe that the supply side of the construction industry are fully versed in procurement strategies and systems. Love et al (2008) point out that during their research which focused on government clients there was a perception by those involved in the WA focus groups that the marketplace within WA (at least) does not have the management experience to effectively embrace innovative forms of procurement.

There is little published research on the learning requirements of the supply side of the industry. A number of reports, notably the Egan Report, has pointed to the need for more training in the industry.

McCabe (2004) in a report produced by the Strategic Forum for Construction, Accelerating Change (2002), suggests that there is an explicit recognition of the need to deal with, what are referred to as, ‘people issues’ One area that the group identified as being of particular concern, was the skills and ability level of people employed at all levels. In particular, it is stated that, ‘Significant shortages of supervisors and managers are anticipated and the industry remains grossly under-qualified’.

McCabe’s paper addresses how some construction organisations operating in the West Midlands region of the UK are “…using training and education initiatives and programmes to create an environment that will not only assist in achieving the target suggested by the members of the strategic forum, but will bring long-term improvement. These initiatives and programmes have developed in order to both provide useful tools and techniques for day-to-day management on site, but also to enable attendees to be willing to engage in reflective thinking and problem-solving. The result of such indicatives and programmes, it is anticipated, will develop ‘front-line’ managers with the capability to provide the sort of leadership and inspiration which, according to one managers interviewed, was driven out of the industry ‘a couple of generations ago’. the paper concludes, “…those companies which regard such training as an essential part of the development of both the organisation and individuals will be best placed to respond to the expectations contained in the so called ‘Egan Reports’.”

The Australian Procurement and Construction Council (2008) report that “…various training programs in procurement that have been developed by APCC members in Australia, of which most are based
on standards of competency within the Australian Qualifications Framework (AQF). In addition, Australian universities are progressively introducing degree-level and postgraduate procurement programs. The Chartered Institute of Purchasing and Supply (CIPS) provides an internationally recognised accreditation framework with its Member of the Chartered Institute of Purchasing and Supply (MCIPS) accreditation at the professional procurement standard. APCC is working with CIPS (Australia) to help grow the capability and professionalism of government procurement.”

3.2 Learning alliances (The following is based on recent research by Davis and Walker (undated))

According to Davis and Love (Undated) “Relationship based procurement leads to mutual benefit in construction business-to-business dealings and provides benefits over traditionally fragmented supply chains both within projects and across projects. ...Project alliances are a particular kind of relationship procurement system that rely on virtual organisations generating new knowledge enabling teams to solve interrelated problems in a complex environment.”

Artto and Wikström (2005: p349) who analyse firms undertaking projects through collaboration, view projects as being part of overall business and a central part of the development, strategic sight and maintaining of the firm’s competitiveness. They also state that “Project business is the part of business that relates directly or indirectly to projects, with a purpose to achieve objectives of a firm or several firms” (Artto and Wikström 2005: p351). This introduces the notion that chains of collaborators deliver projects through shared business interests.

This line of thought helps researchers understand why many organisations try to maximise their dynamic capabilities through leveraging their employees’ stock of knowledge and expertise to work with collaborating organisations to smoothly deliver value to their customers and clients. Thus, a crucial ingredient to an organisation having dynamic capabilities is its ability to tap into a rich form of collaborative advantage and optimise its wider supply chain’s stock of human capital (Nahapiet and Ghoshal 1998). Walker (2003) refers to this more broadly as a firm having a people infrastructure knowledge advantage (K-Adv) with human capital where human capital potential is combined with processes that help that human capital deployment (Walker 2005: p19-20).

If this train of thought is accepted then practitioners are led to reflect upon how various forms of alliances and project supply chain networks, that are highly relationship-based, can develop human capital as part of the project delivery process. This then becomes not just a PM issue but also a PM procurement issue because designing a procurement system that develops human capital could provide real strategic and competitive advantage to those involved. Recent work in linking intangible and implicit benefits such as this with more tangible and explicit outputs has provided a way of seeing project outcomes in a more holistic way (Nogeste 2006). Innovation may be introduced to construction projects in several ways including improved construction procurement approaches (Sidwell and Budiawan 2002). Much of the literature on procurement options such as alliancing, partnering and joint ventures stress the value of generating and building social capital that can reduce overall business transaction costs (see for example Walker 2003). Relationship based procurement approaches also tend to generate additional intangible assets; such as learning and improved joint problem solving (Walker and Maqsood 2008; Walker and Nogeste 2008). These assets focus upon teams finding more holistic solutions that better satisfy a broader range of constituencies.

3.2.1 Learning alliances through working collaboratively

Research carried out by Davis and Walker (2008) demonstrates that human capital be built from delivering projects using a relationship-based approach by offering an argument that collaboration
prompts the formation of projects teams becoming effective learning alliances. They point out that the literature suggests that effective supply chain management can contribute to this effort and can be further advanced through forming communities of practice (COP) that work together to deliver superior project delivery performance. They also contend that the development of human capital be measured and have developed framework which measures social (human) capital development. (See Appendix I for table outlining Social Capital Action Analysis Framework.

### 3.2.2 Knowledge Management

Knowledge has become the source of innovation, growth and performance improvement. Hence, in today’s world, it is absolutely critical to build, preserve and leverage organisational knowledge for learning and making organisational performance improvements (Allee, 1997; Lank, 1997). Effective knowledge management (KM) ensures people with needs can find people who can meet those needs within the organisation (Gourlay, 2001). It also ensures that the knowledge held by employees is amplified and internalised as part of an organisation’s knowledge base. (Olomalaiye et al, 2004)

The key objectives of organisations undertaking a KM activities programme can be summarised as the improvement of the performance of individuals, teams and organisations in order to innovate (TFPL, 1999 cited by Olomalaiye et al (2004).

Knowledge management also focuses on improved sharing of best practice, lesson learned, system engineering methodologies and the rationale for strategic decision making. Failure to capture and transfer knowledge leads to the increased risk of ‘reinventing the wheel’, wasted activity, and impaired organisational performance. (Egbu et al, 2003).

KM ensures that best practices and lessons learnt are available organisational wide. The goal is to (re)use this knowledge in order to prevent facilities managers from reinventing the wheel each time they need knowledge. This type of knowledge has been shown to result in cost savings of about 15 to 20 per cent (Tissen et al., 2000). This is imperative in improving the ability to reach targets of an organisation, i.e. the expected goals and objectives. Knowledge allows work to be carried out efficiently while employees’ expertise, skills and competencies can be used to do the work effectively. This in turn results in improving quality of the organisation. As the Quality Interagency Coordination Task Force (1999) (cited by Olomalaiye et al, 2004) affirms, quality means doing the right thing at the right time, in the right way, for the right person and having the best possible results/outcomes.

Knowledge management facilitates improved communication within teams to provide informed insightful advice to senior managers and top hierarchy of the organisation. Improving coordination and communication requires a no blame culture and KM can be used to create this ‘no blame culture’ through employee encouragement in sharing knowledge. This will provide an opportunity in achieving the following:

- mutual recognition and information exchange regarding objectives and planned outcomes
- improvement of skills and competencies which could ultimately lead to effectiveness and efficiency of practices of employees of the organisation
- avoid duplication of mistakes through sharing of experiences
- avoid gaps or repetition of work through effective communication (Olomalaiye et al, 2004)

### 3.2.3 The Creation of an ‘Appropriate’ Culture

Encouraging an ‘appropriate’ culture for KM within an organization is typically the most important and yet often the most difficult challenge. According to Olomalaiye et al (2004) "For KM to be successfully
implemented for improved performance there is a requirement for an organisational culture that constantly guides employees to strive for knowledge. KM is fundamentally about employees sharing their knowledge with each other and there should be an enabling organisational environment that ensures that these employees are comfortable about sharing what they know. This organisational culture ensures that there is a high degree of emotional safety that employees experience in their working relationship in an organisation. This is achieved through trust. Knowledge will only be transported across an organisation if employees have the necessary level of trust within and across the various teams. This trust, and its creation, has been called the most vital prerequisite of knowledge exchange because it involves vulnerability e.g. reputation, self-esteem, etc. Vulnerability and the need for trust are higher where tasks are interdependent. ... The organisational culture should be such that there is an expectation that knowledge is part of employees' job, a 'no-blame' culture when mistakes are made, celebration of accomplishments and positive attitude towards change."

In-house Training

Olomolaiye et al (2004) stress the need for an organisation-wide policy to increase KM proficiency through training. The aim of training is to change behaviour at the workplace in order to stimulate efficiency and higher performance standards (Cowling and Mailer, 1990, cited by Olomolaiye et al, 2004). Training programs yield many direct benefits such as enhanced problem-solving skills, a more competent and efficient workforce, fewer recruitment problems in obtaining qualified employees and fewer problems with employee relations. Training program also communicate to employees that the organisation is concerned about their wellbeing (Wells and Spinks, 1996). Training can be on-the-job training or in the classroom/in training facilities by instructors. Training on-the-job or in-house is highly favoured by the Japanese because its emphasis is on demonstration, learning by doing and imitating the teacher. The employee works, learns and develops expertise at the same time. Much of the learning can take place naturally through day-to-day contacts (Armstrong, 2003). This is very useful in training employees in those competencies which are required if the organisation is to use knowledge as a means of production. The three most important competencies that employees have to learn and be trained in are (Tissen et al., 2000):

1. Competencies that help us learn from information
2. Competencies that help us improve our thinking and
3. Social competencies that help us interact better with our colleagues and the world around us.

Empowerment

Olomolaiye et al, (2004) affirm that "The culture of empowerment can be related to the development among organisations to reduce hierarchical formation, which inevitably leads to more decisions being made at lower levels of the organisation (Clegg, 1990; Skyles et al, 1997 cited by Olomolaiye et al, 2004)). Empowerment represents a shift towards a greater emphasis upon trust and commitment in the work place which involves the devolution of various degrees of decision-making power and responsibility (Pastor, 1997). Empowerment promotes improved productivity and quality, leads to better utilisation of skill and innovative capabilities, greater job satisfaction, breed organisational loyalty, reduce operating costs, allows greater flexibility, and improves motivation (Swenson, 1997; Mullins and Peacock, 1991; Sashkin, 1984). Empowerment can be applied at the individual, group and organisational levels – either separately or all together (Nonaka, 1994)."

Giving employees their autonomy presents a peculiar challenge to organizations. On one hand, organizations that are committed to implementing KM want employees to behave autonomously and to be co-operative so that they can share their knowledge with each other and the organization. On
the other, they want to ensure that this autonomy is employed for the benefit of the organization and not for slacking or chasing the employee’s personal goals (Newell et al., 2002).

**360-Degree Feedback**

360-Degree Feedback is a multi-source assessment or multi-rater feedback. This involves collecting performance data of an individual employee or group and it is normally derived from a number of stakeholders (Ward, 1995, cited by Olomalaiye et al, 2004). The data collected is usually fed back in the form of ratings against various performance dimensions (Armstrong, 2003). The benefits of this are that individuals get a broader perspective of how they are perceived by others than previously possible, increase awareness of and relevance of competencies, increase awareness by senior management that they too have development needs, encouraging more open feedback and provided a clearer picture to senior management of individual’s real worth.

This process is crucial to the success of KM because it has the active support of top management who themselves take part in giving and receiving feedback and encourage all employees to do the same. Also a culture of openness and communication is reinforced by ensuring that no one feels threatened by the process. This is usually achieved by making feedback anonymous and/or getting a third-party facilitator to deliver the feedback. The challenges to this process are lack of action following feedback, over-reliance on technology and too much bureaucracy. But this can always be minimized by communication, training and follow-up (Armstrong, 2003).

Knowledge management can be used to deliver sustained achievements to organisations by improving the performance of the people who work for them. This might involve:

1. Raising the awareness among the employees and encouraging them to share knowledge
2. Clear guidelines and policies to guide the employees towards an integrated environment of core services
3. Instigating a suitable performance management approach
4. Proper feedback mechanisms to inform employees as well as the top management. (Olomalaiye et al, 2004)

**Performance Management and Benchmarking**

Olomalaiye et al (2004) assert that “Performance Management (PM) is essential to achievement of the desired results of an organisation.” Performance refers to accomplishments of doing the work as well as being about the results achieved and this need to be managed. Selection of suitable performance measures to reflect the actual levels of performance of the organisation can be considered as one of the challenges. It is critical to select appropriate aspects to be measured rather than choosing what is easy to measure. This will require a proper benchmarking system.

Benchmarking is a structured and focused approach for comparing with others how organisational services are provided and the performance levels achieved. The purpose of the comparisons enables organisations to identify where and how they can do better. Having an unsuitable benchmarking system can result in taking incorrect judgements and can eventually result in compromising the quality of the organisational services. The inclusion of PM provides an opportunity to achieve the following:

- Measure progress towards achieving organisational objectives and targets
- Promote benchmarking practices in order to compare performance with the past levels of performance and among organisations
- Promote service improvement through corrective actions.”
4 Scope management

The Guide to the Project Management Body of Knowledge (PMBOK) "Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It is primarily concerned with defining and controlling what is or is not included in the project."

4.1 Poor scope management is a major problem

Key findings in a report of a recent survey carried out by Blake, Dawson (2009) indicate that there is a high prevalence of deficient scoping. 52% of respondents said that the project they were involved in was not adequately scoped by the time the project was submitted to the market. These issues were reflected industry wide with the majority of respondents claiming the problem was getting worse.

As well as an increase in deficient scoping, the majority of scoping inadequacies (64%) were discovered far too late in the life of a project rather than being identified at the more manageable phase before contracts are signed.

There are significant consequences for inadequate scoping. More than 60% of respondents said that inadequate scope documents resulted in a cost overrun, with more than half of those overruns costing more than 10% of the value of the project and a third more than 20%. There was also a high frequency of disputes and delays to projects which were attributed directly to poor scoping, with almost half of the respondents who reported a delay saying it lasted for at least four months. The unifying aspect of each of these effects is inefficiency in the delivery of various projects in Australia.

Reasons for poor scoping (Blake, Waldron, 2009)

There are a range of reasons for poor scoping identified in the report including:

- Lack of experienced and trained personnel who can prepare scoping documents.
- Insufficient time to properly prepare scoping documents.
- Inadequate definition by Principals of required outcomes for projects.
- Incomplete scoping documents, including lack of coordination between, and errors in, those documents.
- Lack of consultation with end users. Where end users were not engaged, respondents considered their projects to be properly scoped only 20% of the time.

4.2 Improving Scope Management

According to the UK Office of Government and Commerce (2003), what clients need to be able to do is:

- be able to define clearly what they want
- be aware of the market and negotiate deals that are justified on whole life value
- know how the industry works, collecting market intelligence and regularly carrying out market research
- know the major players, establish who regularly works well with whom and get to know the specialist suppliers
- develop more effective arrangements to build up and share knowledge about the performance of particular suppliers and the construction market generally, so that decisions about the appointment of suppliers are better informed.
In addition to the above, the following principles developed as a guide by the Australian Procurement and Construction Council (2007) to public sector organizations when considering the issue of sustainable procurement strategies are worthy of broader consideration:

1. Develop strategies to avoid unnecessary consumption and manage demand;

2. In the context of whole-of-life value for money, select products and services which have lower environmental impacts across their life cycle compared with competing products and services;

3. Foster a viable Australian and New Zealand market for sustainable products and services by supporting businesses and industry groups that demonstrate innovation in sustainability; and

4. Support suppliers to government who are socially responsible and adopt ethical practices.

These principles are further explored below.

**Principle One**

*Adopt strategies to avoid unnecessary consumption and manage demand.*

*Implementation activities include:*

- Assess the need for a given purchase and, whenever possible, reduce consumption through demand management initiatives.
- Consider the alternatives to purchasing the product: reuse, refurbish or recondition the product or its components to extend its life.
- Consider acquiring second-hand or used items.
- Consider alternatives to acquisition, such as introducing service options to meet a need.
- Consider the on-going service requirements of any product to be purchased.
- Investigate the possibility of aggregating demand amongst multiple users, to achieve better usage of assets.
- Consider the establishment of management systems to monitor and report consumption levels.
- Adopt flexible work practices and service arrangements that take into account energy and resource efficiencies that balance out peak environmental demand situations.
- Collaborate with service providers to reduce consumption and implement demand management strategies.

**Principle Two**

*In the context of whole-of-life value for money, select products and services which have lower environmental impacts across their life cycle compared with competing products and services. Implementation activities include:*

- Adopt a life-cycle (or total cost of ownership or whole-of-life) costing approach to quantify the ‘total cost’ of procuring products including operational performance, as opposed to only taking into account the initial cost.
- Ensure that decisions on sustainable values of products and services are evidence based.
- With all factors being equal in the purchase of a product, choose a product with the least environmental impact.
- Use of Australian Standards and New Zealand or International Standards Organisation (ISO) standards (where appropriate) to verify the sustainability credentials of a supplier and a product.
- Consider the environmental management practices of the supplier/manufacturer. Refer to benchmarking environmental management programs where practicable, such as Enviro-Mark NZ and ISO 14001.
• Refer to eco-labelling programs and government labelling programs to assist in assessing the environmental performance of products (Energy Star, Energy Rating Label, Water Efficiency Labelling Scheme, Environmental Choice New Zealand).
• Give preference to products that are reusable, recyclable and/or contain recycled content where such products fit the purpose, provide environmental benefits and are of comparable cost and quality to alternative products.

**Principle Three**

Foster a viable Australian and New Zealand market for sustainable products and services by supporting businesses and industry groups that demonstrate innovation in sustainability.

**Implementation activities include:** Environmental Stewardship

• Adopt approaches to product design, production and manufacturing that include a whole-of-life assessment.

• Adopt a whole-of-life approach to building design, construction and building operation that reduce environmental impacts, and where relevant apply environment and ecologically sustainable design principles.

**Encourage suppliers to:**

• Adopt design, manufacturing, production, distribution and service processes that reduce the use of resources (energy, water) reduce greenhouse gas emissions; minimise the release of toxic substances; and minimise waste disposal to landfill.

• Be responsible for end-of-life product impact through extended producer responsibility programs and take part in available government approved product stewardship schemes.

• Become signatories to, and participants in, national commitments and government programs to improve environmental sustainability; for example, the Australian National Packaging Covenant and the Australian Greenhouse Challenge, the New Zealand Packaging Accord and the New Zealand Waste Strategy.

• Work together with their supply chain partners to adopt environmental management systems to track progress towards environmental stewardship by reporting on the sustainability of their operation.

**Market Development**

• Identify industry capability, particularly of Australian and New Zealand SMEs, in all major areas of procurement for sustainable goods and services, consistent with the obligations under Free Trade Agreements.

• Establish specifications and procurement processes that do not restrict innovation or disadvantage local suppliers of sustainable solutions and encourage the commercialisation of environmental initiatives created under contract.

• Support and stimulate long-term relationships with suppliers that adopt sustainable practices.

• Encourage a philosophy and practice of continuous improvement and innovation in sustainability by suppliers.

• Collaborate with all spheres of government, industry and business to stimulate a market for sustainable products and services.

• Support initiatives that promulgate the awareness and procurement of sustainable products and services.

**Principle Four**

Support suppliers to government who are socially responsible and adopt ethical practices.

**Implementation activities include:**

Require suppliers to:

• Demonstrate a commitment to ethical behaviour and sound governance structures and processes.

• Meet their employment obligations as required by relevant legislation and other related instruments.
• Consider relevant government employment policy objectives that relate to particular community sectors, including apprentice training, opportunities for disabled or injured workers returning to work, Aboriginal and Torres Strait Islander people, etc, consistent with international obligations on government procurement.
• Comply with applicable regulatory and legislative requirements of occupation health and safety.

5 Procurement Selection Criteria (From Davis et al 2008)

A primary issue that often is raised within the construction industry relates to what clients want in order to be satisfied with their buildings and the means by which those buildings have been procured. Consequently, it is important to evaluate the clients’ criteria, their importance and then seek performance to match the criteria. All clients require their buildings to be completed on time, within budget and to the highest quality. However, some clients stress that certain criteria are more important than others.

Conventional procurement selection criteria are based around the concepts of time, cost and quality (Rowlinson, 1999b). While the use of such criteria can be used as a guide to assist decision-makers with an initial understanding of the basic attributes of a particular procurement system they should not be used as a basis for selecting the procurement method. This is because of the underlying complexity associated with matching client needs and priorities with a particular method (Kumaraswamy and Dissanayaka, 1998).

The New South Wales Department of Commerce (2006) states that an appropriate procurement method for a project will depend on the characteristics of the project, the factors that impact its delivery and the desired risk allocation and as a result the appropriate selection will provide value for money, manage risk, meet project objectives.

5.1 Determination of selection criteria

NEDO (1985) identified nine criteria that clients could use to select their priorities for projects. These are:

1. **Time**: is early completion required?
2. **Certainty of time**: is project completion of time important?
3. **Certainty of cost**: is a firm price needed before any commitment to construction given?
4. **Price competition**: is the selection of the construction team by price competition important?
5. **Flexibility**: are variations necessary after work has begun on-site?
6. **Complexity**: does the building need to be highly specialised, technologically advanced or highly serviced?
7. **Quality**: is high quality of the product, in terms of material and workmanship and design concept important?
8. **Responsibility**: is single point of responsibility the client’s after the briefing stage or is direct responsibility to the client from the designers and cost consultants desired?
9. **Risk**: is the transfer of the risk of cost and time slippage from the client important?

The aforementioned criteria have been used in to compare the procurement systems identified. In addition, several studies, such as those identified in (Appendix E), have used modified versions of the NEDO criteria in an attempt to develop a selection framework. In the ‘time’ and ‘certainty of time’ criteria have been consolidated as they are similar in nature.
Rowlinson (1999a) has argued that the concept of cost certainty is a fallacy in the context of traditional approaches that are based upon full drawings and bills of quantities. This approach should provide a client with a firm, fixed price for construction but in practice very few projects are actually completed within the tendered price (Rowlinson, 1999a; Love, 2002). Complete drawings and BoQs are generally not available when a projects goes to tender. Rowlinson (1999a:p.49) therefore asks why do clients continue to use this method when it can be argued that it leads to:

- a lack of flexibility;
- a price to pay in terms of claims-conscious behaviour;
- the fallacy of cost certainty; and
- a release of control by the client organisation

Hibberd and Djebarni (1996) identified the variables of accountability, design input, dissatisfaction with the previous process used, knowledge of the process, predictable cost, punctuality, speed of commencement, speed of completion, transference of risk, and working relationships. Kumaraswmay and Dissanyaka (1998) and Luu et al. (2003) undertook an extensive review of the normative literature and identified the key criteria that were considered by clients when selecting a procurement method. In the criteria identified by Kumaraswmay and Dissanyaka (1998) and Luu et al. (2003) are listed along with those used by The New South Wales Department of Public Works (2005). It can be seen the criteria identified are different in nature. The major challenge for clients when selecting a procurement method is identifying the criteria for the project, but the question is that if projects are different in nature and clients’ needs are constantly changing due to internal and external demands, would the same criteria be applicable for all projects? The weighting for criteria will invariably change as would the criteria type.

Luu et al. (2003) state that the use of a limited number of factors such as those identified by NEDO (1985) may give rise to the selection of a sub-optimal procurement system. Since the selection of a procurement system is influenced by client characteristics (Moshini and Botros, 1990), project characteristics (Ambrose and Tucker, 2000), and the external environment (Alhamzi and McCaffer, 2000), procurement selection criteria representing the constraints imposed on the project should be considered before a decision is made. Building on their review of selection criteria, Luu et al. (2003) empirically identified a set of interrelated factors that need to be taken into account during the procurement selection process. The bases of these criteria have been used to develop decision support systems that will be described (Appendix G) (Luu et al. 2005).

The project characteristics identified by Luu et al. (2003) as being key factors influencing procurement selection were project type, project size, and building construction type. The New South Wales Department of Commerce (2006) provide a more comprehensive list of project characteristics and constraints that must be considered when selecting a procurement method for a specific to the project (See Appendix H). The selection of an appropriate procurement method can be effective in mitigating the risks inherent in a project. However, it should be noted that the contract itself will assign and allocate the risk and responsibilities of parties involved in a project.

6 Selection of procurement strategy (From Davis et al/2008)

The efficient procurement of a building project through the choice of the most appropriate procurement strategy has long been recognised as a major determinant of project success (Bennett and Grice, 1990) and a failure to select an appropriate procurement approach as the primary cause of project dissatisfaction (Masterman, 1996). The selection of a procurement method is more than simply establishing a contractual relationship as it involves creating a unique set of social relationships whereby forms of power within a coalition of competing or cooperative interest groups are established.
Differing goals and objectives and varying degrees of power within a project team are often the underlying conditions for triggering adversarial relations (Love et al., 2004).

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.
Define project specification with tender documents, estimate and tender evaluation plan for each contract.

Call/close evaluate tenders for each contract and recommend/approve/engage best project suppliers.

Project implementation with supplier(s) carrying out contract work and asset delivery

Asset operation/maintenance and then disposal after supplier(s) completes asset delivery.

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 integrate 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.

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).

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 construction 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 (Mortledge 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.

Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning selection of procurement strategy. Results relating to this section are given below:

**Exhibit 18 - SURVEY RESULTS**

**Selection of Procurement Strategy**

Early involvement of contractors.

“*This would allow much better judgements to be made*."

“*If you involve contractors early you will have a higher probability of success*.”

Reasonable (or proper) risk allocation.

“*Develop an issues paper with [operational, financial and political scenarios] listed, and work from there to manage risks*."

“*As contractors, we can only take on risks we can be rewarded for*.”

Senior management commitment to creativity.

“*We need to think we are building things for 100 years, not 20*.”

Approaching the market at the right time.

“*i.e. not too early and when specifications are sorted out*”

Streamlining bureaucracy.

“*There needs to be simple processes for simple projects*.”

Honesty in contracting.

More emphasis through relationship contracting.

Set project objectives early, before the selection of a procurement process.

“*If due diligence is done on design, the project will succeed*.”

More alliancing.

Get good legal advice.

### 6.1 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.
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; Mortledge 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 if 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.

## 7 Selection of project teams

In the Foreword to Modernising Construction (2001) Sir Michael Latham notes that “The central message of "Constructing the Team" in 1994 was that the client should be at the core of the construction process. The general route recommended to achieve client satisfaction was through team work and co-operation.”

The three most significant recent reviews regarding selecting the construction team emanate from the UK. The recommendations are relevant to Australia. The following extracts regarding the above reports and the following recommendations are taken directly from Modernising Construction (2001):

**Constructing the Team - Sir Michael Latham (1994).**

This report sought the views of contractors and key private and public sector clients. It proposed a clear action plan with timescales and nominated people to implement its recommendations. It concluded that if its recommendations were implemented, there was the potential to achieve efficiency savings of 30 per cent over five years in total construction costs. It asserted that implementation must begin with the client and recommended that the Government commit itself to becoming a best practice client.
Following the Latham Report, the Cabinet Office initiated an Efficiency Scrutiny into Government procurement of construction which concluded that departments and agencies were partly to blame for the poor performance of the industry. The scrutiny found that departments: were often unrealistic about budgets or timetables; had an over simplistic view of competition; often failed to understand and manage risks; and were not organized so that industry had a single contact with whom they could discuss and resolve common problems across a number of departments and agencies.

By 1997, the recommendations of the Latham report had been largely implemented either as a whole or in part. But progress in achieving improvement in the performance of the construction industry was perceived to be slow by private sector clients and government departments. As a result a number of new initiatives were put in train, the most significant of which was the establishment of the Construction Task Force led by Sir John Egan. The task force's remit was "to advise the Deputy Prime Minister from the clients' perspective on the opportunities to improve the efficiency and quality of delivery of UK construction, to reinforce the impetus for change and to make the industry more responsive to customers' needs". The task force's report saw a need for "a change of style, culture and process". To this end, it identified five "drivers" which needed to be in place to secure improvement in the construction industry; four key processes which had to be significantly enhanced; and set seven quantified targets for the level of improvements to be achieved. These targets included annual reductions in construction costs and delivery times of 10 per cent and reductions in building defects of 20 per cent a year.

The key recommendations from ‘Constructing the Team’ (1994) relevant to Australia are:

- Legislative changes to simplify dispute resolution and ensure prompt payment.
- The establishment of a single organisation to bring together all sections of the industry and clients, - resulted in the establishment of the Construction Industry Board which was set up to implement, monitor and review the recommendations from the report. It was the first organisation to have membership from all sectors of the industry and clients. The formation of a separate group representing clients was also a report recommendation and led to the Construction Clients Forum.
- The publication of a wide variety of guidance, checklists and codes on best practice in various aspects of the procurement, design and construction processes – the Construction Industry Board and other bodies have done this.
- The establishment of a single central public sector register of consultants and contractors – this has resulted in the establishment of ConstructionLine - a central qualification database of contractors and consultants run by a public/private partnership with a Government steering group.
- The need for more standardisation and effective forms of contract, which address issues of clarity, fairness, roles and responsibilities, allocation of risks, dispute resolution and payment this has resulted in the redrafting of the main forms of contract such as “Government Contract (work)".

7.1 **Different approaches to selecting contractors**

'Modernising Construction' (2001) outlines the following examples (from the UK) of different approaches to selecting contractors:
Balancing quality and price - The Highways Agency
In awarding Design and Build contracts, the Highways Agency evaluates tenders on quality and price, the key elements of which are:

- The Agency gives different weightings to quality and price depending on the complexity of the project, for example, for innovative projects the split is 40 per cent on quality and 60 per cent on price, whereas for repeat projects or where a standard design can be used, the split is 20 per cent on quality and 80 per cent on price.
- For each project, the Highways Agency determines the key quality aspects to be assessed, for example, innovative approaches to solving issues such as embankments on motorways, and promoting health and safety.
- Tenderers have to submit the quality and price elements of their bids in separate envelopes. The quality tenders must be at or above a pre-determined threshold before the price tender is considered.
- The system will ensure that in the future only contractors who can demonstrate that they can construct roads of the right quality and within budget will be selected.

Benefits secured –

The Highways Agency is able to give greater consideration to the quality of the final construction. It also means that contractors have more incentive to put forward innovative designs and cover longer term aspects, such as the whole-life costs of roads and environmental impact, because they are aware that price will not be the only criterion by which their tender will be judged.

Integrating design and construction - Defence Estates
Defence Estates’ approach is to appoint a prime contractor who will manage both the design and construction to deliver a building fit for its specified purpose. Selection of prime contractors is based on an assessment of hard issues (a weighting of 60 is given) and soft issues (weighting is 40). A strong emphasis is placed on the Prime Contractor’s ability to integrate and manage his supply chain and on the through-life costs of the facility.

Hard issues include financial stability, technical competence, price, health and safety record, fraud prevention and supply chain management.

Soft issues include ability to manage costs, understanding of the Ministry of Defence culture, attitude to value management, market awareness, quality of ideas, willingness to share risk, concept of trust, flexibility and clearly thought through strategy for working with the client and supply chain. These issues are given a numerical score to reflect their relative priority, for example, if the contractor has no strategy for working with the client and suppliers zero will be awarded; if they consider such a strategy is essential and actively pursued, a mark of five is given.

Selection will follow a normal three stage tender process (i) advertisement through the Office Journal of the European Communities, (ii) prequalification questionnaire and (iii) invitation to tender. During this last stage, tenderers will be asked to submit proposals against an output-based specification, for example, barracks for 40 soldiers in single room accommodation, and to state indicative costs. Interviews will take place to test the quality of proposals and ability to deliver. At the end of this process, Defence Estates will select a preferred bidder and commence negotiations on the technical solution and commercial issues and when these are satisfactorily completed the contract will be awarded.

Benefits secured –
Defence Estates is able to select contractors who have a proven ability to manage both design and construction and who have demonstrated an ability to manage their supply chain. In addition, the selection process puts considerable emphasis on contractors demonstrating the quality of their work and ability to design a building based on a specification framed in terms of the outputs which the building is intended to deliver. Greater emphasis is also put on considering the through-life costs of the building.

**Reducing the number of contractors and developing longer term relationships - The Environment Agency**

Having a large number of low to medium value contracts with a large number of construction firms can be inefficient, as a considerable amount of effort has to be invested in managing contractors and monitoring quality. The Environment Agency is therefore seeking to raise the average financial value of the contracts which it awards, to reduce the number of contractors which it employs, and to build longer term relationships with a smaller group of contractors.

The aim of a longer term relationship is that the contractors should understand the Agency’s needs better, so that quality is enhanced and learning curves can be reduced. Having established a longer term relationship, contractors have more incentive to work with departments and agencies to improve quality and reduce costs because they have some assurance over future business. The Environment Agency uses the following selection criteria to gain assurance as to the reliability and performance of a contractor with whom it may wish to develop a longer term relationship:

- **questionnaires** covering a range of subjects such as the company’s financial performance, company policies on staff, health and safety, and its supply chain;
- **references and the Agency’s own experience** of working with the supplier: references will be sought from other clients on a confidential basis as to the broad strengths and weaknesses of the supplier, their behaviour and response to problems and contractual issues, ability of their staff to work as a team and ways in which they have added value and reduced processing costs;
- **visit by an Agency team** to suppliers’ premises and selected projects to substantiate questionnaire responses and to observe their systems and staff in operation;
- **presentations and interviews** to allow assessment of the capabilities of individual team members and their understanding of the Agency’s priorities.

**Source:** National Audit Office analysis (cited in ‘Modernising Construction’ (2001)).

**Benefits secured –**

The Environment Agency is able to gain greater assurance as to the likely quality and performance of contractors with whom it may decide to enter into longer term relationships.

## 8 Sustainability and considerate construction

Sustainable procurement strategies and considerate construction are interlinked and interdependent. Both require a considerate approach to the environment, society and the economy by minimizing the impact of construction operations while achieving acceptable economic outcomes for the parties involved in procuring and constructing.

### 8.1 Definitions

The following definitions are extracted from the APCC Australian and New Zealand Government Framework for Sustainable Development (2007):
Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable procurement is a process whereby organisations meet their needs for goods, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organisation, but also to society and the economy, whilst minimising damage to the environment.

Sustainable procurement considers products and suppliers. This includes issues such as: resource extraction and consumption; manufacturing and production; transport and logistics; product and asset design; use and maintenance; recycling and disposal options; employee rights and conditions, corruption, unfair competition and ethical behaviour.

The APCC (2007) points out that when buying goods and services organisations practicing sustainable procurement will consider:

• strategies to avoid unnecessary consumption and manage demand;

• minimising environmental impacts of the goods and services over the whole of life of the goods and services;

• suppliers’ socially responsible practices including compliance with legislative obligations to employees; and

• value for money

8.2 Considerate construction

The ‘Considerate Constructors Scheme’ is a UK national initiative, set up by the construction industry to improve its image. Any work that could be construed by the general public as ‘construction’ can be registered with the Scheme, providing it has a duration longer than six weeks. When monitoring sites, the Scheme considers all those involved in the construction process, from the local authority and the client, to the operatives and delivery drivers. Sites that register with the Scheme are monitored against the eight point Code of Considerate Practice, designed to encourage performance beyond statutory requirements and commits those contractors in the Scheme to be considerate and good neighbours, as well as clean, respectful, safe, environmentally conscious, responsible and accountable. The Scheme covers all construction activity within the UK.

The Code of Considerate Practice forms the basis of all the Scheme’s requirements. It includes the following:

Considerate
All work is to be carried out with positive consideration to the needs of traders and businesses, site personnel and visitors, and the general public. Special attention is to be given to the needs of those with sight, hearing and mobility difficulties.

Environment
Be aware of the environmental impact of your site and minimise as far as possible the effects of noise, light and air pollution. Efforts should be made to select and use local resources wherever possible. Attention should be paid to waste management. Reduce, reuse and recycle materials where possible.
Cleanliness
The working site is to be kept clean and in good order at all times. Site facilities, offices, toilets and drying rooms should always be maintained to a good standard. Surplus materials and rubbish should not be allowed to accumulate on the site or spill over into the surroundings. Dirt and dust from construction operations should be kept to a minimum.

Good Neighbour
General information regarding the Scheme should be provided for all neighbours affected by the work. Full and regular communication with neighbours, including adjacent residents, traders and businesses, regarding programming and site activities should be maintained from pre-start to completion.

Respectful
Respectable and safe standards of dress should be maintained at all times. Lewd or derogatory behaviour and language should not be tolerated under threat of severe disciplinary action. Pride in the management and appearance of the site and the surrounding environment is to be shown at all times. Operatives should be instructed in dealing with the general public.

Safe
Construction operations and site vehicle movements are to be carried out with care and consideration for the safety of site personnel, visitors and the general public. No building activity should be a security risk to others.

Responsible
Ensure that everyone associated with the site understands, implements and complies with this Code.

Accountable
The Considerate Constructors Scheme poster is to be displayed where clearly visible to the general public. A site’s contact details should be obvious to anyone affected by its activities.
(Considerate Constructors. 2009)

Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning sustainability and considerate construction. Results relating to this section are given below:
Exhibit 19 - SURVEY RESULTS

Drivers of Sustainability

- To be truly sustainable, the principle designer has to be able to understand and drill in with the engineer, not simply focus on how it looks.
- Having informed and enlightened clients.
- Traditional D&C, or novation is the best to achieve sustainable outcomes.
- If you have flexibility in the design process than you can take benefit from that.
- Aiming for sustainable outcomes should make it possible to innovate.
- Office builders are providing the big push here as they are often the builders AND the building managers. They see the long term payback in their leases.
- Most contractors are pretty keen on avoiding unnecessary consumption e.g. minimise fuel bills. This makes it an innate incentive (rather than a barrier) to manage that.
- Longer term contracts are positive for sustainability, short term contracts are driven by cost.
- Relationship contracting is positive for sustainability.

Value for money

- You need commercial drivers to get people to want to innovate.
- Lack of understanding of performance requirements by client / decision makers.
- There is a perceived cost and a real cost. There are Short sighted views on cost. There may be an initial increase in capital cost but less ongoing costs.
- Lack of information/data plus difficulty in persuading decision makers (tender committees) to agree what is value for money.
- In an alliance, you are continually having the discussion with the owner - 'do you want to spend more up front and get a better outcome from a maintenance perspective?' - With that open dialogue you can create a much better value for money outcome. It might mean they are quite prepared to spend less up front from a capital perspective and do a significant amount of maintenance over time. Or they might want to not have maintenance over time.
Exhibit 19 - SURVEY RESULTS

General Comments

- There is nothing from industry impeding sustainable outcomes. More green star stock is held now than 3-4 years ago.

- Sustainability is essentially carried out on emotional grounds.

- A major influence is being at the whim of Chief Financial Officers who don’t generally understand sustainability as well.

- The accounting period involved can be important, as is the level of commitment from senior management.

- The tenant fitout objectives can work for or against sustainability of a base building project.

- Look at the green star rating points, 40% has to do with how it looks and 60% with how it is managed.

- I would like to see research done on the effect of an emissions trading scheme on the cost of materials. Will it change cost drivers to make sustainability a higher (or lower) priority.

- Economic climates can have an impact

- Safety is always an issue.

- Don’t forget politics.
9 Tools and techniques for selection of procurement system (From Davis, P., et al. 2008)

Despite the difficulties associated with procurement method selection a number of structured methodologies, tools and models have been developed. The approaches developed range from simple (Franks, 1990) to highly complex (Kurmaraswamy and Dissanayka, 1998; Cheung et al., 2001). It is important, however, that method selection is done logically, systematically, and in a disciplined manner by the clients’ principal adviser (Love et al., 1998).

The range in choice of procurement system is now so wide and projects are becoming so complex that the selection process needs to be carried out in a disciplined and objective manner within the framework of the client’s overall strategic project objectives. For example, the Royal Institute of Chartered Surveyors (RICS) produced a handbook that provides a guide for clients and their advisors with a code of procedure to assist them with selecting an appropriate procurement strategy for a construction project (RICS, 2000). The guide is intended to be used as a prompt and focus for the issues to be addressed during the development of a procurement strategy. The strategy is developed from an assessment of client needs and project characteristics. A best fit solution is sought, with an informed client making the decision based on a thorough evaluation of their objectives and the risks involved.

Love (1996) reported that a well established and prominent Australian project management organisation selected procurement methods for their clients using a systematic first-principle analysis, by:
- defining the project;
- determining the project needs;
- establishing a program;
- designing a delivery structure to meet the project needs;
- allocating responsibilities within the project structure; and
- establishing a method of appointing for the various participants involved.

Hibberd and Basden (1996) suggest that a contractual arrangement initially should be selected so as to take into consideration how risk will be transferred between parties, therefore determining the nature of the procurement method so as to fulfil the client’s objectives. In essence, Hibberd and Basden (1996) suggest that risk is the prominent criterion that will determine the selection of a procurement method.

Many of the procurement selection systems developed (e.g., NEDO, 1985; Skitmore and Marsden, 1988, Moshini and Botros, 1990; Ambrose and Tucker, 2000; Cheung et al., 2001) ignore an array of factors, are limited in the options available for consideration, are conditional and not widely applicable, and simply not user friendly (Alhazmi and McCaffer, 2000). While all the systems identified have their merits they tend to be too prescriptive and fail to recognise the complexity associated with the selection process. Often there are many stakeholders that need to be involved in the selection process and decisions are dependent upon the interaction of many variables that incorporate a high degree of subjectivity and intuitive judgement (Morledge et al. 2006).

Many of the systems developed have not been tried and tested in practice over a period of time so as to determine if the method selected was able to produce a successful outcome for the client. There are, however, examples where systems have been developed and tested for one-off projects. Al-Tabtabi (2002) developed a procurement selection system using an analytical hierarchy process for the procurement of the Kuwait University Expansion Program worth approximately US$427 million, which comprised of 40 design and construction work packages.
Fundamentally, the major difficulties associated with procurement selection include:

- no single person or knowledge ‘czar’ has been found who is familiar with all primary procurement methods (Hamilton, 1987);
- no consensus has been found between experts which easily systemises procurement selection; and
- no mutually exclusive sets of criteria uniquely and completely determine the appropriate procurement method for a specific project (Ireland, 1985).

Details of various procurement selection systems and tools are provided in Appendix C.

### 9.1 Conclusion regarding tools and techniques for selection of procurement system

A plethora of tools and techniques have been developed to determine an ideal procurement method for a specific project. No specific techniques has gained widespread acceptance. However, forms of ranking and weighting of specific client priorities against the attributes of a particular procurement method is the most popular technique that have emerged from the review undertaken. While pragmatic and easy to use, this technique is deemed to have many flaws as specific characteristics of the client, project, and external environment are often not taken into account. Notwithstanding this, the determination of ‘generic’ client criteria is deemed to be the most difficult task in procurement selection process. Criteria such as NEDO have been used extensively, but have been identified as being fuzzy in nature and doubts have been cast over using a limited number of selection criteria.

Another major issue that faces decision-makers pertains to the definition procurement selection criteria, as they can consist of an amalgamation of various sub-parameters unique to a project and its stakeholders.

There is a need to develop a pragmatic framework that clients’ can use to select an appropriate procurement. A procurement framework should be able to guide the decision-maker rather than provide a prescriptive solution. More research is specifically required to examine the dynamic and changing needs of clients and to understand why and how a particular procurement is chosen. Learning from previous experiences with regard to procurement selection would provide clients such as the State Government with knowledge about how to best deliver their projects. It is recommended that the following research be undertaken to assist with the development of a framework to determine an appropriate procurement method for a specific project:

- a comprehensive survey of procurement methods and client needs;
- an evaluation of the effectiveness of various procurement selection methods; and
- mapping of current procurement selection processes using case studies to identify and develop areas for improvement.

### Limitations

The review presented in this report has focused solely on the selection criteria and the tools and techniques for selecting a procurement method. No attempt has been made to review contractor and consultant selection procedures, prequalification, tendering, contract forms, and other aspects of the procurement process as they are deemed to be outside the scope of this project.

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4The Queensland Government, Department of Public Works has developed ‘Procurement Strategy and Contract Selection’ (November 2008) to assist Queensland Government departments in this regard.
10 Risk and risk allocation

Risk management is described by Australian Standards as, “An iterative process consisting of well defined steps which, taken in sequence, support better decision-making by contributing a greater insight into risks and their impacts.” In essence risk management is good management practice. (ACEA, 2008)

The Victorian Government (2001) define risk as - the chance of an event occurring which would cause actual project circumstances to differ from those assumed when forecasting project benefit and costs.’

It is at the core of project profitability (for the private party) and efficiency (in delivering public sector objectives). Because management of risks holds the key to project success or failure, ‘projects are about risks, about their evaluation and their subsequent acceptance or avoidance’.

Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning risk and risk allocation. Results relating to this section are given below:

**Exhibit 20 - SURVEY RESULTS**

<table>
<thead>
<tr>
<th>Reasonable (or proper) risk allocation.</th>
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</thead>
<tbody>
<tr>
<td>“Develop an issues paper with [operational, financial and political scenarios] listed, and work from there to manage risks”.</td>
</tr>
<tr>
<td>“As contractors, we can only take on risks we can be rewarded for”.</td>
</tr>
</tbody>
</table>

10.1 Dealing with risk

The Victorian Government (2001) point out that value for money is maximised by allocating risk optimally. In very general terms, this means allocating each risk to the party best able to manage that risk. In theory, this reduces individual risk premiums and the overall cost of the project, because the party in the best position to manage a particular risk should be able to do so at the lowest price.

Wilson and Kusomo (2004) Point out that the critical determination of project costs and price undertaken by clients in the feasibility phase of the tendering process, and by contractors in the bidding phase, relies upon accurate assessments of risk to ensure procurement best value for both contractors and clients. A systematic, comprehensive and rigorous identification, capture and effective utilisation of appropriate knowledge are required to optimise the accuracy of risk assessments and provide this best value outcome. Risk assessments should also be undertaken systematically utilising appropriate methodologies.

10.2 Areas of risk

The Victorian Government (2001) have identified the following areas of risk in procurement projects:
Site risk
Design, construction and commissioning risk
Sponsor and financial risk
Operating risk
Market risk
Network and interface risk
Industrial relations risk
Legislative and government policy risk
Force majeure risk
Asset ownership risk

In addition to the above according Mustow (2004), there is increasing pressure for organizations to reduce corporate risk through adopting ethical procurement practices. Initiatives, organisations and tools that are relevant to ethical procurement of building products include the following:

1. A greater number of product suppliers need to undertake ethical initiatives such as developing and implementing sustainability policies and adopting the Ethical Trading Initiative’s (ETI’s) base code.
2. An independent research organisation (or organisations) needs to carry out a regular, detailed review of the ethical performance of construction products and suppliers.
3. Robust ethical labelling schemes need to be developed for a wider range of construction products.
4. A detailed definition of ethical trade / procurement should be developed and agreed for the construction sector.

Mustow (2004) points out that at present however, construction industry purchasers have only a limited amount of information to determine the ethical credentials of the products that they buy. It is possible, to some extent, for purchasers to collect this information themselves (e.g. using the sustainable supply network management techniques described by Young and Kielkiewicz-Youn (2001)). However, this is costly and time consuming, which partly explains why few companies are attempting to implement ethical procurement.

10.3 Risk allocation

10.3.1 Risk allocation is currently weighted in favour of principals

(The following section has been adapted from Scope for Improvement: A survey of pressure points in Australian Construction and infrastructure projects. (2006).

It is reported that a principle of long standing is: “The person best able to manage a risk should take that risk”. The survey, however, reveals that, in many cases, this is no longer followed in Australia. The survey uncovers considerable dissatisfaction among constructors as to how risk is allocated in a construction contract, with:

- 61% identifying risk allocation as a pressure point.
- 40% of public principals and 29% of private principals also acknowledge that risk allocation is a pressure point.
- 74% of constructors believe that project risk is wholly or predominantly imposed on them by principals.
- 41% of private principals and 35% of public principals also acknowledge this.

In terms of procurement methods, novated design and construct contracts are considered the most likely to have risks allocated wholly or substantially by the principal (77% of all respondents), followed closely by design and construct contracts (62% of all respondents). Conversely, alliance contracts are identified as those most likely to involve a more equitable allocation of risk. However, less than 10% of projects are procured in this way.
10.3.2 Inappropriate risk allocation

With principals enjoying the advantage of establishing the risk allocation they wish constructors to accept in the competitive tender process, constructors are often exposed to some risks over which they have little or no control. Indeed, 69% of constructors admit that some risks have been inappropriately allocated to them, but say they continue to participate in these projects, albeit reluctantly.

In this regard, it is not only up to the principals, but also the constructors to drive a more appropriate risk allocation. If over two thirds of constructors accept risks which they identify as inappropriate to secure work, albeit unwillingly, principals may see that there is little incentive to proffer a more equitable method of risk allocation during the market request phase.

The three most common risks which constructors responding to the survey believe they should not be compelled to carry are:

- delay events (44%)
- site conditions (35%)
- approvals (30%)

The survey finds that constructors are much less inclined to engage external consultants to assist with identifying project risks (12% compared to private principals 53%). Instead, constructors appear to rely almost exclusively on internal review (86%).

Several principals express apprehension about constructors taking on risk without adequate contingency or margin. One notes: “Constructors appear to be willing to continue the trend of taking all project risks, without due diligence or evaluation of the downside.”

10.3.3 Consequences of inappropriate risk allocation

The imposition of risk with limited or no negotiation resulting in misallocation of risks can set the tone for the relationship throughout a project, as the following comments show. “The current practice is to simply transfer risk without any assessment of who is best to manage the risk. It’s an adversarial environment and not a cooperative environment. This practice needs to change.” “Putting undue risk [onto] constructors leads simply to adversarial relationships throughout project structures.”

When faced with imposed or inappropriately allocated risks, constructors appear to back these risks down onto their subcontractors, some of whom have no idea of the consequences. Several principals also identify this as a significant cause for concern. One principal says: “One of the biggest pressure points today is constructors who shift risk to the bottom of the food chain where it cannot be controlled.”

In contrast, as one constructor notes: “One of the most positive impacts on a project is an informed client or clients who do not have unrealistic expectations and who do not try and offload all the contractual risk to the builder.”

One solution put forward by a respondent is to “Look for the ‘fourth option’: one that is not the client’s demand; nor the contractor’s demand; nor the obvious compromise, but one which deals with the risk and issue in a considered manner for the benefit of the project.”
Industry views

“In relation to risk transfer, there are unrealistic client and client advisor (read solicitor!) expectations about a contractor’s ability to control a risk. This is especially so in relation to design errors, ambiguities and discrepancies.” “Despite the rhetoric... that risks should be apportioned to the person who can best manage them, clients produce contracts that pass all risk onto the contractor – for example, wet weather - how can a contractor control this and why should liquidated damages apply for time lost due to this.”

“Sometimes clients have the wrong expectation of banks when it comes to risk allocation. They see us as a dumping ground for risk. Projects are more successful where risks are parked with those parties who can best handle the risk.”

10.3.4 Future Options

- All participants need to recognise that wholesale transfer of all risk to another party does not necessarily lead to the delivery of a successful project. There needs to be an attitudinal change to the preparation of contract documents. Accordingly for each project, there needs to be a critical examination of risks that may arise, and these risks must be allocated fairly.

- Principles should arrange a workshop for key stakeholders to identify the likely risks and then establish a fair risk matrix before going to market.

10.4 Risk management (From Vic Govt. 2001)

The first task in project planning therefore is to identify all the risks and how to manage them to minimise threats to the project. Both the private party and government have an interest in minimizing overall project risks and should contribute to that outcome, regardless of which party formally bears a particular risk. It is important to clearly provide in the contract which party is to bear the financial liability for risks if they eventuate.

The ‘science’ of risk management seeks to identify, prevent, contain and mitigate risks in the interests of the project. Risk management is an ongoing process which continues throughout the life of a project and occurs in five stages:

(i) **Risk identification.** The process of identifying all the risks relevant to the project;
(ii) **Risk assessment.** Determining the likelihood of identified risks materialising and the magnitude of their consequences if they do materialise;
(iii) **Risk allocation.** Allocating responsibility for dealing with the consequences of each risk to one of the parties to the contract, or agreeing to deal with the risk through a specified mechanism which may involve sharing the risk;
(iv) **Risk mitigation.** Attempting to reduce the likelihood of the risk occurring and the degree of its consequences for the risk-taker; and
(v) **Monitoring and review.** Monitoring and reviewing identified risks and new risks as the project develops and its environment changes, with new risks to be assessed, allocated, mitigated and monitored. This process continues during the life of the contract.

In practice, many of these stages do not occur in isolation. For example, risk allocation does not simply take place on a ‘risk by risk’ basis detached from the output specifications, payment structure, government policies and the contract itself.
10.4.1 Optimal risk allocation

Optimal risk allocation seeks to minimise both project costs and the risks to the project by allocating particular risks to the party in the best position to control them. This is based on the theory that the party in the greatest position of control with respect to a particular risk has the best opportunity to reduce the likelihood of the risk eventuating and to control the consequences of the risk if it materialises. Allocating the risk in line with those opportunities creates an incentive for the controlling party to use its influence to prevent or mitigate the risk and to use its capacity to do so in the overall interests of the project.

Risks over which no party has control

There are some risks over which neither party has control, such as force majeure risk. Unless these risks are specifically taken back by government, they fall to the private party. From one perspective, this may be appropriate because many of these changes, such as changes to corporate tax rates, affect the business environment generally. However, rather than incur a high premium for allocating all of these risks to the private party (and thereby diminish the value for money outcome), government may wish to adopt a shared approach to specific risks by using a mechanism like the material adverse effect regime described above, where the parties act together to mitigate and share the consequences of the specified materialised risk. An example might be the cost of future capacity upgrades, which are dependent on future usage patterns which neither party can predict at the time of contract.

Where payment for the service is not made by government but by the end-consumer, the private party may be able to mitigate a materialised risk by passing through any additional costs to the end-users. Any passing through is, however, subject to appropriate contractual restrictions and may be subject to a regulatory regime which ensures that the level of pass-through is justified.

Where a risk beyond the control of either party is likely to eventuate — like movements in general price levels (i.e. inflation) or exchange rates — it is appropriate for it to be dealt with in an express provision in the contract. Such changes may be significant, but they are unlikely to be momentous unless the financial projections are deficient. The long term of the contract should not prejudice the private party's ability to adjust its prices from time to time to reflect changes in general price levels on pre-agreed input costs.

At the opposite end of the spectrum, where a risk is highly speculative, it may also be best dealt with through an agreement to negotiate, or a material adverse effect regime, to avoid government paying a very high premium.

Mitigation and optimal risk allocation

When considering adjustments to the risk allocation implicit in the *Partnerships Victoria* structure, it is important to bear mitigation options in mind. The most obvious of these is to pass the risk through to an insurer, which has the effect of capping the consequences of the risk at the level of the insurance premium.

There are two types of mitigation options:
(i) early options, designed to limit the likelihood of the risk eventuating or to reduce its consequences for the project if it does materialise; and
(ii) later options, generally involving cooperation between the parties to minimise direct financial impacts of a materialised risk. In many cases this may involve use of a material adverse effect regime or other similar regime.

Awareness not only of government's own capacity to mitigate, but also of the other party's
mitigation options, assists in considering whether the risk allocation is in fact optimal.

**Symmetrical risk allocation**

Changes during the life of the project may not always have negative impacts. They may result in 'upside benefits' which increase the profitability of the project in unforeseen ways. When determining a risk allocation, thought should be given to 'symmetrical' provisions which create entitlements to upside benefits as well as any liability arising from a materialised risk. This gives the parties an incentive to achieve efficiencies to benefit the project and allow benefits to neutralise losses from risk events.

10.4.2 Risk Allocation and Contractual Issues

It may not always prove possible to achieve a symmetrical risk allocation at reasonable cost, as bidders are likely to increase the cost of their bids in the absence of the opportunity of upside benefits. The opportunity to share in upside benefits may not be worth the opportunity cost reflected in the additional bid price. This is a matter for case by case identification. However, it is government's preferred position that where government agrees to share in the downside of a risk, it should be entitled to share in any upsides if that risk materialises.

10.5 Monitoring and review

Once risks have been allocated and a contract has been signed, the procurement team needs to establish a risk monitoring system to ensure that:
- services are delivered according to contracted performance specifications;
- commissioning issues are minimised and rectified;
- payment for services is appropriately verified; and
- unforeseen risks are identified and assessed expeditiously.

Implementing a monitoring and review process involves two steps to manage both contracted and unforeseen risks effectively:
- development of a risk management plan; and
- review and implementation.

Risk monitoring and review are enhanced if the members of the contract management team are involved in the tender process. This gives them an understanding of the philosophy behind the risk allocation, as well as familiarity with the individual risks. The contract management team should become involved in the tender process as early as possible.

10.6 Risk/reward models

(The following has been adapted from Chevis et al. In print 2009)

According to Chevis et al (2009), there are currently several sources that detail the typical structure of project alliances’ risk/reward payment models, but there is limited research that has examined the actual influence the structure of a risk/reward payment model has on behaviours exhibited by alliance project teams (Hutchinson and Gallagher, 2003; Ross, 2003; Department of Treasury and Finance Victoria, 2006). Risk/reward models are typically described as collectively incentivising alliance participants’ behaviours towards the achievement of a project’s performance objectives. Typical risk/reward models that are used in projects include: risk/reward sharing percentages amongst non-owner partners (NOPs), project cost risk/reward, non-cost risk/reward, risk cap, and achievability of performance targets.
Chevis et al (2009) conclude that risk/reward incentive based contracts can be used to encourage collaboration and cooperation among suppliers and eliminate opportunistic behaviours, which are often at the heart of contractual disputes. There research examined five fundamental risk/reward models that could be considered to deliver a supply chain solution were examined. These were:

1. **Risk/ Reward Sharing Percentages amongst non-owner alliance partners (NOPs):** The NOPs’ 50% share of project cost underrun/overrun and the NOPs’ non-cost pool payment require a method by which associated risk/ reward is allocated to individual NOPs.
2. **Project Cost Risk/Reward Model:** Sharing project cost underrun/overrun 50:50 between a client/owner and NOPs.
3. **Non-Cost Risk/ Reward Model:** Non-cost monetary pool payment provided to NOPs to incentivise behaviours in non-cost key result areas (KRAs).
4. **Risk Cap:** Capping NOPs’ maximum risk at the loss of their entire ‘limb-2’ fees (i.e. limb-1 cost reimbursements guaranteed).
5. **Achievability of Performance Targets:** The ‘neutral performance score’ on a performance target spectrum for a project alliance’s various key result areas (KRAs) is typically set as “best practice” that can be achieved in non-alliance environments. Given that this represents the neutral performance target, the high performance end of a performance target spectrum thus represents considerably challenging targets for an alliance to try and achieve.

Chevis et al (2009), point out that fundamentally, risk/reward sharing is pivotal to obtaining a successful project outcome for the procurement of civil engineering infrastructure supply chain solutions.

According to Hutchinson and Carter (2004), the two primary methods whereby an alliance’s risk/reward model creates a ‘risk’ or ‘reward’ payment for alliance participants during a project’s delivery are (Hutchinson and Carter 2004; Department of Treasury and Finance and Ross, 2006):

1. All alliance participants, including the client/owner, receive a share of any project cost underruns or overruns generated during an alliance. Such project cost underruns/overruns are determined by calculating the difference between the AOC of an alliance project, to the initial TOC. Project cost thus forms one of the primary KRAs in an alliance.
2. NOPs share amongst themselves a performance-based payment, whether it be a bonus or penalty, from the client/owner. This payment relates to performance outcomes achieved in an alliance’s non-cost KRAs (e.g. timely completion, environment, safety, etc.), and how achieved outcomes compare to pre-agreed performance targets set jointly at the beginning of an alliance.

A primary purpose of an alliance’s risk/reward model is to provide an incentive for participants to deliver outstanding project outcomes in KRAs. This is done by ensuring that all alliance participants receive an equitable sharing of risk or reward, and consequently have a commercial interest in performance outcomes achieved by an alliance team in KRAs included within a risk/reward model. Of the three compensation elements that form an alliance’s overall compensation model (Figure 1), the risk/reward model element appears to be the most influential on the behaviour of project team members.

There are a number of key principles considered when developing and structuring a risk/reward model. According to Hutchinson and Carter (2004:p.23) the key principles are:

- the gain and pain is linked to ‘real’ risk and benefits that affect the value of the project to the owner;
• the only way to outstanding profit is game breaking performance;
• gain share outcomes are either win/win or lose/lose, there should be no opportunity for win/lose;
• potential losses are capped at a pre-agreed percentage of normal profit, corporate overhead and gain share for each participant;
• each participant has meaningful financial incentives;
• the owner is committed to the commercial participants earning 100% of their possible gains hare entitlement;
• there are links between the separate elements of the gain share regime to provide no incentive to sacrifice performance in one objective to secure reward in another; and
• there is complete transparency in all gain share arrangements.

The following table demonstrates some project objective examples:

**Figure 22: Examples of Key Result Areas (KRA) (SKM 2008)**

<table>
<thead>
<tr>
<th>Key Result Area (KRA)</th>
<th>Minimum conditions of satisfaction</th>
<th>Gamebreaking performance objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>Deliver project within budget</td>
<td>Deliver project for 20% under budget</td>
</tr>
<tr>
<td><strong>Schedule</strong></td>
<td>Deliver project on time</td>
<td>Deliver project six months early</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td>Deliver project to agreed</td>
<td>Deliver project to agreed benchmarks of outstanding workmanship</td>
</tr>
<tr>
<td></td>
<td>specifications (workmanship and design)</td>
<td>Design project to agreed benchmarks of high levels of integration with existing and adjoining assets</td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td>Project is not delayed by community or stakeholder opposition</td>
<td>Widespread community advocacy and support for the project.</td>
</tr>
</tbody>
</table>
Benchmarking performance and third party audits

### 11.1 Performance Measurement

"Measuring construction projects' performance is essential for ensuring that planned improvements in cost, time and quality are achieved, comparing achieved performance with that of similar projects, identifying potential for doing things better, and for assessing how contractors compare with other potential suppliers." (Modernising Construction 2001).
Crane (undated) recommends the following headings for Key Performance Indicators (KPI’s):

- Client satisfaction: (Product and Service);
- Defects;
- Construction Cost;
- Construction Time;
- Environmental;
- Company performance in terms of:
  - Profitability
  - Productivity,
  - Safety

KPIs are available from numerous sources for example ?? These measures have been becoming increasingly more sophisticated and “...these measures have been generally successful in raising firms' awareness of the need to assess their performance in delivering construction services to clients and to benchmark their performance against other suppliers.” (‘Modernising Construction’, 2001). According ‘Modernising Construction’ (2001), while these measures are an important first step but now require further development. For example, indicators are needed to measure:

The operational – through life – running costs of completed buildings to determine whether efficiency improvements which the original design was intended to deliver were achieved and to learn lessons for the future;

The cost effectiveness of the construction process such as labour productivity on site, extent of wasted materials, and the amount of construction work that has to be redone;

Quality of the completed construction and whether it is truly fit for the purpose designed and if not what are the lessons for the future; and

Health and safety indicators that are measures of success rather than just failure.

In demonstrating the achievement of improvements in construction, performance at baseline cost should be set for the following:
- Total investment required to complete construction - fit for purpose.
- Cost of the construction - the building process.
- Whole life running costs of the completed building.

‘Modernising Construction’, (2001) recommends that baseline costs should be validated through comparisons with external benchmarks

Examples of key performance indicators (Source ‘Modernising Construction’, 2001)

- Defects - Rated by client on the impact of defects in the project at handover on a scale of 1-10;
- Safety - rate of reportable accidents per 100,000 employed;
- Predictability cost construction - actual outturn cost compared with the figure agreed before construction started.

11.2 Third party audits

Third party audits are increasingly being used by governments and large clients. An example of a structure approach is ‘Gateway’. ‘Gateway’ is a trademark name belonging to the Office of Government Commerce (OGC), United Kingdom. The approach was developed to improve the delivery of major construction projects and programmes in UK.
The Gateway process -
Independent reviews at critical points (known as gates) in the procurement process are a major component of private sector best practice. In June 2000 the UK Office of Government Commerce introduced on a pilot basis "the Gateway process" requiring major procurements including construction to be subject to review at certain key stages, such as agreeing the business need for a project, and before a contract is awarded, by a team sufficiently independent of the project. The purpose is to ensure that the project is justified and that the proposed procurement approach is likely to achieve value for money.

The Gateway review stages (in Figure ? below) are points along the procurement process beyond which the project should not proceed without specific management and funding activities having been completed. At each decision point, the investment decision maker should evaluate the business case and investment proposals and if justified, give approval for the project to proceed.

In the UK the Gateway process must be undertaken for all procurement projects in central civil government. Depending on the level of risk for the project, Gateway reviews may be carried out by independent internal or external review teams. It is important to note that for construction projects there are two additional major decision points between Gates 3 and 4. The first is approval for the outline design, the second is the point at which the detailed design is approved before the construction activity can begin. There may also be a requirement for more than one Gate 3, when the investment decision for the project is made. If there is a second investment decision (such as for two-stage Design & Build) there may be a need for a Gate 3 for the contract award and a subsequent Gate 3 to confirm the investment decision based on the construction price.

Independent client advice may be required in the early stages of a project. Where the client organisation is small and/or an occasional construction client, it is strongly recommended that independent client advice is sought early, to ensure that the project is appropriately scoped and will meet the business need.

12 Alternative approach to project delivery

In ‘Scope For Improvement – a survey of pressure points in Australian construction and infrastructure projects.’ (2006), it is revealed that the survey respondents adopt a conservative approach when selecting a project delivery method, relying too heavily on previous experience in a sector, rather than the particular characteristics of the project in question. Whilst prior experience is an important consideration, project participants should be cautious of choosing a delivery method out of habit, rather than as a result of critical analysis in the context of the project. In fact, 20% of respondents say the procurement method adopted is not the most appropriate choice.

Following are outlines of some recent alternative procurement delivery systems. Very little detailed information is available about these systems and further research is required into their effectiveness.
12.1 Performance Information Procurement System (PIPS)

Performance Information Procurement System (PIPS)©™ is a recent approach in innovative construction procurement systems. It was developed essentially to address the problems of non-performance in the construction industry. As the name indicates, PIPS©™ uses performance information to evaluate the participating contractors. Rather than procuring construction subjectively or based solely on price, PIPS©™ lends objectivity by adopting a risk minimization approach using past performance information along with price for selecting contractors. (Parmar et al. 2004)

According to Parmar et al (2004), a performance based delivery system such as PIPS in a performance-based environment has a higher ability to minimize risk than a delivery system in a price based environment.

The past decade has brought about many changes in the construction industry. Numerous project delivery systems have been proposed. These systems include low-bid, design-bid-build, CM@risk, etc. (Konchar and Sanvido 1998). The low bid system has remained the most popular procurement system. Many users have documented the poor performance and poor quality of contractors that have been procured using the low-bid process (Post 2001, Angelo 2001, Hung 2002). Poor performance has led to dissatisfaction among the owners. Owner education has always been an issue, and the owner’s low bid mentality and lack of education are perceived to be problems in the construction industry (Post 2000). The low bid process has created countless problems in terms of projects not being on-time and within budget (Illia 2001). Project delivery systems, such as construction management-at-risk and various forms of design-build, have solved some problems and created others (Post 2001). But the fact of the matter remains that the problems for owners, in terms of projects not being on-time, within budget, and not meeting quality expectations of the owners, have persisted.

To achieve owner satisfaction, projects have to be completed on time, within budget, and meet or exceed customer expectations. Theoretical research at Performance Based Studies Research Group (PBSRG) at Arizona State University indicates that a system having a higher ability to minimize risk will lead to better performance for the owners. To understand this concept, consider Figure 25 below.
According to Parmar et al. (2004), a strong correlation between the satisfaction which an owner can experience and the construction procurement process, indicates that a construction procurement process which has a higher risk minimizing ability is optimal, it can thus be argued that PIPS©™, a quadrant II process, has a higher ability to minimize risk for the owner than low bid, a quadrant I process.

12.2 Best Value

According to Phillips et al. (2004), “...the UK government’s promotion and support of ‘Best Value’ within the Social Housing Sector has been a prime catalyst in the move away from the traditional culture of acceptance of the lowest bid towards consideration of both price and quality criteria as a basis for contractor selection.

Social Housing in the UK, operates within a very particular regulatory framework that requires the selection methodology and rationale behind the decision making process to be both transparent and capable of audit. The selection procedure must also provide benchmarks against which the contractor’s performance can be effectively measured and continuous improvement can be assessed as the contract proceeds on site."

The concept underpinning ‘Best Value’ is that a new culture of collaborative working can generate value and that this can, initially, be implemented as a “hearts and minds operation” by a series of
workshops involving all the project stakeholders and organised by a facilitator who manages the value-management process. The critical success of these workshops is dependent upon, a degree of value-management knowledge on the part of the participants, participant ownership of the value management process output, senior management support for value management and a plan for implementation. (Kelly and Male 1998)"

How effective is 'Best Value'?
Research has shown that the effectiveness of best value tendering has been diminished for a number of reasons including; poor understanding by the stakeholders of the basic principles of best value tendering and failure to produce audit trails that record the decision making process or don't bear third party scrutiny especially with respect to the measurement of the subjective component of value. Two case studies also recorded that these difficulties have lead to legal challenges, which have directly caused the client organisations involved to suffer financial loss. These results have lead to the development of an approach that aims to refine a tender mechanism that transparently links the client's value system with the procurement process. This would create a formal relationship between the formation of corporate strategy and policy subsequently becoming part of the contractor selection procedure. (Phillips et al. 2004),

12.3 Prime contracting
Prime Contracting can be described as using a single contractor to act as the sole point of responsibility to a public sector client for the management and delivery of a construction project on time, within budget (defined over the lifetime of the project) and fit for the purpose for which it was intended, including demonstrating during the initial period of operation that operating cost and performance parameters can be met in accordance with a pre-agreed cost model. (Achieving Excellence in Construction Procurement Guide)

An Australian parliamentary report referred to the search for excellence in contract management as arguably “one of the most pressing challenges facing the Australian Public Services” (Jones, 2001). Prime contracting was the outcome of research development that entailed the application of supply chain methodologies from the manufacturing and retail industries to two pilot projects, each for the construction a new capital asset of no more than modest size and complexity. In view of this limited research and development it has to be said that the jury is still out on the issue of its benefits compared to other procurement systems.

According to Ndekugri and Corbet (2004), in the UK Prime Contracting is being championed as one of three preferred method for delivering construction projects by Government, the other two being design and build and PFI/PPP. The suggest that the innovations being made through prime contracting are bound to be of particular interest in Hong Kong, Australia and many other countries that share the same dissatisfaction with the performance of their construction industries.

Prime Contracting Theory (From Ndekugri and Corbet.2004)

There is as yet no coherent theory of prime contracting that distinguishes it on rational and coherent doctrinal grounds from other procurement strategies based on supply integration and integration of design and construction such as management contracting, construction management and design and build or even partnered traditional procurement. It is not therefore surprising that it has already been described in the trade press as design and build under another name.
Whole Life Costing and Sustainability
One of the most innovative features of prime contracting is the over-arching importance that it places on WLC. Indeed, as capital costs of the pilot projects increased, it is arguable the main justification for it is that it is more likely to result in reduced WLC.

Public Interest Considerations
The basic assumption underlying the movement towards collaborative working is that it will drive down costs and improve the quality of infrastructure. But the flip side of this assumption is that it could in time create cosy relationships and erect barriers to market entry (Winch 2000). Such concerns have already been raised regarding allegations of cartels and secret anti-competition agreements in the automobile and retail industries, which have been held out as the exemplars of supply chain integration. The adequacy of any protective measures against this risk needs investigation.

12.4 Build-Own-Operate-Transfer (BOOT)

The private sector is playing an increasingly important role in the procurement process for infrastructure development. According to Jefferies, et al (undated) "This trend has partly arisen out of a necessity for the development of infrastructure to be undertaken at a rate that maintains and allows growth. This has become a major challenge for many countries where it is evident that these provisions cannot be met by government alone. The emergence of Build-Own-Operate-Transfer (BOOT) schemes as a response to this challenge provides a means for developing the infrastructure of a country without directly impacting upon the government’s budgetary constraints. The concepts of BOOT are without doubt extremely complex arrangements, which bring to the construction sector risks not experienced previously."

The BOOT structure was developed specifically as a way of involving the private sector in the provision of new infrastructure. A private consortium undertakes to finance and construct infrastructure required by the government. The consortium owns, operates and carries end-user risk. The consortium then operates the facility for a period under a concession awarded by the government, and in this way derives revenue from the operation of the facility. Ownership is transferred to the government at the end of the concession period, which will be of such length to allow the builders and financiers to recover their outlays with a return. To guard against consortia keeping maintenance and capital replacement cost to a minimum, particularly as the date for handover draws near, predetermined performance criteria must be established for the operation of the facility and at handover at the completion of the period. Typically the BOOT method is best suited to large-scale projects exceeding $100 million. (QDMR, 2003, cited in Sidwell, T., et al. undated).

The tender process involves competitive bids based on set parameters. Evaluation of tenders includes both price and non-price criteria. In terms of budget allocations, the owner usually contributes the land to the project, and may contribute to the cost of construction. Owners may also contribute to operating costs, with the consortium paying the owner a share of profits. If government policies change in the course of the operating period, the owner may be forced to buy out the consortium. (Sidwell, T., et al. undated).

12.5 E-procurement

E-procurement refers to the use of web-based technologies and communication to connect buyers and sellers. According to the Audit Office of the NSW Government (undated) “The use of e-procurement offers potential for significant savings. Achieving full value from e-procurement is a substantial challenge. Structures will have to change, as will attitudes. This will require strong
executive vision, commitment and leadership, efficient and effective processes, quality management information and sound infrastructure."

The Australian Procurement and Construction Council (undated) have recognised the need for a nationally consistent approach to electronic commerce in a range of key areas and simultaneously have been developing internal strategies that meet both their own and their suppliers' needs. A consistent approach on the following key areas have been identified to assist both industry and government;
1. Confidentiality, Security and Authentication;
2. Tender Management Systems;
3. Supplier Awareness and Education; and
4. Accessing Supplier Information on the Internet:
   - Business Registration;
   - Catalogues;
   - Identification Systems.

The APCC recognises that, in the dynamically changing world of electronic commerce, prescriptive and detailed legislation and regulation is often inappropriate. It has also recognised the need for nationally consistent and evolving guidelines that provide a flexible framework to encourage and support the rapid take-up of electronic commerce in both the public and the private sectors. In developing this National Framework a number of principles have been considered:
   - That electronic commerce infrastructure and procedures should support and facilitate a collaborative relationship between industry and government;
   - That the confidentiality and integrity of information exchanged between jurisdictions and their suppliers should have the same level of security as existing non-electronic systems, and that neither party should use information for purposes other than those originally intended;
   - That individual jurisdictions' electronic commerce strategies are at various stages of development and will build on existing systems in an evolutionary manner, and that the implementation time frames for member jurisdictions will be determined by the prevailing environment for each Government;
   - That systems used and developed for communication between business entities should be easy to use, flexible, employ open standards and be cost-effective for both government and suppliers.

Additionally, as part of this research project, interviews were carried out with senior personnel from industry concerning innovative procurement processes. Results relating to this section are given below:
Exhibit 21 - SURVEY RESULTS

Comments re. Most innovative procurement processes

"Without a doubt it would be alliancing, by a long way".

"Alliancing is the preferred way".

"Green leases - where a schedule at the back of a lease is used as a collaborative arrangement".

"We have found when we are included in the tender team with architects, we can suggest enormous changes to enable workability and this wins the project. These are the projects we think are a great success".

"Management Contracting - it allows you to assign risk in a reasonable way".

"The 1st Australian Alliance model...in 1994. It was extremely rewarding".

"Alliance contracting...where the measure of success was not just time and/or cost".


13 Summary of Alternative Approaches to Procurement

Key issues that relate to alternative procurement approaches include (Love et al., 2004): prime contracting, relationship contracting (e.g., alliances/integrated teams); serial contracting in conjunction with continuous benchmarking of project team performance, focus on whole life cycle costing, replace contracts with performance measurement, staged gateways (e.g., design audits, reviews, verifications), incentive/reward payments for consultants/contractors/subcontractors, and reduce the reliance on tendering.

During a project’s operation, benchmarking (e.g., safety, waste, RFIs, variations etc) and continuous monitoring of the project team needs to occur, particularly when alliancing is introduced. This may be viewed as a cumbersome task in the short term, but can enable continuous learning that may be used to rectify problematic issues that arise. In addition, the lessons learned can be transferred to other projects. Alliancing should not be simply used for a specific project but continued after a project is completed. For long-term relationships to be developed they need to be nurtured and maintained so that knowledge transfer can become an on-going process between organizations (Davis, 2004). For such a practice to occur, clients, consultants, contractors and subcontractors will be required to adopt an endogenous cooperative culture that is conducive to learning and sharing knowledge with other firms within the industry. It is through this learning process that innovations are able to come to fruition. An immediate challenge for firms embracing alternative ways of procuring projects is to accept that they have to change their mindsets to one of working in a cooperative and collaborative manner to procure projects successfully. Anecdotal evidence indicates that many firms set out with the best intentions of entering into relationship contracting arrangements. However when something goes wrong and their profit margins begin to erode they begin to revert back to ‘traditional’ adversarial work practices rather working through to solve the problem at hand.

13.1 Inappropriate contract procurement and delivery methods are commonly being used

In Scope For Improvement – a survey of pressure points in Australian construction and infrastructure projects (2006), it is revealed that the survey respondents adopt a conservative approach when selecting a project delivery method, relying too heavily on previous experience in a sector, rather than the particular characteristics of the project in question. In fact, 20% of respondents indicated that the procurement method adopted in the project being studied is not the most appropriate choice.

The survey also revealed that generally the principals and constructors in the survey held different views on how best to procure major infrastructure projects. This suggests a lack of understanding between the two parties. However the survey found some exceptions where the use of inappropriate contract delivery methods appears to be considerably less prevalent. For example respondents from the water industry reported that adequate consideration is given to the choice of delivery method, with the most appropriate method being used in 90% of their projects. The authors of the survey concluded however that there is still some scope for improvement generally.

Crane (undated) proposes the following approach with regard to an alternative approach to procurement:

- Remove reliance on lowest cost-go for value
- Reduce costly competitive tendering
- Replace “contracts” with performance measurement
- Involve all members of the industry
- Establish integrated teams
- Adopt a whole life approach
- Design for construction and use
- Specify by output & outcomes performance
- Client users must get involved; don’t leave it to technical/procurement staff
- Integrate design/construct/maintenance and the teams
- Establish a review process based on feedback
- Keep teams going, partner and provide ongoing mentoring/facilitation

### 13.2 Drivers for implementing alternative forms of procurement

The key drivers for change and implementing alternative procurement forms of procurement are committed leadership, the development of a customer focus strategy, project team integration, a focus on quality and a commitment to people (Egan, 1998).

**Who is likely to drive innovative procurement?**

Recent research (Manly et al., 2009) indicates that certain industry groups are more likely to be ‘encouragers’ of innovation than others. Large/repeat clients, architects, engineers manufacturers building designers and main contractors are found to be the most likely ‘encouragers’ (59% - 43%), with quantity surveyors, funders, government regulators, letting agents and insurers as the least likely (38% - 26%). Other groups such as developers, project managers, one-off clients, trade contractors, other suppliers and organisations that set industry standards rank between the most likely and least likely groups (38% - 26%).

Research carried out for this report indicates that the client, designers (architects and engineers) and consultants can all be drivers of innovative forms of procurement but the client is seen as the likely main driver.

The primary consideration when developing an alternative procurement strategy is the need to embrace the following principles:

- Building quality into the evaluation processes to appoint the consultants and contractors.
- Avoiding waste and conflict through both the use of team working and partnering arrangements.
- Defining the project carefully at the outset to meet user needs.
- Using value management and risk management techniques.
- Taking account of whole life costs and sustainability.

### 13.3 Learning needs and learning alliances

**Lack of understanding of appropriate methods of procurement**

Several reports have indicated that lack of owner understanding of critical issues leads to poor procurement solutions. In a recent report by Blake, Dawson (2009) of a survey concerning PPP’s, in relation to scope management (the client’s responsibility) 52% of respondents said that the project they were involved in was not adequately scoped by the time the project was submitted to the market. These issues were reflected industry wide, with the majority of respondents claiming the problem was getting worse.

**Contractors / the supply side of the industry**

While the client is likely to wield most influence in the choice of procurement route, the input of other key ‘players’ such as consultants, contractors etc can be significant. (Naoum, 1994; Luu et al., 2005).
McCabe (2004) in a report produced by the Strategic Forum for Construction, *Accelerating Change* (2002), suggests that there is an explicit recognition of the need to deal with, what are referred to as, ‘people issues’ One area that the group identified as being of particular concern, was the skills and ability level of people employed at all levels. In particular, it is stated that, ‘Significant shortages of supervisors and managers are anticipated and the industry remains grossly under-qualified’.

**Learning alliances**

According to Davis and Love (Undated) “Relationship based procurement leads to mutual benefit in construction business-to-business dealings and provides benefits over traditionally fragmented supply chains both within projects and across projects. …Project alliances are a particular kind of relationship procurement system that rely on virtual organisations generating new knowledge enabling teams to solve interrelated problems in a complex environment.”

**13.4 Knowledge Management**

Knowledge has become the source of innovation, growth and performance improvement. Hence, in today’s world, it is absolutely critical to build, preserve and leverage organisational knowledge for learning and making organisational performance improvements (Allee, 1997; Lank, 1997). Effective knowledge management (KM) ensures people with needs can find people who can meet those needs within the organisation (Gourlay, 2001). It also ensures that the knowledge held by employees is amplified and internalised as part of an organisation’s knowledge base. (Olomalaiye et al, 2004)

**Performance Management and Benchmarking**

Olomalaiye et al (2004) assert that “Performance Management (PM) is essential to achievement of the desired results of an organisation.” Performance refers to accomplishments of doing the work as well as being about the results achieved and this need to be managed. Selection of suitable performance measures to reflect the actual levels of performance of the organisation can be considered as one of the challenges. It is critical to select appropriate aspects to be measured rather than choosing what is easy to measure. This will require a proper benchmarking system.

Benchmarking is a structured and focused approach for comparing with others how organisational services are provided and the performance levels achieved. The purpose of the comparisons enables organisations to identify where and how they can do better. Having an unsuitable benchmarking system can result in taking incorrect judgements and can eventually result in compromising the quality of the organisational services. The inclusion of PM provides an opportunity to achieve the following:

- measure progress towards achieving organisational objectives and targets
- promote benchmarking practices in order to compare performance with the past levels of performance and among organisations
- promote service improvement through corrective actions.”

**13.5 Poor scope management is a major problem**

Key findings in a report of a recent survey carried out by Blake, Dawson (2009) indicate that there is a high prevalence of deficient scoping. 52% of respondents said that the project they were involved in was not adequately scoped by the time the project was submitted to the market. These issues were reflected industry wide with the majority of respondents claiming the problem was getting worse.

As well as an increase in deficient scoping, the majority of scoping inadequacies (64%) were discovered far too late in the life of a project rather than being identified at the more manageable phase before contracts are signed.
There are significant consequences for inadequate scoping. More than 60% of respondents said that inadequate scope documents resulted in a cost overrun, with more than half of those overruns costing more than 10% of the value of the project and a third more than 20%. There was also a high frequency of disputes and delays to projects which were attributed directly to poor scoping, with almost half of the respondents who reported a delay saying it lasted for at least four months. The unifying aspect of each of these effects is inefficiency in the delivery of various projects in Australia.

**Reasons for poor scoping (Blake, Waldron, 2009)**

There are a range of reasons for poor scoping identified in the report including:

- Lack of experienced and trained personnel who can prepare scoping documents.
- Insufficient time to properly prepare scoping documents.
- Inadequate definition by Principals of required outcomes for projects.
- Incomplete scoping documents, including lack of coordination between, and errors in, those documents.
- Lack of consultation with end users. Where end users were not engaged, respondents considered their projects to be properly scoped only 20% of the time.

**13.6 Procurement Selection Criteria**

A primary issue that often is raised within the construction industry relates to what clients want in order to be satisfied with their buildings and the means by which those buildings have been procured. Consequently, it is important to evaluate the clients’ criteria, their importance and then seek performance to match the criteria. All clients require their buildings to be completed on time, within budget and to the highest quality. However, some clients stress that certain criteria are more important than others.

Conventional procurement selection criteria are based around the concepts of time, cost and quality (Rowlinson, 1999b). While the use of such criteria can be used as a guide to assist decision-makers with an initial understanding of the basic attributes of a particular procurement system they should not be used as a basis for selecting the procurement method. This is because of the underlying complexity associated with matching client needs and priorities with a particular method (Kumaraswamy and Dissanayaka, 1998).

Rowlinson (1999a) has argued that the concept of cost certainty is a fallacy in the context of traditional approaches that are based upon full drawings and bills of quantities. This approach should provide a client with a firm, fixed price for construction but in practice very few projects are actually completed within the tendered price (Rowlinson, 1999a; Love, 2002). Complete drawings and BoQs are generally not available when a projects goes to tender. Rowlinson (1999a:p.49) therefore asks why do clients’ continue to use this method when it can be argued that it leads to:

- a lack of flexibility;
- a price to pay in terms of claims-conscious behaviour;
- the fallacy of cost certainty; and
- a release of control by the client organisation

**13.7 Selection of procurement strategy**

The efficient procurement of a building project through the choice of the most appropriate procurement strategy has long been recognised as a major determinant of project success (Bennett and Grice, 1990) and a failure to select an appropriate procurement approach as the primary cause of
project dissatisfaction (Masterman, 1996). The selection of a procurement method is more than simply establishing a contractual relationship as it involves creating a unique set of social relationships whereby forms of power within a coalition of competing or cooperative interest groups are established. Differing goals and objectives and varying degrees of power within a project team are often the underlying conditions for triggering adversarial relations (Love et al., 2004).

### 13.8 Selection of project teams

In the Foreword to Modernising Construction (2001) Sir Michael Latham notes that “The central message of "Constructing the Team" in 1994 was that the client should be at the core of the construction process.

The general route recommended to achieve client satisfaction was through team work and co-operation.”

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 (Mortledge 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.

### 13.9 Sustainability and considerate construction

Sustainable procurement strategies and considerate construction are interlinked and interdependent. Both require a considerate approach to the environment, society and the economy by minimizing the impact of construction operations while achieving acceptable economic outcomes for the parties involved in procuring and constructing.

### 13.10 Tools and techniques for selection of procurement system

A plethora of tools and techniques have been developed to determine an ideal procurement method for a specific project. No specific techniques has gained widespread acceptance. However, forms of ranking and weighting of specific client priorities against the attributes of a particular procurement method is the most popular technique that have emerged from the review undertaken. While pragmatic and easy to use, this technique is deemed to have many flaws as specific characteristics of the client, project, and external environment are often not taken into account. Notwithstanding this, the determination of ‘generic’ client criteria is deemed to be the most difficult task in procurement selection process. Criteria such as NEDO have been used extensively, but have been identified as being fuzzy in nature and doubts have been cast over using a limited number of selection criteria. Another major issue that faces decision-makers pertains to the definition procurement selection criteria, as they can consist of an amalgamation of various sub-parameters unique to a project and its stakeholders.

There is a need to develop a pragmatic framework that clients’ can use to select an appropriate procurement. A procurement framework should be able to guide the decision-maker rather than provide a prescriptive solution. More research is specifically required to examine the dynamic and changing needs of clients and to understand why and how a particular procurement is chosen. Learning from previous experiences with regard to procurement selection would provide clients such as the State Government with knowledge about how to best deliver their projects. It is recommended that the following research be undertaken to assist with the development of a framework to determine an appropriate procurement method for a specific project:

- a comprehensive survey of procurement methods and client needs;
• an evaluation of the effectiveness of various procurement selection methods; and
• mapping of current procurement selection processes using case studies to identify and develop areas for improvement.

13.11 **Dealing with risk**

All participants need to recognise that wholesale transfer of all risk to another party does not necessarily lead to the delivery of a successful project. There needs to be an attitudinal change to the preparation of contract documents. Accordingly for each project, there needs to be a critical examination of risks that may arise, and these risks must be allocated fairly.

Optimal risk allocation seeks to minimise both project costs and the risks to the project by allocating particular risks to the party in the best position to control them. This is based on the theory that the party in the greatest position of control with respect to a particular risk has the best opportunity to reduce the likelihood of the risk eventuating and to control the consequences of the risk if it materialises. Allocating the risk in line with those opportunities creates an incentive for the controlling party to use its influence to prevent or mitigate the risk and to use its capacity to do so in the overall interests of the project.

13.12 **Risk/reward models**

According to Chevis et al (2009), there are currently several sources that detail the typical structure of project alliances’ risk/reward payment models, but there is limited research that has examined the actual influence the structure of a risk/reward payment model has on behaviours exhibited by alliance project teams (Hutchinson and Gallagher, 2003; Ross, 2003; Department of Treasury and Finance Victoria, 2006). Risk/reward models are typically described as collectively incentivising alliance participants’ behaviours towards the achievement of a project’s performance objectives. Typical risk/reward models that are used in projects include: risk/reward sharing percentages amongst non-owner partners (NOPs), project cost risk/reward, non-cost risk/reward, risk cap, and achievability of performance targets.

Chevis et al (2009) conclude that risk/reward incentive based contracts can be used to encourage collaboration and cooperation among suppliers and eliminate opportunistic behaviours, which are often at the heart of contractual disputes. There research examined five fundamental risk/reward models that could be considered to deliver a supply chain solution were examined. These were:

6. **Risk/ Reward Sharing Percentages amongst non-owner alliance partners (NOPs):** The NOPs’ 50% share of project cost underrun/overrun and the NOPs’ non-cost pool payment require a method by which associated risk/ reward is allocated to individual NOPs.

7. **Project Cost Risk/Reward Model:** Sharing project cost underrun/overrun 50:50 between a client/owner and NOPs.

8. **Non-Cost Risk/ Reward Model:** Non-cost monetary pool payment provided to NOPs to incentivise behaviours in non-cost key result areas (KRAs).

9. **Risk Cap:** Capping NOPs’ maximum risk at the loss of their entire ‘limb-2’ fees (i.e. limb-1 cost reimbursements guaranteed).

10. **Achievability of Performance Targets:** The ‘neutral performance score’ on a performance target spectrum for a project alliance’s various key result areas (KRAs) is typically set as “best practice” that can be achieved in non-alliance environments. Given that this represents the neutral performance target, the high performance end of a performance target spectrum thus represents considerably challenging targets for an alliance to try and achieve.
13.13 Alternative approach to project delivery

In ‘Scope For Improvement – a survey of pressure points in Australian construction and infrastructure projects.’ (2006), it is revealed that the survey respondents adopt a conservative approach when selecting a project delivery method, relying too heavily on previous experience in a sector, rather than the particular characteristics of the project in question. Whilst prior experience is an important consideration, project participants should be cautious of choosing a delivery method out of habit, rather than as a result of critical analysis in the context of the project. In fact, 20% of respondents say the procurement method adopted is not the most appropriate choice.

Performance Information Procurement System (PIPS)

Performance Information Procurement System (PIPS)©™ is a recent approach in innovative construction procurement systems. It was developed essentially to address the problems of non-performance in the construction industry. As the name indicates, PIPS©™ uses performance information to evaluate the participating contractors. Rather than procuring construction subjectively or based solely on price, PIPS©™ lends objectivity by adopting a risk minimization approach using past performance information along with price for selecting contractors. (Parmar et al. 2004)

Best Value

According to Phillips et al. (2004), “...the UK government’s promotion and support of ‘Best Value’ within the Social Housing Sector has been a prime catalyst in the move away from the traditional culture of acceptance of the lowest bid towards consideration of both price and quality criteria as a basis for contractor selection.

The concept underpinning ‘Best Value’ is that a new culture of collaborative working can generate value and that this can, initially, be implemented as a “hearts and minds operation” by a series of workshops involving all the project stakeholders and organised by a facilitator who manages the value-management process. The critical success of these workshops is dependent upon, a degree of value-management knowledge on the part of the participants, participant ownership of the value management process output, senior management support for value management and a plan for implementation. (Kelly and Male 1998)"

Research has shown that the effectiveness of best value tendering has been diminished for a number of reasons including; poor understanding by the stakeholders of the basic principles of best value tendering and failure to produce audit trails that record the decision making process or don’t bear third party scrutiny especially with respect to the measurement of the subjective component of value. Two case studies also recorded that these difficulties have lead to legal challenges, which have directly caused the client organisations involved to suffer financial loss. These results have led to the development of an approach that aims to refine a tender mechanism that transparently links the client’s value system with the procurement process. This would create a formal relationship between the formation of corporate strategy and policy subsequently becoming part of the contractor selection procedure. (Phillips et al. 2004).

Prime contracting

Prime Contracting can be described as using a single contractor to act as the sole point of responsibility to a public sector client for the management and delivery of a construction project on time, within budget (defined over the lifetime of the project) and fit for the purpose for which it was intended, including demonstrating during the initial period of operation that operating cost and performance parameters can be met in accordance with a pre-agreed cost model. (Achieving Excellence in Construction Procurement Guide).

An Australian parliamentary report referred to the search for excellence in contract management as arguably “one of the most pressing challenges facing the Australian Public Services” (Jones, 2001).
Prime contracting was the outcome of research development that entailed the application of supply chain methodologies from the manufacturing and retail industries to two pilot projects, each for the construction a new capital asset of no more than modest size and complexity. In view of this limited research and development it has to be said that the jury is still out on the issue of its benefits compared to other procurement systems.

**BOOT**

The Build Own Operate and Transfer (BOOT) structure was developed specifically as a way of involving the private sector in the provision of new infrastructure. A private consortium undertakes to finance and construct infrastructure required by the government. The consortium owns, operates and carries end-user risk. The consortium then operates the facility for a period under a concession awarded by the government, and in this way derives revenue from the operation of the facility. Ownership is transferred to the government at the end of the concession period, which will be of such length to allow the builders and financiers to recover their outlays with a return. To guard against consortia keeping maintenance and capital replacement cost to a minimum, particularly as the date for handover draws near, predetermined performance criteria must be established for the operation of the facility and at handover at the completion of the period. Typically the BOOT method is best suited to large-scale projects exceeding $100 million. (QDMR, 2003, cited in Sidwell, T., et al. undated).

**E-procurement**

E-procurement refers to the use of web-based technologies and communication to connect buyers and sellers. According to the Audit Office of the NSW Government (undated) “The use of e-procurement offers potential for significant savings. Achieving full value from e-procurement is a substantial challenge. Structures will have to change, as will attitudes. This will require strong executive vision, commitment and leadership, efficient and effective processes, quality management information and sound infrastructure.”
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## APPENDIX A

### Expert Sample Interviewed (grouped by jurisdiction)

<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
<th>Jurisdiction</th>
<th>Type of Organisation</th>
<th>Industry Sector</th>
<th># Years Experience</th>
<th>Annual Turnover of Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Manager Operations</td>
<td>Australia</td>
<td>Consultants</td>
<td>Civil, Commercial, Residential, Consulting</td>
<td>&gt;20</td>
<td>$9.1 billion</td>
</tr>
<tr>
<td>3</td>
<td>Director</td>
<td>Commonwealth</td>
<td>Government</td>
<td>Commercial</td>
<td>&gt;20</td>
<td>&gt;$100 million</td>
</tr>
<tr>
<td>5</td>
<td>Design Manager</td>
<td>Australia</td>
<td>Contractor</td>
<td>Commercial, Residential</td>
<td>&gt;20</td>
<td>$220 million</td>
</tr>
<tr>
<td>11</td>
<td>CEO and Chairman</td>
<td>Australasia</td>
<td>Design Professional/ Contractors</td>
<td>Civil, Commercial</td>
<td>&gt;20</td>
<td>$256 million</td>
</tr>
<tr>
<td>4</td>
<td>Manager</td>
<td>Western Australia</td>
<td>Government</td>
<td>Commercial</td>
<td>&gt;20</td>
<td>$650 million</td>
</tr>
<tr>
<td>9</td>
<td>Executive Director</td>
<td>Western Australia</td>
<td>Contractor</td>
<td>Civil, Commercial, Residential</td>
<td>&gt;20</td>
<td>$450 million</td>
</tr>
<tr>
<td>10</td>
<td>Founding Director</td>
<td>Western Australia</td>
<td>Contractor</td>
<td>Commercial</td>
<td>&gt;20</td>
<td>$350 million</td>
</tr>
<tr>
<td>13</td>
<td>Business Development Coordinator</td>
<td>Western Australia</td>
<td>Government</td>
<td>Civil, Commercial, Residential</td>
<td>&gt;20</td>
<td>$50-$100 million</td>
</tr>
<tr>
<td>14</td>
<td>Executive Director</td>
<td>Western Australia</td>
<td>Government</td>
<td>Civil</td>
<td>&gt;20</td>
<td>&gt;$100 million</td>
</tr>
<tr>
<td>2</td>
<td>Manager</td>
<td>New South Wales</td>
<td>Contractor</td>
<td>Civil, Commercial</td>
<td>&gt;20</td>
<td>$600 million</td>
</tr>
<tr>
<td>7</td>
<td>Project Director</td>
<td>New South Wales</td>
<td>Contractor</td>
<td>Civil, Commercial</td>
<td>&gt;20</td>
<td>$5 billion</td>
</tr>
<tr>
<td></td>
<td>Position</td>
<td>Location</td>
<td>Sector</td>
<td>Experience</td>
<td>Revenue</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---------------------------</td>
<td>---------------------------</td>
<td>-------------------------</td>
<td>------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Manager Project Management</td>
<td>Western Australia</td>
<td>Government</td>
<td>&gt;20</td>
<td>&gt;$2billion</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Commercial Manager</td>
<td>New South Wales / ACT</td>
<td>Contractor</td>
<td>Civil</td>
<td>20 years</td>
<td>$2billion</td>
</tr>
<tr>
<td>6</td>
<td>Group Commercial Manager</td>
<td>Queensland</td>
<td>Contractor/Developer</td>
<td>Civil</td>
<td>&gt;20</td>
<td>$1.2billion</td>
</tr>
<tr>
<td>8</td>
<td>Procurement Manager</td>
<td>Victoria</td>
<td>Government</td>
<td>Civil</td>
<td>&gt;20</td>
<td>$250million</td>
</tr>
<tr>
<td>15</td>
<td>Director Design</td>
<td>Victoria</td>
<td>Government</td>
<td>Civil</td>
<td>&gt;20</td>
<td>$60-80million</td>
</tr>
<tr>
<td>12</td>
<td>State Manager</td>
<td>South Australia</td>
<td>Contractor</td>
<td>Commercial</td>
<td>&gt;20</td>
<td>$260million</td>
</tr>
<tr>
<td>16</td>
<td>Manager Building Management Contracts</td>
<td>South Australia</td>
<td>Government</td>
<td>Civil Commercial Residential</td>
<td>&gt;20</td>
<td>Not available</td>
</tr>
</tbody>
</table>
### APPENDIX B

**SURVEY RESULTS: Strategies Identified to Improve Procurement**

<table>
<thead>
<tr>
<th>Strategy</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Education and training.</td>
<td>6</td>
</tr>
<tr>
<td>“Innovation comes from informed clients”.</td>
<td></td>
</tr>
<tr>
<td>“There is little knowledge or exposure to corporate knowledge. We need</td>
<td></td>
</tr>
<tr>
<td>a better understanding of the drivers”.</td>
<td></td>
</tr>
<tr>
<td>“Especially for project managers”.</td>
<td></td>
</tr>
<tr>
<td>2. Early involvement of contractors.</td>
<td>6</td>
</tr>
<tr>
<td>“This would allow much better judgements to be made”.</td>
<td></td>
</tr>
<tr>
<td>“If you involve contractors early you will have a higher probability of</td>
<td></td>
</tr>
<tr>
<td>success”.</td>
<td></td>
</tr>
<tr>
<td>3. Reasonable (or proper) risk allocation.</td>
<td>3</td>
</tr>
<tr>
<td>“Develop an issues paper with [operational, financial and political</td>
<td></td>
</tr>
<tr>
<td>scenarios] listed, and work from there to manage risks”.</td>
<td></td>
</tr>
<tr>
<td>“As contractors, we can only take on risks we can be rewarded for”.</td>
<td></td>
</tr>
<tr>
<td>4. Better quality documents.</td>
<td>2</td>
</tr>
<tr>
<td>“The quality of documents produced by consultants in the single biggest</td>
<td></td>
</tr>
<tr>
<td>problem leading to issues”.</td>
<td></td>
</tr>
<tr>
<td>“The client will get the best price if they give correct documentation”</td>
<td></td>
</tr>
<tr>
<td>5. Senior management commitment to creativity.</td>
<td>2</td>
</tr>
<tr>
<td>6. A better understanding of probity issues.</td>
<td>2</td>
</tr>
<tr>
<td>“I do sympathise with government in their procurement”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7.</td>
<td>Approaching the market at the right time.</td>
</tr>
<tr>
<td></td>
<td>“i.e. not too early and when specifications are sorted out”</td>
</tr>
<tr>
<td>8.</td>
<td>Streamlining bureaucracy.</td>
</tr>
<tr>
<td></td>
<td>“There needs to be simple processes for simple projects”.</td>
</tr>
<tr>
<td>9.</td>
<td>Honesty in contracting.</td>
</tr>
<tr>
<td>10.</td>
<td>Legislating Sustainability.</td>
</tr>
<tr>
<td></td>
<td>“Then we have a level playing field. At the moment it is only driven by market perception”.</td>
</tr>
<tr>
<td>11.</td>
<td>More emphasis through relationship contracting.</td>
</tr>
<tr>
<td>12.</td>
<td>Set project objectives early, before the selection of a procurement process.</td>
</tr>
<tr>
<td>13.</td>
<td>Design processes – build ability and flexibility.</td>
</tr>
<tr>
<td></td>
<td>“If due diligence is done on design, the project will succeed”.</td>
</tr>
<tr>
<td>14.</td>
<td>More alliancing.</td>
</tr>
<tr>
<td>15.</td>
<td>Get good legal advice.</td>
</tr>
<tr>
<td>16.</td>
<td>Combine alliancing and a panel.</td>
</tr>
</tbody>
</table>
## APPENDIX C

### Tools and techniques for procurement selection

Table 8 Procurement selection systems (Adapted from Sidwell et al., 2001b)

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEDO</td>
<td>1985</td>
<td>Procurement path decision chart. Use of a rating system using client’s priorities for nine criteria</td>
</tr>
<tr>
<td>Skitmore and Marsden</td>
<td>1988</td>
<td>Use of multi-attribute utility analysis based on NEDO with a rating system and weighting of client priorities</td>
</tr>
<tr>
<td>Brandon et al.</td>
<td>1988</td>
<td>ELSIE – A computer expert system based on project characteristics and client requirements. Subjective and contained a limited number of procurement options</td>
</tr>
<tr>
<td>Franks</td>
<td>1990</td>
<td>Simple rating (ranking) system of criteria against a limited number of procurement options</td>
</tr>
<tr>
<td>Bennett and Grice</td>
<td>1990</td>
<td>Based on NEDO’s and Skitmore and Marsden’s model using MAUA. Enables client’s to weight specific criteria multiplied by a set of utility ratings for various procurement options</td>
</tr>
<tr>
<td>Moshini and Botros</td>
<td>1990</td>
<td>PASCON-An expert system similar in nature to ELSIE.</td>
</tr>
<tr>
<td>Lui</td>
<td>1994</td>
<td>An organisational behaviour-based model utilising an act-to-outcome process governed by organisational goals, which are subject to moderators and determine goal/performance relationships</td>
</tr>
<tr>
<td>Chan et al.</td>
<td>1994</td>
<td>Utilises the Bennett and Grice model, but uses a different procurement category developed for the Australian construction industry</td>
</tr>
<tr>
<td>Griffith and Headley</td>
<td>1997</td>
<td>Use of weightings to assess criteria and procurement options for small building works. Simple and easy to use.</td>
</tr>
<tr>
<td>Kumaraswamy, and Dissanayaka</td>
<td>1998</td>
<td>Weighting of priorities and ranked using the rank agreement factor. The matched against various procurement options. This was developed into a computerised expert system. Not able to update system database.</td>
</tr>
<tr>
<td>Kumaraswamy, and</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dissanayaka</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Love et al.</td>
<td>1998</td>
<td>Based on Skitmore and Marsden’s model, and tested widely throughout Australia.</td>
</tr>
<tr>
<td>Ambrose and Tucker</td>
<td>2000</td>
<td>MAUA based model that includes three dimensions. Complex to use.</td>
</tr>
<tr>
<td>Alhamzi and McCaffer</td>
<td>2000</td>
<td>Allows users to choose from a reduced number of prescribed strategies and alternative contract types. Sue of weighting/ranking systems juxtaposed with AHP. Very complex system to arrive a procurement option.</td>
</tr>
<tr>
<td>Construction Industry Institute</td>
<td>2001</td>
<td>Project delivery selection workbook. Suitability matrix. Rates critical project goals by level of importance, scores each goal and ranks the most critical metrics. Limited options and prescribes optimum project delivery system</td>
</tr>
<tr>
<td>SRD Consulting</td>
<td>2000</td>
<td>Suitability matrices developed for Qld Dept of Main Roads. Scoring and rating to pre-determine optimum project deliver system</td>
</tr>
<tr>
<td>Cheung et al.</td>
<td>2001</td>
<td>Use of MAUT and analytical hierarchy process. NEDO criteria used. Utility factors corresponding to various procurement strategies established. To cater for individual project characteristics, the relative weightings of the selection criteria are assessed using AHP.</td>
</tr>
<tr>
<td>Chang and Ive</td>
<td>2001</td>
<td>Transaction-cost-based procurement selection technique. Use of MAUA and alignment with procurement route with attributes of the construction transaction. Client selects procurement option based on their particular project context rather than on generic solution based on preferences.</td>
</tr>
<tr>
<td>Luu et al.</td>
<td>2005</td>
<td>Case-based reasoning – capture and reuse of experiential knowledge from previous projects for procurement decision-making. Project characteristics, client characteristics and external environment taken into account.</td>
</tr>
<tr>
<td>New South Wales Department of Commerce</td>
<td>2006</td>
<td>Weighting of client priorities and procurement method to achieve the priorities. Simple to use but too many criteria</td>
</tr>
</tbody>
</table>
Weighted Score Models

One of the earliest models published was Think About Building (NEDO, 1985) which looked at ranking various client criteria to assist with the selection of an appropriate method. The NEDO criteria alone are deemed to be insufficiently sophisticated to enable a final decision to be taken as to the method appropriate for a building project (Love et al., 1998). Similarly, Franks (1990) proposed a rating system based on the ability of each procurement system to meet seven common satisfying criteria. A scale of 1 to 5 is used, where 1 is the minimum and 5 the maximum. Masterman (1992) stated that the use of this technique in determining clients’ needs is valid, but is flawed with subjectivity.

A number of procurement selection tools have been developed by weighting selection criteria against specific procurement methods (e.g., Franks, 1990; Griffith and Headley, 1997; Kumaraswamy and Dissanayaka, 1998; NSW, 2006). Weighted score models are a common technique to use and combine quantitative and qualitative measures as an aid to operational decision-making and enable multiple criteria to be taken into account. Each criterion is weighted depending upon its relative importance, and the most important is awarded the highest weighting. A score is assigned to each procurement method under consideration. The product of criterion weightings and procurement route scores is calculated for each procurement method. The method with the highest final score is considered most appropriate. In quantitative terms,

$$\sum_{i=1}^{n} W_{ij} S_{ik}$$

Where n is the number of criteria, i = 1,2,3……n is the criterion used, W is the weighting of the criterion for a particular project, j is the number assigned to a particular job, S is the score of the criteria for a particular procurement method, and k is a particular procurement method.

Griffith and Headley (1997) advocated the use of this method to select a procurement method for small building works. They suggest that the determination of the best procurement method for small building works in any given situation involves a two-stage process. The first stage considers the procurement methods potentially available (k) and the relative importance of identified criteria considered to impinge upon the works (i) for each of the potential procurement methods (S).

Details of various procurement selection systems and tools are provided in Appendix C.

For a particular small works job, experience, together with recorded data from similar works undertaken should be used to identify a series of possible procurement routes (Griffith and Headley, 1997). For example, the following could be considered for a specific project:

- Method 1: k = Schedule of rates (SOC)
- Method 2: k = Cost reimbursement contract (CRC)
- Method 3: k = Daywork term contract (DTC)
Table 9: Procurement routes and checklist for small building works (Adapted from Griffith and Headley, 1997:p.343-344)

<table>
<thead>
<tr>
<th>Procurement routes</th>
<th>Checklist for the identification of the salient and important features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lump sum contracts</td>
<td>Is the job of a maintenance, alteration or new work nature?</td>
</tr>
<tr>
<td>Cost reimbursement contract</td>
<td>What is the approximate cost of the work?</td>
</tr>
<tr>
<td>Fixed price maintenance contracts</td>
<td>What are the attendant risks accompanying the job itself and also the consequences to the organisation as a whole of defective performance?</td>
</tr>
<tr>
<td>Measured term contracts with schedule of rates</td>
<td>What is the desired standard of quality?</td>
</tr>
<tr>
<td>Measurement contracts with in-house or published schedule of rates</td>
<td>What is the time available for the preparation of documentation?</td>
</tr>
<tr>
<td>Simplified measured term contracts using global rates for certain types of work</td>
<td>Does minimising the cost of work outweigh other considerations?</td>
</tr>
<tr>
<td>Specialist term contracts</td>
<td>What is the complexity of the work?</td>
</tr>
<tr>
<td>Daywork term contracts</td>
<td>What is known of the scope of the work at the outset?</td>
</tr>
<tr>
<td>Standing orders</td>
<td>What is the predictability of the work?</td>
</tr>
<tr>
<td>Negotiated contracts</td>
<td>What is the probability of variations being made to the scope of the work during progress?</td>
</tr>
<tr>
<td>Directly employed labour</td>
<td>To what extent is the composition of the total work order understood in detail?</td>
</tr>
<tr>
<td></td>
<td>To what extent is there a complete understanding of what happens during the total process of procuring work within each of the available methods?</td>
</tr>
<tr>
<td></td>
<td>Are there any geographical constraints?</td>
</tr>
<tr>
<td></td>
<td>What are the characteristics of the local marketplace?</td>
</tr>
<tr>
<td></td>
<td>Can the work be procured effectively using minimal resource use eg in terms of the staff of the small works department?</td>
</tr>
<tr>
<td></td>
<td>What financial considerations/constraints apply?</td>
</tr>
<tr>
<td></td>
<td>Is there a requirement for subcontracting an element of the work?</td>
</tr>
</tbody>
</table>

The score for each criterion, in this example on a scale of 1 to 4, reflecting poor to excellent, is assigned. The ability of SOC to provide a quick response to the problem at hand is deemed excellent and is given a score of 4 (.). The second stage of the process focuses on the particular small works job. Each criterion is weighted according to its degree of importance (W) and related to the score (S)
of each procurement method. This is summarised by the following process (Griffith and Headley, 1997:p346).

1. The criteria shown in column 1 are weighted according to their relative importance for the project to be undertaken (shown in Column 2).
2. The score, on, a scale 1 to 4 (poor, acceptable, good, excellent) awarded to each criterion (assigned in) for each of the available procurement methods.
3. The product of the criterion weightings and scores are calculated (shown in columns 3 to 5).
4. The sum of the products for each of the procurement methods is calculated (shown in the total score row).
5. The preferred procurement method is that with the highest total score (shown in column 3).

Table 10: Hypothetical scores of criteria for various procurement routes (Adapted from Griffith and Hedley, 1997)

<table>
<thead>
<tr>
<th>Criterion</th>
<th>( k = \text{DTC} )</th>
<th>( k = \text{CRC} )</th>
<th>( k = \text{SOC} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick response</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Certainty of finish date</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Price competitiveness</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Minimal risk for the client</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Minimal client resource use</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 11: Weighted score

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Weighting</th>
<th>( k = \text{DTC} )</th>
<th>( k = \text{CRC} )</th>
<th>( k = \text{SOC} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick response</td>
<td>2</td>
<td>( 2 \times 3 = 6 )</td>
<td>( 2 \times 2 = 4 )</td>
<td>( 2 \times 4 = 8 )</td>
</tr>
<tr>
<td>Certainty of finish date</td>
<td>1</td>
<td>( 1 \times 3 = 3 )</td>
<td>( 1 \times 3 = 3 )</td>
<td>( 1 \times 4 = 4 )</td>
</tr>
<tr>
<td>Price competitiveness</td>
<td>3</td>
<td>( 3 \times 2 = 6 )</td>
<td>( 3 \times 3 = 9 )</td>
<td>( 3 \times 2 = 6 )</td>
</tr>
<tr>
<td>Minimal risk for the client</td>
<td>2</td>
<td>( 2 \times 3 = 6 )</td>
<td>( 2 \times 4 = 8 )</td>
<td>( 2 \times 4 = 8 )</td>
</tr>
<tr>
<td>Minimal client resource use</td>
<td>4</td>
<td>( 4 \times 4 = 16 )</td>
<td>( 4 \times 1 = 4 )</td>
<td>( 4 \times 1 = 4 )</td>
</tr>
<tr>
<td>Total score</td>
<td></td>
<td>( 37 )</td>
<td>28</td>
<td>30</td>
</tr>
</tbody>
</table>

**Multi-attribute Utility Approach**

The MAUA is a more sophisticated approach than weighted score model and is regarded to be the foremost technique appropriate for examining the criteria of clients and the preferences of experts’ weights for each method in the most objective way (Skitmore and Marsden, 1988; Love et al., 1998; Ambrose and Tucker, 2000; Chang and Iye, 2001). MAUA is an attempt to apply a quantitative
decision method to the context of construction procurement route selection so as to provide clear
normative advice for improving the quality of clients’ decision-making (Skitmore and Marsden, 1988;
Singh, 1990; Chan, 1995; Love et al., 1998; Ambrose and Tucker, 2000; Chang and Ive, 2002).

For a client facing a multitude of alternative procurement choices, each choice they make will lead to
a different set of possible consequences (and probability distribution) and degrees of satisfaction.
Expected utility theory dictates that choice x is better than y if and only if the expected utility coming
from x is larger than that of y (Chang and Ive, 2001). This can be expressed as follows

\[ x > y \text{ if and only if } U(x) > U(y) \quad (1) \]

\[
U(x) = \sum_{a \in A} P_x(a) R_x(a)
\]

\[
U(y) = \sum_{a \in A} P_y(b) R_y(b)
\]

where A and B are the sets of consequences brought about by strategies x and y; a and b indicate the
elements of each set; Px(a) and Py(b) are probabilities of each consequence occurring, and Rx(a)
and Ry(b) are the benefits of each consequence. Decisions faced by clients are more complicated
than this and probabilities and benefits are hard to assess. In dealing with this case an objective
measure of probability can be replaced with a subjective judgement and alternative options can be
compared on an equal basis (Skitmore and Marsden, 1988; Chang and Ive, 2002). As a result, the
multi-attribute utility approach is developed, where the expected utility of choice j is determined by

\[
U_j = \sum_{i=1}^{n} w_{ij} x_i
\]

where \( x_i \) is the value given to the attribute i of a utility function, decided by the decision-maker’s
subjective evaluation and \( w_{ij} \) are the utility coefficients relating attributes to options. No matter what
issue is under review, the appropriateness of employing a multi-attribute approach lies with the two
links identified in Figure 1 (Chang and Ive, 2001): link 1, the attributes of the outcome should be able
to fully reflect the decision-maker’s criteria for assessing the consequences of each option; and link 2,
the effect of each option on these attributes of the outcome should be clearly identified. With these
two links combined a comparison of options by assigning subjective evaluation to \( x_i \)
The application of MAUA to a procurement selection problem involves four steps (Singh, 1990; Love et al., 1998):

1. The client weights the relative importance of each criterion (i.e. speed, certainty, flexibility etc) on a scale 1 to 20. This relative score is termed a priority rating.

2. Rationalised priority ratings are then calculated (by dividing each priority rating by the sum of all ratings). The sum of the rationalised priority ratings then will always be equal to 1.

3. Each rationalised priority rating is taken in turn and multiplied by a utility factor representing the extent to which a procurement method satisfies criterion. The utility factors connect each criterion to each procurement method in a consistent way, irrespective of the project. The traditional method, for example, which is considered to be a poor performer in terms of ‘time performance’, could be given a fairly low utility score.

4. The rationalised priority rating-utility factor products are added for each procurement method and the resulting total ranked in descending order. The most appropriate procurement method is taken to be the one with the highest total.

An example of procurement decision chart is shown in . In the chart the rationalised priority rating utility products are in the column labelled results. The sum of these for each procurement option is shown in the last row, together with the rank order of the total. In this example, the best procurement option is novation, with a total sum of 84.59. Love et al. (1998) found that novation was the ideal procurement method for all 41 projects analysed, despite the use of other forms. Also, the clients sampled were most satisfied with novation, design and build and traditional lump sum methods.

While MAUA can provide a suitable outcome for procurement selection it has its limitations. The problem with this technique lays with the selection of procurement criteria, specifically those identified by NEDO (Chang and Ive, 2002). Chang and Ive (2002) suggest that there is an inappropriate association of procurement routes with differing coefficients for priority variables due to the assumption of complete contracting. In overcoming these limitations expert systems can be developed to replace the deterministic and generic utility coefficients to the linking of consequence
variables (i.e. criteria against which the achievement of client’s goal is assessed) with particular procurement methods (Chang and Iye, 2001).

**Analytical Hierarchy Process**

Cheung et al. (2001) and Al-Tabtabi (2002) attempted to improve the robustness of selecting priority weightings for by using the analytical hierarchy process (AHP). AHP is a multi-objective and multi-criteria decision-making approach which employs a pairwise comparison procedure to arrive at a scale of preferences among a set of alternatives. To apply AHP, the following logical steps are adopted:

1. Breakdown a complex unstructured problem into component parts, enabling identification of constituent attributes associated with the problem.
2. Arrange the constituent parts into a hierarchical order of several levels that can be more easily comprehended and evaluated (enables understanding of each part within its appropriate context).
3. Assign numerical values to subjective judgements based on the relative importance of each variable.
4. Synthesise the judgements to determine which variables have the highest priority and should be acted upon to influence the outcome.
Table 12: A simplified version of a procurement route decision chart presented in Love et al. (1998)

<table>
<thead>
<tr>
<th>Client’s priority variables</th>
<th>Client priority weighting</th>
<th>Rationalised priority rating</th>
<th>Utility factor</th>
<th>Result</th>
<th>Utility Coefficient</th>
<th>Result</th>
<th>Utility Coefficient</th>
<th>Result</th>
<th>Utility Coefficient</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>15</td>
<td>0.11</td>
<td>52.50</td>
<td>5.59</td>
<td>90.50</td>
<td>9.63</td>
<td>88.60</td>
<td>0.00</td>
<td>83.50</td>
<td>8.88</td>
</tr>
<tr>
<td>Certainty</td>
<td>20</td>
<td>0.14</td>
<td>88.50</td>
<td>12.55</td>
<td>55.60</td>
<td>7.89</td>
<td>50.20</td>
<td>7.12</td>
<td>85.60</td>
<td>12.14</td>
</tr>
<tr>
<td>Flexibility</td>
<td>14</td>
<td>0.10</td>
<td>75.60</td>
<td>7.51</td>
<td>95.60</td>
<td>9.49</td>
<td>94.80</td>
<td>9.41</td>
<td>73.80</td>
<td>7.33</td>
</tr>
<tr>
<td>Quality</td>
<td>18</td>
<td>0.13</td>
<td>100</td>
<td>12.77</td>
<td>73.60</td>
<td>9.40</td>
<td>71.20</td>
<td>9.09</td>
<td>85.20</td>
<td>10.88</td>
</tr>
<tr>
<td>Complexity</td>
<td>12</td>
<td>0.09</td>
<td>80.60</td>
<td>6.86</td>
<td>105</td>
<td>8.94</td>
<td>100</td>
<td>8.51</td>
<td>95.30</td>
<td>8.11</td>
</tr>
<tr>
<td>Risk allocation</td>
<td>19</td>
<td>0.13</td>
<td>80.00</td>
<td>10.78</td>
<td>45.00</td>
<td>6.06</td>
<td>40.00</td>
<td>5.39</td>
<td>92.50</td>
<td>12.46</td>
</tr>
<tr>
<td>Responsibility</td>
<td>17</td>
<td>0.12</td>
<td>88.60</td>
<td>10.68</td>
<td>36.00</td>
<td>4.34</td>
<td>35.80</td>
<td>4.32</td>
<td>90.50</td>
<td>10.91</td>
</tr>
<tr>
<td>Arbitration and disputes</td>
<td>10</td>
<td>0.07</td>
<td>75.30</td>
<td>5.34</td>
<td>58.30</td>
<td>4.13</td>
<td>55.20</td>
<td>3.91</td>
<td>95.60</td>
<td>6.78</td>
</tr>
<tr>
<td>Price competition</td>
<td>16</td>
<td>0.11</td>
<td>94.50</td>
<td>10.72</td>
<td>90.00</td>
<td>10.21</td>
<td>90.00</td>
<td>10.21</td>
<td>62.50</td>
<td>7.09</td>
</tr>
<tr>
<td>Totals</td>
<td>141</td>
<td>1.00</td>
<td>82.80</td>
<td>70.09</td>
<td>57.97</td>
<td>84.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rank Order</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Numerical values are assigned to variables based on pairwise comparison. The decision-maker should compare the elements, at a given level, on a pairwise basis to estimate their relative importance in relation to the element at the immediately higher (or preceding) level. For instance, while performing this comparison, one can ask how important is variable X relative to variable Y, with respect to the relevant immediately preceding variable Z. These comparisons can be made using a nine-point ratio scale developed by Saaty and Vargas (1991) and are presented in (Cheung et al., 2001:p.431). If a client indicates that ‘speed’ is a very strongly more important than ‘certainty’, then the rating assignment matrix would appear as identified in . If speed is considered to be strongly importance compared to certainty in the selection of a procurement strategy for a project, a ‘7’ is inserted in the juncture cell between speed and certainty.

**Table 13: AHP pair wise comparison matrix**

<table>
<thead>
<tr>
<th>Intensity of importance</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equal importance</td>
<td>Two criteria are of equal importance</td>
</tr>
<tr>
<td>3</td>
<td>Weak importance of one over another</td>
<td>Experience and judgement slightly favour one criterion over another</td>
</tr>
<tr>
<td>5</td>
<td>Essential and strong importance</td>
<td>Experience and judgement strongly favour one criterion over another</td>
</tr>
<tr>
<td>7</td>
<td>Very strong and demonstrated importance</td>
<td>A criterion is strongly more important than the other</td>
</tr>
<tr>
<td>9</td>
<td>Absolute importance</td>
<td>The evidence favouring one criterion is strongly more important than the other</td>
</tr>
<tr>
<td>2,4,6,8</td>
<td>Intermediate values between adjacent scale values</td>
<td>When comprise is needed</td>
</tr>
<tr>
<td>Reciprocals of above non-zero</td>
<td>If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value compared with i.</td>
<td>A reasonable assumption</td>
</tr>
</tbody>
</table>
Table 14: Rating assignment matrix (Cheung et al. 2001:p.431)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Speed</th>
<th>Certainty</th>
<th>Flexibility</th>
<th>Quality</th>
<th>Complexity</th>
<th>Risk avoidance</th>
<th>Price competition</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td></td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certainty</td>
<td></td>
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<tr>
<td>Flexibility</td>
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</tr>
<tr>
<td>Quality</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
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<td></td>
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<td></td>
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<tr>
<td>Risk avoidance</td>
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<td></td>
</tr>
<tr>
<td>Price competition</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

There are numerous software applications that can be used to undertake the pairwise comparisons such as ExpertChoice© (Version 10). Using this software in conjunction with MAUA and NEDO criteria, Cheung et al. (2001) were able to match the procurement method identified with what was actually used in real-life for approximately 50% of projects investigated. Cheung et al. (2001) concluded that AHP improved the objectivity and consistency of the weightings for criteria and deemed their system to be reliable. They suggested that the non-matching of procurement strategies was due to the clients being risk averse and leaning toward the use of traditional procurement systems with which they were familiar with.

Alhazmi and McCaffer (2000) developed a project procurement system selection model based on AHP and Parker’s (1985) judging alternative technique of value engineering into a multi-criteria multi-screening system. The system developed by Alhazmi and McCaffer (2000) is very complicated and tedious, and the reliability of the output that is presented is questionable considering the level of detail the system goes through to determine a suitable procurement system. Initially, evaluation criteria are established to judge competing procurement systems for feasibility. Then each of the procurement systems are scored using a scale of 0 to 5, with 5 being the score for the highest probability of implementation for the least time, most benefit and required quality. The purpose of scoring is to determine a list of feasible and non-feasible procurement options.

Once the list is complete then a comparison of feasible procurement systems is made by listing the advantages and disadvantages of each. Once the systems are compared then they are ranked according to the preferences of decision-makers. The lowest ranked systems are eliminated and then the highest ranked are used for the next stage. A weighted evaluation process is next used to identify the optimum procurement system with reference to the factors considered to be the most influential in the selection process. During this stage, the initial steps of the AHP are employed: (1) determination of pairwise comparisons and (2) development of the matrix analysis. Like Cheung et al. (2001)
pairwise comparisons for client criteria are determined (1). Criteria used for their example were classified under the following four categories:

1. **Total cost of the project** – capital cost, maintenance cost, prequalification cost, cost overrun, and reduction of financial risk.
2. **Time** – construction time, early start of construction, planning and design time, rapid response to new needs, minimisation of interference, speed of construction, and time overrun.
3. **Quality** – design reliability and durability, design innovation, building systems guarantees, suitability for intended purpose, flexibility, and aesthetic appearance of the building.
4. **General needs** – parties involvement, allocation of responsibilities, professional team performance, cooperation and motivation, safety, accountability, and existing building operation/disruption caused

Once weights are established for the client’s priority weightings, then these are evaluated against the procurement systems that survived the ‘culling’ process. The procurement systems are scored 1 to 5 with 1 being poor, and 5 excellent. The procurement systems for the criteria are scored by experts for each criterion. For example, design and build was considered to be an excellent performer in relation to the criterion of capital cost. In the final screening the software ExpertChoice is used to determine the ideal form of procurement system by considering client needs and procurement options available.

**Decision Support Systems**

While such tools such as the weighted score model, MAUA and AHP fulfil their intended purpose of rationalising procurement selection decisions, they fail to address the implicit interrelationships that exist between various procurement selection criteria (Luu et al., 2005). In reality, however, a combination of procurement selection criteria such as speed, time, certainty, etc have to be considered to encapsulate the distinctive characteristics for each project and client. Several decision support tools (e.g., Sidwell et al. 2001c; Luu et al. 2003) and expert systems such as ELSIE (Brandon et al., 1990), PASCON (Moshini and Botros, 1990), and Performance Integrated Procurement System (PIPS) (Kashiwagi and Mayo, 2001) have been developed in an attempt to automate the procurement selection process. Yet, whether they can provide a reliable and accurate solution is questionable considering the complexity of the procurement process and the number of stakeholders who have a vested interest in a project.

While it has become increasingly evident over recent years that an appropriate choice of procurement system is necessary for project success, it is not sufficient to ensure it. For example, management, organisation and contextual variables are more strongly associated with project performance than the procurement form itself (Walker, 1994; Kurmaraswamy and Dissanayka, 1998; Alhazmi and McCaffer, 2000; Chan et al., 2001). Masterman (1992) states that procurement selection decisions should be founded on the success or failure of previous examples and coupled with intuition in achieving the distinctive requirements of the current situation.

Sidwell et al. (2001c) have attempted to address this problem with the development of their ‘Value Alignment Delivery Model’ and classifies projects in terms of size, complexity, predictability and objectives (speed, economy and workmanship quality). The system relies on a database of previous projects to assist the decision-maker during the design phase of a project. Like other systems it is cumbersome to use with no guarantee that it will produce a reliable result that will meet the needs of the client. Intuition and experience is needed by the decision-maker to make the final procurement decision once a recommendation is identified. Agreeably, the decision-maker should use the decision-support system as a means to explore alternatives through ‘what if analysis’, but the development of such a tool for procurement selection is far too complex because of the array of variables that need to be considered.
Sidwell et al. (2001c) suggest that the decision support system they have developed is able to determine what variables add value to a project, but the definition of ‘value’, its quantification and ‘value to whom’ is not identified. While Sidwell et al. (2001c) decision support system is still under development it is difficult to evaluate its effectiveness as limited information pertaining to the theoretical underpinning (i.e. why this system is better than other systems that use MAUA, case-based reasoning etc) and underlying logic as to why and how decisions and processes associated with the selection of various procurement options are made.

Luu et al. (2003:p.429) state that a decision support system for procurement selection should take into account the “various requirements unique to the client, project and external environment so that the success of the project is not a result of mere chance but direct and guaranteed contribution of the procurement system”. Luu et al. (2003) have recognised the importance of learning from previous experiences with regard to procurement selection and developed a system based on case-based reasoning system referred to as Case-Based Procurement Advisory System (CPAS), which utilises the case-based reasoning shell ART*Enterprises. Similar in principal to the system developed by Sidwell et al. (2001c), CPAS is an experience-based approach, the experiences of previous cases are made available to users to provide early indication of the likely future outcomes of a prospective project. The system comprises of the following modules: input, criteria, selection and output. The input module provides the user with an interface with which to provide data about the client, project and environment. This data is then fed into the criteria module. The criteria module is responsible for compiling the procurement selection criteria and descriptors (linguistic conditions) for each condition (Luu et al., 2005).

Ng et al. (2002) have suggested that procurement selection criteria such as those identified by NEDO (1985) are fuzzy (linguistic) in nature requiring decision-makers value judgements when assessed. The criteria complexity, for example, may exhibit a level of vagueness concerning its semantic meaning (Ng et al., 2002). Recognising the problems with procurement selection criteria, Luu et al. (2003) developed a series of linguistic classifications for criteria the NEDO criteria they used. Terms such as high flexibility, low complexity, and medium quality were used to denote clients’ requirements. Noteworthy, the assignment of appropriate linguistic classifications for the identified criteria requires a considerable amount of experience. Input data is used to retrieve from the case library with characteristics and requirements similar to the project being examined. The list of predominant criteria and descriptors are provided to user through the user interface of the output module. Depending on the weightings and linguistic classifications entered, similar cases are retrieved by a selection module.

**Strategic needs analysis** (From Smith, J., et al. 2008)

The term strategic needs analysis (SNA) was initially used to address problems that arose during the development of strategic performance briefs (Wyatt and Smith, 2000; Wyatt et al, 2004). SNA starts with the premise that the solution delivered will be the most appropriate to satisfy the stakeholder’s strategic needs and this is likely to be, but may not always be assumed to be the construction of a new facility. SNA is designed to make a valuable contribution to this important formative stage of a project. It reflects and is sensitive to the strategic direction identified in the strategic management process and so overlaps it. Indeed, strategic management (David,1997; Thompson and Strickland , 2001) and problem solving approaches (Ackoff, 1978) have greatly influenced the development of this approach and it is designed specifically for the concept or project inception stages of a project.

An essential aim of SNA process is to assist clients to re-orientate the definition of projects (project initiation) from the prescriptive and standard response, to one where they have a strategic view of their own organisation’s true goals, objectives, needs and requirements. SNA is an effective method of ensuring that the proposed project fits within the strategic framework for delivery of their services now, and in the future. The SNA process aims to (Wyatt and Smith, 2000):
• develop a service vision for the organization based on a clear understanding of the nature of the use and demand for such services;
• involve as many of the existing and potential stakeholders in such a facility in the definition of alternative strategies;
• identify as many realistic alternative strategies for the achievement of the vision;
• analyze the alternative strategies with the stakeholders; and
• decide on a preferred strategy.

Noteworthy, Smith and Jackson (2000) state the progress toward a feasible solution can only be achieved with the cooperation of the senior management that makes and implements the decision to build. An essential part of the process is that stakeholders should broaden and re-orientate their frame of reference in defining projects (project inception) from the prescriptive and standard response, to one where they have a strategic view of their own organisation’s true goals, objectives, needs and requirements (Wyatt and Smith, 2000). Any projects arising out of this process should be able to withstand scrutiny and justification both internally and externally (Quinn et al., 1988). The identified options should be consistent with the strategic direction enunciated by the organisation in its strategic management process. To withstand this type of examination the preferred strategy should be developed as a result of a rigorous analysis and evaluation process. The SNA process follows standard planning workshop, problem-solving approaches (Lichfield et al., 1979; Rosehead, 1989; Checkland and Scholes, 1990; Popper, 1994). That is the stages involve and are divided into the following major activities:

1) collect information to understand the nature of the problem;
2) discuss and analyze the problem;
3) develop options to solve the problem;
4) decide on a preferred option or direction, and
5) make a recommendation to implement the decision on the basis of workshop activities.

The above activities are condensed into a three-stage process for the purpose of implementing the SNA:

1) Information seminar (understand the problem).
2) Workshop One (develop appropriate options to solve the problem).
3) Workshop Two (decide and recommend)
### APPENDIX D

**Table 15: Comparison of procurement systems (Adapted from Cox and Clamp, 1990)**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Traditional (Separated)</th>
<th>Design and Construct (Integrated)</th>
<th>Management (Packaged)</th>
<th>Collaborative (Relational)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed</strong></td>
<td>Not the fastest of methods. Desirable to have all information at the tender stage. Consider two stage or negotiated tendering.</td>
<td>Relatively fast method. Pre-tender time largely depends on the amount of detail in the client's requirements. Construction time reduced because design and building proceed in parallel.</td>
<td>Early start on site is possible, long before tenders have been invited for some of the works packages.</td>
<td>High level of dependence on relationships, teamwork, and the adaptability and performance of individuals, more demanding on all personnel involved, and difficult culture and attitude shifts/changes required of many</td>
</tr>
<tr>
<td><strong>Complexity</strong></td>
<td>Basically straightforward but complications can arise if the client or their representative requires that certain subcontractors are used.</td>
<td>An efficient single contractual arrangement integrating design and construction expertise within one accountable organisation.</td>
<td>Design and construction skills integrated at an early stage. Complex management operation requiring sophisticated techniques.</td>
<td>Considerable complexity involved. Collaboration and mutual scope development enable the team to resolve environmental issues or those that require special stakeholder involvement for example.</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td>Client requires certain standards to be shown or described. Contractor is wholly responsible for achieving quality on site.</td>
<td>Client’s representative has no direct control over the contractor’s performance. Contractor’s design expertise may be limited. The client has little say in the choice of specialist sub-contractors.</td>
<td>Client requires certain standards to be shown or described. Management contractor responsible for quality of work and materials on site.</td>
<td>Some potential for quality to be comprised to meet cost targets, mitigated by cost targets and client involvement</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Client’s representative controls design and variations to a large extent.</td>
<td>Almost none for the client once the contract is signed without cost penalties. Flexibility in developing details or making substitutions is to the contractor’s advantage.</td>
<td>Client can modify or develop design requirements during construction. Management contractor can adjust programme and costs.</td>
<td>Project scope is developed collaboratively albeit unclear or uncertain in the concept phase. Effort is required to properly define in the time available. Requires a high degree of flexibility but fixed within a Target Outturn Cost (TOC) constraint.</td>
</tr>
<tr>
<td><strong>Certainty</strong></td>
<td>Certainty in cost and time before commitment to build. Clear accountability and cost monitoring at all stages.</td>
<td>There is a guaranteed cost and completion date.</td>
<td>Client is committed to start building on a cost plan, project drawings and specification only.</td>
<td>Once the TOC is determined history of alliance projects has shown that few exceed cost. Past project have also demonstrated adherence to time deadlines</td>
</tr>
<tr>
<td><strong>Competition</strong></td>
<td>Competitive tenders are possible for items. Negotiated tenders reduce competitive element.</td>
<td>Difficult for the client to compare proposals which include for both price and design. Direct Design and Build very difficult to evaluate for competitiveness. No benefit passes to client if the contractor seeks greater competitiveness for specialist work and materials.</td>
<td>Management contractor is appointed because of management expertise rather than because their fee is competitive. However, competition can be retained for the works packages'.</td>
<td>Selection is based on non-cost criteria in the case of a pure alliance, Alternative models of procurement are introducing elements of cost competition at the time of tender, Selection criteria include an ability to work in a collaborative environment.</td>
</tr>
<tr>
<td><strong>Responsibility</strong></td>
<td>Can be clear-cut division of design and construction. Confusion possible where there is some design input from the contractor or specialist subcontractors and suppliers.</td>
<td>Can be clear division, but confused where the client’s requirements are detailed as this reduces reliance on the contractor for design or performance. Limited role for the client’s representative during construction.</td>
<td>Success depends on the management contractor’s skill. An element of trust is essential. The professional team must be well coordinated through all the stages.</td>
<td>The contract has a heavy focus on collaboration. Developing and maintaining relationships with the use of expert facilitation is the key. Davis (2005).</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>Generally fair and balanced between the parties.</td>
<td>Can lie almost wholly with the contractor.</td>
<td>Lies mainly with the employer – almost wholly in the case of construction management.</td>
<td>Project risks are shared and collaboratively managed. Complex 3 limb model used to manage the financial risk and reward</td>
</tr>
<tr>
<td>Summary</td>
<td>Benefits of <strong>cost</strong> and <strong>quality</strong> but at the expense of <strong>time</strong>.</td>
<td>Benefits of <strong>cost</strong> and <strong>time</strong> but at the expense of <strong>quality</strong></td>
<td>Benefits of <strong>time</strong> and <strong>quality</strong> but at the expense of <strong>cost</strong></td>
<td>Alliances instil a no blame culture of collaboration and trust. Fiscal transparency is at the fore. Selection on the basis of best for project generates commitment and alignment of mutual goals Davis (2005)</td>
</tr>
</tbody>
</table>
**APPENDIX E**

Table 16: Documented priority variables affecting the client’s decision for procurement systems (Chang and Ive, 2002: p.278)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Speed</td>
<td>1. Time</td>
<td>1. Speed</td>
<td>1. Speed</td>
</tr>
<tr>
<td>How important is early</td>
<td>Is early completion</td>
<td>How important is</td>
<td>How important is</td>
</tr>
<tr>
<td>completion to the success of</td>
<td>completion required?</td>
<td>early completion</td>
<td>early completion to</td>
</tr>
<tr>
<td>your project?</td>
<td></td>
<td>to the success</td>
<td>the success of your</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of your project?</td>
<td>project?</td>
</tr>
<tr>
<td>Do you require a firm price</td>
<td>Is a firm price</td>
<td>certainty</td>
<td>Does your organisation</td>
</tr>
<tr>
<td>and/or a strict completion</td>
<td>needed before any</td>
<td></td>
<td>require a firm price</td>
</tr>
<tr>
<td>date for the project before</td>
<td>commitment to</td>
<td></td>
<td>and/or a strict</td>
</tr>
<tr>
<td>you can commit yourself to</td>
<td>construction is formed?</td>
<td></td>
<td>completion date for</td>
</tr>
<tr>
<td>proceed with construction?</td>
<td></td>
<td></td>
<td>the project before</td>
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<td></td>
<td></td>
<td></td>
<td>your organisation</td>
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<td></td>
<td></td>
<td></td>
<td>can commit to a building</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>project?</td>
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<tr>
<td>To what degree do you</td>
<td>Are variations</td>
<td>variation</td>
<td>During the course of</td>
</tr>
<tr>
<td>foresee the need to alter</td>
<td>necessary after work</td>
<td></td>
<td>a building project,</td>
</tr>
<tr>
<td>the project in any</td>
<td>has begun on site?</td>
<td></td>
<td>to what extent does</td>
</tr>
<tr>
<td>way once it has begun on</td>
<td></td>
<td></td>
<td>your organisation</td>
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<tr>
<td>site?</td>
<td></td>
<td></td>
<td>feel it necessary to</td>
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<td></td>
<td></td>
<td></td>
<td>later the project in</td>
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<td></td>
<td></td>
<td></td>
<td>any way once it has</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>begun on site?</td>
</tr>
<tr>
<td>What level of quality,</td>
<td>Is high quality</td>
<td>level</td>
<td>What level of quality</td>
</tr>
<tr>
<td>aesthetic appearance do you</td>
<td>important?</td>
<td></td>
<td>do you require in the</td>
</tr>
<tr>
<td>require in the design and</td>
<td></td>
<td></td>
<td>design and workmanship</td>
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<tr>
<td>workmanship?</td>
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</tr>
<tr>
<td>Does your building need to be highly specialised, technologically advanced or highly serviced?</td>
<td>Is the building highly specialised, technologically advanced or highly serviced?</td>
<td>Does your building (as distinct from what goes into it) need to be technically advanced or highly serviced?</td>
<td>Does your organisation require a technologically advanced or highly specialised building?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Is it important for you to choose your construction team by price competition, so increasing the likelihood of a low price?</td>
<td>Is completion on time important?</td>
<td>Do you need to choose your construction team by price competition?</td>
<td>Is it important to select the construction team by price competition?</td>
</tr>
</tbody>
</table>

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<tr>
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</thead>
<tbody>
<tr>
<td>To what extent do you wish one single organisation to be responsible for the project or to transfer the risks of cost and time slippage?</td>
<td>Is transfer of responsibility for the consequence of slippages important?</td>
<td>Do you want to pay someone to take the risk of cost and time slippage from you?</td>
<td>Does your organisation want to limit the amount of speculative risk and design liability?</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Is single point responsibility wanted?</td>
<td>Can you manage separate consultancies and contractor, or do you want just one firm to be responsible after the briefing stage?</td>
<td>To what extent do you wish one single organisation to be responsible for the project; or to transfer the risks of cost and time slippage?</td>
<td>Do you want professional accountability to you from the designers and cost consultants?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>To what extent does your organisation wish to avoid disputes and arbitrations?</td>
<td>To what extent does your organisation wish to avoid disputes and arbitrations?</td>
<td>To what extent does your organisation wish to avoid disputes and arbitrations?</td>
</tr>
</tbody>
</table>
### APPENDIX F

Table 17: Client priorities for procurement selection

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of design competition</td>
<td>Client experience</td>
<td>Design development flexibility</td>
</tr>
<tr>
<td>Level of price competition</td>
<td>Client type</td>
<td>Extent of design input by the agency</td>
</tr>
<tr>
<td>Economy</td>
<td>Client’s in-house technical capability</td>
<td>Flexibility of scope resolution</td>
</tr>
<tr>
<td>Value for money</td>
<td>Client’s financial capacity</td>
<td>Ability to address complexity</td>
</tr>
<tr>
<td>Life cycle costs</td>
<td>Client’s willingness to take risks</td>
<td>Ability to address uncertainty</td>
</tr>
<tr>
<td>Cost certainty</td>
<td>Client’s willingness to be involved</td>
<td>Ability to address the extraordinary</td>
</tr>
<tr>
<td>Speed</td>
<td>Client’s trust toward other parties</td>
<td>Cost/time with brief quality</td>
</tr>
<tr>
<td>Time certainty</td>
<td>Client’s requirement for highly serviced or technically advance building</td>
<td>Flexibility with the design brief</td>
</tr>
<tr>
<td>Urgency to complete project</td>
<td>Client’s requirement for aesthetic building</td>
<td>Flexibility with scope, agency, design and technology change</td>
</tr>
<tr>
<td>Urgency to commence construction</td>
<td>Client’s requirement for on-time completion</td>
<td>Impact of design change</td>
</tr>
<tr>
<td>Importance of intermediate milestones</td>
<td>Client’s requirement for within budget completion</td>
<td>Brief/design realisation risk/cost</td>
</tr>
<tr>
<td>Aesthetic value</td>
<td>Client’s requirement for low maintenance cost</td>
<td>Package coord/interface risks</td>
</tr>
<tr>
<td>Durability</td>
<td>Client’s requirement for low operational cost</td>
<td>Risk with design extra costs</td>
</tr>
<tr>
<td>Innovations</td>
<td>Client’s requirement or value for money</td>
<td>Designer continuity</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>Project size</td>
<td>Contractor design responsibility</td>
</tr>
<tr>
<td>Construction risks allocation</td>
<td>Project types</td>
<td>Optimising life cycle costs</td>
</tr>
<tr>
<td>Design risks allocation</td>
<td>Building construction type</td>
<td>Optimising maintenance and design and defects minimisation</td>
</tr>
<tr>
<td>Financial risk allocation</td>
<td>Project site location</td>
<td>Contractor maintenance responsibility</td>
</tr>
<tr>
<td>Other risk allocation</td>
<td>Unknown site risk factors</td>
<td>Completion timing certainty</td>
</tr>
<tr>
<td>Need for mid project design changes</td>
<td>Known factors likely to cause problems</td>
<td>Completion timing minimised</td>
</tr>
<tr>
<td>Need to be kept informed</td>
<td>Usage of pioneering technology</td>
<td>Min. time pre-contract</td>
</tr>
<tr>
<td>Need to be involved</td>
<td>Market’s competitiveness</td>
<td>Flexibility with timing changes</td>
</tr>
<tr>
<td>Need to assign single point responsibility</td>
<td>Technology feasibility</td>
<td>Flexibility with cashflow control</td>
</tr>
<tr>
<td>Need to delegate decision-making</td>
<td>Regulatory feasibility</td>
<td>Early start to design</td>
</tr>
<tr>
<td>Desire for good communication</td>
<td>Materials availability</td>
<td>Staged design allowed</td>
</tr>
<tr>
<td>Health and safety concerns during construction</td>
<td>Experienced contractor availability</td>
<td>Early start to construction</td>
</tr>
<tr>
<td>Importance of planning</td>
<td>Labour productivity</td>
<td>Staging flexibility</td>
</tr>
<tr>
<td>Importance of controls</td>
<td>Inclement weather</td>
<td>Delay effect of one contract on others</td>
</tr>
<tr>
<td>Technology transfer/exchange</td>
<td>Natural disasters</td>
<td>Capital cost minimised</td>
</tr>
<tr>
<td>Technology innovations</td>
<td>Industrial actions</td>
<td>End cost versus budget certainty</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational guarantees</td>
<td>Objection from local lobby groups</td>
<td>Value for money for special projects</td>
</tr>
<tr>
<td>Design life certainty</td>
<td>Objection from neighbour</td>
<td>Risk of contractual claims</td>
</tr>
<tr>
<td>Maintainability</td>
<td>Political constraints</td>
<td>Extent of management/effort for agency for general projects</td>
</tr>
<tr>
<td>Constructability</td>
<td>Cultural differences</td>
<td>Risk contingency in tender prices</td>
</tr>
<tr>
<td>Reduce environmental impacts</td>
<td>Minimising tender costs</td>
<td></td>
</tr>
<tr>
<td>Disputes (and claims) minimisation</td>
<td>Minimising tender process costs</td>
<td>Quality certainty/outcomes/risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality of management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Choice of contractors</td>
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<td></td>
<td>Availability of contractors</td>
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<td></td>
<td></td>
<td>Simplicity of contract</td>
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<td></td>
<td></td>
<td>Reliance of relationships</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Novation/relationship complexity</td>
</tr>
</tbody>
</table>
## Table 18: Procurement selection criteria (Luu et al., 2003:p.216)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Associated variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. External environment</td>
<td>Regulatory feasibility&lt;br&gt;Material availability&lt;br&gt;Technology feasibility&lt;br&gt;Labour productivity&lt;br&gt;Market’s competitiveness and contractor’s availability</td>
</tr>
<tr>
<td>2. Project risks</td>
<td>Industrial action&lt;br&gt;Political constraints&lt;br&gt;Site risk factors&lt;br&gt;Use of pioneering technology</td>
</tr>
<tr>
<td>3. Client’s long term objectives</td>
<td>Client’s requirement for low operational cost&lt;br&gt;Client’s requirement for low maintenance cost</td>
</tr>
<tr>
<td>4. Client’s short term objectives</td>
<td>Client’s requirement for within budget completion&lt;br&gt;Client’s requirement for on-time completion&lt;br&gt;Client’s requirement for value for money</td>
</tr>
<tr>
<td>5. Client’s characteristics</td>
<td>Client’s experience&lt;br&gt;Client type</td>
</tr>
<tr>
<td>6. Client’s involvement and risk allocation</td>
<td>Client’s willingness to be involved&lt;br&gt;Clients trust toward other parties&lt;br&gt;Client’s willingness to take risks</td>
</tr>
<tr>
<td>7. Project characteristics</td>
<td>Project type&lt;br&gt;Project size&lt;br&gt;Building construction type</td>
</tr>
<tr>
<td>8. Building aesthetics and complexity</td>
<td>Client’s requirement for aesthetic building&lt;br&gt;Client’s requirement for advanced building</td>
</tr>
</tbody>
</table>
### APPENDIX H

#### Table 19: Project characteristics that affect the choice of procurement method

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| **Funding**             | Funding source and availability  
Flexibility of budget including contingencies  
Cash flow requirements / restrictions |
| **Timing**              | Required start date  
Time available for completion  
Flexibility available in the program  
Staging requirements |
| **Policy matters**      | Government policies impacting on the project  
Requirements of regulatory authorities |
| **Project complexities**| Interfaces with other contracts/projects  
Stakeholder attitudes and influence  
Coordination with other agencies  
Principal supplied materials, eg. Furniture  
Environmental, heritage, archaeological issues |
| **Agency requirements** | Extent of control over design activities  
Resource limitations: availability and expertise |
| **Brief**               | Completeness and clarity of the brief  
Likelihood of changes from outside the agency’s control  
(political, funding or technological)  
Status of investigation work  
Availability of design or performance standards |
| **Type of work**        | New work, refurbishment, maintenance or demolition  
Building or civil engineering or other  
Removal of hazardous materials or site rehabilitation  
Specialist technical requirements or technology |
| **Site**                | Geographical location  
Greenfield or developed site  
Premises are currently occupied or vacant  
Availability of site services  
Unknown conditions requiring investigation or preparatory work |
| **Other**               | Value of project  
Desirability/availability of innovative designs, construction techniques, proprietary systems |
## Table 20: Social Capital Action Analysis Framework based on CMM (From Davis and Walker (undated))

<table>
<thead>
<tr>
<th>CMM levels</th>
<th>Social Capital Actions</th>
<th>How can we develop social capital?</th>
<th>Inactive AWARENESS</th>
<th>Pre-active INITIATION</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Trust Accountability + Transparency</td>
<td>By developing trust between SC partners and within-organisation teams through creating an open and honest environment.</td>
<td><strong>AUTOCRATIC</strong> or anarchic decision-making prevails with a dictatorial and <em>ad hoc</em> relationship team management style with no requirement for explaining any rationale.</td>
<td>People see NO need to find <strong>COMMON GROUND</strong> beyond non-essential activities. There are quite different cultures within separate teams and SC partner groups with no desire to change that.</td>
<td>There is a sense that <strong>TRUST IS MISSING</strong> between groups and that it would be a good idea if trust could be achieved. However, there is no real understanding of how trust, accountability and transparency may be linked.</td>
<td>Organisations make a point of providing training</td>
</tr>
<tr>
<td>Structural Ties Strength of Norms and Obligations</td>
<td>By developing strong ties between SC partners and within-organisation teams through linking people with a collaborative team spirit.</td>
<td>People would like to co-operate and <strong>COLLABORATE</strong> more closely but there are many <strong>IMPEDIMENTS</strong> to do so ranging from organisational processes, reward systems and clarity about what loyalty means.</td>
<td>Expectation that each group and individual will look out for themselves with rewards be allotted to those that play the <strong>COMPETITIVE GAME</strong> the hardest. No shared vision.</td>
<td>People would like to co-operate and <strong>COLLABORATE</strong> more closely but there are many <strong>IMPEDIMENTS</strong> to do so ranging from organisational processes, reward systems and clarity about what loyalty means.</td>
<td>Systems are established to bring SC partners</td>
</tr>
<tr>
<td>Shared Understanding Identification and Shared Vision</td>
<td>By developing a shared vision of what all teams wish to achieve that is aligned with win-win outcomes.</td>
<td>People seem to bemoan a lack of common purpose but there are no mechanisms for them to get together to discuss and effectively negotiate their needs. <strong>A LARGE POWER DISTANCE</strong> remains between SC partners.</td>
<td>People seem to bemoan a lack of common purpose but there are no mechanisms for them to get together to discuss and effectively negotiate their needs. <strong>A LARGE POWER DISTANCE</strong> remains between SC partners.</td>
<td>The <strong>RHETORIC OF PARTNERING</strong> and</td>
<td></td>
</tr>
<tr>
<td><strong>ADOPTION</strong></td>
<td>and corporate communications to <strong>INFORM EMPLOYEES</strong> that trust, accountability and transparency are good—but they do not ‘walk the talk’.</td>
<td>together including <strong>INFORMAL COP</strong>. While there is a shared understanding of what ‘should’ happen, processes and SC partner reward system work against this.</td>
<td>collaboration is in place but the details of how to accommodate and processes for negotiating genuine different views is lacking. The dominant vision prevails ‘in theory’.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pro-active ACCEPTANCE + ADAPTATION</strong></td>
<td>There is a focus on first having a <strong>MATCHING VISION TO ACCOUNTABILITY</strong> and then to define accountabilities.</td>
<td>Senior SC partner leaders establish forums and ways to occasionally get groups to interact and share their world view. <strong>COP</strong> and other <strong>LINKAGES</strong> are <strong>ENCOURAGED</strong>.</td>
<td>A project vision and charter is established to identify ways in which <strong>SC</strong> partners can <strong>LINK</strong> their <strong>INDIVIDUAL AIMS</strong> with a project vision. Detailed processes vary on how it is achieved across the SC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Embedded ROUTINISATION + INFUSION</strong></td>
<td>The link between rules, accountability and how these are enacted is clear, understood <strong>REGULARLY REVIEWED AND IMPROVED</strong>.</td>
<td>There is a strong <strong>CULTURE</strong> that recognises, develops and <strong>DEFENDS COLLABORATION</strong> among SC partners.</td>
<td>All levels of management in the SC have an <strong>UNDERSTANDING OF</strong> where they <strong>FIT</strong> in meeting the project vision and how that fulfils or clashes with individual goals.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>